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Income fluctuations and subjective well-being: Partially mediating effects of remittances

Azizbek Tokhirov*

* CERGE-EI, a joint workplace of Charles University and the Economics Institute of the Czech Academy of Sciences, Prague, Czech Republic; GEOMIGRACE, Geographic Migration Centre, Department of Social Geography and Regional Development, Faculty of Science, Charles University, Prague, Czech Republic. Albertov 6, 128 00 Prague, Czech Republic; azizbek.tokhirov@natur.cuni.cz.

Landshuter Straße 4
D-93047 Regensburg

Telefon: (0941) 943 54-10
Telefax: (0941) 943 54-27
E-Mail: info@ios-regensburg.de
Internet: www.ios-regensburg.de
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Abstract

I investigate the consequences of income fluctuations caused by commodity price changes on happiness levels in regions specialising in export agriculture. Using a difference-in-differences framework, I compare subjective well-being patterns of households living in cotton and non-cotton geographical areas of Tajikistan before and after the 2010/11 cotton price increase. The results indicate that exposure to income fluctuations, even to a positive one, is associated with a notable decrease in the reported levels of financial and overall life satisfaction. The well-being changes are mainly observed between households engaged in agricultural employment, the number of which became larger only in cotton regions in response to the shock. The results of triple difference-in-differences estimations reveal that remittances mediate the negative effects of export price fluctuations but only on financial satisfaction, suggesting that a mere compensation of income losses does not fully restore subjective well-being.

JEL-Classification: I31, Q02

Keywords: subjective well-being, export prices, household income, remittances

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Data availability statement
The Tajikistan Household Panel Survey 2011 can be obtained via contacting LaMBDa Research Data Portal (lambda@ios-regensburg.de). The Living Standards Survey 2007 and 2009 can be downloaded upon registration from https://doi.org/10.48529/39ay-kr43 and https://doi.org/10.48529/frwh-7q04 respectively.

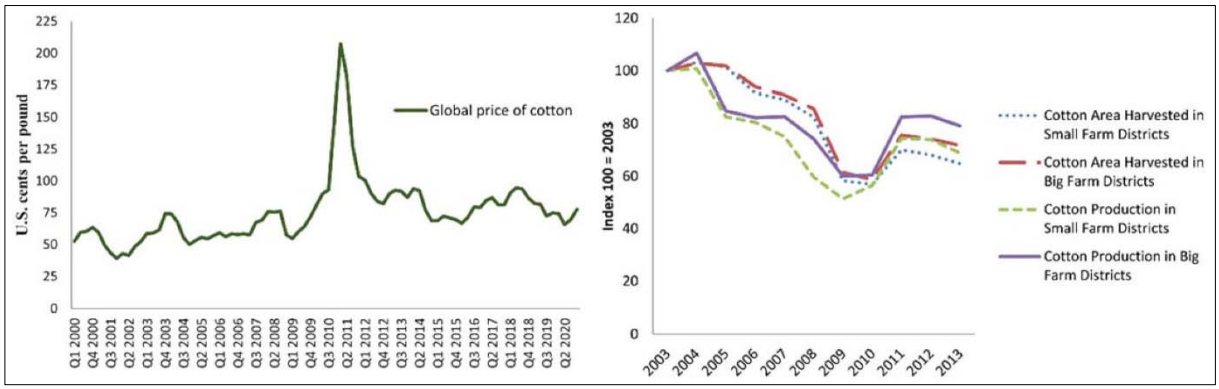
1 Introduction

The agricultural sector significantly depends on climate (Nelson et al. 2014). Unexpected and even expected environmental changes might lead to production disruptions and subsequent consumption losses. Thus, it is not surprising that there is a consensus in the literature regarding the negative effects of climate change on agriculture. However, this was not always the case, and the views of academic researchers were more optimistic in the early 1990s (Reilly et al. 1994; Tobey et al. 1992). It was argued that the effects of climate change can be positive, while its negative effects might be mitigated by interregional adjustments. Despite a notable increase in the usage of natural resources from 1992 to 2005 that was much larger than of population growth (UN 2011), the radical shift in the literature is in fact mainly driven by the improvements in data availability and modeling (Nelson et al. 2014).

Methodological advancements also make it possible to capture the effects of climate change on agriculture workers even in directly unaffected countries. One of such mechanisms operates via global commodity prices. Environmental incidents might create deficits and encourage producers to increase production via higher prices, confirming the prediction of King's Law (Mpabe Bodjongo 2022). The inverse relationship between climate change and commodity prices is well documented (Adams et al. 1998; Nelson et al. 2009). A less researched area is whether climate change translates into well-being losses via commodity prices. In this study, I investigate the consequences of climate induced price changes that affected the cotton industry using robust econometric tools and country-representative survey data.

The cotton commodity market is typically characterized by stable prices. However, due to floods and droughts in the major cotton producing countries, including China, India, and Pakistan, cotton more than doubled in global price between July 2010 and March 2011. Observing this sudden price increase, agriculture workers in cotton-suitable areas in non-affected countries saw an opportunity to improve their incomes by switching from other crops to cotton. One of these countries is Tajikistan, where cotton accounted for a 30% of export revenue back in 2011, and the global 2010/11 cotton price increase had an impact on agricultural production in Tajikistan. Figure 1 illustrates a link between cotton production in Tajikistan and global cotton prices, suggesting that Tajik agriculture workers did respond to the cotton price increase. The figure also indicates the short-term nature of global cotton price increase as the global price of cotton returned to its pre-shock value rather quickly.

Figure 1: Global cotton price dynamics and cotton production in Tajikistan

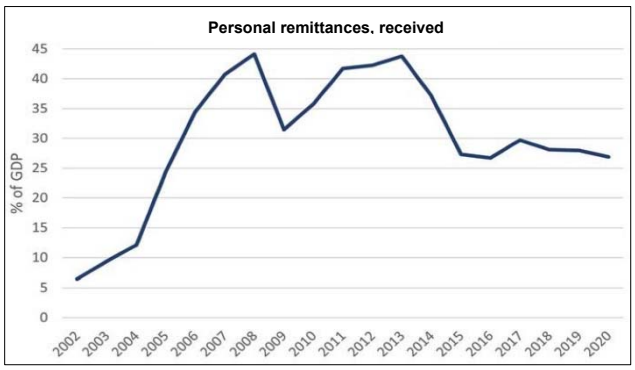


Source: Federal Reserve Bank of St. Louis; Danzer and Grundke (2020)

Based on the results of Danzer and Grundke (2020), who investigated the labour market consequences of the 2010/11 cotton price increase in Tajikistan, I propose to view the 2010/11 cotton price increase as a positive income shock for households living in agriculture areas, without negative consequences on households living in other parts of the country. I aim to quantify the household-level consequences of the 2010/11 cotton price by comparing the subjective well-being patterns of households in cotton-producing and non-cotton regions of Tajikistan before and after this short-term income shock. Thus, the main contribution of this study is to improve the understanding of the relationship between income fluctuations and family well-being.

Typically, economic volatility should motivate internal and external mobility (Kroeger and Anderson 2014). Ivlevs, Nikolova, and Graham (2019) also highlight positive effects of remittances on subjective well-being. Thus, to better understand the effects of short-term income shock on well-being in Tajikistan, I also investigate how access to remittances alter the relationship between income fluctuations and subjective well-being. This is especially relevant for Tajikistan since this country is one of the world leaders in terms of dependence on migrant financial transfers measured by a considerable margin of personal remittances in the country's national income. As shown in Figure 2, in certain years, the value of official remittances received accounted for more than 40% of Tajikistan's GDP.

Figure 2: Exposure to remittances in Tajikistan



Source: World Development Indicators

For a long time, the area of well-being research remained limited to psychology (Frey and Stutzer 2002). Although psychological studies emphasize the role of personality traits in affecting the level of happiness, they might fail to robustly quantify the effects of external well-being determinants, such as income (Powdthavee 2010). For instance, "personality bias" highlighted by psychologists might actually be driven by unobserved heterogeneity (Kahneman et al. 1999). Starting from the seminal work of Easterlin (1974), who report that the relationship between national income and well-being is non-trivial, economists have contributed to the field of happiness research by the means of large-scale empirical analyses (Frey and Stutzer 2002). Despite the significance of the income-welfare nexus, most previous research has been regionally or methodologically constrained. This study contributes to the scarce literature devoted to robustly identifying the effects of income shocks on subjective well-being patterns in lower income economies. Central Asia in general and Tajikistan (one of the poorest post-Soviet states) in particular should not be disregarded since it is one of vulnerable regions, as identified by Collier (2008), where development assistance is needed.

2 Data and setting

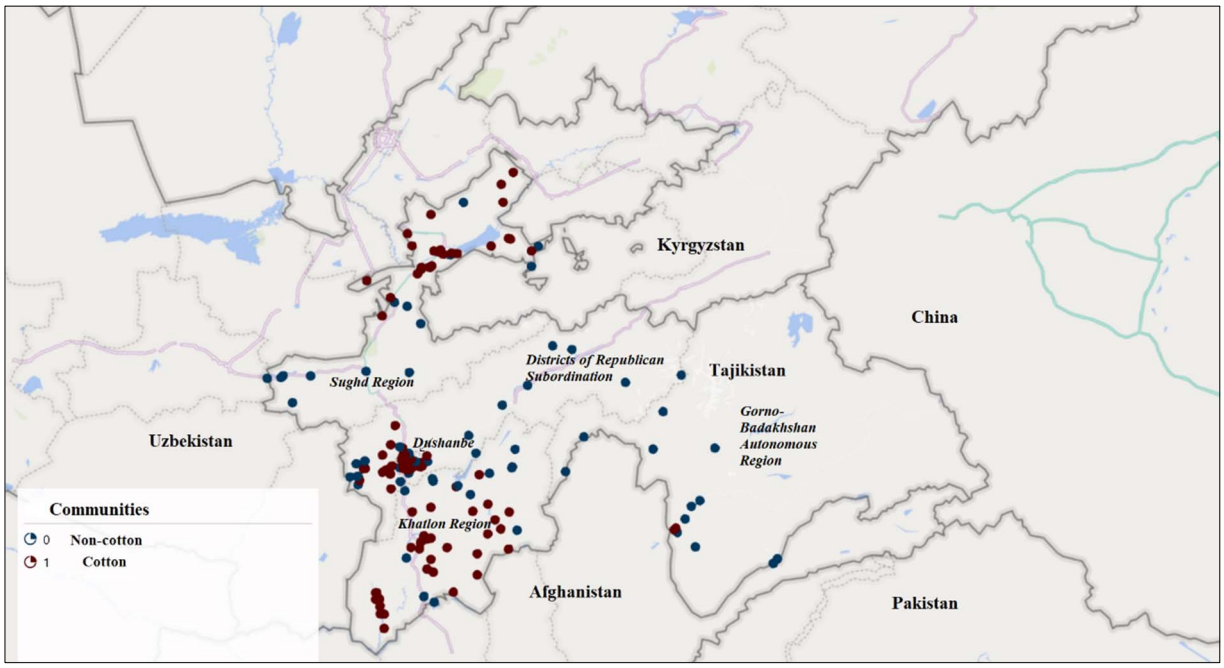
In this study, I use data from the country-representative Tajikistan Living Standards Survey (TLSS) conducted by the World Bank and UNICEF in 2007 and 2009, and Tajikistan Household Panel Survey (THPS) conducted by the Institute for East- and Southeast European Studies in 2011. Initially, 4,860 households were randomly selected to participate in the first survey. After 2 and 4 years, a random subsample of 1,503 and 1,392 households from the first survey were re-interviewed. After merging the survey waves, inspecting and deleting data records, the final sample in this study comprises a balanced panel of 1,305 households.[1]

For the outcome variable, I consider two measures of subjective well-being based on the following survey questions: "Overall how satisfied are you with your life?" and "How satisfied are you with your current financial situation?". Unfortunately, the answers to this question were recorded at the household level based on the opinion of the most informed household member. Although not ideally, it is plausible to assume that these indicators should be highly correlated with the actual levels of household well-being. Moreover, the answers were recorded on a Likert scale and answer options are slightly different across the survey waves. To enable the comparison between the waves, I generate two binary variables indicating household satisfaction with life and financial situation.

The territory of Tajikistan is covered by mountains and only in certain areas, it is possible to produce cotton. For the empirical specification, I identify these areas at the community level to construct a treatment variable. I concentrate on the TLSS 2007 community questionnaire and define a primary sampling unit as cotton producing if cotton is the first or second major agricultural crop grown in this unit. Figure 3 illustrates the current setting that comprises 103 cotton and 62 non-cotton communities with 810 and 495 households across each wave of the survey.

[1] Table A1 provides summary statistics for the sample under consideration.

Figure 3: Cotton and non-cotton areas of Tajikistan



In Figure 4, I plot the evolution of household life and financial satisfaction from 2007 to 2011 by the treatment status. Although households both from cotton and non-cotton communities saw an increase in their average levels of subjective well-being over the observed period, the growth curve for the latter group was much steeper. The upward trend is also in line with the findings of Guriev and Melnikov (2018) on the "happiness recovery" in post-communist countries after the Global Economic Crisis.

In Figure 5, I also plot the evolution of agricultural employment (whether a household has at least one agriculture worker) and migrant remittances (whether a household received cash or in-kind transfers over the course of the year) in Tajikistan. In line with the predictions, agriculture employment increased mainly in cotton areas. Remittances patterns, however, were similar across the country possibly due to the short-term nature of the export price shock.

Figure 4: Subjective well-being levels across communities of Tajikistan

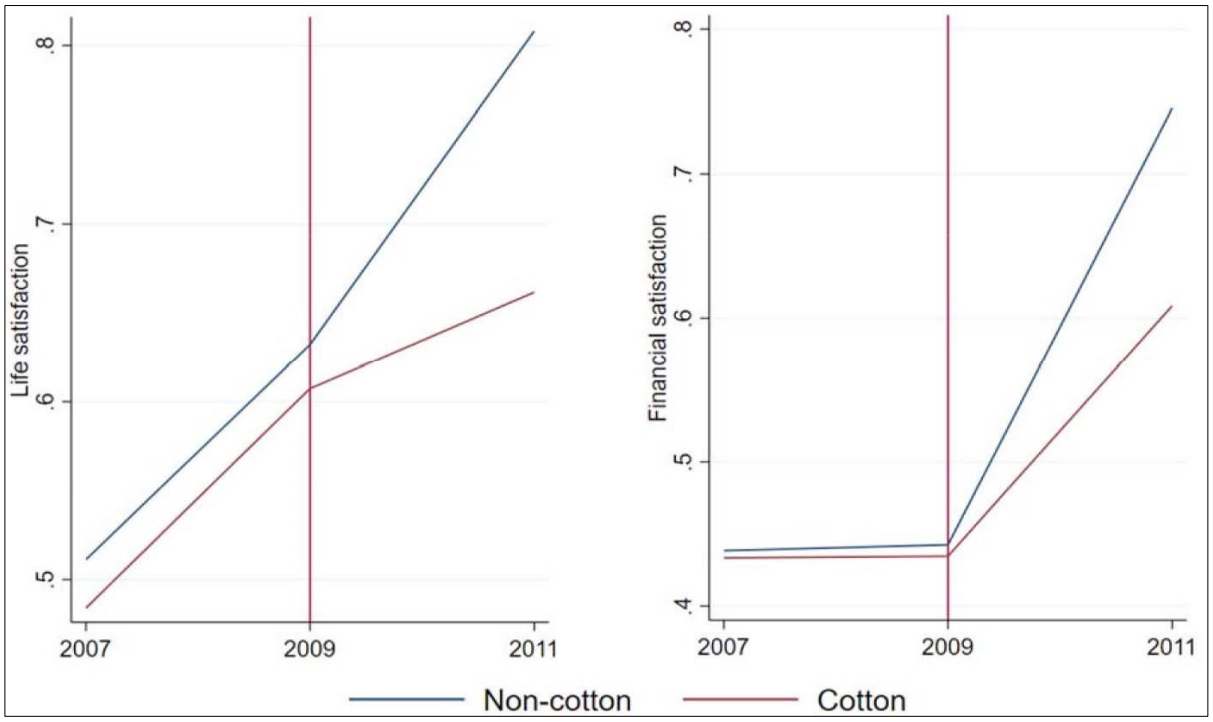
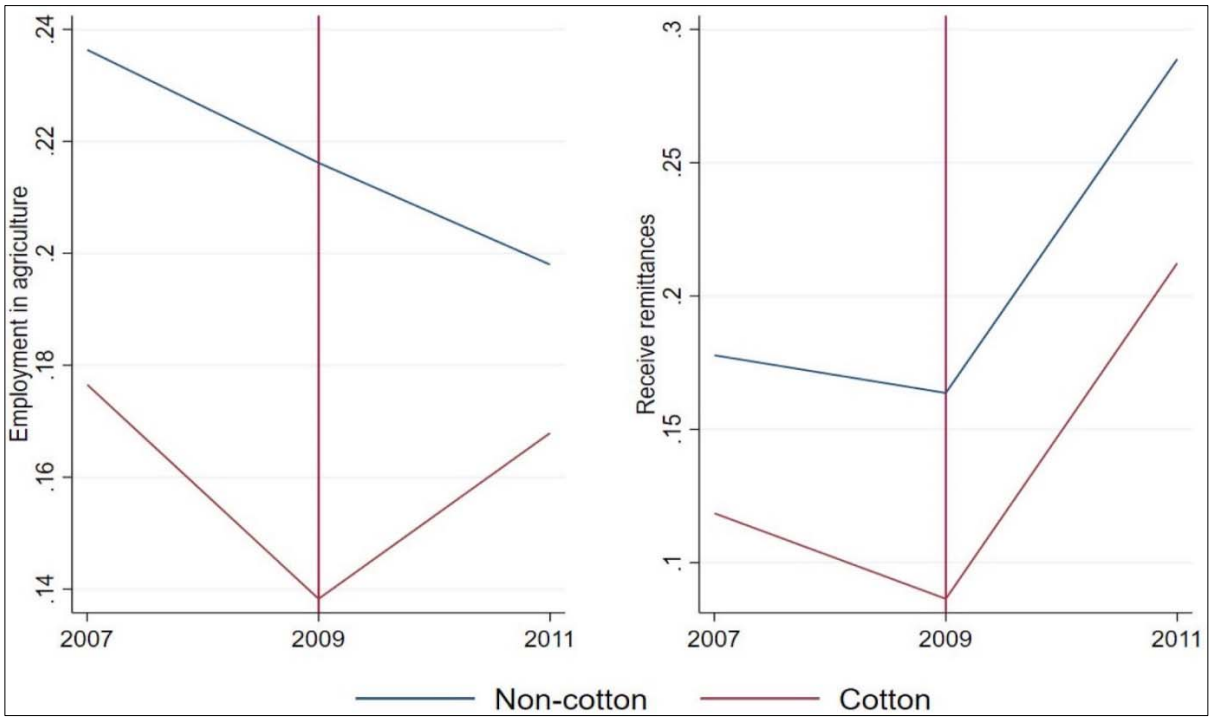


Figure 5: Agriculture and remittances across communities of Tajikistan



3 Empirical methodology

To identify the effects of income shocks on subjective well-being, I consider households to be affected by income shock if they live in a community that specializes in producing cotton. I then determine treatment timing: the world cotton price growth occurred between July 2010 and March 2011. Since the THPS 2011 data were collected in October, November and December, this survey wave provides post-treatment data. By the same token, the TLSS 2007 and TLSS 2009 provide pre-treatment data. Given the treatment definition and timing, I estimate its effects on the selected measures of subjective well-being in a standard event-study difference-in-differences (DD) model.

$$Y_{ict} = \alpha_i + \gamma_t + \sum_{\substack{\tau=2007 \\ \tau\neq 2009}}^{2011} \sigma_\tau \, Cotton_c + \varepsilon_{ict}, \tag{1}$$

where Y_{ict} is the well-being outcome for household i in community c at survey year t, $Cotton_c$ indicates exposure to treatment, α_i and γ_t $(2007, 2011)$ are the individual and survey wave fixed effects.

The identification relies on the well-known parallel trends assumption, which I assume to hold because the cotton price increase was caused by external events, outside Tajikistan, and production capacities of the country are limited to affect the global cotton market. Given the short-term nature of the shock endogenous selection can also be ruled out. I also consider splitting the sample by agricultural employment and examine a more comparable group of households.

To determine whether remittances affect the relationship between income shock and subjective well-being, I consider a triple difference-in-differences (DDD) specification by augmenting the community-level treatment exposure with household remittance status. Although remittances can also be viewed as an income shock, the probability to receive them is endogenously determined by households. Thus, I aim to quantify only their mediating effects determined by exogenous export price increase.

$$\begin{aligned} Y_{ict} = \alpha_i + 2007 + 2011 + \gamma Rem_{ict} + \delta_1(2007 \times Cotton_c) + \delta_2(2011 \times Cotton_c) \\ + \delta_3(2007 \times Rem_{ict}) + \delta_4(2011 \times Rem_{ict}) + \delta_5(Rem_{ict} \times Cotton_c) \\ + \delta_6(2007 \times Rem_{ict} \times Cotton_c) + \delta_7(2011 \times Rem_{ict} \times Cotton_c) + \varepsilon_{ict}, \end{aligned} \tag{2}$$

where additionally Rem_{ict} is the household-level treatment identifier for receiving remittances.

4 Results

4.1 Baseline estimations

Table 3 presents the results of baseline DD estimations. Since income shocks possibly affect all households within communities (either directly or indirectly), I cluster standard errors at the community level. The results highlight the negative treatment effects of income fluctuations on subjective well-being. More specifically, in the absence of the 2010/11 cotton price change, general and financial satisfaction levels in cotton areas of Tajikistan would have been higher by nearly 20% and 25% respectively.

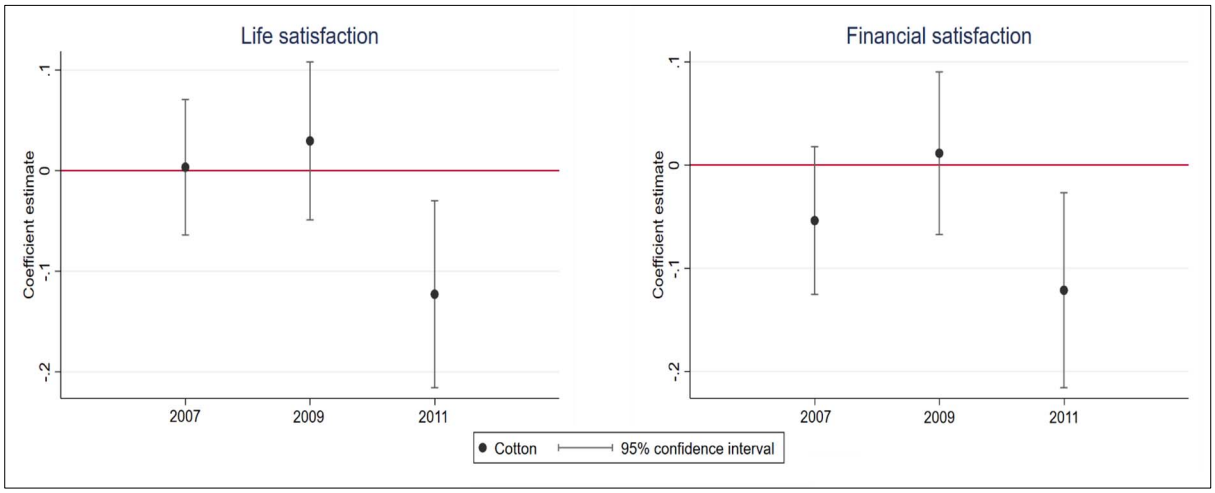
Table 1: DD estimations

	(1) Life satisfaction	(2) Financial satisfaction
Cotton × 2007	–0.002	0.003
	(0.045)	(0.042)
Cotton × 2011	–0.121**	–0.129**
	(0.054)	(0.054)
Dep. Var. Mean	0.610	0.511
Dep. Var. SD	0.488	0.500
Household FE	Yes	Yes
Year FE	Yes	Yes
Observations	3,915	3,915
Communities	167	167
Households	1,305	1,305
R^2	0.060	0.083

Note: clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

The treatment coefficients for life satisfaction are both qualitatively and quantitatively comparable to the ones estimated for financial satisfaction. This implies that the shock was sufficiently large to affect several domains of well-being. Table 1 also indicates that there were no well-being differences between cotton and non-cotton communities before the income shock, supporting the identification assumption of DD estimation. I illustrate the findings regarding the negative effects of income fluctuations in Figure 5. The coefficients are taken from year-by-year estimations with numerous controls presented in Table A2.

Figure 6: The effects of cotton price fluctuations on subjective well-being



4.2 Heterogeneity analyses

Table 2 presents the results of DD regressions disaggregated by household occupation status. According to the estimations, the well-being differences between non-agriculture households in cotton and non-cotton regions were absent both before and after the cotton price increase. Concurrently, the well-being differences between agriculture households became significant after the shock. The latter result is possibly driven by newcoming agricultural workers, who could not capture the benefits of the income shock.

Table 2: Further DD estimations

	(3)	(4)	(5)	(6)
	Agricultural HH		Non-agriculture HH	
	Life satisfaction	Financial satisfaction	Life satisfaction	Financial satisfaction
Cotton × 2007	–0.061	–0.170	–0.007	0.033
	(0.138)	(0.146)	(0.049)	(0.046)
Cotton × 2011	–0.247**	–0.271*	–0.086	–0.090
	(0.120)	(0.147)	(0.058)	(0.062)
Household FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	713	713	3,202	3,202
R^2	0.091	0.135	0.052	0.065

Note: clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

I present the results of DDD estimations in Tables 3. They indicate that the inclusion of additional terms to capture remittance status at the household level do not significantly alter the effects of export price shock on life satisfaction. However, if we consider financial well-being, the treatment effects are different: the effects of export price shock on those households who live in cotton communities and do not receive remittances are still negative, but their counterparts who receive remittances are well-off after the shock. These findings possibly indicate that remittances can provide financial protection against agriculture related income shocks, but their protective effects are largely limited to the monetary domain. It is possible to further hypothesize that non-monetary well-being losses could further be driven by empathy for neighbours or anticipation of negative socio-economic transformations in the community (e.g., poverty or unemployment).

Table 3: DDD estimations

	(7) Life satisfaction	(8) Financial satisfaction
Cotton × 2007	–0.005	–0.010
	(0.048)	(0.046)
Cotton × 2011	–0.132**	–0.187***
	(0.063)	(0.058)
Remittances	0.065	0.143**
	(0.073)	(0.066)
Remittances × 2007	–0.059	–0.047
	(0.093)	(0.096)
Remittances × 2011	–0.047	–0.195**
	(0.074)	(0.089)
Cotton × Remittances	–0.031	–0.168*
	(0.101)	(0.096)
Cotton × 2007 × Remittances	–0.005	0.111
	(0.136)	(0.125)
Cotton × 2011 × Remittances	0.049	0.303**
	(0.112)	(0.125)
Household FE	Yes	Yes
Year FE	Yes	Yes
Observations	3,915	3,915
R^2	0.061	0.087

Note: clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

5 Concluding remarks

I study how income shock caused by agriculture factors affects subjective well-being. I empirically investigate the consequences of the 2010/11 world cotton price increase on Tajik households. Thus, the main contribution of this study is that it brings to subjective well-being literature household-level evidence from a less researched setting. I find that the relationship between exposure to agriculture related income shock and subjective well-being is negative. This result is in contradiction with the finding of Bayer and Juessen (2015) that transitory shocks do not have a significant impact on happiness. On the contrary, I show that households living in the communities affected by income shock are likely to become significantly dissatisfied with their lives and financial situation. I also demonstrate that households can protect themselves against the negative effects of income shocks via remittances. Nevertheless, the mediating effects of remittances are limited to financial satisfaction and do not cover life satisfaction. This finding highlights the structural differences between subjective well-being domains. Thus, a typically adopted separation between evaluative, hedonic, and eudaimonic well-being (Graham and Nikolova 2015) might be insufficient, and even within these disaggregated well-being categories, a distinction between general and financial domains should be made.

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Appendix

Table A1: Descriptive statistics

	Obs.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
		2007		2009		2011	
Treatment and outcome variables:							
Cotton	1,305	0.62	0.49	0.62	0.49	0.62	0.49
Life satisfaction	1,305	0.49	0.50	0.62	0.49	0.72	0.45
Financial satisfaction	1,305	0.44	0.50	0.44	0.50	0.66	0.47
Household composition:							
Number of children below the age of 6	1,305	0.76	1.02	0.88	1.14	0.89	1.20
Number of children aged between 6 and 15	1,305	1.57	1.36	1.47	1.33	1.32	1.33
Number of adults aged between 16 and 65	1,305	3.77	1.93	4.16	2.07	3.93	2.01
Number of elderly over the age of 65	1,305	0.26	0.54	0.26	0.53	0.27	0.54
Number of female adults aged between 16 and 65	1,305	2.02	1.15	2.17	1.20	2.10	1.17
Educational attainment of household members:							
Average education (0 if None, … , 7 if higher education)	1,305	2.55	0.90	2.62	0.90	2.67	0.95
Number of household members with tertiary education	1,305	0.39	0.76	0.42	0.80	0.44	0.83
Household head characteristics:							
Age	1,305	51.69	13.32	52.92	12.83	54.52	12.85
Ethnicity (1 if Tajik, 0 otherwise)	1,305	0.77	0.42	0.76	0.43	0.78	0.42
Gender (1 is male, 0 otherwise)	1,305	0.81	0.39	0.83	0.38	0.74	0.44
Marital status (1 is married, 0 otherwise)	1,305	0.81	0.40	0.80	0.40	0.77	0.42
Household location:							
1 if urban, 0 otherwise	1,305	0.34	0.47	0.34	0.47	0.33	0.47
1 if Districts of Republican Subordination, 0 otherwise	1,305	0.21	0.41	0.21	0.41	0.21	0.41
1 if Dushanbe (capital city), 0 otherwise	1,305	0.16	0.37	0.16	0.37	0.16	0.37
1 if Gorno-Badakhshan Autonomous region, 0 otherwise	1,305	0.10	0.30	0.10	0.30	0.10	0.30
1 if Khatlon region, 0 otherwise	1,305	0.26	0.44	0.26	0.44	0.26	0.44
1 if Sughd region, 0 otherwise	1,305	0.26	0.44	0.26	0.44	0.26	0.44
Household economic characteristics:							
Agriculture (1 if at least one household member works in agriculture, 0 otherwise)	1,305	0.20	0.40	0.17	0.37	0.18	0.38
Remittances (1 if receive, 0 otherwise)	1,305	0.14	0.35	0.12	0.32	0.24	0.43
Total household expenditure (in Tajikistani Somoni)	1,305	996.42	901.03	1479.94	935.04	2105.03	2184.76
Total household expenditure (in USD)	1,305	291.88	263.03	371.30	234.59	442.61	459.37

Table A2: Year-by-year estimations with controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Life satisfaction			Financial satisfaction		
	2007	2009	2011	2007	2009	2011
Cotton community	0.003	0.030	–0.123***	–0.054	0.011	–0.121**
	(0.034)	(0.040)	(0.047)	(0.036)	(0.040)	(0.048)
Household composition:[1]						
Number of children (6–15)	0.015	–0.012	–0.007	0.012	–0.028**	–0.010
	(0.013)	(0.013)	(0.014)	(0.011)	(0.013)	(0.016)
Number of adults	–0.006	0.030**	–0.027**	0.009	–0.012	–0.029**
	(0.015)	(0.013)	(0.013)	(0.015)	(0.012)	(0.012)
Number of elderly (>65)	–0.052	–0.029	0.001	–0.010	0.071	0.007
	(0.034)	(0.041)	(0.036)	(0.034)	(0.045)	(0.035)
Number of female adults	–0.025	–0.066***	0.007	–0.045**	–0.009	0.009
	(0.024)	(0.021)	(0.021)	(0.021)	(0.019)	(0.021)
Educational attainment of household members:						
Average education	0.058**	0.001	0.059**	0.052***	0.032	0.034
	(0.023)	(0.022)	(0.025)	(0.019)	(0.024)	(0.026)
Number of people with tertiary education	0.007	0.023	0.012	0.020	0.047**	0.038*
	(0.025)	(0.020)	(0.021)	(0.023)	(0.020)	(0.020)
Household location:[2]						
Urban	–0.101**	–0.012	–0.026	–0.010	0.032	–0.043
	(0.043)	(0.038)	(0.069)	(0.041)	(0.042)	(0.074)
Districts of Republican Subordination	0.002	–0.084	–0.038	–0.163***	–0.045	–0.084
	(0.062)	(0.059)	(0.093)	(0.059)	(0.057)	(0.090)
GBA Region	–0.038	0.121*	0.162*	–0.168**	0.079	0.216**
	(0.076)	(0.065)	(0.095)	(0.072)	(0.072)	(0.108)
Khatlon Region	–0.052	–0.143**	0.097	–0.095*	–0.009	0.186*
	(0.059)	(0.056)	(0.099)	(0.054)	(0.059)	(0.095)
Sughd Region	0.136***	–0.045	0.065	–0.042	0.127**	0.160*
	(0.046)	(0.055)	(0.080)	(0.058)	(0.052)	(0.082)
Household head characteristics:						
Age	–0.015*	–0.016*	–0.011*	–0.006	0.003	–0.008
	(0.008)	(0.008)	(0.006)	(0.008)	(0.009)	(0.007)
Age^2	0.000*	0.000*	0.000	0.000	–0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.054	–0.010	0.037	0.020	–0.007	0.028
	(0.063)	(0.060)	(0.043)	(0.061)	(0.062)	(0.046)
Married	0.018	0.049	–0.011	0.089	0.049	–0.009
	(0.065)	(0.057)	(0.049)	(0.062)	(0.064)	(0.054)
Tajik	0.082**	0.015	0.077*	–0.000	–0.047	0.053
	(0.036)	(0.038)	(0.046)	(0.032)	(0.041)	(0.048)
Household economic characteristics:						
Receive remittances	0.041	0.039	0.092**	0.072*	0.066	0.076*
	(0.044)	(0.044)	(0.037)	(0.037)	(0.044)	(0.041)
ln(Total household expenditure)	0.129***	0.117***	0.118***	0.153***	0.222***	0.106***
	(0.025)	(0.027)	(0.034)	(0.031)	(0.026)	(0.034)
Observations	1,305	1,305	1,305	1,305	1,305	1,305
R^2	0.071	0.063	0.107	0.080	0.114	0.115

Note: clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The reference categories for [1] and [2] are number of children below the age of 6 and Dushanbe (capital city).