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Does revolution change risk attitudes? Evidence from Burkina Faso

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Abstract

A popular uprising in 2014, led to a revolution that overthrew the sitting President of Burkina Faso. We investigate if individuals' risk attitudes changed due to this revolution. We examine this impact by the main determinants of risk attitudes: gender, age and level of education. The analysis is based on unique panel survey data, allowing us to track the changes in the risk attitudes of the same individuals before, during and after the revolution. Our results suggest that individuals become risk averse during the revolution but return back to their pre-revolution risk attitudes, with a slight increase in their risk attitudes, after the revolution is over.

KEYWORDS
Burkina Faso, exogenous shock, revolution, risk attitudes

JEL CLASSIFICATION
D12, D74, D81, O12, Z10

1 | INTRODUCTION

For a long time, the consensus in influential economic models was that individuals have stable preferences over time, which are exogenous and fixed at least in the short term (Stigler & Becker, 1977). However, with insight from behavioural economics and psychology (Almlund et al., 2011; Barsky et al., 1997; Bauer et al., 2016; Borghans et al., 2008;

Byrnes et al., 1999; Hanoch et al., 2006; Slovic, 1972; Weber et al., 2002), recent empirical economic studies have challenged this to suggest that individuals' risk preferences are domain-specific (Beauchamp et al., 2017; Dohmen et al., 2011). They may be altered by large exogenous shocks, such as natural disasters (Eckel et al., 2009), financial crises (Sahm, 2012) and traumatic events from conflicts (e.g., Bozzoli et al., 2011; Jakiela & Ozier, 2019; Voors et al., 2012) etc. Yet, there is no consensus about the direction of these exogenous shocks and how they affect risk preferences. Some studies find that individuals become more risk tolerant (Voors et al., 2012), others suggest that individuals become risk averse (Cassar et al., 2017), while some find that men become more risk tolerant while the same pattern is not observed for women (Hanaoka et al., 2018). Our overall objective is to examine this ambiguity.

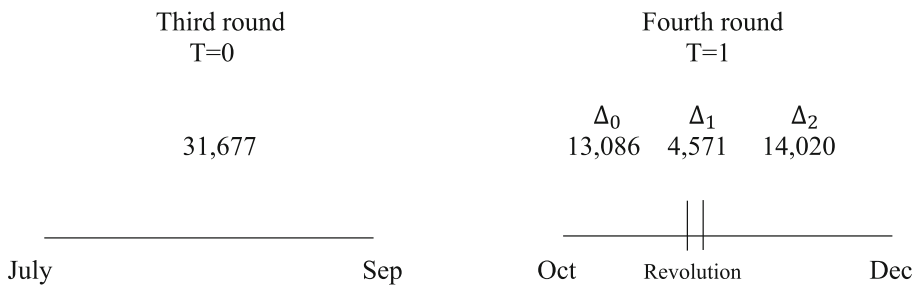
This study investigates if a large general exogenous shock, like a revolution, changes an individual's risk attitudes in Burkina Faso. In 2014, Burkina Faso experienced a popular uprising that resulted in the overthrowing of the sitting President Blaise Compaoré, and led to the loss of family, friends and physical capital. We further test if the revolution has a different impact on the individuals' risk attitudes depending on their gender, age and education, which are the main determinants of risk attitudes.

We understand revolution to be defined as: "a popular uprising that leads to a change in the political regime, which takes place in a relatively short period of time" (see Table A1, Appendix A for an extended overview of the literature). Our aim is to explore how a revolution impacts a fundamental determinant of individuals' economic behaviour, their risk attitudes. Changes in risk attitudes have important consequences for economic behaviour because an individual's willingness to take risk predicts aspects of occupation (Bonin et al., 2007), self-employment (Cramer et al., 2002), investment in human capital (Guiso & Paiella, 2008) and sexual behaviour (de Walque, 2013). For instance, individuals with a lower willingness to take risk (in other words, those who are more risk averse) are less likely to be self-employed and countries with higher aggregate risk aversion have a lower total factor productivity (Dohmen et al., 2011).

The analyses in this study are based on the Household Budget Survey (HBS) data that captures individuals' risk attitudes in the third and the fourth survey rounds of a large nationally representative panel covering 31,677 individuals in Burkina Faso in 2014. The third round was conducted during July–September 2014, whereas the fourth round of data collection was conducted between October–December 2014. It was during this fourth round that the revolution took place and was restricted to a period between October 28 and November 2. This provides us with a unique randomly selected sample of the respondents in the fourth round, which captures the risk attitudes 'during' and 'after' the revolution. Note that the respondents in rounds three and four of the survey are the same individuals. As illustrated by Figure 1, in the fourth round, about 13,086 individuals answered the risk question before the revolution (i.e., before October 28: October 1–27), while 4,571 individuals answered the risk question during the revolution (i.e., between October 28 and November 2). The remaining 14,020 individuals were surveyed after the revolution ended (i.e., from Nov. 3-Dec. 31).

This creates unique panel data where we exploit the timing of the response to our survey through a difference-in-difference approach to identify the effect of revolution on individuals' risk attitudes. This panel structure allows us to track the changes in risk attitudes of the same individuals before, during and after the revolution; and to control for unobserved individual heterogeneity. It thus provides us with the possibility to examine if individuals were more likely to participate in the uprising (risk seeking) rather than staying indoors (risk averse).

We find that during the 2014 revolution in Burkina Faso, individuals became more risk-averse. During the post-revolution period, the risk attitudes returned to the pre-revolution levels, although they remained slightly elevated. While both men and women became more risk-averse during the revolution, some gender differentials are observable. Post-revolution, women are more risk-taking vis-a-vis men. Moreover, during the revolution older individuals become more risk-averse. Both during and in the post-revolution phase, the older individuals are less risk-taking as compared to the younger individuals. Furthermore, individuals with higher education are more risk averse. Post-revolution, those with secondary education are more risk-taking, while individuals with no or low level of education are relatively risk-averse.



Note: The Figure shows the basic setup of this study, which exploits the variation in the timelines of the revolution. We have information of the same 31,677 individuals at two different time points, T={0,1} i.e., the third and fourth round. During the fourth round of data collection of the HBS a revolution occurred. 13,086 individuals answered the risk questions before the revolution (i.e., before October 28: 1-27 October), 4,571 individuals answered the risk questions during the revolution (i.e., between October 28 and November 2), and 14,020 individuals answered after the revolution (i.e., after November 2: Nov. 3 to Dec. 31). As we have a panel structure, the two time points, T={0,1}, allows us to estimate the change in risk attitudes among the same individuals before (Δ_0), during (Δ_1) and after (Δ_2) the revolution.

FIGURE 1 The research setup. *Note*: The figure shows the basic setup of this study, which exploits the variation in the timelines of the revolution. We have information of the same 31,677 individuals at two different time points, $T = \{0,1\}$ i.e., the third and fourth round. During the fourth round of data collection of the HBS, a revolution occurred. 13,086 individuals answered the risk questions before the revolution (i.e., before October 28: 1–27 October), 4,571 individuals answered the risk questions during the revolution (i.e., between October 28 and November 2), and 14,020 individuals answered after the revolution (i.e., after November 2: Nov. 3 to Dec. 31). As we have a panel structure, the two-time points, $T = \{0,1\}$, allows us to estimate the change in risk attitudes among the same individuals before (Δ_0), during (Δ_1) and after (Δ_2) the revolution.

The paper contributes to the literature at several levels. First, this is one of the few, if not the only study that empirically investigates changes in individuals' risk attitudes due to a large political shock like a revolution in a developing country.

[1] Second, it contributes by investigating the direction of the effect of the exogenous shocks on risk attitudes. The results in the previous empirical literature are ambiguous regarding the direction of the impact of an exogenous shock on risk attitudes. Some of these studies are based on analysis of cross-sectional data, collected directly after an exogenous shock like a natural disaster etc. (Hanaoka et al., 2018 is one of the few exceptions). Results from such studies do not fully capture the impact on those that migrate from an area affected by an exogenous shock such as a natural disaster (attrition).

Third, it analyses and collects unique data, at a unique point of time. Risk preferences can be elicited in multiple ways (for an overview see Charness et al., 2013). Our analysis is based on the data that employs a self-reported risk question (similar to that used in previous nationally representative surveys such as the German Socio-Economic Panel, SOEP). The HBS respondents aged 18 years and older were asked the following question to assess their willingness to take risks in general: "How do you see yourself: Are you a person who is fully prepared to take risks or do you try to avoid taking risks? On a scale from 1 to 10, where 1 = not at all willing to take risk and 10 = very willing to take risk. In general?". Previous literature uses different measurements to capture risk preferences. For instance, many studies use different hypothetical lottery questions (Kim & Lee, 2014; Sahm, 2012). Others use subjective or self-reported risk questions (Guiso et al., 2018; Necker & Ziegelmeyer, 2016) or a combination of self-reported questions with other measures such as binary-stock/bond-market participation risk (Malmendier & Nagel, 2011). The different methods of eliciting risk preferences make it difficult to compare the results of these studies. Since our

analysis is based on a nationally representative HBS panel, we are better able to address these reliability and comparability issues (refer to Sepahvand & Shahbazian, 2021b for further details).

Fourth, earlier literature does not analyse the different types of shocks that may have differential effects on different segments of the population. This study further contributes by investigating the effect of revolution on risk attitudes by gender, age, categories and different levels of education.

The following section describes the 2014 Burkina Faso revolution. Section 3 discusses the identification strategy and the empirical methodology. The results and related discussion on the impact of revolution on individual risk attitudes are presented in Section 4. The concluding discussions are presented in the final section.

2 | THE REVOLUTION IN BURKINA FASO

The popular uprising that led to the 2014 revolution, resulting in nationwide uncertainty and the change of the political regime in Burkina Faso, took place between October 28 and November 2. Despite its relativity short time frame, it created a major trauma that fundamentally changed the political landscape in Burkina Faso affecting millions of Burkinabès.

It was President Compaoré attempt to amend the constitution to extend his 27-year term that led to the 2014 Burkinabè uprising. When the President was re-elected in 2010 it was for a constitutionally last term. However, in the hope of staying in power, he had plans to amend the two-term limit set by Article 37 of the constitution. The amendment required a 75% majority in the parliament. On October 21, 2014, the Council of Ministers announced that the National Assembly would vote on amending Article 37 on October 30.

In anticipation of popular protests, all schools and universities in the country were closed on October 26. Large demonstrations and social uprisings had occurred in the past (2011) in Burkina Faso, without resulting in a revolution overthrowing the sitting President (France24, 2011; Bloomberg, 2011).[2] Initial mobilization started on October 28 and thousands of citizens were encouraged by the opposition and the civil rights movement to protest in Ouagadougou, the capital of Burkina Faso.[3] The next morning banks, shops and markets reopened, but the opposition leaders and the civil rights activists led mass rallies, huge protests and occasional clashes with the security forces. By October 30, the protests had spread to other bigger cities across the country such as Bobo-Dioulasso, Ouahigouya, Koudougou, Fada N'gourma.[4] The protests intensified and the street battles between the protestors and the police and the security forces broke out. The building of the National Assembly of the country was attacked and parts of it were set on fire by protestors. Other buildings associated with the President, such as the headquarters of President's party CDP (In French: *Congrès pour la Démocratie et le Progrès*) and residences of the President's family, were also attacked. The protestors got closer to the presidential palace and the state television and radio were stormed. In an attempt to control the crowds, the presidential guard and security forces used tear gas and fired gunshots, thereby killing several of the protesters. During the evening, other incidents of violence and arson, like burning tyres and blocking traffic were also reported in Ouagadougou.

A night curfew was imposed by the military, but the tension persisted between the protesters and the security forces on October 31. It became evident that President Compaoré did not have the authority to stay in power. In a speech to the nation, Compaoré announced that he would resign and General Honoré Nabéré Traoré was named the next head of state. It was later revealed that the French special forces helped President Compaoré to leave the country. The French President Hollande explained that France helped Blaise Compaoré in order to prevent a bloodbath.[5] In the following days, a power struggle ensued within the army and Lieutenant Colonel Yacouba Isaac Zida, seized the opportunity and took power.

In protest, the opposition and the civil right movement called for a large demonstration on November 2 to demand that a civilian government should take power as soon as possible. In order to calm the protest Colonel Zida aligned himself with the protesters and requested the support of international actors such as the African Union (AU), the Economic Community of West African States (ECOWAS) and France. He also sought the support of the domestic

players like military chiefs and key spiritual leaders. He promised on November 3 that a national unity government would rule the country within the framework of the constitution as quickly as possible. These actions by Colonel Zida calmed the situation.

After the revolution, an interim government was put in place with the mandate to prepare the country for national democratic elections. Dr. Michel Kafando, a former vice-president in the United Nations (UN) General Assembly and Burkina Faso's diplomatic representative to the UN, was appointed as the interim President, with Colonel Zida as the interim prime minister. A short military coup dissolved the interim government in September 2015. However, it was not successful in gaining power due to the massive pressure from the Burkinabè people and other regional actors, such as ECOWAS and AU. The general elections were held on November 29, 2015, and Roch Marc Christian Kaboré of the People's Movement for Progress won the elections in the first round of voting and was sworn in as President of Burkina Faso on December 29, 2015, thus bringing greater stability to Burkina Faso.

3 | IDENTIFICATION STRATEGY AND EMPIRICAL METHODOLOGY

3.1 | Data and identification strategy

The analysis is based on a multipurpose Household Budget Survey (HBS) collected by the National Institute of Statistics and Demography (INSD, *Institut National de la Statistique et de la Démographie*) of Burkina Faso.[6] The HBS is a face-to-face national representative panel survey covering 900 enumeration areas (EA)[7] with 12 households per EA, i.e., 10,800 households spread across the 13 regions of Burkina Faso (INSD, 2013). Each household was interviewed in four rounds during 2014. The HBS interviews at the household level were randomly scheduled throughout the country before each round, thus there was no way to self-select the timing or the date of the survey.[8] The additional module on risk attitudes was added during the third and fourth round. It was during the fourth round of the survey that the revolution took place. Thus, we can easily identify the changes in the risk attitudes as the same 31,677 individuals were surveyed using the exact same question modules in the third and the fourth round.

Our identification strategy exploits the exogeneity of the revolution and the timing of the survey (see further discussion on this in Section 3.3). In the absence of an exogenous shock, risk attitudes are assumed to be stable across time. The survey data from the third and fourth round allows us to estimate the change in risk attitudes of the individuals. In round three of the survey between July–September 2014, there is no revolution. During the fourth round, about 13,086 individuals were surveyed before the revolution began (i.e., before October 28: October 1–27). This group is our counterfactual or control group. About 14,020 individuals who were surveyed after the revolution had ended (i.e., after November 2: Nov. 3 – Dec. 31), constitute our treatment group (treatment group 1). The remaining group of 4,571 individuals, which were surveyed during the revolution (i.e., between October 28 and November 2) is our second treatment group (treatment group 2).

3.2 | Difference-in-difference approach

The difference-in-difference (DiD) approach is employed to capture the effect of the revolution (see Figure 1). This implies that we compare the change in the risk attitude over time of the respondents that were surveyed before the revolution in round four (control group: $T = 1$, Δ_0) with those in the group after the revolution in round four (treatment group 1: $T = 1$, Δ_2). The difference-in-difference approach is also employed to capture the effect on the risk attitudes during the revolution. This is done by comparing the change in the risk attitude of the respondents before the revolution (control group: $T = 1$, Δ_0) with those respondents surveyed during the period of the revolution from October 28 to November 2, 2014 (treatment group 2: $T = 1$, Δ_1).[9]

The trends in the risk attitudes are examined before, during and after the revolution (see Appendix B, Figure B2). Optimally, we would want to go back as far as we can to investigate the pre-trends. Our data allows us to go back to the third survey round of 2014 and examine the pre-trend to when the revolution occurred in the fourth survey round. We further argue that the assumption of parallel trends in risk attitudes is fulfilled based on Schildberg-Hörisch (2018) detailed framework as depicted by Figure B1 in Appendix B that shows that an individual's risk preference besides temporary variations is stable over time in the absence of an exogenous shock (like a revolution). We come back to this in the impact of revolution section.

3.3 | Exogeneity and selection bias

Was the 2014 revolution in Burkina Faso an exogenous shock or was it foreseeable? A key assumption underlying our empirical approach is that the revolution was an exogenous shock. However, any covariance of risk attitudes and effects from the revolution may be due to non-random attrition in the sample. We argue that the revolution was exogenous and hence the individuals could not have anticipated it and adapted their self-reported risk attitudes to this shock.

The HBS interviews at the household level were randomly scheduled throughout the country before each round, thus there was no way to self-select the timing or the date of the survey. Figure B3 in Appendix B shows that the distribution of HBS interviews per day during the revolution (October 28 until November 2) is similar to two weeks before and after the revolution. This gives an indication of temporary variations over time and thus no delay in the survey schedule. Moreover, the differences in sample size between control and treatment group 1 relative to the sampling periods (13,086 respondents during 28 days of October 1–27 and 14,020 respondents during about 60 days of November 3 to December 31) is related to the fact that 99% of the observations in treatment group 1 are interviewed in November.[10] The harvest period starts from December and onwards, which implies that the respondents in the HBS are not available for interview as they are working within the agricultural sector.[11] In terms of geographic implementation of the survey over time, Figure B4 in Appendix B shows that the six-day window during the revolution (October 28 to November 2) was spread across the regions in Burkina Faso.

The unanticipated nature of the revolution may also be judged by the fact that none of the foreign governments evacuated their citizens and officials (including the French, Chinese, Americans etc.) to protect them from the expected upheaval of the revolution.[12] This is important, especially since after the tragic events at the US diplomatic compound, in Benghazi and Libya, several nations decided to evacuate their personnel if a violent event was anticipated.

Furthermore, if the revolution was expected, the financial markets would have reflected it (Acemoglu et al., 2018). Burkina Faso is the fourth largest gold producer in Africa and gold accounted for 55% of its total exports in 2014. Figure B5 in Appendix B presents the stock price of Semafo during 2014, which is a Canadian goldmining company with gold production in Burkina Faso,[13] and is registered at the NASDAQ OMX Stockholm in Sweden. It was not until October 29, 2014, that the stock price of Semafo exhibited a sudden fall. And after November 3 the stock price recovered and increased rapidly. We take the evolution of Semafo's stock price as an indication that the financial markets, did not foresee the revolution till it actually occurred between October 28 and November 2.

Our results are robust to a number of potential concerns about selection bias. It may be argued that during the revolution, the risk-seeking individuals were more likely to participate in the uprising and street protests. This may result in them being excluded from the survey due to being physically home-absent during the day of the interview or being jailed, injured or displaced as a result of their participation in the revolution.[14] We verify that this is not the case, and there exists no selectivity in terms of risk-averse individuals in our sample during the revolution (see Appendix B, Table B1). Table B1 shows the number of observations in both survey rounds and the attrition rate for the two treatment groups (during and after the revolution), and the control group. The

attrition rate in treatment group 2 is low, around 1 percentage. This is in line with the attrition rate of the control group. For the first treatment group (after the revolution) we detect a somewhat higher attrition rate, around 5 percentage (647 observations), which depicts attrition in the fourth round. Investigating this further in Table B1, we find that the two groups on average have the same level of risk attitudes. Second, the majority of these missing individuals seem to be the siblings and other relatives of the household head that had migrated seasonally for work in another region. The rest of them were not able to participate in the survey due to sickness or death.

As our survey is conducted in a poor developing country, our interviewers were instructed to return to the surveyed household during the day of the interview if a member of the household was not present at the time of the interview to prevent survey nonresponse, with no return visit on another day. This was possible as the survey implementation was at the level of the enumeration areas rather than the regions. Thus, the random order of the survey rollout was at a disaggregated level. This interviewing strategy allowed our results to remain unaffected by the revolution. All household respondents that were 18 years and older, and were present at the time of interview, have answered the risk question.[15]

Given that the revolution was a large exogenous shock creating nationwide uncertainty across all the 13 regions (rural and urban) of Burkina Faso, we assume that there is no substantial geographic heterogeneity in the participation in the revolution (see Figure B4, Appendix B). This also holds true for the fact that there is no potential for nonrandom attrition correlated with treatment apart from the revolution, such as the day of the week, time of the month effects, as the social uprising and revolution went on both during weekdays and the weekend and did not occur simultaneously with any other holiday or religious day.

4 | IMPACT OF REVOLUTION ON INDIVIDUALS' RISK ATTITUDES

The descriptive statistics for the variables are reported in Appendix C (Table C1) and suggest no difference in the characteristics of the control and treatment groups except for minor differences in terms of religion (Muslim and Animism). However, these differences are not correlated with differential trends in risk attitudes.

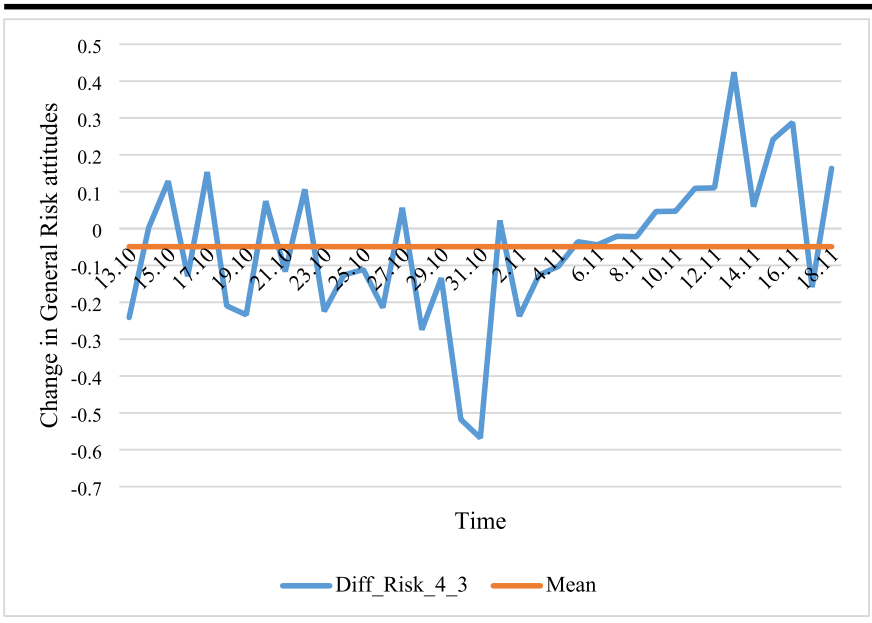
The difference-in-difference (DiD) estimates investigate the effects of treatment groups 1 and 2 separately to illustrate the impact more clearly for each treatment group. These results are presented in Table 1. We find a substantial decrease of about 0.10 standard deviation in risk attitudes during the revolution, as compared to before it occurred. To examine this further, Figure 2 illustrates how the trends in average change per day in risk attitudes move before, during and after the revolution. The average changes in risk attitudes before the revolution (before October 28) are similar for the treatment and control groups and indicate temporary variations. During the revolution (October 28 until November 2) there was a decrease in risk compared to the pre-treatment period in the third survey round. For the post-revolution period (November 3 and onwards) risk attitudes revert back to the pre-revolution levels, with a slow-moving increase in risk-taking.

Our results suggest that during large shocks, like a revolution when the level of uncertainty is high, individuals become more risk averse. The psychological literature argues that experiences of an extreme event or strong emotions influence risk attitudes (for literature review see Loewenstein et al., 2003). However, the direction of the change in risk attitudes depends on the type of shock. For instance, if individuals are faced with a high probability of loss, they are more willing to take risk as compared to a situation with a high possible gain (Tversky & Kahneman, 1992). After the revolution is over, we find that the risk attitudes return to the pre-revolution levels with a slight increase in risk-taking. This increase in risk-taking behaviour may be due to the optimism inspired by the new regime or related to the fact that individuals are adjusting to the decline in the political uncertainty and adapting to the new regime. This implies that changes in the underlying risk preferences may also play a role (e.g., as is in the case of a natural disaster, as shown by Cameron & Shah, 2015). However, it does not change in the same way for the whole population, as some benefit from the optimism during the revolution while others may lose. Our results

TABLE 1 Difference-in-difference results for changes in risk attitudes.

Variables	(1) During	(2) During	(3) After	(4) After
Revolution Impact	**−0.10**	**−0.10**	**0.06**	**0.06**
	(0.03)	**(0.03)**	**(0.02)**	**(0.02)**
Controls	NO	YES	NO	YES
Constant	0.02	−0.23	0.02	−0.48
	(0.02)	(0.33)	(0.02)	(0.25)
Observations	35,314	35,228	54,212	54,102
R-squared	0.001	0.111	0.000	0.111

Note: Shows the DiD estimates for individuals' general risk attitudes during and after the revolution. The dependent variable is measured on a scale from 1 to 10, where 1 = not at all willing to take risk and 10 = very willing to take risk in general, standardized to mean zero and standard deviation one. The individual's gender, age, education, yearly consumption (food and non-food) civil status, household size, hours worked, employment status, health status, religious belief, level of poverty, having access to a bank account, residential zone (urban/rural), subjective poor, illiteracy, employment sector and food shortage are included as controls (for descriptive statistics, see Appendix C, Table C1). Standard errors in parentheses are clustered at the household level. Clustering the standard errors at the individual level shows similar results and the same for running the first-difference estimation to eliminate the individual fixed-effect, available upon request. The mean difference of risk attitudes between treatment groups 1 and 2 is statistically significantly different to zero (*t*-test of mean differences: *P*-value<0.001, corresponds to the "Revolution impact" coefficient).



Note: The Figure shows the average changes per day in general risk attitudes between round four and three for the time period October 13 until November 18 year 2014.

FIGURE 2 Average changes in risk attitudes across time. *Note*: The figure shows the average changes per day in general risk attitudes between rounds four and three for the time period October 13 until November 18 year 2014.

are similar to the literature on civil war and risk attitudes. For example, Voors et al. (2012) also find that in post-conflict situations, individuals become more risk-taking.

Gender is one of the most important determinants of willingness to take risks: previous research has shown that there exists a difference in the levels of risk attitudes between men and women due to shocks such as earthquakes and natural disasters (Eckel et al., 2009; Fessler et al., 2004; Hanaoka et al., 2018), while others find no evidence of gender differences in risk attitudes (Harrison et al., 2007; Nelson, 2016). Table 2 presents the results for the changes in risk attitudes, by gender. We find that women are somewhat more risk-taking as compared to men, after the revolution. However, during the revolution, they are more risk-averse. It may be argued that since the political representation of women is quite low in Burkina Faso (World Development Indicators, 2016) and they are largely limited to the vicinity of their homes, the revolution would not affect their daily lives as much. Thus, while women are risk averse during the revolution, they may perceive the regime change as a positive development. Sepahvand and Shahbazian (2021a; 2021c) also find a similar increase in women's risk attitude after the revolution. Hanaoka et al. (2018), find that men who lived in the areas affected by an earthquake became more risk-tolerant. Our results show that men's risk attitude increases after the revolution, beyond their pre-revolution levels. However, this result is not statistically significant. During the revolution, we find that both men and women become more risk-averse.

Risk attitudes have been shown to decrease with age (Bishai, 2004; Dohmen et al., 2016; Tanaka et al., 2010). Sepahvand and Shahbazian (2021b) show that individuals in Burkina Faso become more risk-averse by age, with a large difference in risk attitudes between the youngest and the oldest cohorts. Almost half of the population in Burkina Faso is under 20 years old (INSD, 2015). Thus, it is interesting to examine if the revolution has a differential impact on the young as compared to the older Burkinabés' risk attitudes. Our results suggest that during the revolution the older individuals are more risk averse as compared to before (see Appendix C, Table C2). In the after-revolution phase, the older individuals are less risk-taking as compared to the younger categories. Thus, irrespective of the treatment group, the older individuals are as a rule more risk averse as compared to the younger ones. These results are consistent with the previous literature.

TABLE 2 Difference-in-difference results for changes in risk attitudes, by gender.

Variables	(During) Female	(After) Female
Revolution Impact * Female (=1)	**−0.11**	**0.02**
	(0.02)	**(0.01)**
Controls	YES	YES
Constant	−0.23	−0.49
	(0.33)	(0.25)
Observations	35,228	54,102
R-square	0.111	0.111

Note: Shows the DiD estimates for individuals' general risk attitudes during and after the revolution for females and males separately. The dependent variable is the same as in Table 1, i.e., risk-taking. The interaction term is an interaction between gender and risk attitudes during and after the revolution. The individual's age, education, yearly consumption (food and non-food) civil status, household size, hours worked, employment status, health status, religious belief, level of poverty, having access to a bank account, residential zone (urban/rural), subjective poor, illiteracy, employment sector and food shortage are included as controls (for descriptive statistics, see Appendix C, Table C1). Standard errors in parentheses are clustered at the household level. The mean difference between and within treatment groups 1 and 2 for female's and male's risk attitudes is statistically significantly different to zero (*t*-test of mean differences, *P*-value<0.001, corresponds to the "Revolution impact" coefficient), with the exception for the mean difference for male's risk attitudes between the after-revolution treatment group and the before-revolution control group (*t*-test of mean differences, *P*-value = 0.3753).

Previous studies on risk attitudes have shown that there exists a positive relationship between the level of education and risk-taking (e.g., Dohmen et al., 2011). Cassar et al. (2017) found a positive relationship between the level of education and risk-taking after a tsunami.[16] Higher education allows the individuals to access information and analyse it more accurately as compared to those with less education, which in turn may influence their risk-taking behaviour during a large exogenous shock creating nationwide uncertainty. We find that during the revolution, the individuals with higher education are more risk-averse. After the revolution, the effect is less clear (see Appendix C, Table C3).

The end of the 27-year regime of President Blaise Compaoré was a big relief for the Burkinabès and they perceived the regime change as a positive development allowing them for the first time to elect their own political leaders. Civil society groups had been actively working against the constitutional change for a long time but had not succeeded until late October 2014. There was a period of political uncertainty after the revolution, with the initial period of the interim government, questions about free and fair elections in the future and the short military coup attempt in 2015. It is plausible that a sense of political uncertainty persisted in the months following the revolution. However, there seems to be no nationwide uncertainty on the same scale as during the revolution. For example, people's perception of continuing the positive development that they began in late October 2014, was also present during the post-revolution period. One indication of this was the unsuccessful attempt of the military coup that dissolved the interim government in 2015. The coup was short-lived due to massive pressure from the Burkinabè people.

Our results might be explained by the conceptual framework of Schildberg-Hörisch (2018). She argues that an individual's risk preference may change given different possible scenarios, such as through an exogenous shock like a natural disaster, a temporary variation in emotions and over the life cycle with age (see Figure B1 in Appendix B). She shows that the willingness to take risk decreases with age (solid line), whereas variation in stress, self-control, or emotions causes temporary fluctuations in risk preferences around a baseline or average level (jagged line). However, a large exogenous shock, which can create large nationwide uncertainty may induce changes in risk-taking (dashed line) of the individual.

5 | CONCLUSIONS

Individuals' risk preferences in the face of large exogenous shocks have been a topic of considerable research interest. The question of whether individuals become more risk-tolerant or risk-averse when confronted with such shocks, or if their preferences remain stable and fixed over time, remains ambiguous within the existing literature. This lack of consensus stems from the multifaceted and context-dependent nature of risk preferences, as well as the diversity of responses observed among different individuals and across various scenarios.

This study investigates how a substantial, general exogenous shock, such as a revolution in Burkina Faso, influences an individual's risk attitudes. In addition to exploring the overall impact of the revolution on risk attitudes, it also seeks to ascertain whether this impact varies among individuals based on their gender, age and education, as these factors are recognized as principal determinants of risk attitudes. Employing a rigorous empirical approach, the study analyses HBS data using difference-in-difference approach to provide a comprehensive analysis of the complex relationship between exogenous shocks, individual risk attitudes and socio-demographic variables.

Our results indicate that expressed risk attitudes change to mitigate unavoidable external risk factors such as those created by a revolution or political uprising. This is highly relevant from a policy perspective because it suggests a pathway by which political uncertainty impacts individual risk attitudes. Several developing countries are experiencing major political, social and economic changes. Social uprising and revolution create nationwide uncertainty and greater volatility in an individuals' decision-making. It increases their risk aversion during the revolution, which may negatively impact their self-employment, investments and total factor productivity. This in turn may amplify the impact of other macroeconomic downturns. Such nationwide exogenous shocks create uncertainty

severe enough to impact individuals' risk attitudes. With the return to the status quo, risk attitudes may return to the same level as before. However, we cannot conclusively claim that the impact on risk attitudes after the revolution is transitory or not.

These results may have important policy relevance for several developing countries, even if they are transitory. They point to the negative consequences and societal cost of the evolution of risk attitudes throughout political upheaval. The results in this paper are not without limitations. Most importantly, when trying to understand the change in risk attitudes in response to a large exogenous shock creating nationwide uncertainty, we cannot claim that the impact on risk attitudes after the revolution is transitory or not. Our reference period captures the last two quarters of 2014, it would be important for future research to understand how a large exogenous shock, impacts individual's risk attitudes in the long term, when the uncertainty is over. A long-term impact would imply that the shock might have a persistent impact on risk-taking and hence decision-making. One notable exception is a similar study by Hanaoka et al. (2018), which finds persistent results over a long-term period where men who live in the areas affected by an earthquake are still risk-tolerant five years after the event has occurred. This is also to some extent supported by Voors et al. (2012) in terms of violent conflicts. They find that the civil war violence that occurred in communities has an impact on individual behaviour more than ten years later. Despite spillover effects, their results indicate that large temporary shocks may have long-term consequences.

In conclusion, our results may reflect long-term effects even if risk attitudes rebound after the revolution is over. As is shown by Cameron and Shah (2015) and recently by Cheong (2022) exposure to a traumatic event has a large impact on an individual's risk-taking behaviour beyond the period in which the trauma occurred. However, our results could also be reassuring to see that there might be transitory effects that fade away with a return to political stability. This is important, as continued risk-aversion from nationwide uncertainty or political turmoil is very likely impairs economic growth, which is essential for developing sub-Saharan African countries such as Burkina Faso.

CRediT authorship contribution statement

Mohammad H. Sepahvand: Formal analysis, writing, Data curation. **Roujman Shahbazian:** Formal analysis, writing. **Ranjula Bali Swain**: Formal analysis, writing.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the National Institute of Statistics and Demography (INSD, Institut National de la Statistique et de la Démographie) of Burkina Faso, but restrictions apply to the availability of these data, which were used under license for the current study, and thus are not publicly available. Instructions for how other researchers can obtain the data, and all the information needed to proceed from the dataset to the results of the paper (including code) are, however, available from the corresponding author upon reasonable request and with permission of INSD.

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ENDNOTES

[1] Acemoglu et al. (2018) analyzed whether the intensiveness of protest in the Tahrir square (during Egypt's 2014 Arab Spring) had any effect on stock prices for firms connected to the group currently in power. They found that the more intense protests in Tahrir Square are associated with lower stock market valuations for firms connected to the group currently in power relative to non-connected firms. However, they do not look at individuals risk attitudes; instead, they focus on stock market valuations.

[2] As a robustness check, we estimate parameters by omitting individuals that are surveyed one or two weeks before and after the revolution. The results are similar to those in Tables 1 and 2 and are available upon request from the authors.

[3] News reports about the event found at: https://www.huffingtonpost.com/2014/10/31/burkina-faso-protest-photos_n_6084474.html (2015-10-31) and https://uk.reuters.com/article/uk-burkina-politics/clashes-at-burkina-faso-protest-against-leaders-plan-to-extend-rule-idUKKBN0IH10920141028 (2014-10-28).

[4] News reports about the event found at: http://www.bbc.com/news/world-africa-29831262 (2014-10-30); https://www.theguardian.com/world/2014/oct/30/protesters-storm-burkina-faso-parliament-constitution-vote-president-blaise-compaore (2014-10-30); https://www.reuters.com/article/us-burkina-politics/burkina-army-imposes-interim-government-after-crowd-burns-parliament-idUSKBN0IJ0NZ20141030 (2014-10-30); http://www.bbc.com/news/live/world-africa-29831591 (2014-10-30) and http://forums.ssrc.org/african-futures/2014/12/09/citizens-revolt-in-burkina-faso/ (2014-12-10).

[5] News reports about the event found at http://www.aljazeera.com/news/africa/2014/11/african-leaders-tackle-burkina-faso-crisis-201411511173925951 6.html (2014-11-05).

[6] The survey was funded as part of a government cooperation project between INSD and Statistics Sweden (SCB). Statistics Sweden jointly with the World Bank provided the technical assistance. The project was financed by the Swedish International Development Cooperation Agency (Sida).

[7] The enumeration area is a statistical defined geographic unit for sampling purposes. The selection of the EAs is a random selection, including both urban and rural areas. A two-stage stratified sampling technique is used. In the first stage, the EAs are drawn from a frame with a probability proportional to the number of households in the EA. The frame constitutes of 13,821 mapped EAs defined during the population census of 2006. Then a listing procedure is conducted in each drawn EA in order to update the number of households, i.e., the frame of the second stage. In the second stage, 12 households per EA are drawn with equal probability in each EA. For more information on the data see Sepahvand (2019).

[8] The differences in the distribution of responses among groups surveyed before, during and after the revolution are similar across regions for the control and treatment groups, i.e., the distribution of responses is similar within a region for the different groups. These results are available upon request. We also see this similarity in Table C1 Appendix C where the before-during-after samples are comparable in terms of individual and household characteristics.

[9] According to equation (1.1) of Sepahvand et al. (2019), the following model is estimated: $r_{it} = \beta_0 + \beta_1 G + \delta_0 T + \delta_1 T * G + \gamma X_{it}^{T} + \varepsilon_{it}$, where r_{it} is a measure for our outcome variable, risk attitude of individual i at time t (third or fourth round), T is a dummy variable for the second time period (fourth round), the dummy variable G equals 1 for those that were scheduled for survey after the revolution was over. The time period dummy, T, captures aggregate factors that would cause changes in r_{it} in the absence of the revolution. The coefficient of interest, δ_1, captures the DiD

effect and hence the impact of the revolution on the outcome individual risk attitude variable after the revolution has occurred. δ_1 multiplies the interaction term, $T * G$, which is the same as a dummy variable equal to one for those observations in the treatment group in the second time period (fourth round). X_{it}^{T} includes gender, age and other individual-specific control variables. The same model is estimated for treatment group 2, with the differences that the variable G equals 1 for those scheduled for survey during the revolution.

[10] According to the randomized survey plan, all interviews of respondents were supposed to be finished by the end of November. However, 231 individuals were interviewed in December. These individuals are pastoral farmers implementing a nomadic form of pastoralism and thus where not at their household at the time of the interview and had to be traced by the interviewers.

[11] The agricultural sector provides employment for about 80% of the working-age population (Ministry of Agriculture Burkina Faso, http://agriculture-bf.info/, accessed at 2021-04-22.

[12] News reports (in French) show that it was only on October 30, 2014, at 22.49 hrs. That the Belgian embassy passed the security update that no unnecessary trips to Burkina Faso should be taken, and that several embassies suggested to their citizens in Burkina Faso to stay calm and/or contact their embassy. News reports as accessed at: http://www.lefigaro.fr/flash-actu/2014/10/30/97001-20141030FILWWW00433-la-belgique-deconseille-d-aller-au-burkina-faso.php(2014-10-30) and https://www.nytimes.com/2014/10/31/world/africa/burkina-faso-protests-blaise-compaore.html (2014-10-30).

[13] Information about Semafo, as accessed at http://www.semafo.com/English/home/default.aspx (2018-01-01).

[14] The households where randomly determined in advance, in the beginning of the survey year, spread across weekdays and weekends.

[15] The interviewers were instructed to ask all individual questions alone with the respondents, since there were other more sensitive modules than the risk module, such as violence, sexual practices etc.

[16] However, the coefficient estimates from the Cassar et al. (2017) is not significant, which might be related to reduced statistical power due to their small sample size (278 individuals).

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