Weather Shocks, Impact on Households, and Ability to Recover in Morocco

Cong Nguyen, Minh and Wodon, Quentin

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Minh Cong Nguyen and Quentin Wodon

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Abstract

What is the likelihood that Moroccan households, and especially those involved in agriculture, may be confronted with extreme weather events such as droughts and floods? Who suffers the most from such events when they occur? To what extent are different types of households able to recover from such shocks? This chapter provides answers to these questions on the basis of questions on weather shocks added to a nationally representative household survey implemented in Morocco in 2009-10. The data suggest that most households working in agriculture are affected by weather shocks, often seriously. In the population as a whole, the proportion of households affected is about one fourth. A majority of households declare not being able to recover much from weather shocks, as well as other shocks. But in comparison to other shocks, including unexpected increases in the prices of food and other basic essential commodities, households are slightly more likely to be able to recover from weather shocks.

1.   Introduction

Climate change is expected to result in an increase in global temperatures by 3°C to 5°C in this century, as well as in a reduction in rainfall and greater seasonal temperature and rainfall variability in many areas. Higher sea levels are also a threat to many areas, including in the MENA region where a large share of its population is located in low lying areas. With agriculture remaining essential for livelihood in the region, and existing conditions in terms of water scarcity being already precarious in many areas, climate change represents a significant concern for households. Expectations are that extreme weather events such as floods and droughts are likely to become more frequent, which has implications for coping and adaptation mechanisms (e.g., UNDP 2009; IPCC, 2012; Elasha, 2010; McSweeney, New, and Lizcano, 2009; World Bank, 2010; Verner, 2012). For a brief review of the literature which informs this chapter, see the introduction of chapter 2 by Wodon et al. (2014) and chapter 3 on the five countries of focus for this work by Burger et al. (2014a), both in this study.

In the case of Morocco, periodic droughts have now become the norm rather than the exception. These droughts tend to have substantial effects on households involved in agriculture in part because irrigated land is rare (Skees, 2001; Swearingen and Bencherifa, 2000). The evidence points to a decrease in rainfall of up to 25 percent and an increase in the frequency of droughts over the last three decades, which in turn has led to an increase in the volatility of the contribution of agriculture to GDP (Azzam and Sekkat, 2005; Barakat and Handoufe, 1998; Skees, 2001). While farmers have developed new ways to cope with droughts and the share of households relying primarily or solely on agriculture for their livelihood has decreased (Swearingen and Bencherifa, 2000), many households remain engaged in agriculture and highly vulnerable to droughts, especially among the rural poor.

This chapter provides a new assessment of the extent to which households are subject to extreme weather shocks in Morocco, who suffers the most from these shocks, and whether households are able to recover from the shocks. The analysis is based primarily on perceptions- with households assessing subjectively the extent to which they are affected by weather shocks as well as their ability to recover from these shocks. The data come from a recent nationally representative household survey data collected in Morocco in 2009-10. The main objective of the survey was to collect data on youth employment and civic engagement, but questions were added to the survey for this study on climate change both to assess to what extent households were affected by extreme weather events and to be able to compare their ability to recover from those shocks as opposed to other shocks.

The data suggest that virtually all households working in agriculture are affected by weather shocks, often seriously. In the population as a whole, the proportion of households affected by weather shocks is about one fourth, simply because this is also roughly the proportion of those involved in agriculture, with other households less likely to be affected. A majority of households declare not being able to recover much from weather shocks, as well as a range of other shocks, and this is especially the case for poorer households. But in comparison to other shocks, including unexpected increases in the prices of food and other basic essential commodities, households are slightly more likely to be able to recover from weather shocks.

These findings confirm, as was already observed in the analysis of chapter 3 (Adoho and Wodon, 2014), that the poor tend to be most affected by extreme weather events that are likely to become more frequent with climate change, while they also have fewer means to cope with such events or recover from them. The chapter is organized as follows. Section 2 introduces the data used for the analysis. Section 3 provides basic statistics on the extent to which households are

affected by weather and other shocks, and whether they are able to recover from the shocks. Section 4 provides a multivariate analysis of the correlates of both the likelihood of being affected by various shocks, and the ability to recover. A brief conclusion follows.

2.   Data

This chapter is based on data from the Morocco Household and Youth Survey (MHYS) implemented in 2009–2010. The survey is nationally representative (even if it does not include the scarcely populated Western Sahara southern part of the country) and includes data on 2,000 households (1,216 in urban areas and 784 in rural areas). The survey was implemented with funding from the World Bank between December 2009 and March 2010. Much of the questionnaire focused on issues critical to youth, and especially the obstacles that they encounter on the labor market and for civic participation. Questions were also asked about young people's intentions to emigrate. Other more traditional modules deal with standard questions on household member demographics and education as well as employment information. The questionnaire also focused on various shocks affecting households and their ability to cope with these shocks. In order to be able to use the survey also for this work on migration in the MENA region, additional questions as well as options within existing questions were asked at the design stage of the survey on household perceptions regarding changes in climate, and whether this affected migration decisions. While the survey also included a separate instrument administered to most young individuals in the surveyed households, that part of the survey is not used here.

Apart from a range of household and individual characteristics which are used as controls in the regression analysis, a few central questions are used for the analysis presented in this chapter. In section 6B of the questionnaire devoted to climate change and shocks in agriculture, households are asked the following question: *"Is one of the members of household involved in agriculture or agriculture related activities?"* For those households involved in agriculture, the following question was then asked: *"Over the last five years has your household faced the following problems?"* The list of problems identified was as follows: (1) Reduction in agricultural yields due to inadequate rainfall (periodic and recurrent water scarcity due to droughts); (2) Reduction in agricultural yields due to too much water (too much rain or flooding); (3) Poor soil quality due to erosion reducing agricultural yields; (4) Changing and unpredictable climate and temperatures reducing agricultural yields (i.e. too hot, too cold, too rainy, too dry); (5) Pest or locust infestation reducing agricultural yields; (6) Reduced job opportunities in the agricultural sector; (7) Death of livestock due to bad weather conditions; (8) Reduction in the stock of livestock since the availability of grazing land is becoming less due to droughts and floods. Next households were asked: *"How serious was the financial loss to the household due to these climate related factors listed above?"* The potential answers were very serious, moderate, serious, and negligible. Finally households were asked *"Was (the household) forced to change the economic activity after the shock?"*

In section 6A about the incidence of shocks and household responses, households are asked whether since November 2004, the respondent or a member of the household experienced various shocks. The shocks listed are: (1) Weather shocks (Droughts; floods; Pest infestation, crop and livestock diseases); (2) Unexpected increase in prices of food or other essential commodities consumed; (3) Unexpected loss of job; (4) Involuntary reduction in employment or the number of hours worked; (5) Unexpected decline in prices or demand for products that you sell; (6) Unexpected increase in prices or shortages of inputs or products needed for your activity; (7) Loss of asset or of livestock due to theft, death, or accident; (8) Cut-off or decrease

in remittances to household; (9) Death of main earner for the household; (10) Death of another member of the family; (11) Serious injury or illness that kept any member from doing normal activities; (12) Divorce or abandonment by husband; (13) Big amount of dowry for daughter's marriage; (14) Other (specify). For every shock that they were faced with, households are then asked *"Have you managed to recovered from the negative consequences of this shock?"* The possible answers were not at all, not much but some, much but not completely, or completely.

3.   Basic Statistics

Information on the share of households involved in agriculture and affected by various climate and weather shocks is provided in table 1. The data is provided by type of shock, and information is also reported on the share of households that have been affected by at least one of the shocks in the last five years in the sample of households involved in agriculture, as well as in the overall sample of households. Table 1 suggests that 28.1 percent of households are involved in agriculture, with the proportion being as expected much higher in rural areas and in the lower wealth quintiles of the population (following standard practice, wealth quintiles were obtained using factorial analysis on a range of assets owned by households as well as dwelling characteristics). For example, in the bottom quintile of wealth, 70.7 percent of households have at least one member involved in agriculture. Among those involved in agriculture, an overwhelming majority declares having been affected by at least one climate-related shock. That proportion is at 92.1 percent, and does not vary too much according to the quintile of well-being of the household, although it is lower in the top quintile in comparison with other quintiles.

The most likely shock is a reduction in agricultural yields due to inadequate rainfall (62.2 percent of households) followed by Reduced job opportunities in the agricultural sector (43.9 percent), a reduction in agricultural yields due to too much water (38.2 percent), and changing and unpredictable climate and temperatures reducing agricultural yields (34.5 percent). Other shocks affect less than a third of those involved in agriculture, but are still significant. Among those involved in agriculture, there are few differences between quintiles in terms of the likelihood to be affected by specific shocks. However, in the population as a whole, the likelihood of being affected by climate-related shocks is much higher in the bottom quintiles simply because the share of the population in those quintiles involved in agriculture is much higher, as already mentioned. For example the proportion of those affected by the various shocks listed in table 1 is at 65.8 in the bottom quintile nationally, versus 5.3 percent in the top quintile. As to the seriousness of the shocks, it is also similar across quintiles, or at least there are few patterns that display clear differences by quintiles. Households in the bottom quintiles are slightly more likely to state that the shocks was very serious than is the case among other quintiles, but the differences are not very large. Much the same can be said about the probability that households were forced to change the economic activity after the shock.

As mentioned in the previous section, another question asked in the survey about the types of shocks that have affected households. The shocks listed include not only weather shocks (as one category), but also a dozen other shocks including unexpected increases in the prices of food or other essential commodities, unexpected losses of job or involuntary reductions in employment or the number of hours worked, unexpected declines in prices or in the demand for products sold, or conversely unexpected increases in prices or shortages of inputs or products needed for the household's activity, and other shocks related to theft, death, accidents, illnesses, or adverse family events such as divorce or abandonment and large amounts of dowry paid for a

daughter's marriage. The survey asked not only whether households were affected by those shocks, but also whether they have been able to recover from the shocks.

Table 2 provides the results regarding the share of households affected by the most important t shocks (the shocks affecting less than two percent of households are not included in the table) and their ability to recover from those shocks. The shock that affected the largest share of the population was the increase in food and other prices, with 71.7 percent of households declaring being affected. Weather shocks came in second with 21.6 percent of the population being affected. Note that this proportion is of the same order of magnitude as the share of the population affected by climate shocks because of their involvement in agriculture in table 1. In table 1, 25.9 percent of households declared being affected, and there is a high degree of coherence in the responses to both questions in that those involved in agriculture declaring being affected by the climate shocks are also in many cases those mentioning being affected by a weather shock in the other part of the questionnaire. The fact that the two questions yield similar results is reassuring about the ability of the survey to identify those affected by climate shocks.

The third largest type of shock in terms of the share of the households affected is the unexpected loss of job (14.3 percent), followed closely by a reduction in employment or hours worked (13.5 percent). The other shocks (serious injury/illness preventing work, shortage of inputs or increase in input prices, loss of assets or livestock, decline in prices or in the demand for sales, death of another family member, or death of the main income earner in the household) tend to affect a smaller of households. For all ten shocks identified in the survey, the likelihood of being affected is higher in the bottom quintile as compared to the top quintile, but the differential is especially large for weather shocks, as well as the loss of assets or livestock. This is again related to the fact that the poor are much more likely to make a living in agriculture and livestock, and are therefore much more likely to be affected by extreme weather events.

Table 1: Weather Shocks and Impact on Agriculture

	Q1	Q2	Q3	Q4	Q5	Urban	Rural	All
Household has a member involved in agriculture or related activities	70.69	38.82	18.20	7.04	5.30	6.15	64.00	28.07
Household faced with climate-related shock								
Reduction in agricultural yields due to inadequate rainfall	60.98	58.66	74.87	68.23	50.35	56.37	63.09	62.18
Reduction in agricultural yields due to too much water	39.89	33.38	41.82	49.74	19.15	25.43	40.17	38.17
Poor soil quality due to erosion reducing agricultural yields	22.91	21.10	21.23	19.79	16.51	15.01	22.87	21.80
Changing and unpredictable climate and temperatures reducing agricultural yields	34.84	31.43	43.86	32.10	22.89	27.34	35.64	34.51
Pest or locust infestation reducing agricultural yields	14.13	18.61	26.63	22.39	7.08	8.25	18.62	17.21
Reduced job opportunities in the agricultural sector	43.75	49.31	38.72	35.56	34.15	29.97	46.04	43.86
Death of livestock due to bad weather conditions	28.37	31.25	14.62	22.58	10.41	13.18	28.53	26.44
Reduction in stock of livestock due to lower availability of grazing land	37.55	32.52	14.62	19.12	10.61	21.78	32.73	31.24
At least one problem in the last five years (sample of households in agriculture)	93.09	88.79	95.92	97.52	81.20	86.69	92.96	92.10
At least one problem in the last five years (national sample)	65.81	34.47	17.46	6.87	4.30	5.33	59.49	25.85
Seriousness of financial loss to the household due to climate								
Negligible	20.20	24.14	24.73	37.92	18.31	28.58	21.87	22.78
Moderate	44.51	36.16	42.00	39.88	35.49	34.55	42.38	41.31
Serious	22.90	24.44	25.61	15.95	27.39	20.13	23.98	23.46
Very serious	5.48	3.47	3.58	3.77	0.00	3.43	4.55	4.40
Household forced to change the economic activity after the shock	17.38	13.38	14.79	29.39	13.64	20.42	15.84	16.46

Source: Authors' estimation.

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Table 2: Incidence of Shocks and Ability to Recover

	Q1	Q2	Q3	Q4	Q5	Urban	Rural	All
(1) Increase in food/other prices	**79.29**	**74.45**	**75.34**	**72.86**	**55.05**	**68.13**	**77.64**	**71.73**
No recovery	50.39	49.05	52.53	49.44	47.59	51.19	48.19	49.96
Some recovery	36.19	34.57	32.42	27.79	21.55	27.35	36.65	31.16
Substantial recovery	11.40	15.82	11.67	19.96	17.24	16.29	13.34	15.08
Full recovery	2.02	0.55	3.38	2.81	13.63	5.17	1.82	3.79
(2) Unexpected loss of job	**13.81**	**16.16**	**15.86**	**14.23**	**11.04**	**14.96**	**13.17**	**14.28**
No recovery	52.08	55.14	53.20	56.52	46.96	57.01	46.28	53.26
Some recovery	30.65	26.61	23.74	27.14	15.58	23.92	27.92	25.32
Substantial recovery	10.58	15.58	9.80	14.18	28.84	13.20	18.01	14.88
Full recovery	6.70	2.68	13.25	2.16	8.62	5.86	7.79	6.54
(3) Weather shocks	**51.79**	**29.99**	**14.77**	**7.04**	**3.93**	**6.88**	**45.70**	**21.58**
No recovery	38.24	48.67	34.40	26.51	6.89	31.77	40.46	38.74
Some recovery	33.25	32.98	41.06	32.46	40.64	30.28	35.47	34.44
Substantial recovery	21.93	15.61	13.88	21.04	41.85	27.10	17.83	19.66
Full recovery	6.58	2.73	10.66	19.99	10.62	10.86	6.24	7.16
(4) Reduction in employment/hours worked	**18.23**	**15.73**	**15.59**	**11.31**	**6.28**	**11.37**	**17.06**	**13.53**
No recovery	54.98	47.03	49.27	46.68	38.27	47.12	50.83	48.89
Some recovery	20.85	27.73	36.70	28.20	23.45	32.17	22.76	27.67
Substantial recovery	21.48	23.58	10.42	25.11	38.28	18.48	24.76	21.48
Full recovery	2.69	1.66	3.61	0.00	0.00	2.23	1.64	1.95
(5) Serious injury or illness preventing work	**8.31**	**7.12**	**8.50**	**5.88**	**4.06**	**6.34**	**7.58**	**6.81**
No recovery	56.19	24.14	58.59	59.93	48.06	55.03	42.89	49.91
Some recovery	29.60	30.64	22.46	15.45	23.86	21.14	29.71	24.75
Substantial recovery	11.44	27.98	7.92	5.90	19.18	11.37	17.17	13.81
Full recovery	2.78	17.23	11.03	18.72	8.90	12.47	10.23	11.53
(6) Shortage of inputs/increase in prices	**9.87**	**6.73**	**4.93**	**3.51**	**2.80**	**3.20**	**9.48**	**5.58**
No recovery	73.32	26.09	49.45	44.95	7.50	42.81	50.62	47.84
Some recovery	15.92	28.70	36.66	16.51	37.86	31.26	21.14	24.75
Substantial recovery	10.76	39.16	13.90	30.86	42.92	15.89	28.24	23.83
Full recovery	0.00	6.06	0.00	7.69	11.72	10.03	0.00	3.58
(7) Loss of asset/livestock	**13.29**	**7.14**	**3.70**	**0.82**	**0.78**	**1.38**	**11.34**	**5.15**
No recovery	54.75	45.35	64.49	70.03	70.77	60.48	53.33	54.52
Some recovery	24.21	30.31	13.99	0.00	29.23	14.64	25.55	23.73
Substantial recovery	14.29	17.38	6.08	29.97	0.00	11.53	14.63	14.11
Full recovery	6.75	6.97	15.44	0.00	0.00	13.36	6.50	7.64
(8) Decline in prices/demand for sales	**6.53**	**5.36**	**6.75**	**2.51**	**3.72**	**4.36**	**5.94**	**4.96**
No recovery	47.76	33.98	51.16	32.60	18.53	39.41	40.83	40.06
Some recovery	31.05	21.57	44.51	41.68	52.93	43.10	29.30	36.84
Substantial recovery	21.20	32.41	4.32	25.72	28.54	14.48	27.76	20.50
Full recovery	0.00	12.03	0.00	0.00	0.00	3.01	2.10	2.60
(9) Death of other family member	**3.08**	**4.33**	**3.90**	**1.55**	**2.68**	**2.65**	**3.81**	**3.09**
No recovery	49.26	19.71	61.10	46.80	39.95	49.60	33.86	42.24
Some recovery	35.39	28.41	12.68	15.94	16.67	14.38	32.00	22.61
Substantial recovery	8.74	19.50	26.22	15.18	10.53	16.85	17.55	17.17
Full recovery	6.61	32.37	0.00	22.09	32.85	19.18	16.60	17.97
(10) Death of main earner	**1.76**	**2.25**	**2.42**	**2.07**	**1.06**	**2.32**	**1.29**	**1.93**
No recovery	87.88	79.66	71.33	81.76	77.94	78.96	80.61	79.38
Some recovery	12.12	8.75	28.67	0.00	22.06	15.34	8.71	13.66
Substantial recovery	0.00	0.00	0.00	18.24	0.00	5.70	0.00	4.26
Full recovery	0.00	11.59	0.00	0.00	0.00	0.00	10.68	2.71

Source: Authors' estimation.

What about the ability of households to recover from shocks? This ability seems to be limited for most shocks. About half of households declare that they were not able at all to recover from most shocks, including the increase in food/other prices, unexpected job losses, a reduction in employment or hours worked, a serious injury or illness preventing work, a shortage of inputs/increase in prices, or a loss of asset/livestock. The share of those not able to recover is slightly lower at about 40 percent for weather shocks as well as for a decline in prices/demand for sales and the death of other family member, but it is much higher for the death of the main income earner in the household, at 70.4 percent. The share of those declaring being able to achieve some, but not a substantial recovery, is also high, so that only a relatively small minority of households declare being able to recover from the shocks substantially or fully. In many cases, but not in all cases, poorer households tend to be less able to recover from various shocks than wealthier households, and this is especially the case of weather shocks. Thus, not only are poor households more likely to be affected by weather shocks due to their involvement in agriculture, but in addition they are also less likely to be able to recover from those shocks when they occur.

4.   Correlates of the Likelihood of Shocks and the Ability to Recover

This section provides a more detailed analysis of the likelihood of being affected by various shocks and the ability to recover in a multivariate setting using regression analysis. The analysis is still descriptive, but it permits for example to assess whether some types of households, say by quintile of wealth, are more likely to be affected by shocks, or less likely to be able to recover when affected, controlling for other factors such as their geographic location.

Table 3 provides the results of simple probit regressions (with robust standard errors) for the correlates of the probability of being affected by the main types of shocks (for shocks affecting very few households, the regression analysis was not implemented). Consider first the coefficient estimates for the level of well-being of households by quintiles of wealth. There is clear evidence that poorer households tend to be more affected by many of the shocks than better off households. In some cases, the coefficients are statistically significant only for the top quintile (the reference category being the bottom and poorest quintile), which suggests that only the wealthiest households are comparatively more protected than other households. But in other cases there is a clear gradation in risk. This is the case for weather shocks, where the coefficients estimates are statistically significant for three of the four quintiles of wealth, and monotically decreasing as wealth increases. Households in the top quintile are 13.1 percentage points less likely to be affected by weather shocks that households in the bottom quintile controlling for other factors, and this decreases to 11.4 points for the fourth quintile, 7.1 point for the third quintile, and 3.0 points for the second quintile, although that last coefficient is not statistically significant. Similar monotonic or quasi monotonic gradation patterns are observed for a few of the other shocks (even though coefficients may not always be statistically significant) including especially job losses and less hours worked, as well as serious illnesses or injuries.

A number of other statistically significant coefficients are interesting. As expected, when households own more than one acre of land, which is the case mostly for households involved in agriculture, or when the household head is involved in agriculture, they tend to be much more likely to be affected by weather shocks. The effects are not only statistically significant, but also large, at 21.2 percentage points for land ownership, and at an additional 8.3 percentage points for a household head working in agriculture as compared to salaried work. By contrast, households with substantial land are less likely to be affected by unexpected increases in food prices or other essential commodities, simply because many of these households tend to be net producers of

food, so that they may actually benefit from increases in food prices. Note however that households with a head involved in agriculture are more likely to be affected by the increase in food prices than the reference category of salaried work – so not all households in rural areas are protected from such food price increases. Households with land and those with a head involved in agriculture are both less likely to be affected by job losses, suggesting the protective effect of self-employed for this type of shock. But households with land are more likely to be affected by an increase in input prices and by losses of assets and livestock. A few other effects related to the occupation of the head are at work, including differences in the probability to lose work.

Urban households are less likely to be affected by weather shocks than rural households, but also somewhat surprisingly less likely to be affected by unexpected increases in the price of food, perhaps because they tend to be better of (even if this is partially controlled by the assets quintiles). Urban households are more likely to be affected by the death of the main income earner in the household, perhaps because they tend to be smaller and thereby without other income sources. Larger households tend to be more affected by most shocks, which reflects the fact they live in areas more affected by weather shocks and that with more household members, the probability that at least one of them will suffer from a negative shock is simply higher. Female headed households are also more likely to be affected by several of the shocks, also this is compensated in part by the coefficient for the female adult ratio. Households with older heads are less affected by several of the shocks, possibly because of a higher rate of self-employment when working, but they are more affected by the possibility of the death of the main earner, as expected. In general, a higher level of education for the household head is associated with a lower risk of being affected by shocks – this is mainly the case for weather shocks (since households with better educated heads work less in agriculture) and job losses or losses in hours worked (since individuals in households with better educated heads tend to have more secure and stable jobs), but there are a few cases when education is positively correlated with shocks.

In a few cases the likelihood of shocks is related to geographic location after controlling for household characteristics. The reference geographic location in the regression model is the prefecture of Tanger-Tétouhan, which is located in the tip of the northern part of the country towards Spain. In the case of weather shocks, in comparison to that region, only one region has a statistically significant and higher likelihood of shocks (the region of Méknès-Tafilalet, located in the north-east part of the country, bordering Algeria), while two regions have a lower probability of weather shocks (the regions of Oriental, located just north of Méknès-Tafilalet, and Rabat-Salé-Zemmour-Zaér, located to the west of Rabat-Salé-Zemmour-Zaér). All other geographic effects are not statistically significant, even though they are all positive. It should not be inferred from these results that the likelihood of weather shocks is uniform across areas, but simply that the household survey data does not generate very marked profiles of weather shocks by area at the level of regions. Of course, the fact that the household survey sample is limited in each of the regions (there are 14 regions included in the survey, and 2000 household, so that on average less than 150 households are included in the sample for each region) also contributes to the lack of statistical significance of the effects. In a nutshell, while it is important to include geographic in the regression analysis, not too much should be inferred from the coefficient estimates for these controls. But the results displayed according to household characteristics, and especially the vulnerability of poorer households to weather and other shocks, is important.

Table 3: Correlates of the Probability of Being Affected by Different Types of Shocks (dF/dX)

	Weather shocks	Increase in prices	Job Loss	Less hours worked	Lower prices for products	Higher prices for inputs	Loss of assets	Death of other member
Head's age	0.005*	0.003	-0.002	-0.004*	-0.001	-0.003***	-0.001	-0.000
Head's age squared	-0.000*	-0.000	0.000	0.000	0.000	0.000***	0.000	0.000
Female head	-0.041	-0.039	-0.024	0.054***	0.033***	0.008	-0.013	0.021**
Head married	-0.080	-0.089	0.015	-0.015	0.012	-0.003	0.006	-0.006
Adult female ratio	0.052	-0.025	-0.126***	-0.155***	-0.020	-0.045**	-0.008	-0.005
Household size	0.007**	0.005	0.009***	0.010***	0.003**	0.003**	0.003**	0.001
Owns > 1 acre	0.212***	-0.069**	-0.091***	-0.028	0.002	0.021*	0.018*	0.015
Urban	-0.153***	-0.078***	0.032	-0.001	0.013	-0.016*	-0.018*	-0.002
Head Education								
Primary	0.005	0.010	-0.007	0.002	0.002	0.003	-0.005	0.007
College	-0.001	-0.032	-0.077**	-0.079**	-0.021	0.022*	0.003	0.026**
Secondary	-0.081***	-0.069	-0.009	-0.052**	-0.006	-0.001	-0.017*	0.058*
Tertiary and up	-0.048	-0.096	-0.066**	-0.045	0.023	-0.002	Dropped	0.017
Head Occupation								
Work for other	-0.041*	0.036	-0.029	0.034	-0.006	-0.016*	-0.014	-0.004
Agricultural work	0.083***	0.089**	-0.076***	0.015	0.032***	0.011	0.012	-0.009
Non-ag. Work	-0.037	0.049	-0.041**	0.147***	0.113***	0.058**	-0.006	0.006
Self produce work	-0.035	-0.164	Dropped	-0.011	Dropped	Dropped	Dropped	0.087
Wealth Index								
Q2	-0.030	-0.033	-0.002	-0.029	-0.012	-0.006	-0.009	0.018
Q3	-0.071***	0.008	0.003	-0.027	-0.004	0.005	-0.005	0.014
Q4	-0.114***	-0.013	-0.033	-0.061***	-0.027***	-0.003	-0.024***	-0.011
Q5	-0.131***	-0.211***	-0.059**	-0.094***	-0.024***	-0.011	-0.020**	0.003
Region								
Guélmim-Es Sem.	0.126	0.220***	-0.002	0.024	-0.019	0.007		-0.011
Souss-Massa-Draâ	0.083	0.005	0.127*	0.077	0.024	0.036	-0.009	-0.007
Gharb-Cher.-B.	0.123	0.174***	-0.060*	0.052	0.036	0.037	-0.006	-0.019**
Chaouia-Ouard.	0.047	0.015	0.036	-0.035	-0.024**	-0.016*	-0.018**	-0.015
Marr.-Ten.-AH.	0.075	-0.048	0.287***	0.203***	0.051	0.075	0.015	-0.006
Oriental	-0.106***	0.055	0.064	-0.030	0.011	0.002	-0.018**	-0.025***
Grand-Casablanca	0.118	0.098**	0.063	0.040	0.005	-0.016	-0.023***	-0.027***
Rabat-Salé-Z.-Z.	-0.099***	0.220***	-0.086***	0.047	-0.017	-0.019**	-0.021***	Dropped
Doukala-Abda	0.002	-0.125*	0.038	-0.009	0.039	-0.017**	-0.008	-0.013
Tadla-Azilal	-0.010	-0.120*	0.002	0.008	-0.013	-0.022***	-0.025***	-0.005
Méknès-Tafilalet	0.179**	0.171***	0.045	0.034	0.014	0.012	-0.019***	-0.020**
Fès-Boulemane	0.077	0.038	0.117	0.139*	0.037	-0.009	Dropped	-0.017*
Taza-Al H.-Tao.	0.083	0.113**	0.039	-0.098***	-0.023**	-0.021***	-0.014	-0.021***
Observations	1,986	1,986	1,976	1,986	1,976	1,976	1,762	1,858

Source : Authors' estimation.

What about the ability to recover from the shocks? A probit regression analysis is provided in table 4, where for the sake of simplification, a household was considered as being able to recover from a shock if the household declared that it had recovered very much or completely (the results are not qualitatively different when estimating an ordered probit or logit). All households who declare having been affected by a shock are included in the analysis, and when a household has been affected by more than one shocks, the different shocks are taken into account. The fact of combining all types of shocks in the analysis enables us to use the data in a richer way, including by comparing whether it is more or less difficult for households to recover from different types of shocks (by contrast, if the analysis were conducted for each type of shock separately, for many shocks the sample size would be too small to uncover meaningful results). Two different models are estimated, with the addition in the second model of the leave-out-mean share of households declaring having been affected by a shock in a given areas.

Again, a very clear pattern emerges in table 4 by quintile of wealth, with richer households much more likely to be able to recover from shocks. Households in the top quintile are approximately 20 percentage points more likely to recover from a shock than households in the bottom quintile, and for the fourth quintile, the gain is at about 11 percentage points versus the bottom quintile. A better education is also associated with a higher likelihood of recovering, although the effect is statistically significant only for the *collège* level (which means lower secondary education and not higher education as is the case in the United States). Households involved in non-agricultural work are also more likely to recover from shocks, as are households with older heads (taking into account quadratic effects). Geographic effects are for the most part not statistically significant. But what is important is the fact that as compared to the excluded category of shocks, which is the unexpected increase in food or other essential commodity prices, the ability of households to recover from a weather shock is actually higher by six to seven percentage points depending on the specification, and not lower (the coefficients for the other shocks are not statistically significant, but this may be because for some of the shocks the sample is small). The fact that the ability to recover from shocks was slightly higher for weather shocks than for the rise in food and other prices was already apparent in the basic statistics in table 2, but this is simply confirmed in the regression analysis after introducing a number of controls. While this does not mean that the effect of weather shocks is small, it means that other shocks – in this case the increase in food and other prices, may be even more devastating.

Table 4: Correlates of the Ability to Recover from Shocks (dF/dX)

	Without LOM	With LOM
Head's age	-0.005*	-0.004*
Head's age squared	0.000**	0.000**
Female Head	0.011	0.014
Head Married	0.070	0.048
Adult female ratio	-0.035	-0.020
HH Size	-0.003	-0.003
Own more than 1 acre	0.051**	0.043*
Urban	-0.011	-0.015
Head's Education		
Primary	0.024	0.026
College	0.112***	0.099***
Secondary	0.024	0.023
Tertiary and up	0.039	0.051
Head's Occupation		
Work for other	0.027	0.031
Agricultural work	0.020	0.031
Non-agricultural work	0.072**	0.084***
Self produce work	0.070	0.042
Wealth Index		
Q2	0.043*	0.038
Q3	0.044	0.034
Q4	0.112***	0.115***
Q5	0.213***	0.203***
Region		
Guélmim-Es Semara	0.123	0.124
Souss-Massa-Draâ	0.100*	0.089
Gharb-Cherarda-Béni Hssen	-0.044	-0.050
Chaouia-Ouardigha	0.083	0.080
Marrakech-Tensift-Al Haouz	0.136**	0.118**
Oriental	-0.069	-0.040
Grand-Casablanca	0.058	0.049
Rabat-Salé-Zemmour-Zaér	-0.104***	-0.093**
Doukala-Abda	0.109	0.108
Tadla-Azilal	-0.042	-0.033
Méknès-Tafilalet	0.009	0.015
Fès-Boulemane	-0.011	0.005
Taza-Al Hoceima-Taounate	0.045	0.057
Events		
Weather shocks	0.075***	0.062**
Serious injury illness	0.021	-0.000
Unexpected loss of job	-0.000	-0.004
Reduction in employment/ hours worked	0.037	0.051
decline in prices/demand for products	0.006	0.020
increase in prices/shortage of inputs	0.038	0.038
Loss of assets/livestock	-0.006	0.013
Leave-out mean		0.122***
Number of observations	2,891	2,694

Source: Authors' estimation.

5.   Conclusion

What is the likelihood that Moroccan households, and especially those involved in agriculture, may be confronted with extreme weather events such as droughts and floods? Who suffers the most from such events when they occur? To what extent are different types of households able to recover from such shocks? This chapter provides answers to these questions on the basis of questions on weather shocks added to a nationally representative household survey implemented in Morocco in 2009-10. The data suggest that most households working in agriculture are affected by weather shocks, often seriously. In the population as a whole, the proportion of households affected is about one fourth. A majority of households declare not being able to recover much from weather shocks, as well as other shocks. But in comparison to other shocks, including unexpected increases in the prices of food and other basic essential commodities, households are slightly more likely to be able to recover from weather shocks.

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