Climate Events and Insurance Demand - The effect of potentially catastrophic events on insurance demand in Italy.

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CLIMATE EVENTS AND INSURANCE DEMAND

The effect of potentially catastrophic events on insurance demand in Italy

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KEY WORDS

Climate change, extreme events, precipitations, floods, catastrophic events, insurance, Italy, statistics, regression, fixed effects.

ABSTRACT

Climate extreme events are constantly increasing. What's the effect of these potentially catastrophic events on insurance demand in Italy, with particular reference to the economic activities?

Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent by the end of this century, as global mean surface temperature increases.

If we look to Italy, examination of the precipitation time series shows a sensitive and highly significant decrease in the total number of precipitation events in Italy (average of 12% from 1880 to the present), with a trend of events intense dissimilar as regards to low and high intensity, with a decline of firsts and an increase of seconds. The risk related to hydrological natural disasters is in Italy one of the most important problem for both damage and number of victims.

How evolves the ability to pay for damages, with a view to safeguarding work and economic activities, and employment protection?

GLOBAL WARMING.

Climate extreme events are constantly increasing.

What's the effect of these potentially catastrophic events on insurance demand in Italy, with particular reference to the economic activities?

We refers to the IPCC Intergovernmental Panel on Climate Change (Climate Change 2013, WG1 Working Group I, 5th Assessment Report).

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.

Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. In the Northern Hemisphere, 1983–2012 was *likely* the warmest 30-year period of the last 1400 years (*medium confidence*).

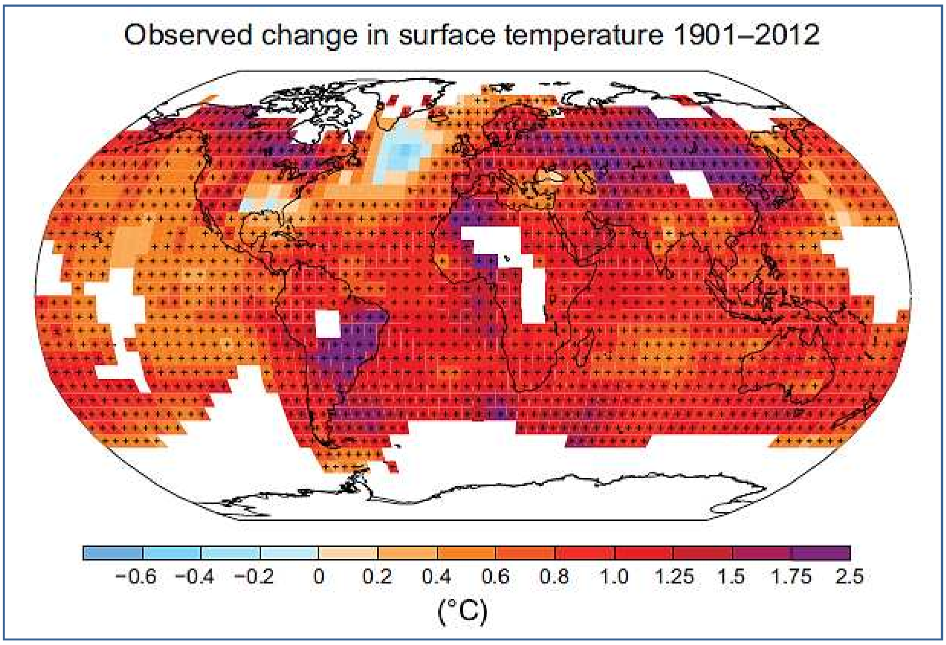


Fig. 1. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since AR4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.

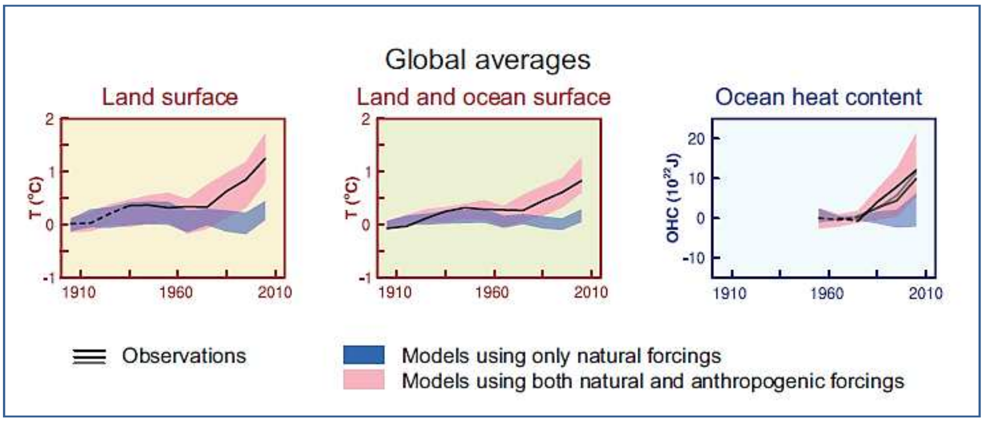


Fig. 2. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

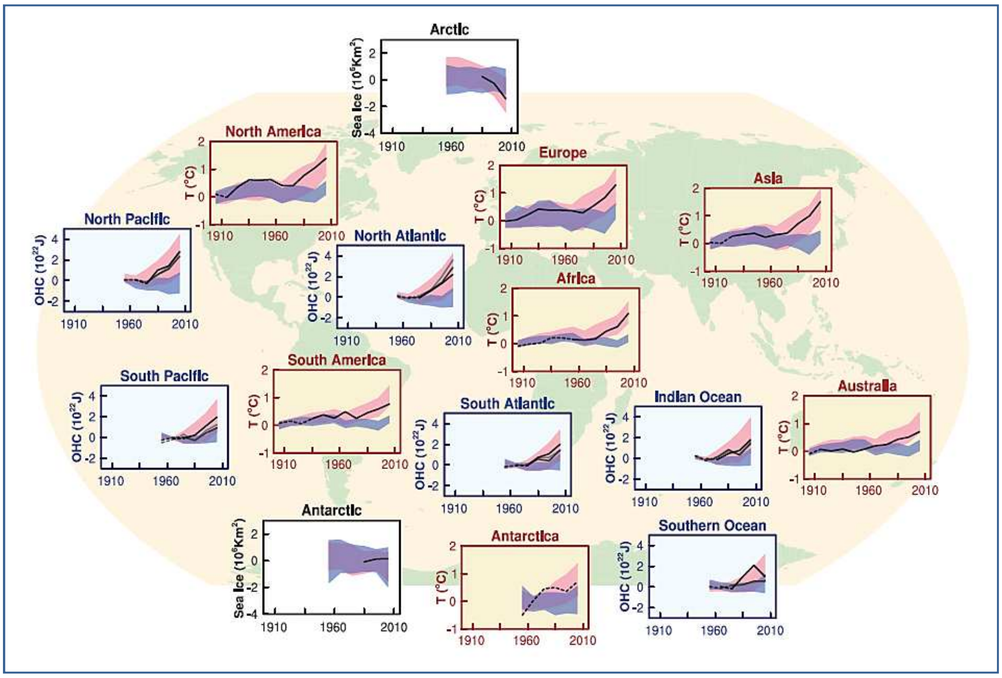


Fig. 3. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

Global surface temperature change for the end of the 21st century is likely to exceed 1.5°C relative to 1850 to 1900. Warming will continue beyond 2100. Warming will continue to exhibit interannual-to-decadal variability and will not be regionally uniform.

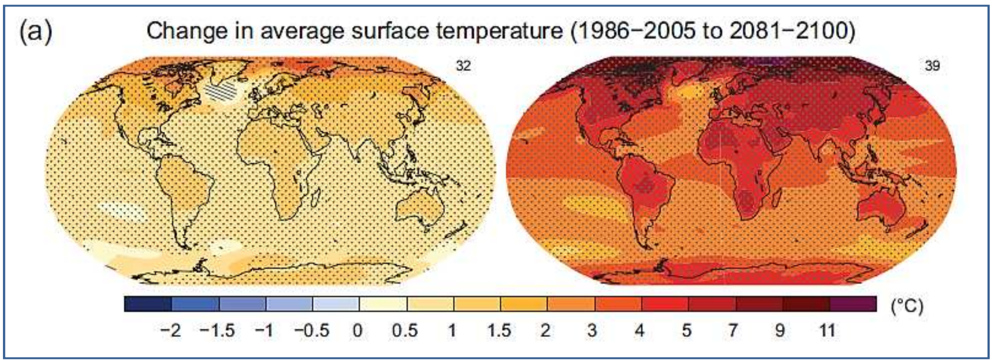


Fig. 4. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

Changes in the global water cycle in response to the warming over the 21st century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions.

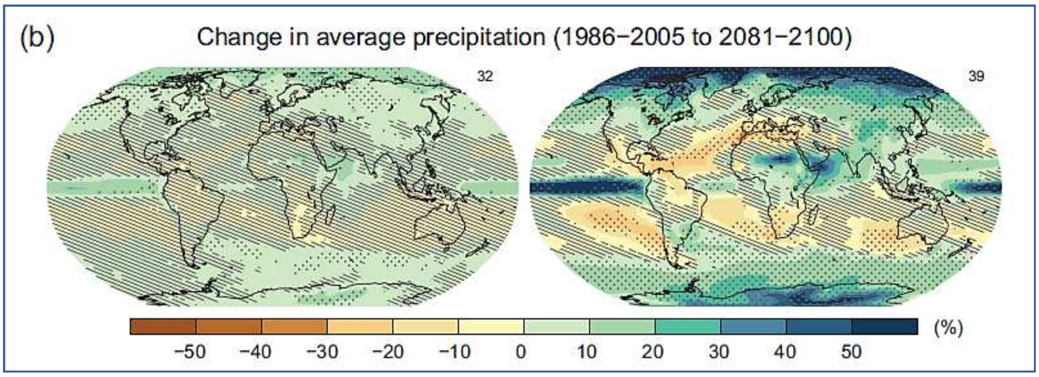


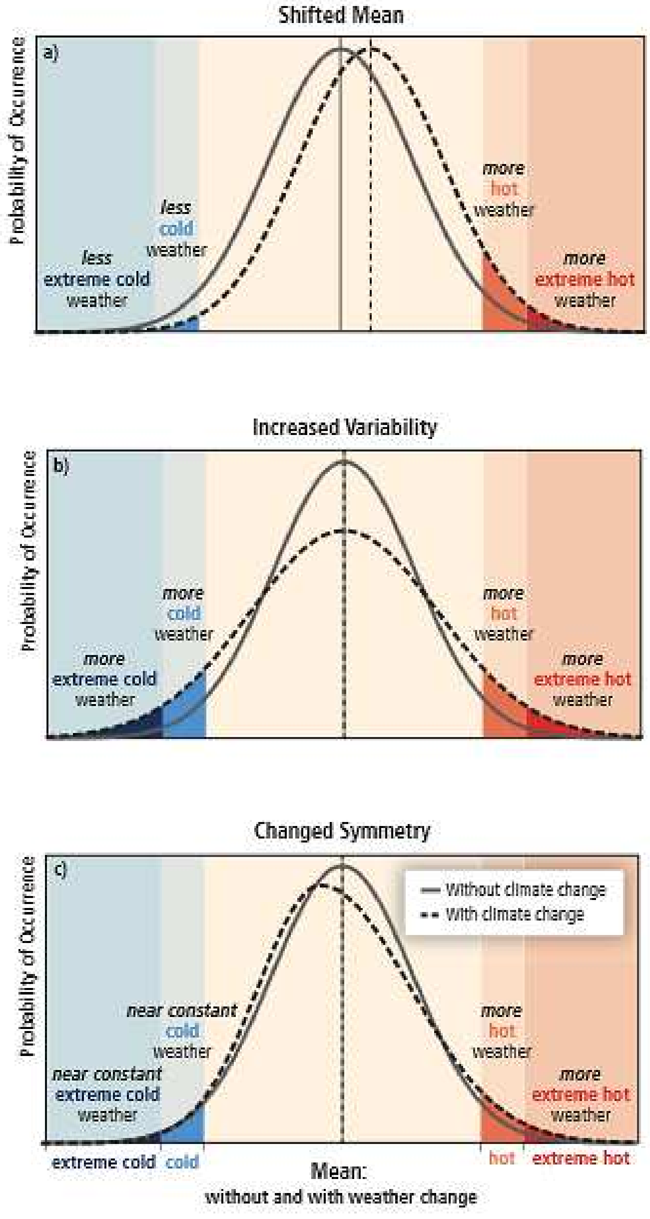
Fig. 5. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent by the end of this century, as global mean surface temperature increases.

EXTREME EVENTS.

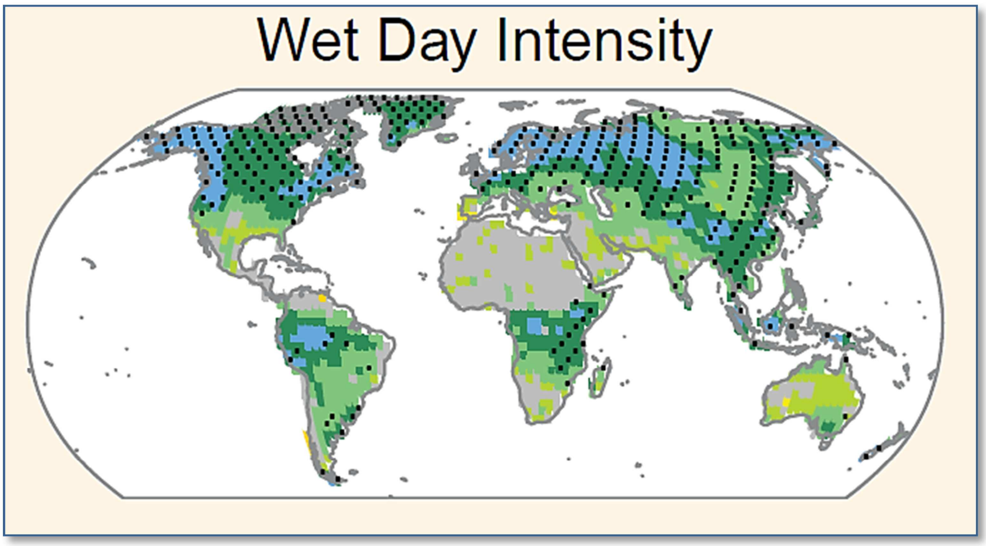
Still refering to the IPCC Intergovernmental Panel on Climate Change (Climate Change 2013, WG1 Working Group I, 5th Assessment Report).

The impacts of climate extremes and the potential for disasters result from the climate extremes themselves and from the exposure and vulnerability of human and natural systems. Observed changes in climate extremes reflect the influence of anthropogenic climate change in addition to natural climate variability, with changes in exposure and vulnerability influenced by both climatic and non-climatic factors.



Figg. 6-7-8. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

Economic losses from weather- and climate-related disasters have increased, but with large spatial and interannual variability (high confidence, based on high agreement, medium evidence). Global weather- and climate-related disaster losses reported over the last few decades reflect mainly monetized direct damages to assets, and are unequally distributed. Loss estimates are lowerbound estimates because many impacts, such as loss of human lives, cultural heritage, and ecosystem services, are difficult to value and monetize, and thus they are poorly reflected in estimates of losses. Impacts on the informal or undocumented economy as well as indirect economic effects can be very important in some areas and sectors, but are generally not counted in reported estimates of losses.



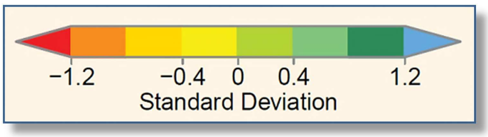


Fig. 9. Source: IPCC Intergovernmental Panel on Climate Change - Climate Change 2013, WG1 Working Group I, 5th Assessment Report.

“If we look to Italy, examination of the precipitation time series shows a sensitive and highly significant decrease in the total number of precipitation events in Italy (average of 12% from 1880 to the present), with a trend of events intense dissimilar as regards to low and high intensity, with a decline of firsts and an increase of seconds.

No wonder if in a world more "hot", where precisely the "Gaussian" temperature has aready moved towards higher values may occur more extreme events, both related to the thermal field and rainfall, and which it cause more heat waves, drought and more intense perturbations (it’s already much more controversial if they can be even more numerous.)” (*Carlo Cacciamani, Arpa Emilia-Romagna).*

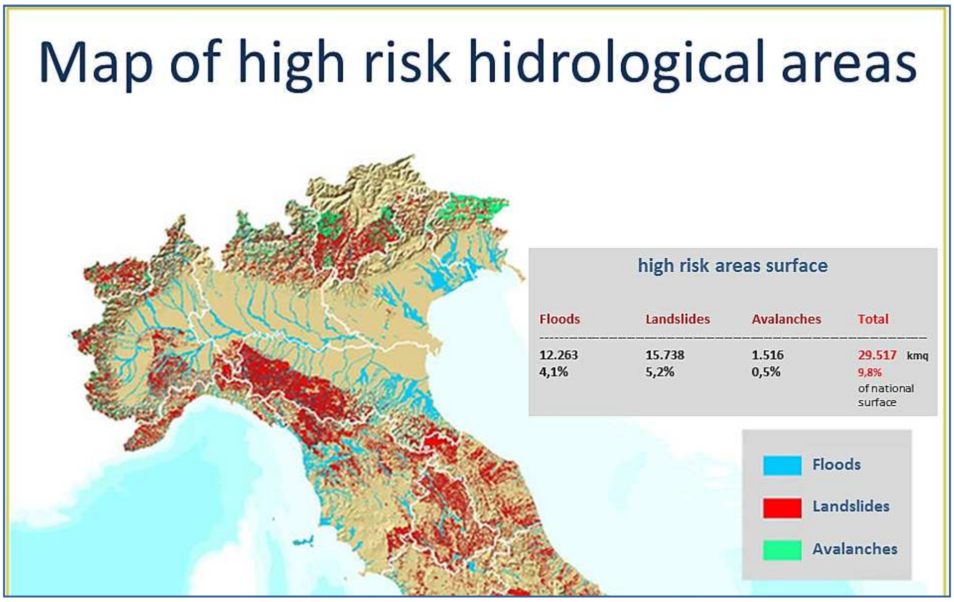


Fig. 10.

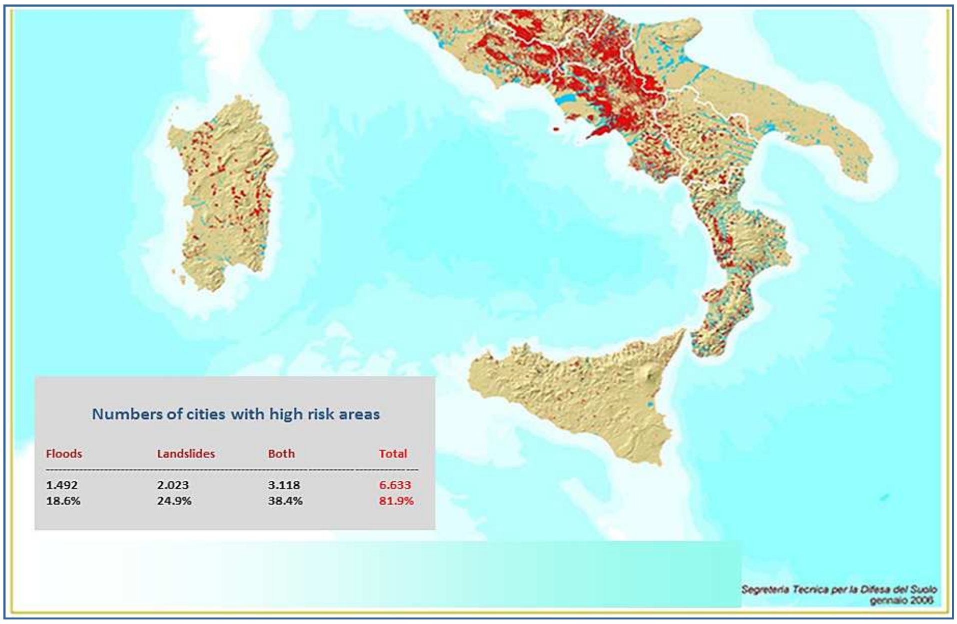


Fig. 11.

"The risk related to hydrological natural disasters is in Italy one of the most important problem for both damage and number of victims. The increasing impact of hydrological disasters in the area, since the war, it should first be attributed to the changed scenarios that favored occupation and exploitation of naturalized areas and, marginally, to weather and climate changes. In practice, most of the damage resulting from the hydrological instability are mainly determined by human behavior and by practical development models, rather than by an presumed increase in natural hazard in the area." (*Willer Bordon, Ministro dell'Ambiente).*

Fig. 12.

RESEARCH.

As said, we know that extreme weather events are increasing constantly, not only in frequency, but also in intensity and their destructive power. And Italy by the hydrogeological point of view is not in an optimal condition.

How evolves the ability to pay for damages, with a view to safeguarding work and economic activities, and employment protection?

The current Italian system is based on ad hoc approved refunding after a catastrophic event.

Historically, the public compensation did not cover the total amount of damage, but a percentage ranging from 50% to 80%.

The current system does not provide incentives for prevention and mitigation of risk, and especially not aside reserves to cover for events, reserves that, if invested, would compete to mitigate the cost.

EVENTS	COVERAGE DIFFUSION	OFFERS AVAILABILITY
CLIMATE EVENTS	**High** (>30%)	**High** (always offered without selection)
EARTHQUAKES	**Medium** (5% to 30%)	**Medium** (offered with low underwriting selection)
FLOODS	**Medium** (5% to 30%)	**Medium** (offered with low underwriting selection)
LANDSLIDES	**Negligible** (<1%)	**Negligible** (never offerd)
ERUPTIONS	**Negligible** (<1%)	**Low** (offered with strong selection)
SNOW	**Medium** (5% to 30%)	**Medium** (offered with low underwriting selection)

Tab. 1. Source: LO STATO DELL'ARTE SULL' ASSICURAZIONE DEI RISCHI CATASTROFALI, R. Manzato, ANIA.

From the surveys Perils for the corporate insurance market segment, there is a significant exposure to catastrophic risks (flood and earthquake), equal to, in 2013, about 300 billion euro (sums insured).

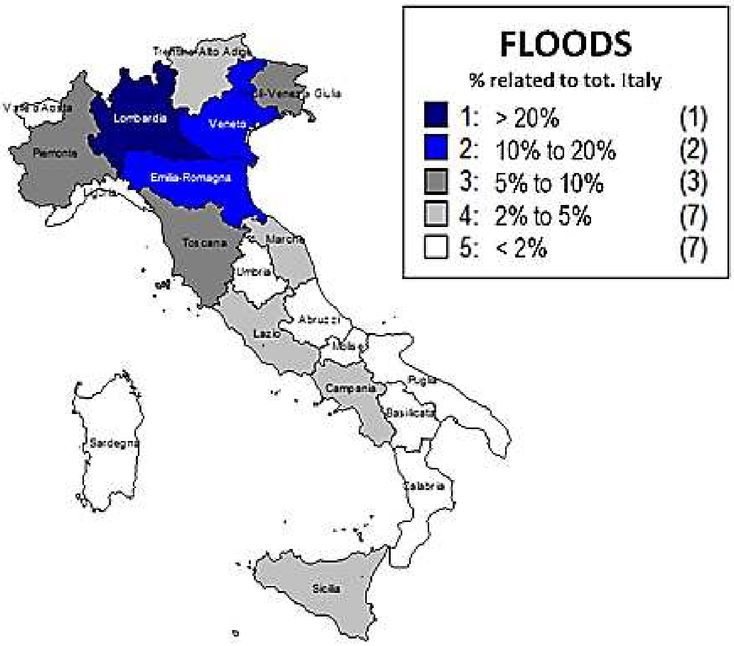


Fig. 13. Source: LO STATO DELL'ARTE SULL' ASSICURAZIONE DEI RISCHI CATASTROFALI, R. Manzato, ANIA.

These exposures are concentrated especially in the most industrialized regions, i.e. Lombardy, Emilia Romagna and Veneto.

DATASETS.

Reserach used two different datasets:

- the first one relative to italian climate data from last eleven years (2003-2013);
- the second one relative to insurance data from a primary italian Insurance Company.

Climate dataset.

For each month from Jan 2003 to Dec 2013, the database contains:

- Region;
- province;
- Average Temperature °C;
- Total average rainfalls (mm) peak excluded;
- Average wind km/h;
- Max wind km/h;
- Day or days in the month where occured the catastrofic event (for us is flood);

- Number of dead (direct or indirect causes);
- Total days event duration;
- Affected provinces;
- Event rainfalls mm;
- Monetary quantification of the damage.

List of extreme weather events has been provided by SMI - Italian Meteorological Society.

Were detected general climate events in 88 provinces compared to 110 provinces in Italy, but all extreme events occurred are listed in the database.

Climate dataset summarize shows 34 months in which occured at least one extreme event in period 2003-2013.

. sum

Variable	Obs	Mean	Std. Dev.	Min	Max
regione	0				
provincia	0				
anno	11062	2007.973	3.135485	2003	2013
mese	11062	6.504701	3.452118	1	12
tmediac	11062	15.44323	7.386522	-1.45	32.03
pioggiamed~h	11062	83.93602	64.48151	0	1176.7
ventomedio~h	11062	8.92498	4.098252	0	30.85
ventomaxkmh	11062	39.79407	19.62325	0	100
dateeventi~a	0				
numeroeven~e	34	1.029412	.1714986	1	2
mortitotali	34	3.823529	6.762063	0	36
duratatota~i	34	1.823529	2.492055	1	15
cittcolpite	0				
precipextr~m	34	291.7471	131.8975	105	542
stimadanni~o	0				
danni	0				

Tab. 2.

Months without extreme events was 11,028. In 34 months with extreme events, only one had two events, and the others had a single event.

. tab evento

evento	Freq.	Percent	Cum.
0	11,028	99.69	99.69
1	34	0.31	100.00
Total	11,062	100.00	

Tab. 3.

```
. tab numero,m
```

numeroeventiextranelmese	Freq.	Percent	Cum.
1	33	0.30	0.30
2	1	0.01	0.31
.	11,028	99.69	100.00
Total	11,062	100.00	

Tab. 4.

Extreme events without dead was 9 (11,037 «events zero dead» - 11,028 «months without extreme events»). Events with dead are distributed as shown in tabulation. Only one extreme event had a particularly high mortality (36 dead).

```
. tab1 morti precipitazioni

-> tabulation of morti
```

morti	Freq.	Percent	Cum.
0	11,037	99.77	99.77
1	5	0.05	99.82
2	6	0.05	99.87
3	3	0.03	99.90
4	4	0.04	99.94
5	2	0.02	99.95
6	2	0.02	99.97
12	1	0.01	99.98
18	1	0.01	99.99
36	1	0.01	100.00
Total	11,062	100.00	

Tab. 5.

```
-> tabulation of precipitazioni
```

precipitazioni	Freq.	Percent	Cum.
0	11,028	99.69	99.69
105	1	0.01	99.70
115	1	0.01	99.71
150	1	0.01	99.72
154	1	0.01	99.73
163	1	0.01	99.74
190	1	0.01	99.75
195.2	2	0.02	99.76
198	1	0.01	99.77
200	4	0.04	99.81
203	1	0.01	99.82
205	1	0.01	99.83
213	1	0.01	99.84
225	1	0.01	99.85
230	1	0.01	99.86
250	1	0.01	99.86
265	1	0.01	99.87
312	1	0.01	99.88
372	1	0.01	99.89
381	1	0.01	99.90
385	1	0.01	99.91
396	1	0.01	99.92
400	3	0.03	99.95
414	1	0.01	99.95
485	1	0.01	99.96
517	2	0.02	99.98
542	2	0.02	100.00
Total	11,062	100.00	

Tab. 6.

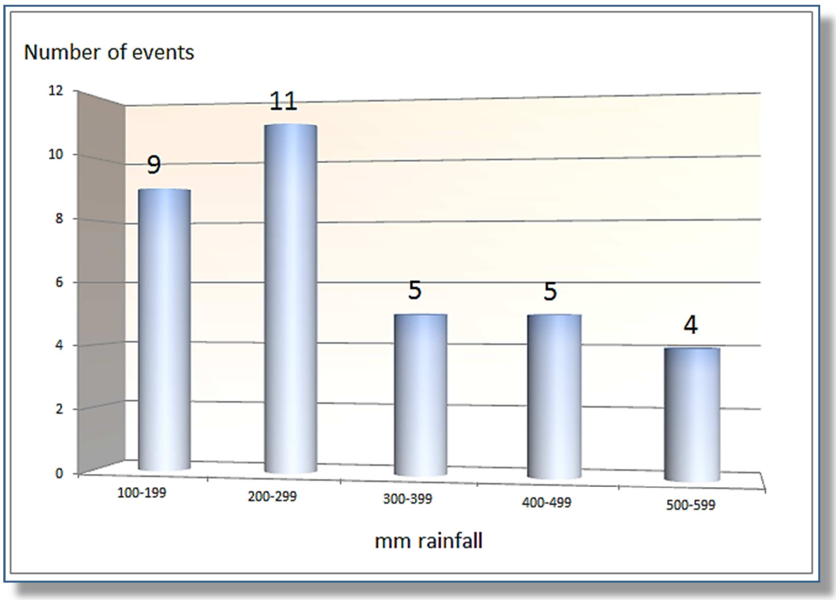


Fig. 14.

Insurance dataset.

A record for each issued policy in period 2003-2013.

Each record contains:

- Policy effect date;
- Policy issue date;
- Product type;
- Region of Contractor;
- province of Contractor.

Data are from a portion of database of an italian Casualty primary Insurance Company, and are absolutely anonimous.

Products usefull for the research are two: they are not «stand alone» but is present the additional peril «flood».

Into the anlysis they are indicated as:

- Class 1
- Class 2

ramoufficiopol	Freq.	Percent	Cum.
(01) INCENDIO	9,442	49.96	49.96
(14) RISCHI TECNOLOGICI	9,456	50.04	100.00
Total	18,898	100.00	

Tab. 7.

It was generated a single database merging the insurance database with the climate one.

Items present in both databases are 18,898: they are number of months in which we have both climate events and policies (i.e. we know presence in both datasets), related to each province and each kind of policy (class 1 and class 2).

. tab _m

_merge	Freq.	Percent	Cum.
1	7,921	29.52	29.52
2	11	0.04	29.56
3	18,898	70.44	100.00
Total	26,830	100.00	

Tab. 8.

. tab provincia

provincia	Freq.	Percent	Cum.
ANCONA	262	1.39	1.39
AREZZO	258	1.37	2.75
BARI	264	1.40	4.15
BELLUNO	250	1.32	5.47
BERGAMO	264	1.40	6.87
BOLOGNA	264	1.40	8.27
BOLZANO	196	1.04	9.30
BRESCIA	264	1.40	10.70
BRINDISI	246	1.30	12.00
CAGLIARI	262	1.39	13.39
CAMPOBASSO	228	1.21	14.59
CATANIA	261	1.38	15.98
CATANZARO	232	1.23	17.20
CHIETI	260	1.38	18.58
COMO	261	1.38	19.96
COSENZA	261	1.38	21.34
CREMONA	261	1.38	22.72
CROTONE	181	0.96	23.68
CUNEO	264	1.40	25.08
ENNA	169	0.89	25.97
FERRARA	257	1.36	27.33
FIRENZE	264	1.40	28.73
FOGGIA	253	1.34	30.07
FROSINONE	241	1.28	31.34
GENOVA	264	1.40	32.74
GORIZIA	148	0.78	33.52

Tab. 9.

METHODS AND REGRESSIONS.

In the months following an extreme event, how much insurance are issued compared to how much it would be issued in the absence of the event?
Two different regressions were done, one for each class of insurance.

$$\mathbf{Number\_policies_{t,i} = \beta * event12m_{t,i} + \varepsilon_{i,t}}$$

$$(Numero\_polizze_{t,i} = \beta * evento12m_{t,i} + \varepsilon_{i,t})$$

- Number_policies = new policies at month ***t*** in province ***i***
- event12m = extreme event in last 12 months from ***t*** in province ***i***
- ε = casual error

As a first step has been checked the effect that a flood event within twelve months, omitting other variables. The effect is significative only for the Class 2, while the Class 1 already at this early stage is not affected by the presence of extreme events.

Class 1

```
. reg numero_polizze  evento12m if( ramo1 == 1 & calendario >= 13)

      Source |       SS       df       MS              Number of obs =    8547
-------------+------------------------------           F(  1,  8545) =    0.58
       Model |  142.383618     1  142.383618           Prob > F      =  0.4479
    Residual |   2112155.5  8545  247.180281           R-squared     =  0.0001
-------------+------------------------------           Adj R-squared = -0.0000
       Total |  2112297.88  8546  247.168018           Root MSE      =  15.722

------------------------------------------------------------------------------
numero_pol~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   evento12m |  -.7419354    .977559    -0.76   0.448    -2.658187    1.174316
       _cons |   11.66703   .1727793    67.53   0.000     11.32834    12.00572
------------------------------------------------------------------------------
```

Tab. 10.

Class 2

```
. reg numero_polizze  evento12m if( ramo2 == 1 & calendario >= 13)

      Source |       SS       df       MS              Number of obs =    8594
-------------+------------------------------           F(  1,  8592) =    3.11
       Model |   587.69174     1   587.69174           Prob > F      =  0.0779
    Residual |  1623702.25  8592  188.978381           R-squared     =  0.0004
-------------+------------------------------           Adj R-squared =  0.0002
       Total |  1624289.94  8593  189.024781           Root MSE      =  13.747

------------------------------------------------------------------------------
numero_pol~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   evento12m |   1.504482   .8531357     1.76   0.078    -.1678694    3.176832
       _cons |   10.84626   .1506565    71.99   0.000     10.55094    11.14159
------------------------------------------------------------------------------
```

Tab. 11.

By controlling the distribution of policy numbers in the months through the use of dummies drivers, the significance for the Class 1 continues to be null, while for the Class 2 is weakened because of the fact that the months with significance do not match with the months calendar in which normally occurring flood events.

Class 1

```
. reg numero_polizze  evento12m month* if( ramo1 == 1 & calendario >= 13)
```

Source	SS	df	MS
Model	70607.4536	12	5883.95447
Residual	2041690.43	8534	239.241907
Total	2112297.88	8546	247.168018

Number of obs =	8547
F(12, 8534) =	24.59
Prob > F =	0.0000
R-squared =	0.0334
Adj R-squared =	0.0321
Root MSE =	15.467

numero_pol~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
evento12m	-.7532646	.9618112	-0.78	0.434	-2.638647	1.132118
month1	-5.94962	.8112923	-7.33	0.000	-7.539949	-4.35929
month2	-7.633893	.8141416	-9.38	0.000	-9.229807	-6.037978
month3	-6.095613	.8129893	-7.50	0.000	-7.689269	-4.501958
month4	-7.542789	.813853	-9.27	0.000	-9.138138	-5.94744
month5	-7.059884	.8115697	-8.70	0.000	-8.650757	-5.469011
month6	-4.218481	.807406	-5.22	0.000	-5.801192	-2.635769
month7	-6.407586	.8127104	-7.88	0.000	-8.000695	-4.814477
month8	-12.47554	.8315272	-15.00	0.000	-14.10554	-10.84555
month9	-8.806514	.8158919	-10.79	0.000	-10.40586	-7.207168
month10	-8.377686	.8147219	-10.28	0.000	-9.974738	-6.780634
month11	-9.244385	.8188614	-11.29	0.000	-10.84955	-7.639218
_cons	18.58561	.572955	32.44	0.000	17.46248	19.70874

Tab. 12.

Class 2

```
. reg numero_polizze  evento12m month* if( ramo2 == 1 & calendario >= 13)
```

Source	SS	df	MS
Model	18170.735	12	1514.22792
Residual	1606119.21	8581	187.171566
Total	1624289.94	8593	189.024781

Number of obs =	8594
F(12, 8581) =	8.09
Prob > F =	0.0000
R-squared =	0.0112
Adj R-squared =	0.0098
Root MSE =	13.681

numero_pol~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
evento12m	1.51091	.8491691	1.78	0.075	-.153666	3.175485
month1	-.4063101	.7269103	-0.56	0.576	-1.831229	1.018609
month2	-.3518765	.727157	-0.48	0.628	-1.777279	1.073526
month3	.9732354	.7248868	1.34	0.179	-.447717	2.394188
month4	-.0216314	.7266495	-0.03	0.976	-1.446039	1.402776
month5	1.416699	.7234104	1.96	0.050	-.0013592	2.834757
month6	1.823802	.7231654	2.52	0.012	.4062238	3.24138
month7	2.231362	.725136	3.08	0.002	.8099207	3.652803
month8	-3.668699	.7367475	-4.98	0.000	-5.112901	-2.224497
month9	.4411226	.7243902	0.61	0.543	-.9788564	1.861102
month10	.5604933	.7226681	0.78	0.438	-.85611	1.977097
month11	-.5552617	.7212156	-0.77	0.441	-1.969018	.8584944
_cons	10.61949	.516069	20.58	0.000	9.607867	11.63111

Tab. 13.

FIXED EFFECTS.

Two different regressions were done, one for each class of insurance, with the presence of fixed effect ***u*** to analyze the variations within individual provinces, so as to separate the events of each province; were also considered dummy variables to control the effect of the passing of months and years.

$$\mathbf{Number\_policies_{t,i} = \beta * event12m_{t,i} + recurrence\_month_{t,i} + year_{t,i} + u_i + \varepsilon_{i,t}}$$

$$(Numero\_polizze_{t,i} = \beta * evento12m_{t,i} + mese\_di\_ricorrenza_{t,i} + anno_{t,i} + u_i + \varepsilon_{i,t})$$

- Number_policies = new policies at month ***t*** in province ***i***
- event12m = extreme event in last 12 months from ***t*** in province ***i***
- U= fixed effect for province ***i***
- Recurrence month = dummy driver with value 1 in month of issue
- year = dummy driver as control of number of policies during the years, in month ***t*** in province ***i***
- ε = casual error

It should be pointed out that there is a negative effect of years due to the fact that it's important to take into account the effect generated by the economic recession with regard to the number of policies issued to be insured against floods.

Class 1

```
. xtreg numero_polizze  evento12m month* year* if( ramo1 == 1 & calendario >= 13) , fe i(id)

Fixed-effects (within) regression               Number of obs      =      8547
Group variable (i): id                          Number of groups   =        77

R-sq:  within  = 0.2451                         Obs per group: min =        41
       between = 0.2223                                        avg =     111.0
       overall = 0.0908                                        max =       120

                                                F(21,8449)         =    130.65
corr(u_i, Xb)  = -0.0342                        Prob > F           =    0.0000

------------------------------------------------------------------------------
numero_pol~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   evento12m |   .8194356   .6088896     1.35   0.178     -.374137    2.013008
      month1 |  -6.097217   .4753393   -12.83   0.000    -7.028999   -5.165436
      month2 |  -7.972837   .4771732   -16.71   0.000    -8.908214   -7.037461
      month3 |  -6.335782   .4764798   -13.30   0.000    -7.269799   -5.401765
      month4 |  -7.822425   .4768856   -16.40   0.000    -8.757238   -6.887613
      month5 |  -7.246241   .4755417   -15.24   0.000     -8.17842   -6.314063
      month6 |    -4.1576   .4731381    -8.79   0.000    -5.085067   -3.230134
      month7 |  -6.627047    .476261   -13.91   0.000    -7.560635   -5.693458
      month8 |  -13.59466   .4875003   -27.89   0.000    -14.55028   -12.63904
      month9 |  -9.169998     .47815   -19.18   0.000    -10.10729   -8.232707
     month10 |  -8.683881   .4774495   -18.19   0.000    -9.619799   -7.747964
     month11 |  -9.732187   .4800404   -20.27   0.000    -10.67318   -8.791191
       year3 |  -.4136465    .429318    -0.96   0.335    -1.255215    .4279219
       year4 |   .3291208   .4297934     0.77   0.444    -.5133795    1.171621
       year5 |  -1.641549   .4304074    -3.81   0.000    -2.485253   -.7978452
       year6 |  -2.037514    .431087    -4.73   0.000     -2.88255   -1.192478
       year7 |  -4.052614   .4325043    -9.37   0.000    -4.900428     -3.2048
       year8 |  -5.755845   .4335356   -13.28   0.000    -6.605681   -4.906009
       year9 |  -8.589889   .4387981   -19.58   0.000    -9.450041   -7.729737
      year10 |  -10.87751   .4442192   -24.49   0.000    -11.74829   -10.00674
      year11 |  -11.22408   .4473713   -25.09   0.000    -12.10104   -10.34712
       _cons |    23.0528   .4416981    52.19   0.000     22.18696    23.91863
-------------+----------------------------------------------------------------
     sigma_u |  11.860596
     sigma_e |  9.0604979
         rho |  .63148555   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(  76, 8449) =   196.61         Prob > F = 0.0000
```

Tab. 14.

Class 2

```
. xtreg numero_polizze  evento12m month* year* if( ramo2 == 1 & calendario >= 13), fe i(id)

Fixed-effects (within) regression               Number of obs      =      8594
Group variable (i):  id                           Number of groups   =        77

R-sq:  within  =  0.1346                          Obs per group: min =        21
       between =  0.0953                                         avg =     111.6
       overall =  0.0230                                         max =       120

                                                  F(21,8496)         =     62.94
corr(u_i, Xb)  =  -0.0126                         Prob > F           =    0.0000
```

numero_pol~e	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
evento12m	.1631627	.3829879	0.43	0.670	-.5875868	.9139121
month1	-.3149127	.3034863	-1.04	0.299	-.9098196	.2799943
month2	-.2832221	.3035568	-0.93	0.351	-.8782673	.3118232
month3	1.130582	.3026288	3.74	0.000	.5373564	1.723809
month4	.0451799	.3032939	0.15	0.882	-.5493499	.6397096
month5	1.652193	.3019626	5.47	0.000	1.060273	2.244113
month6	2.069507	.3018621	6.86	0.000	1.477784	2.66123
month7	2.385579	.3027172	7.88	0.000	1.79218	2.978978
month8	-4.003326	.3075962	-13.01	0.000	-4.606289	-3.400362
month9	.6108626	.3023697	2.02	0.043	.0181443	1.203581
month10	.7946191	.3016608	2.63	0.008	.2032907	1.385948
month11	-.216707	.301037	-0.72	0.472	-.8068128	.3733988
year3	-.4046892	.2759851	-1.47	0.143	-.9456872	.1363087
year4	-.5676074	.2755057	-2.06	0.039	-1.107666	-.0275492
year5	.3234366	.2769845	1.17	0.243	-.2195203	.8663936
year6	.8141031	.2753354	2.96	0.003	.2743787	1.353827
year7	.5555603	.2745892	2.02	0.043	.0172988	1.093822
year8	1.982738	.2746391	7.22	0.000	1.444378	2.521097
year9	3.63963	.2736522	13.30	0.000	3.103205	4.176055
year10	.3216964	.2745402	1.17	0.241	-.2164692	.859862
year11	-2.921898	.2765643	-10.56	0.000	-3.464032	-2.379765
_cons	10.1434	.2828633	35.86	0.000	9.588915	10.69788
sigma_u	12.189694					
sigma_e	5.7087583					
rho	.82012265	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(  76, 8496) =   528.82           Prob > F =  0.0000
```

Tab. 15.

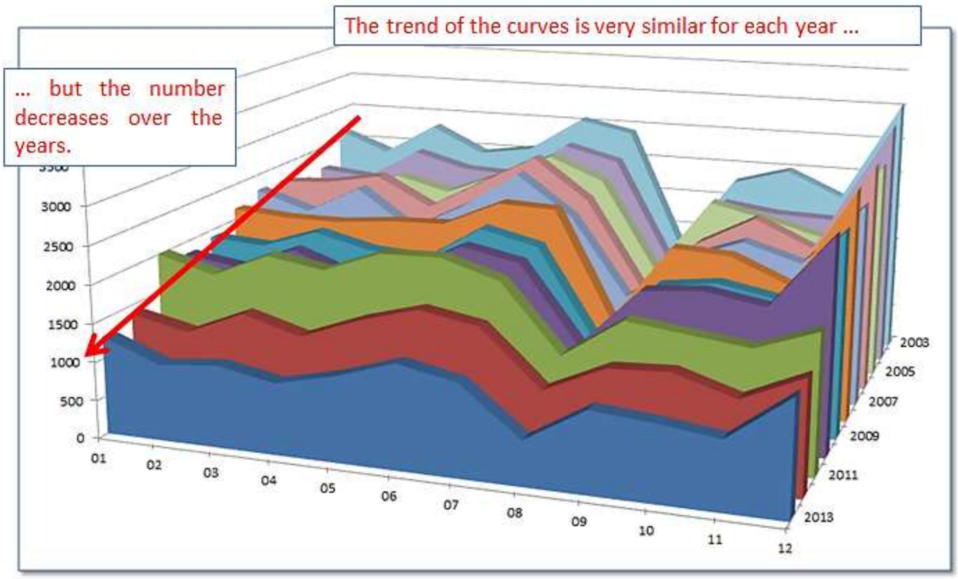
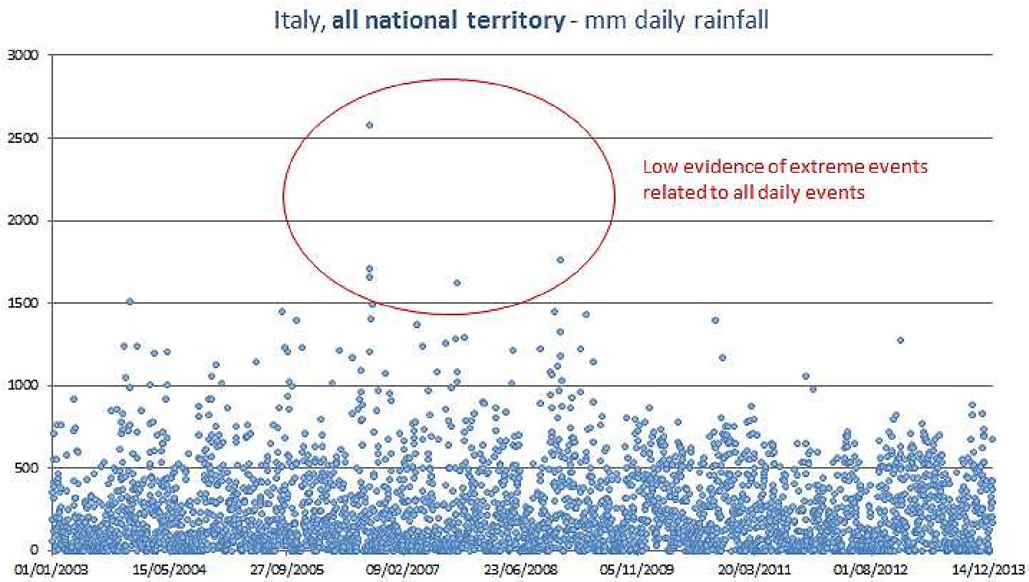
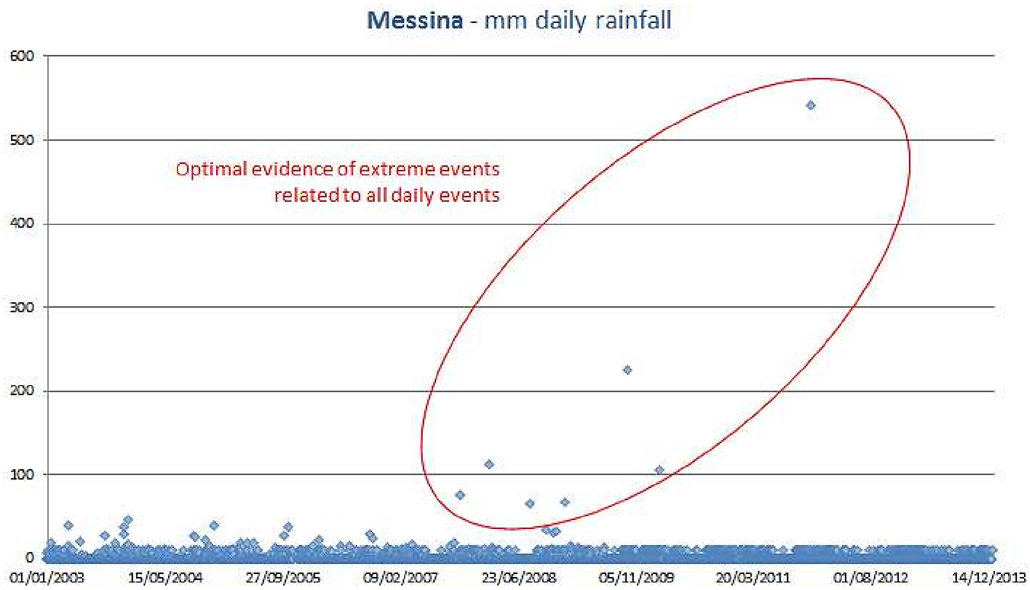


Fig. 16.



Italy, all national territory - mm daily rainfall
3000
2500
2000
1500
1000
500
0
Low evidence of extreme events
related to all daily events
01/01/2003
15/05/2004
27/09/2005
09/02/2007
23/06/2008
05/11/2009
20/03/2011
01/08/2012
14/12/2013

Fig. 17.



Messina - mm daily rainfall
600
500
400
300
200
100
0
Optimal evidence of extreme events
related to all daily events
01/01/2003
15/05/2004
27/09/2005
09/02/2007
23/06/2008
05/11/2009
20/03/2011
01/08/2012
14/12/2013

Fig. 18.

CONCLUSIONS.

A flood event causes in the months following an increase of appropriate policies to cover events?

Analysis of the data obtained by the regressions seems to tell us that there is no empirical evidence, due to the fact that the varibile that measures the presence of an event does not assume significance , while the control variables for months and years, independent by the presence of an extreme even, are significant.

We can deduce by the negative trend of issued policies that the increase of extreme events happening in recent years not only has an impact on the trend of the issue of insurance policies to cover these events, but even it seems to contract the market.

Where present, the insurance culture does not seem to suffer influence of the occurrence of floods in Italy, so the portion of the population that has so far been without insurance culture in relation to climate events continue to maintain this behavioral gap. On the other hand, even in geographic areas with greater attention to the protection of the risk does not seem to be noted significant increases in proportion to the increase of events.

THE PROPOSAL OF ANIA (National Insurance Enterprises Association).

1. As suggested by the OECD, governments should create the conditions so that private or public insurance instruments (or mixed) for natural disaster are made available in order to plan the economic resources to cover damages.
2. As suggested by the OECD for the best efficiency, even in systems where the risk taker is a public fund (eg Spain, the USA limited to floods, Turkey), the existing private insurance infrastructure should be used for the distribution of contracts and for the evaluation and settlement of claims.
3. For the sustainability of the system, is required a sort of geographical dispersion of risk (avoiding the so-called anti-selection ie the concentration of insured property only in areas at highest risk) and the attainment of a certain critical mass to achieve economies of scale.
4. The insurance/reinsurance private sector can allocate a certain amount of capital for catastrophe risk in Italy. If the diffusion of coverage was vary

large, It will be insufficient to cover the demand. State intervention is therefore needed as a co-reinsurer. Note that the systems adopted in countries with a high exposure to catastrophic risks (like Italy) provides for a reduction of compensation in proportion in the case of events that exceed the capacity of the system (see California, Japan, Belgium) .

5. As a matter of principle, premiums proportional to the risk encourage prevention measures (as recommended by the OECD that suggests contributions to needy categories). However, it may provide the maximum prices to make insurance coverage popular and widely accessible.

ANIA aims to spread the culture of insurance to form conscious citizens.

Two arguments at the core of a project:

- prevention, useful to decrease the probability that a negative event may occur;
- mutuality, which allows protection offer to those who find in condition to deal with adverse events.

“Io&irischi” addresses to italian schools to promote a greater awareness of risk and a culture of prevention and its management during the life, with an important goal: educate to risk for educate to future.

In 2008, the OECD has given importance to these issues in the publication *Recommendation on Good Practices for Enhanced Risk Awareness and Education on Insurance Issues*, defining objectives and best practices for years to come, such as the diffusion of educational pathways, starting with the compulsory education, addressed to increase awareness and responsibility towards the potential risks to which they may be exposed individuals, and especially in high schools, the deepening of the concept of risk and the basic mechanisms of insurance.

“Io&irischi” is aligned to these recommendations that, through the project “Io&irischi teens”, guides the high school students to the understanding of "basic" insurance, such as “pure risks” and “speculative risks”, the law of large numbers, the calculation of policy premiums, allowance and excess, in addition to supplementary social security schemes offered by the insurance sector.

INSURANCE CULTURE.

"The damage caused by natural disasters have increased dramatically over the last thirty years, especially due to the increasing economic value, and the insurance industry is the leading candidate for the distribution and management of the risks faced by households and firms and for the damages payment.“
This is what says Prof. Antonio Coviello , researcher at the Institute for research on tertiary activities of the CNR and professor of economics and management of insurance companies at the Second University of Naples, author of the interesting volume " Natural disasters and insurance coverage .“

According to this study :

- between 1963 and 2012 a number of 782 Italian cities have suffered flooding and landslides;
- 1,563 victims of floods and 5,192 victims of landslides (dead, injured and missing);
- 421 227 persons displaced and homeless;
- in 2011 in the world more than 366 billion dollars in economic damage (about 280 billion Euros);
- direct damages caused by natural disasters in emerging countries achieve an average of 2.9% of GDP each year (Department of Economic Research of Munich Re);
- In these cases, the mandatory insurance coverage is the most appropriate instrument to manage economic damage from natural disaster: adopted in many European countries, is also advocated by the OECD, which suggests the introduction of appropriate regulatory frameworks in this field, to allow economic actors to plan possible interventions for prevention and preparedness;
- The insurance has surely a first indirect effect of damages reduction, as premiums are an incentive for taking preventive measures and give the respective risk a price, as well as obviuosly to directly support the reconstruction in case of a catastrophe.

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