Export price shocks and rural labor markets: The case of cotton in Tajikistan

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Abstract

This paper investigates whether the economic lives of the poorest are affected by sudden demand changes in the globalized production process. We exploit an unprecedented surge in the world market price of cotton in late 2010 to investigate whether agricultural workers employed in the cotton sector benefit from the price shock as compared to their peers in other agricultural production. Exploiting regional variation in the suitability of land for cotton production in Tajikistan in combination with household data from a novel panel survey in a difference-in-differences framework suggests substantial wage increases in the cotton sector following the cotton price hike. While women, who work in cotton picking for their dexterity, gain in terms of wages following the price shock, men's agricultural wages remain unaffected.

JEL codes: F16, J43, O13, Q17

Keywords: export price shock, trade, cotton, wage, labor market, difference-in-differences

1. Introduction

How does globalization influence the daily lives of the poor? While this question has gained substantial interest in the wake of the global financial crisis, the internationalisation of production processes suggests a highly relevant but more narrowly defined problem set-up: Can changes in international commodity markets transform poor people's living conditions? This paper investigates the effect of exogenous labor demand shocks in one clearly defined industry on the rural labor market in a poor developing country. We exploit regional differences in cotton production in Tajikistan to study the impact of the 2011 export price hike for cotton on wages of agricultural laborers using a unique household panel data set spanning from 2007 until 2011.

In 2010/2011 the world market prices for cotton increased sharply, implying an exogenous shock to the Tajik economy in which cotton production is the most important export sector. Owing to the price shock, the Tajik cotton production increased by over 40 percent between 2010 and 2011. While cotton is important for Tajikistan (it accounts for roughly one fifth of total exports), Tajikistan is only a minor player in the world market for this commodity accounting for around 1% of total world exports (Table 1). Hence, price fluctuations on the world market are truly exogenous to the country.

The analysis is based on a difference-in-differences approach using data from the nationally representative Tajikistan Household Panel survey, which started in 2007 in combination with a community survey that identified cotton growing regions. We want to specifically answer the question whether agricultural workers in the cotton sector benefitted from a sudden price increase through an unforeseeable demand expansion. While our main interest rests on the wages of cotton pickers, we also study the effect on labor supply (in progress). In the future, we plan to use the link between trade and the labor market as a first stage relationship to investigate the impact of an exogenous income shock on various household decisions.

Our paper contributes to the recently emerging empirical literature that exploits exogenous labor demand shocks to investigate local labor markets (Autor, Dorn and Hanson 2012; Kaur 2012; Greenstone and Moretti 2003, 2011). This paper builds on a wider literature that employs exogenous price variation and regional differences in the production structure of countries to identify exogenous labor demand shocks (Black et al. 2005; Acemoglu 2009; Angrist and Krueger 2009; Kovak 2011; Chiqiar 2008; Topalova 2010). Another strand of literature that we contribute to focuses on the gender dimension of the labor market in

developing countries. Our paper shares an important feature with the study by Qian (2008) who analyses the effect of increases in the price of tea (as opposed to other agricultural commodities) on the sex imbalances in China: Similar to tea, cotton is predominantly picked by women, hence adding a gender dimension to our labor market story. Finally, there exists a literature on export prices and their effects on households, which mostly employs CGE modeling to evaluate the effects of export taxes (e.g. Warr 2001, Warr 2002; for an econometric study see Hudson and Ethridge, 1999). Interestingly, Tajikistan implemented an export tax in 2011 to mitigate the effects of rising cotton prices for the domestic cotton processing industry.

Our preliminary results indicate that the cotton world price hike benefitted those workers who were employed in the cotton sector, but not other agricultural workers. With more than 20 percent, wage effects are substantial. In line with the predominant employment of women in cotton picking, we find that women benefit strongly from the price shock, while men gained close to nothing from the export price shock. The results of our falsification exercise indicate no relative changes in the remuneration of non-cotton workers in cotton regions, suggesting that there are no unobserved omitted regional wage trends and lending credibility to our identification strategy.

The remainder of the paper is structured as follows: Section 2 gives an overview over the case study, Tajikistan and its cotton sector. Section 3 presents the empirical methodology and the new panel data set. Section 4 describes and discusses the preliminary results, while Section 5 concludes.

2. Tajikistan and the cotton sector

Tajikistan is a lower income country in Central Asia, located between Afghanistan, China, Kyrgyzstan and Uzbekistan. In the year 2011, the country ranked 150 out of 185 in terms of GDP per capita PPP according to the IMF. Hence, Tajikistan's GDP per capita PPP is less than one fourth of China's and only one twenty-fourth of the USA. Tajikistan is populated by 7.6 million inhabitants. Around 67 percent of its working population is employed in agriculture. In rural areas, where the economically active population mainly consists of women, this share almost reaches 100 percent (FAO 2011). A large fraction of Tajikistan's territory is hilly or mountainous, making cotton production impossible (Figure 1). Cotton relies on specific climatic and geographic preconditions leading to a concentration of

growing areas in few flat regions which command irrigation as well as transport infrastructure.

In the world market for raw cotton, Tajikistan is a small country exporting around 1% of total world exports (Table 1). Thus, we can treat the export price for cotton as exogenous to Tajikistan. In Tajikistan, however, cotton is the most important export commodity next to aluminum. Cotton exports generate around 30% of yearly export earnings (FAO 2011). Historically, the cotton industry comprised mostly big firms which grow cotton on large plantations and which hire agricultural laborers. After independence, the government allowed small private (*dekhan*) farmers to grow food on their personal plots, not least to support the country's precarious food situation. However, large cotton companies, cotton spinning mills as well as regional governments always prevented the free crop choice of small farmers by exerting political pressure (International Crisis Group 2005, p.6). In the end, *dekhan* farmers were always pushed towards growing cotton. In 2010, the share of Tajikistan's cotton production that originates from *dhekan* farms reached 75% (up from 63% in 2007; FAO 2011, p.11). Cotton picking requires a high degree of dexterity and that is why the jobs on cotton farms are predominantly performed by women (and children during harvest time).

Apart from cotton, wheat is the most important crop and also the most important food commodity in TJ (FAO 2009, p. 8, 9).[1] Tajikistan is highly dependent on wheat imports from Kazakhstan and other neighboring countries and the world prices for wheat strongly affect domestic prices (FAO 2011, WFP 2011). The modest rather unsuccessful liberalization of production plans after independence was meant to increase the country's wheat production and food security. Official cotton quotas were effectively relaxed only in 2007. As a result the area used for cotton in regions suitable for cotton production decreased in exchange for wheat production (FAO 2009, p. 4, 8, 9, see also Figure 5a and 5b; the large increase in wheat production in 2009 was also due to good weather conditions). From 2010-2011 world wheat prices increased (Figure 4) and so did domestic wheat prices (FAO 2011, p. 26, 27). However, in the beginning of 2011, there was an unprecedented surge in world prices for cotton. From July 2010 until March 2011 prices more than doubled (Figure 2). This led to an increase in cotton production in Tajikistan in 2011 by 40 percent, reversing the decade long declining trend that was owing to the country's lack in investments to modernize irrigation and infrastructure and the shift towards food production (Akramov and Shreedhar 2012). The

[1] In non-cotton regions there is a lot of vegetable production next to wheat production (see Table 2). Since the production of vegetables and fruits (including main produce potatoes) takes predominantly place at household plots and for local consumption, there are no reliable production statistics.

cotton area harvested increased by almost 30 percent in 2011 (Figures 3a and 3b). Obviously, the acreage used for cotton could only be expanded in areas seemed suitable for cotton production in terms of climate and soil.

We exploit regional differences in cotton production to investigate the effect of the rising cotton price on regional labor markets. Basically, we divide the country in areas that are suitable for cotton production and areas that are not.

3. Empirical methodology and data

Our data basis comprises the Tajikistan Living Standards Survey (TLSS) conducted by the World Bank and UNICEF in fall 2007 and 2009 and a follow up survey for 2011 conducted by the Institute for East and Southeast European Studies (IOS). All three waves were collected in fall, during the cotton harvest season, so that we have reliable measures of labor market participation in the cotton sector. The first wave in 2007 contains a representative sample of 4,860 households. In the second and third wave, the sample contained a representative sub-set of 1,503 households (Danzer, Dietz and Gatskova 2013). The survey contains an array of information on household characteristics, migration, education, health, labor market status and consumption. In a first step, we will focus on the effects of the cotton price shock on individual labor market outcomes.

We define cotton regions based on information about primary sampling units (PSUs) in the 2007 community survey that was conducted alongside the TLSS. PSUs in which cotton was reported as the first or second most important crop, are defined as cotton regions. Non-cotton regions are all remaining regions which are predominantly characterized by agricultural production. We exclude the few regions that are predominantly engaged in mining as well as the capital city of Tajikistan, Dushanbe. Workers employed in agriculture in these cotton regions comprise the treatment group. The control group contains agricultural workers in non-cotton regions.

Because of the cotton price spike in 2010/2011 and increased cotton production in 2011, labor demand should have increased strongly in cotton growing regions in 2011. We expect wages of the treatment group to increase from 2009 until 2011 relative to wages of the control group. From 2007 to 2009, cotton prices slightly decreased and we expect a negative or no effect on wages of the treatment group relative to the control group. Figures 6 and 7

which plot the unconditional means of wages for the treatment vs. control groups in each year provide evidence in support of this hypothesis.

Our empirical analysis uses the following main specification. We estimate the following model by OLS using only the sample of agricultural workers:

$$\ln(\text{wage})_{i,t} = \alpha + \beta_1(\text{cottonregion} \times \text{year09}) + \beta_2(\text{cottonregion} \times \text{year11}) + \beta_3\text{cottonregion} + \beta_4\text{year09} + \beta_5\text{year11} + \gamma X_{i,t} + u_{i,t} \quad (1)$$

for individual *i* at time *t*.

The dependent variable is the log wage for individual *i* in year *t*. In the survey, wages are measured as monthly net wages in the previous month. Currently, we use no CPI correction for these wages as we have no regional CPIs. We interact the year dummies with a dummy for cotton regions to capture the effect of the rising cotton price on the treatment group β_2 in the year 2011. The coefficient β_1 represents the result from a falsification exercise where we test whether the wage growth between cotton and other agricultural workers differed already in the pre-price hike period. In addition, the variables year and cotton region are included separately. Control variables $X_{i,t}$ include sex, age, two dummies for middle and higher education (*secondaryedu* and *tertiaryedu*), three dummy variables for groups of occupation (*occhigh* stands for one-digit occupational codes 1-3, *occ4578* stands for one-digit occupational codes 4, 5, 7 and 8, *occagriskilled* stands for skilled agricultural occupations), a dummy for firm size (*firmbig*), and a dummy for state enterprises (*statefirm*). In a second specification, we include district fixed effects in the model. In all regressions, we use robust standard errors clustered at the individual level.

>> Table comparing characteristics of cotton vs. non-cotton regions (in progress) <<

4. Results

We report the preliminary results originating from an OLS regression of equation (1) in Table 3. The first column indicates a highly significant effect of the cotton price shock on wages of the treatment group from 2009 to 2011 (p-value of 0.008). Wages increase by more than 20 percent in the treatment group compared to the control group. Since there was little variation in cotton prices between 2007 and 2009 we expect no positive effect on agricultural wages in cotton regions. The fact that wages in cotton regions did not increase from 2007 until 2009 further strengthens our argument. Hence, we can rule out a pre-trend in wages for

agricultural workers in cotton regions. Once we include district fixed effects, the effect of the cotton price increase on the treatment group becomes smaller (22 percent wage increase), but it is still significant at the 5% level.

As mentioned earlier, women comprise the major part of the workforce in agricultural regions. Furthermore, women play a major role in cotton harvesting activities. Therefore, we expect the effect of rising cotton prices on wages to be more pronounced among female agricultural workers in cotton regions than among male workers. When we run the main regression for male and female workers separately, we have strong evidence for this hypothesis. The first two columns of Table 4 show that the effect becomes smaller and less significant for male workers. In the regression with district fixed effects, the coefficient is 0.16 and not significantly different from zero. The coefficient for female workers, however, increases strongly. Even in the regression with district fixed effects, the effect remains significant. Once we control for time invariant district specific characteristics, wages for female agricultural workers in cotton regions increase by 28.8 log points (compared to the control group) from 2009 until 2011.

We also conduct an additional falsification exercise using only the sample of non-agricultural workers. Table 5 shows that from 2009 until 2011 there is no significant increase for wages of non-agricultural workers in cotton regions compared to the control group, when we include district fixed effects. This implies that the wage increase we find for agricultural workers is not related to some underlying common wage trends in the cotton regions.

If rising cotton prices increased the demand for cotton, one might suspect that the greater workload in cotton fields led cotton pickers to work more hours. As a consequence, the wage effects found previously could merely reflect an increase in working time at a constant wage rate. However, once we focus on hourly rather than monthly wages our main results on the wage effects of the cotton price increase are even strengthened (Table 6). This finding confirms that wages really increased as a consequence of the price hike.

This suggests that labor demand was met at the extensive rather than intensive margin of labor supply and that more workers entered the cotton sector due to the price shock. We test this hypothesis in two set-ups. First, individuals who were out of the labor force or unemployed might have found employment in the cotton sector. Second, workers employed in other sectors of the economy might have turned to the cotton sector because wages became attractive. Because we cannot clearly determine in our data whether an individual person actually picks cotton, we analyze more generally the determinants of the probability of

working in the agricultural sector in relation to the working age population (age 18-55 for women and age 18-60 for men) as well as in relation to the working population (all those in working age who either have dependent employment or work as self-employed). Table 7 investigates the propensity to be an agricultural worker in the entire working age population and clearly shows a strong movement towards participation in the year of the cotton price hike 2011. The entry into agricultural employment is especially strong for women. Quite differently, we find little evidence that people who previously belonged to the working population changed into agriculture as a consequence of the cotton price hike (Table 8)

Hence, the increased demand for agricultural work was satisfied by individuals—predominantly women—who previously were not attached to the labor market. In the next step we will also analyze working hours of those who used to work in the cotton sector before the price change.

5. Conclusion

In this preliminary paper, we have identified the effect of a sudden cotton price shock on wages of agricultural workers in cotton areas of Tajikistan as compared to workers in non-cotton areas. The wage increase following the expansion of the cotton production is substantial. While women, who normally work as cotton pickers, gain from the increase in world market prices, no such wage increase can be detected for men. This has substantial social implications: Women working in the cotton sector are considered the most deprived working poor without social benefits (International Crisis Group 2005). The cotton price hike seems to have benefitted the most disadvantaged part of the workforce in terms of wages. Moreover, the growth in paid labor market participation of women will most likely have benefitted their absolute and relative economic standing within households and within the society as a whole.

The paper sheds light on the link between international trade and the labor market conditions of some of the most disadvantaged workers in developing countries, those working in sectors producing basic commodities for the global market. While working conditions in the cotton sector of Tajikistan are harsh, we observe strong price adjustments following increased demand. The fact that the cotton growing infrastructure (e.g. irrigation) in Tajikistan has been neglected since independence may have contributed to wage growth as cotton producers had to demand more or better labor inputs in the presence of an outdated capital

stock. In this respect the global hunger for basic commodities benefitted some of the poorest workers. The presented case study clearly shows how a strong external dependence on exports results in labor market risks for a substantial fraction of the local workforce and potentially pushes the boundaries of national social security institutions. While this time, the rise in the world market price of cotton benefitted the population, an equally likely drop in the world market price might produce massive social costs in Tajikistan. At this stage, it remains an open question whether export taxes or subsidies on cotton (as currently discussed in Tajikistan) are useful policy instruments to stabilize producer prices at the farm gate.

In the future we plan to use the cotton price shock as instrument in the estimation of household responses to income changes.

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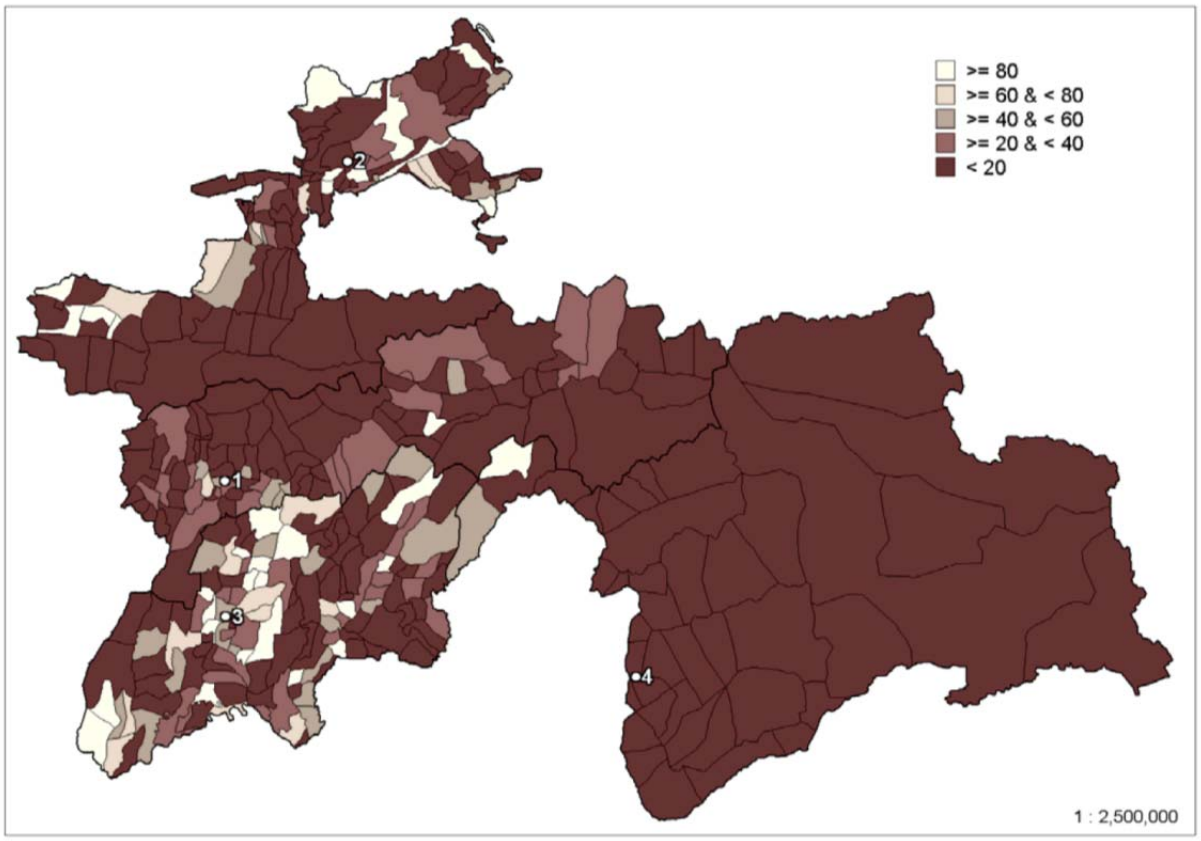
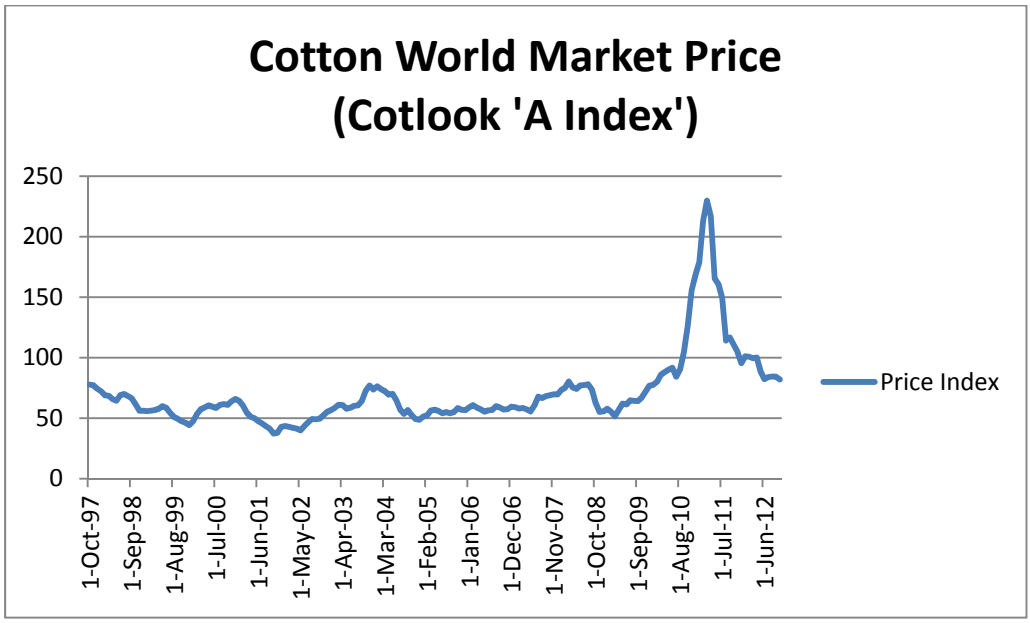
Appendix

Figure 1: Percentage land classed as cotton (other crops)



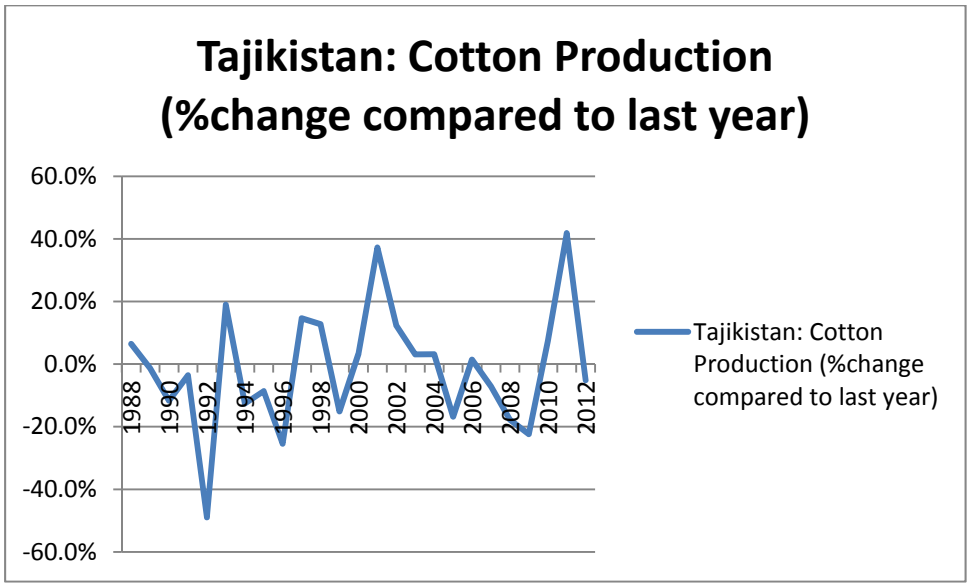
Source: Socio-Economic Atlas of Tajikistan (2005)

Figure 2: Cotton world market price



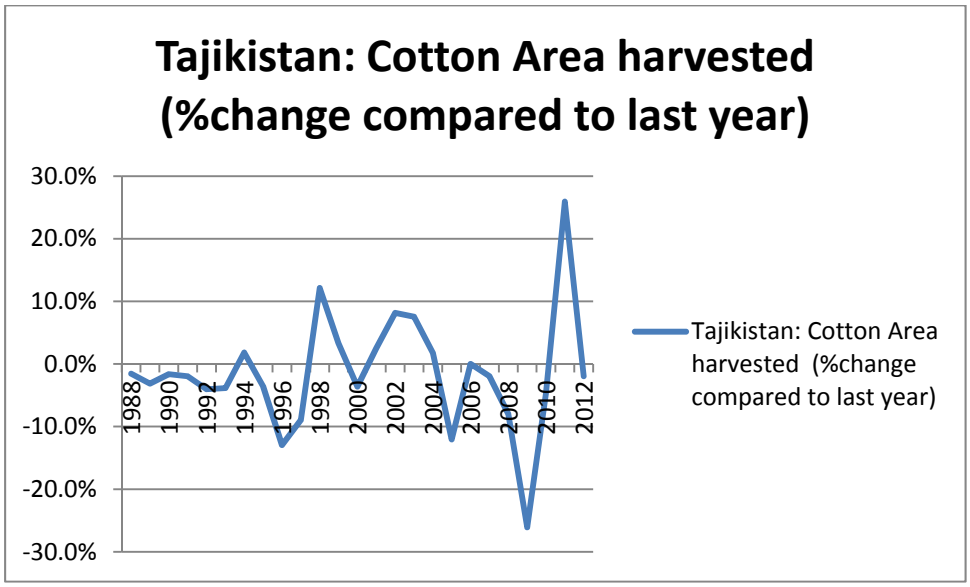
Source: IMF Primary Commodity Prices (Cotton Outlook 'A Index', Middling 1-3/32 inch staple, CIF Liverpool, US cents per pound)

Figure 3a: Cotton production



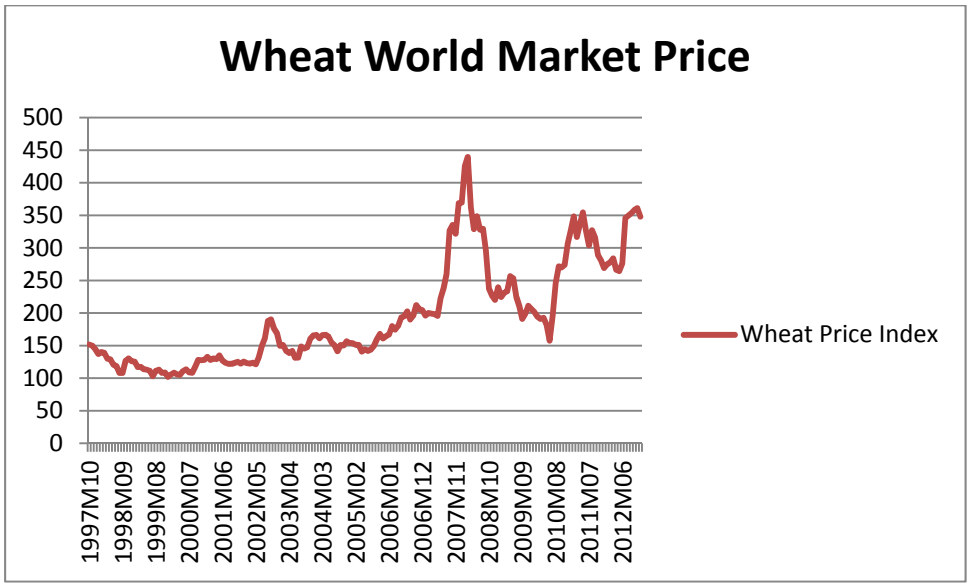
Source: United States Department of Agriculture (USDA) - Foreign Agricultural Service (FAS)

Figure 3b: Cotton area harvested



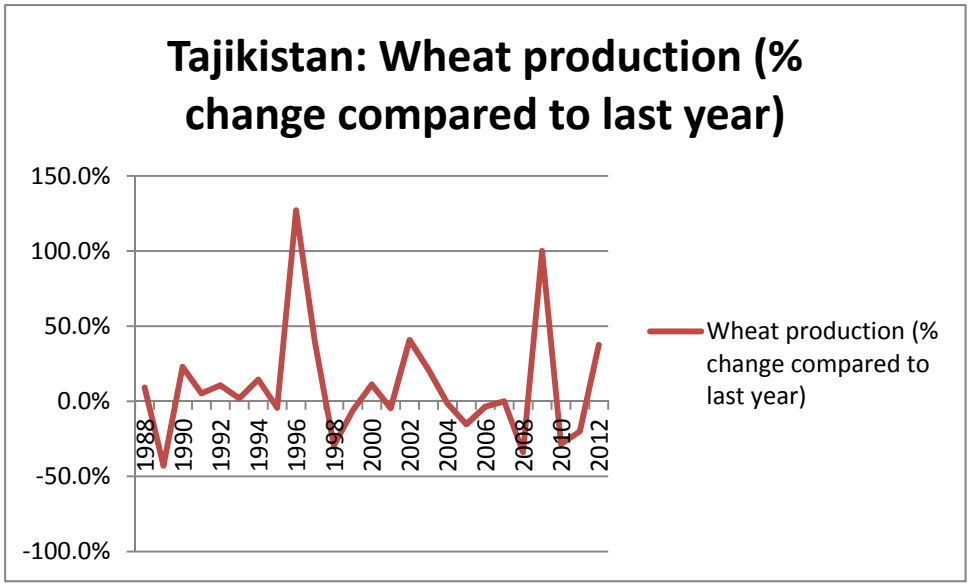
Source: United States Department of Agriculture (USDA) - Foreign Agricultural Service (FAS)

Figure 4: Wheat world market price



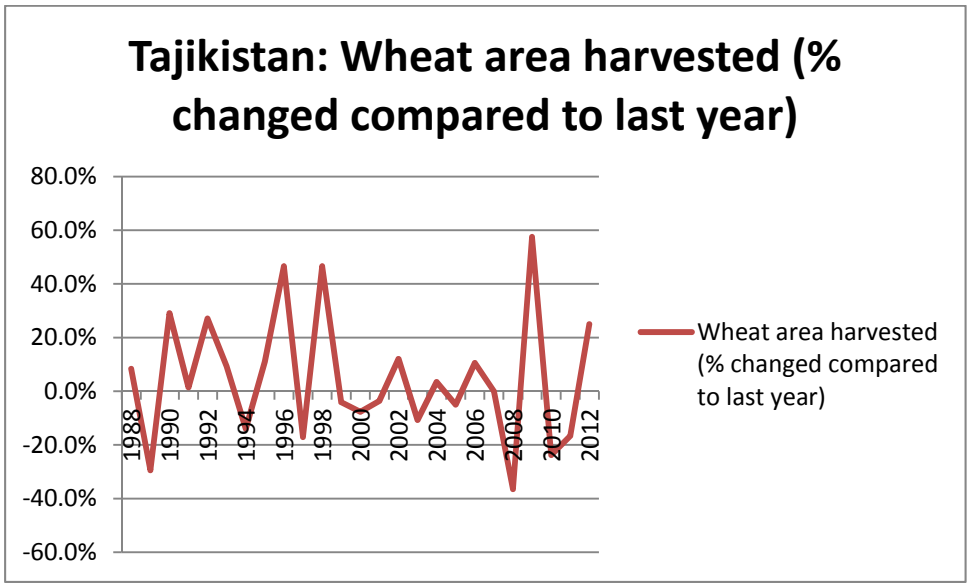
Source: IMF Primary Commodity Prices (Wheat, No.1 Hard Red Winter, ordinary protein, FOB Gulf of Mexico, US$ per metric ton)

Figure 5a: Wheat production



Source: United States Department of Agriculture (USDA) - Foreign Agricultural Service (FAS)

Figure 5b: Wheat area harvested



Source: United States Department of Agriculture (USDA) - Foreign Agricultural Service (FAS)

Figure 6: Unconditional mean wage for treatment/control group

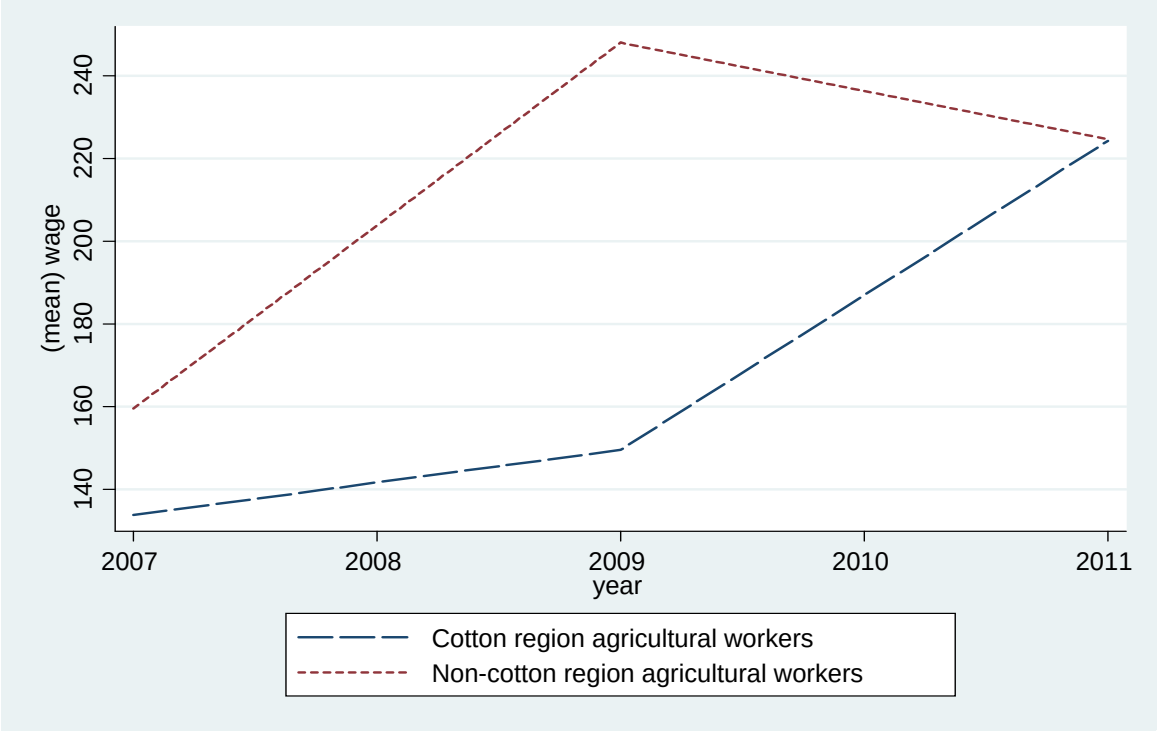


Figure 7: Unconditional mean wage for treatment/control group (splitted sample)

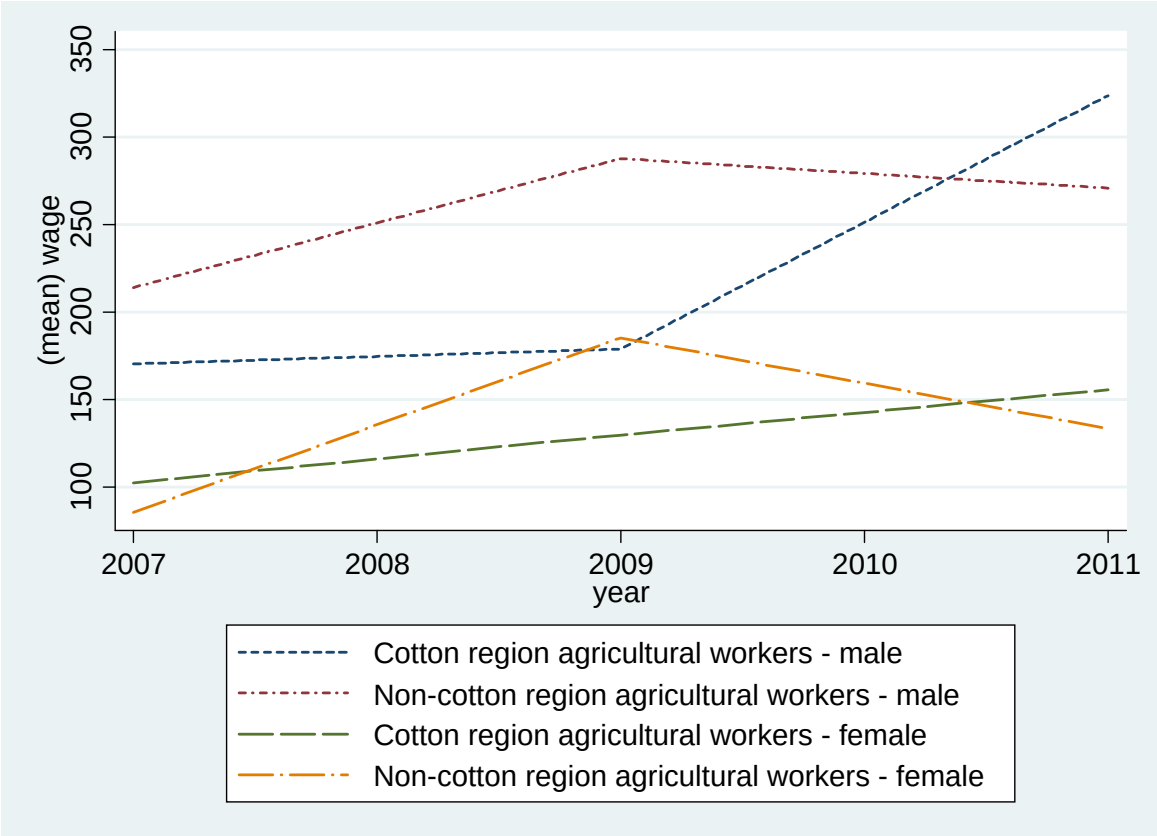


Table 1: Share of world exports for raw cotton per country

	2010			2011			2012	
	Country	Share in World Exports		Country	Share in World Exports		Country	Share in World Exports
1	United States	40.45%	1	United States	25.51%	1	United States	31.37%
2	India	14.07%	2	India	24.13%	2	India	11.57%
3	Uzbekistan	7.46%	3	Brazil	10.44%	3	Brazil	11.31%
4	Australia	7.06%	4	Australia	10.11%	4	Australia	11.06%
5	Brazil	5.63%	5	Uzbekistan	5.44%	5	Uzbekistan	6.94%
6	Turkmenistan	3.10%	6	Pakistan	2.72%	6	Greece	2.57%
7	Greece	2.11%	7	Malaysia	2.23%	7	Burkina	2.31%
8	Pakistan	1.90%	8	Greece	2.18%	8	Mali	2.19%
9	Burkina	1.90%	9	Turkmenistan	1.63%	9	Turkmenistan	2.06%
10	Mali	1.27%	10	Mali	1.36%	10	Malaysia	1.93%
11	Zimbabwe	1.20%	11	Burkina	1.31%	11	Tajikistan	1.29%
12	Egypt	1.20%	12	Tajikistan	1.09%	12	Pakistan	1.29%
13	Tajikistan	1.13%	13	Egypt	1.03%	13	Benin	1.16%
14	Kazakhstan	0.98%	14	Zimbabwe	0.93%	14	Cote d'Ivoire	1.09%
15	Argentina	0.91%	15	Argentina	0.90%	15	Zimbabwe	1.03%

Source: United States Department of Agriculture (USDA) - Foreign Agricultural Service (FAS)

Table 2: Two most important agricultural crops in cotton and non-cotton regions (percentage of PSUs per group)

	Non-cotton region	Cotton region
Cotton-growing	0%	100%
Gardening	33%	2%
Grain crops	56%	28%
Plant growing	5%	1%
Vegetable growing	82%	67%
Vineyard	2%	1%
Legumes	2%	0%
Total Number of PSUs	**108**	**162**

Note: PSU is counted, if its first or second most important crop is x (for some PSUs the same crop appears twice so that the columns do not add up to 200%)

Table 3: OLS Regression for agricultural workers (full sample)

	(1)	(2)
	logwage	logwage
_Icottonreg_1	-0.199**	-0.383***
	(0.020)	(0.004)
_Iyear_2009	0.327***	0.257**
	(0.004)	(0.013)
_Iyear_2011	0.475***	0.486***
	(0.000)	(0.000)
_IcotXyea_1_2009	**0.0578**	**0.00719**
	(0.639)	(0.950)
_IcotXyea_1_2011	**0.282*** **	**0.218** **
	(0.008)	(0.041)
sex	-0.369***	-0.269***
	(0.000)	(0.000)
age	0.00625***	0.00532***
	(0.000)	(0.000)
secondaryedu	0.0492	0.0520
	(0.325)	(0.272)
tertiaryedu	0.276**	0.116
	(0.014)	(0.295)
firmbig	-0.251***	-0.197***
	(0.000)	(0.000)
statefirm	-0.161***	-0.252***
	(0.001)	(0.000)
occhigh	0.300***	0.324***
	(0.003)	(0.003)
occ4578	0.290***	0.302***
	(0.003)	(0.004)
occagriskilled	-0.0773	-0.0320
	(0.121)	(0.523)
District dummies	No	Yes
Sample	Full sample	Full sample
_cons	4.931***	5.042***
	(0.000)	(0.000)
N	2066	2066
R-sq	0.209	0.347
adj. R-sq	0.204	0.328
p-values in parentheses		
="* p<0.10	** p<0.05	*** p<0.01"

Table 4: OLS Regression for agricultural workers (splitted sample)

	(1)	(2)	(3)	(4)
	logwage	logwage	logwage	logwage
_Icottonreg_1	-0.170	-0.176	-0.220*	-0.545***
	(0.160)	(0.354)	(0.073)	(0.002)
_Iyear_2009	0.330**	0.220	0.318*	0.323**
	(0.022)	(0.114)	(0.081)	(0.033)
_Iyear_2011	0.583***	0.547***	0.259	0.412***
	(0.000)	(0.000)	(0.102)	(0.004)
_IcotXyea_1_2009	**-0.0121**	**-0.0250**	**0.0988**	**-0.0260**
	(0.941)	(0.879)	(0.605)	(0.872)
_IcotXyea_1_2011	**0.252***	**0.160**	**0.443*****	**0.288***
	(0.088)	(0.318)	(0.006)	(0.056)
age	0.00443**	0.00410**	0.00820***	0.00562***
	(0.049)	(0.047)	(0.000)	(0.005)
secondaryedu	0.0313	0.0733	0.0589	0.0321
	(0.729)	(0.395)	(0.315)	(0.546)
tertiaryedu	0.319**	0.214	-0.265	-0.605**
	(0.019)	(0.104)	(0.282)	(0.023)
firmbig	-0.264***	-0.163**	-0.250***	-0.193***
	(0.000)	(0.026)	(0.000)	(0.000)
statefirm	-0.128*	-0.224***	-0.199***	-0.288***
	(0.072)	(0.004)	(0.002)	(0.000)
occhigh	0.193	0.246*	0.814***	0.598**
	(0.104)	(0.053)	(0.000)	(0.018)
occ4578	0.258**	0.292**	0.128	-0.278
	(0.020)	(0.014)	(0.628)	(0.364)
occagriskilled	-0.180**	-0.103	-0.0209	0.00794
	(0.013)	(0.177)	(0.768)	(0.912)
District dummies	No	Yes	No	Yes
Sample	Male	Male	Female	Female
_cons	4.683***	4.710***	4.117***	5.341***
	(0.000)	(0.000)	(0.000)	(0.000)
N	986	986	1080	1080
R-sq	0.172	0.308	0.151	0.352
adj. R-sq	0.161	0.265	0.141	0.319
p-values in parentheses				
="* p<0.10	** p<0.05	*** p<0.01"		

Table 5: OLS Regression for non-agricultural workers

	(1)	(2)	(3)	(4)	(5)	(6)
	logwage	logwage	logwage	logwage	logwage	logwage
_Icottonreg_1	-0.0742*	-0.0317	-0.117**	-0.0749	0.0961	0.189
	(0.065)	(0.612)	(0.012)	(0.269)	(0.223)	(0.184)
_Iyear_2009	0.233***	0.230***	0.206***	0.199***	0.361***	0.375***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
_Iyear_2011	0.650***	0.638***	0.548***	0.536***	1.061***	1.065***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
_IcotXyea_1_2009	**0.132****	**0.0961**	**0.127***	**0.101**	**0.0670**	**0.0216**
	(0.034)	(0.125)	(0.080)	(0.168)	(0.563)	(0.852)
_IcotXyea_1_2011	**-0.0360**	**-0.0263**	**0.0191**	**0.0298**	**-0.306*****	**-0.320*****
	(0.540)	(0.649)	(0.776)	(0.654)	(0.008)	(0.007)
sex	-0.598***	-0.588***	.	.	.	.
	(0.000)	(0.000)	.	.	.	.
age	-0.00333***	-0.00313***	-0.00505***	-0.00452***	0.00381	0.00240
	(0.006)	(0.010)	(0.000)	(0.000)	(0.244)	(0.442)
secondaryedu	0.167***	0.176***	0.234***	0.233***	-0.0308	-0.0346
	(0.001)	(0.000)	(0.000)	(0.000)	(0.758)	(0.730)
tertiaryedu	0.360***	0.354***	0.375***	0.344***	0.365***	0.389***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)
firmbig	0.327***	0.276***	0.370***	0.328***	0.162**	0.123*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.017)	(0.073)
statefirm	-0.575***	-0.544***	-0.521***	-0.471***	-0.664***	-0.637***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
occhigh	0.139***	0.108**	0.0153	-0.00552	0.406***	0.370***
	(0.009)	(0.042)	(0.820)	(0.934)	(0.000)	(0.000)
occ4578	0.282***	0.249***	0.225***	0.190***	0.397***	0.403***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
occagriskilled	-0.411**	-0.378**	-0.476***	-0.459**	-0.194	0.234
	(0.012)	(0.027)	(0.004)	(0.010)	(0.620)	(0.540)
District dummies	No	Yes	No	Yes	No	Yes
Sample	Full sample	Full sample	Male	Male	Female	Female
_cons	6.128***	5.903***	5.635***	4.967***	4.527***	4.465***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	3993	3993	3095	3095	898	898
R-sq	0.307	0.350	0.189	0.252	0.332	0.391
adj. R-sq	0.304	0.340	0.186	0.237	0.322	0.348
p-values in parentheses						
="* p<0.10	** p<0.05	*** p<0.01"				

Table 6: OLS Regression for agricultural workers (log of wage per hour)

	(1)	(2)	(3)	(4)	(5)	(6)
	logwageph	logwageph	logwageph	logwageph	logwageph	logwageph
Icottonreg	-0.138*	-0.282**	-0.112	0.0422	-0.145	-0.545***
	(0.067)	(0.013)	(0.327)	(0.783)	(0.132)	(0.000)
_Iyear_2009	0.608***	0.493***	0.582***	0.484***	0.644***	0.531***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
_Iyear_2011	0.950***	0.985***	1.057***	1.133***	0.734***	0.830***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
_IcotXyea_1_	**-0.00883**	**-0.0485**	**-0.128**	**-0.188**	**0.0518**	**0.00937**
	(0.945)	(0.687)	(0.475)	(0.295)	(0.786)	(0.955)
_IcotXyea_1_	**0.404*** **	**0.262** **	**0.269**	**0.0370**	**0.668*** **	**0.464*** **
	(0.000)	(0.023)	(0.101)	(0.836)	(0.000)	(0.001)
sex	-0.277***	-0.164***	.	.	.	.
	(0.000)	(0.000)	.	.	.	.
age	0.00717***	0.00569***	0.00431*	0.00359	0.0103***	0.00727***
	(0.000)	(0.000)	(0.082)	(0.112)	(0.000)	(0.000)
secondaryed	0.00561	0.0255	-0.0160	0.0582	0.0154	-0.00382
	(0.916)	(0.603)	(0.870)	(0.535)	(0.808)	(0.946)
tertiaryedu	0.287**	0.142	0.294*	0.195	0.0898	-0.296
	(0.025)	(0.238)	(0.060)	(0.175)	(0.760)	(0.352)
firmbig	-0.413***	-0.304***	-0.406***	-0.255***	-0.417***	-0.314***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
statefirm	-0.126**	-0.252***	-0.0652	-0.178**	-0.181***	-0.304***
	(0.014)	(0.000)	(0.393)	(0.029)	(0.008)	(0.000)
occhigh	0.238**	0.255**	0.139	0.223*	0.633**	0.0438
	(0.033)	(0.031)	(0.267)	(0.098)	(0.018)	(0.882)
occ4578	0.304***	0.353***	0.210*	0.268*	0.537	0.126
	(0.010)	(0.003)	(0.099)	(0.054)	(0.148)	(0.732)
occagriskille	-0.0806	-0.0486	-0.197**	-0.139	0.0124	-0.0223
	(0.182)	(0.410)	(0.018)	(0.111)	(0.894)	(0.789)
District dumi	No	Yes	No	Yes	No	Yes
Sample	Full sample	Full sample	Male	Male	Female	Female
_cons	-0.452***	-1.216***	-0.529***	-0.654***	-1.195***	0.116
	(0.000)	(0.000)	(0.001)	(0.003)	(0.000)	(0.784)
N	2065	2065	986	986	1079	1079
R-sq	0.301	0.445	0.257	0.397	0.311	0.502
adj. R-sq	0.296	0.429	0.247	0.359	0.302	0.476
p-values in parentheses						
="* p<0.10	** p<0.05	*** p<0.01"				

Table 7: Participation of working age population in agricultural production (Probit-Regression)

	(1)	(2)	(3)	(4)	(5)	(6)
	partdummy	partdummy	partdummy	partdummy	partdummyf	partdummy
main						
_Icottonreg_1	-0.112**	-0.364***	-0.104	-0.344***	-0.178**	-0.449***
	(0.030)	(0.000)	(0.118)	(0.004)	(0.048)	(0.000)
_Iyear_2009	0.135**	0.109*	0.0841	0.0589	0.193**	0.187*
	(0.020)	(0.060)	(0.256)	(0.442)	(0.047)	(0.054)
_Iyear_2011	0.424***	0.400***	0.378***	0.358***	0.508***	0.486***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
_IcotXyea_1_2009	**0.144***	**0.186****	**0.0370**	**0.0517**	**0.302****	**0.369*****
	(0.069)	(0.024)	(0.719)	(0.635)	(0.022)	(0.007)
_IcotXyea_1_2011	**0.453*****	**0.495*****	**0.225****	**0.242****	**0.693*****	**0.788*****
	(0.000)	(0.000)	(0.024)	(0.021)	(0.000)	(0.000)
sex	-0.383***	-0.392***	.	.	.	.
	(0.000)	(0.000)	.	.	.	.
age	0.00952***	0.00981***	0.0191***	0.0195***	0.00390*	0.00442**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.082)	(0.049)
secondaryedu	0.0320	-0.0424	0.00775	-0.0748	0.0307	-0.0398
	(0.438)	(0.349)	(0.904)	(0.283)	(0.589)	(0.531)
tertiaryedu	-0.380***	-0.406***	-0.407***	-0.480***	-0.311	-0.202
	(0.000)	(0.000)	(0.000)	(0.000)	(0.105)	(0.307)
firmbig	0.521***	0.593***	0.283***	0.380***	0.955***	1.014***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
statefirm	-0.141	-0.0636	-0.306***	-0.268**	0.183	0.279
	(0.123)	(0.506)	(0.005)	(0.021)	(0.305)	(0.136)
occhigh	-0.0376	-0.0210	0.0704	0.0996	-0.658***	-0.632***
	(0.709)	(0.845)	(0.527)	(0.410)	(0.004)	(0.006)
occ4578	-0.574***	-0.532***	-0.617***	-0.599***	-0.451***	-0.242
	(0.000)	(0.000)	(0.000)	(0.000)	(0.010)	(0.155)
occagriskilled	3.773***	3.799***	3.340***	3.358***	4.150***	4.308***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
District dummies	No	Yes	No	Yes	No	Yes
Sample	Full sample	Full sample	Male	Male	Female	Female
_cons	-1.340***	-1.549***	-1.891***	-2.077***	-2.041***	-2.371***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	16091	15903	7527	7346	8200	8087
p-values in parentheses						
="* p<0.10	** p<0.05	*** p<0.01"				

Table 8: Participation of working population in agricultural production (Probit regression)

	(1)	(2)	(3)	(4)	(5)	(6)
	dummyjob change	dummyjob change	dummyjob change	dummyjob change	dummyjob change	dummyjob change
dummyjobchange						
_Icottonreg_1	-0.122	-0.256**	-0.113	-0.369**	-0.0111	0.296
	(0.103)	(0.044)	(0.169)	(0.014)	(0.948)	(0.206)
_Iyear_2009	0.0327	-0.00166	0.0290	0.000275	0.135	0.134
	(0.694)	(0.985)	(0.753)	(0.998)	(0.421)	(0.465)
_Iyear_2011	0.378***	0.314***	0.318***	0.272***	0.547***	0.593***
	(0.000)	(0.000)	(0.000)	(0.003)	(0.002)	(0.005)
_IcotXyea_1_2009	**0.157**	**0.135**	**0.0862**	**0.0923**	**0.154**	**-0.0213**
	(0.169)	(0.262)	(0.506)	(0.500)	(0.514)	(0.935)
_IcotXyea_1_2011	**0.248****	**0.243****	**0.130**	**0.136**	**0.332**	**0.137**
	(0.015)	(0.025)	(0.269)	(0.281)	(0.137)	(0.582)
sex	0.345***	0.395***	.	.	.	.
	(0.000)	(0.000)	.	.	.	.
age	0.00372*	0.00462**	0.00700***	0.00715***	-0.00726*	-0.00515
	(0.055)	(0.023)	(0.002)	(0.003)	(0.075)	(0.228)
secondaryedu	0.0850	-0.00351	0.135*	0.00770	0.0873	0.105
	(0.177)	(0.959)	(0.094)	(0.929)	(0.473)	(0.436)
tertiaryedu	-0.241**	-0.291***	-0.288**	-0.401***	0.0793	0.273
	(0.016)	(0.006)	(0.010)	(0.001)	(0.758)	(0.309)
firmbig	0.136*	0.208**	0.109	0.199**	0.0319	-0.0122
	(0.064)	(0.010)	(0.232)	(0.045)	(0.786)	(0.931)
statefirm	-0.805***	-0.785***	-0.591***	-0.574***	-1.176***	-1.144***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
occhigh	-0.925***	-0.896***	-0.647***	-0.622***	-1.661***	-1.672***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
occ4578	-1.717***	-1.686***	-1.532***	-1.524***	-2.438***	-2.470***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
occagriskilled	2.373***	2.378***	2.365***	2.395***	2.408***	2.515***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
District dummies	No	Yes	No	Yes	No	Yes
Sample	Full sample	Full sample	Male	Male	Female	Female
_cons	-0.614***	-0.906***	-0.515***	-0.529**	0.644***	0.141
	(0.000)	(0.000)	(0.000)	(0.011)	(0.002)	(0.684)
N	7865	7773	5054	4953	2811	2676
p-values in parentheses						
="* p<0.10	** p<0.05	*** p<0.01"				