



**A microsimulation model to evaluate  
Italian households' financial vulnerability**

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**ONLINE APPENDIX**

## 1. DETAILED RESULTS

### 1.1. Baseline scenario

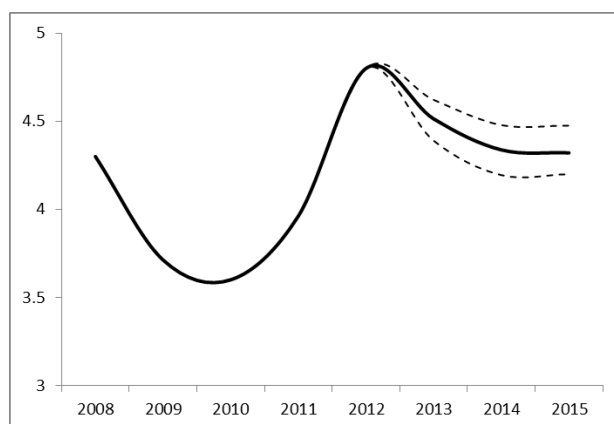
**Table 1**

	2012	2013	2014	2015
Percentage of vulnerable households over total households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.6	1.6
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.4	1.2	1.1
<i>Below the median</i>	2.9	2.9	2.8	2.7
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	1.0	0.9	0.8
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.8
<b>TOTAL</b>	4.8	4.6	4.4	4.4
Percentage of vulnerable households over indebted households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	7.4	6.8	6.7
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.3	5.2	4.6
<i>Below the median</i>	14.6	13.6	12.0	11.2
50 <sup>th</sup> -75 <sup>th</sup> percentile	6.0	4.4	3.8	3.3
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.0	3.2	3.3
<b>TOTAL</b>	24.1	21.2	19.1	18.1
Percentage of debt held by vulnerable households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.4	9.7	9.2
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	9.1	7.9	7.0
<i>Below the median</i>	19.7	19.3	17.4	16.0
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.4	5.9	5.2
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	9.1	8.7	8.2
<b>TOTAL</b>	37.5	34.7	31.8	29.5

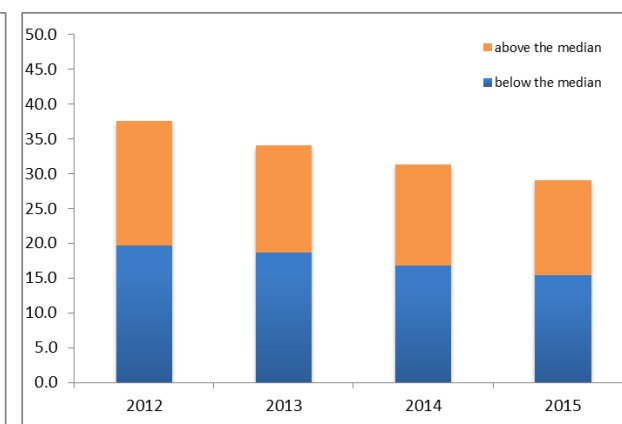
Note: Households are divided into classes according to their equalized income gross of imputed rents. The reported values have been approximated to the first decimal.

## 1.2. Suspension of loan payments

**Percentage of households with DSR>30%**



**Percentage of debt held by vulnerable households**



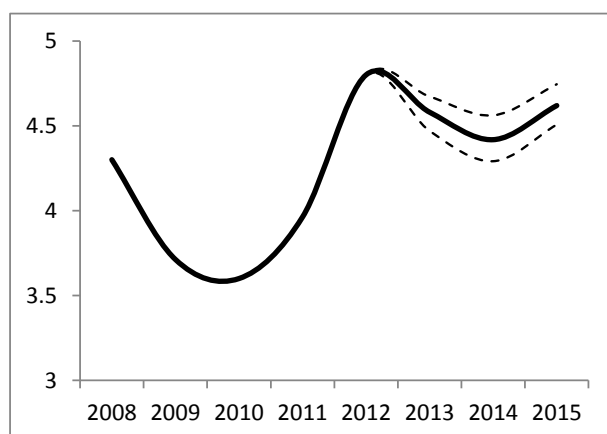
**Table 2**

	2012	2013	2014	2015
<b>Percentage of vulnerable households over total households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.5	1.6
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.3	1.2	1.1
<i>Below the median</i>	2.9	2.9	2.7	2.6
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	1.0	0.9	0.8
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.8
<b>TOTAL</b>	4.8	4.5	4.3	4.3
<b>Percentage of vulnerable households over indebted households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	7.2	6.5	6.4
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.2	5.2	4.4
<i>Below the median</i>	14.6	13.3	11.6	10.9
50 <sup>th</sup> -75 <sup>th</sup> percentile	6.0	4.4	3.8	3.3
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.0	3.2	3.3
<b>TOTAL</b>	24.1	20.9	18.8	17.8
<b>Percentage of debt held by vulnerable households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.1	9.1	8.8
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	8.9	7.9	6.8
<i>Below the median</i>	19.7	18.7	16.7	15.4
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.4	5.9	5.2
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	9.1	8.7	8.2
<b>TOTAL</b>	37.5	34.0	31.4	29.1

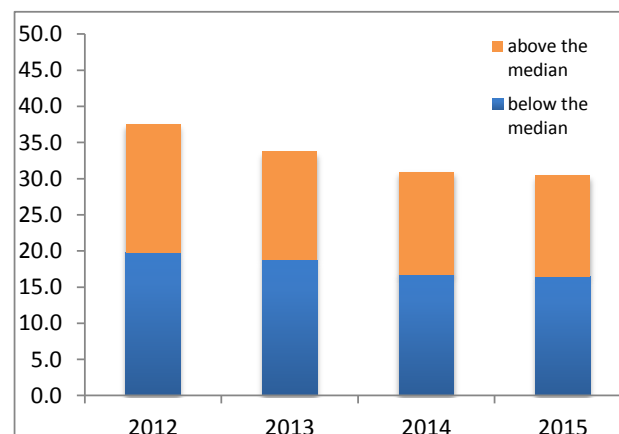
### 1.3. Stress test scenarios

#### 1.3.1. Interest rate shock

**Percentage of households with DSR>30%**

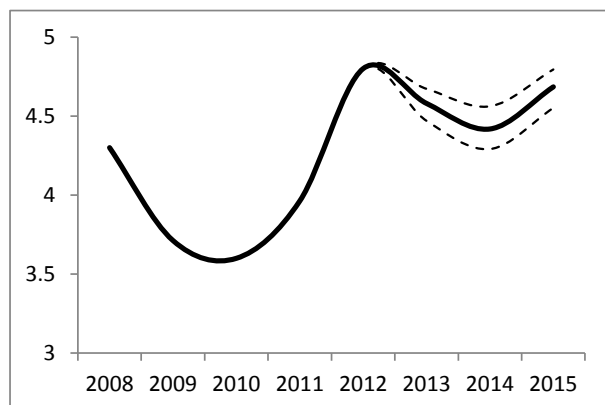
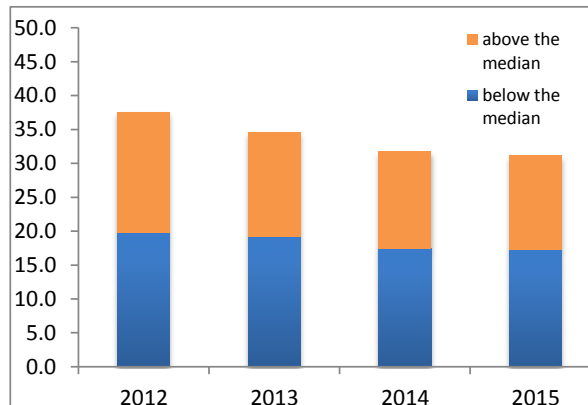


**Percentage of debt held by vulnerable households**



**Table 3**

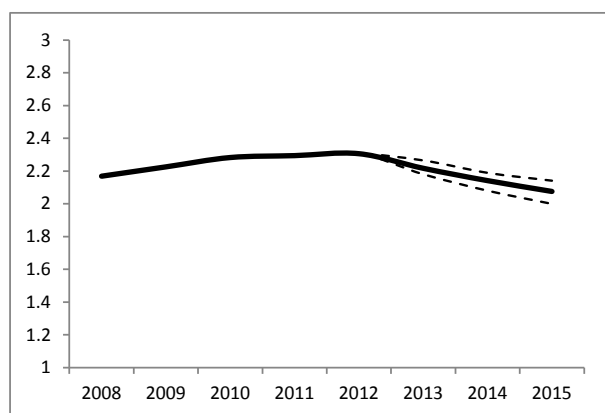
	2012	2013	2014	2015
Percentage of vulnerable households over total households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.6	1.7
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.4	1.2	1.2
<i>Below the median</i>	2.9	2.9	2.8	2.9
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	1.0	0.9	0.9
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.8
<b>TOTAL</b>	4.8	4.6	4.4	4.6
Percentage of vulnerable households over indebted households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	7.4	6.8	6.9
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.3	5.2	4.9
<i>Below the median</i>	14.6	13.6	12.0	11.8
50 <sup>th</sup> -75 <sup>th</sup> percentile	6.0	4.4	3.8	3.5
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.0	3.2	3.4
<b>TOTAL</b>	24.1	21.2	19.1	19.0
Percentage of debt held by vulnerable households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.4	9.7	9.7
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	9.1	7.9	7.6
<i>Below the median</i>	19.7	19.3	17.4	17.1
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.4	5.9	5.7
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	9.1	8.7	8.7
<b>TOTAL</b>	37.5	34.7	31.8	31.4

1.3.2. *Income shock***Percentage of households with DSR>30%****Percentage of debt held by vulnerable households****Table 4**

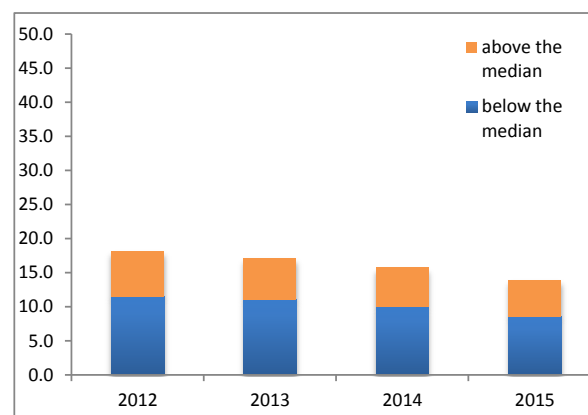
	2012	2013	2014	2015
Percentage of vulnerable households over total households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.6	1.7
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.4	1.2	1.3
<i>Below the median</i>	2.9	2.9	2.8	3.0
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	1.0	0.9	0.9
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.7
<b>TOTAL</b>	4.8	4.6	4.4	4.7
Percentage of vulnerable households over indebted households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	7.4	6.8	6.9
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.3	5.2	5.4
<i>Below the median</i>	14.6	13.6	12.0	12.3
50 <sup>th</sup> -75 <sup>th</sup> percentile	4.0	4.4	3.8	3.8
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.0	3.2	3.0
<b>TOTAL</b>	24.1	21.2	19.1	19.3
Percentage of debt held by vulnerable households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.4	9.7	9.5
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	9.1	7.9	8.0
<i>Below the median</i>	19.7	19.3	17.4	17.3
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.4	5.9	5.5
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	9.1	8.7	8.2
<b>TOTAL</b>	37.5	34.7	31.8	31.2

### 1.4. Households are vulnerable if DSR > 40%

**Percentage of households with DSR>40%**



**Percentage of debt held by vulnerable households**

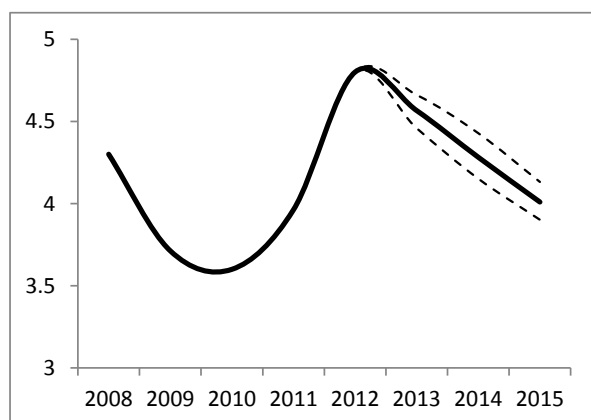


**Table 4**

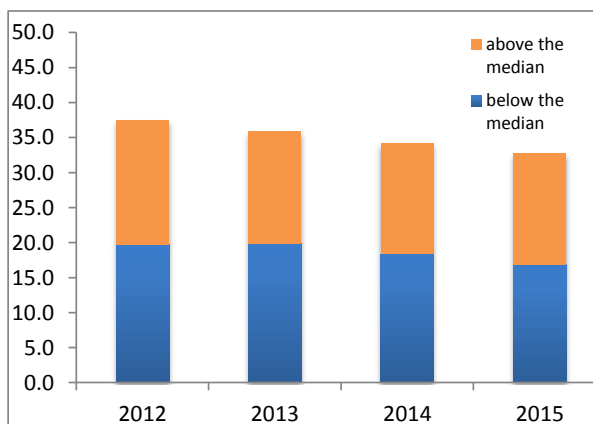
	2012	2013	2014	2015
Percentage of vulnerable households over total households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.0	1.0	1.0	1.0
25 <sup>th</sup> -50 <sup>th</sup> percentile	0.6	0.6	0.5	0.5
<i>Below the median</i>	1.6	1.6	1.5	1.4
50 <sup>th</sup> -75 <sup>th</sup> percentile	0.4	0.3	0.3	0.3
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.3	0.3	0.3	0.3
<b>TOTAL</b>	2.3	2.2	2.1	2.1
Percentage of vulnerable households over indebted households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	4.8	4.5	4.2	4.1
25 <sup>th</sup> -50 <sup>th</sup> percentile	3.1	2.7	2.2	1.9
<i>Below the median</i>	7.9	7.3	6.4	5.9
50 <sup>th</sup> -75 <sup>th</sup> percentile	2.1	1.6	1.3	1.2
75 <sup>th</sup> -100 <sup>th</sup> percentile	1.5	1.3	1.3	1.3
<b>TOTAL</b>	11.5	10.2	9.2	8.5
Percentage of debt held by vulnerable households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	6.6	6.9	6.3	5.8
25 <sup>th</sup> -50 <sup>th</sup> percentile	4.9	4.2	3.6	3.0
<i>Below the median</i>	11.5	11.1	9.9	8.6
50 <sup>th</sup> -75 <sup>th</sup> percentile	3.4	3.0	2.5	2.1
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.3	3.1	3.1	2.9
<b>TOTAL</b>	18.2	17.1	15.7	13.8

## 1.5. No originations

**Percentage of households with DSR>30%**



**Percentage of debt held by vulnerable households**



**Table 5**

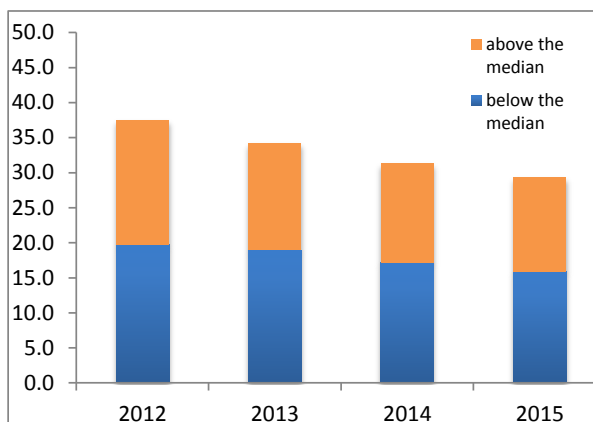
	2012	2013	2014	2015
<b>Percentage of vulnerable households over total households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.4	1.3
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.4	1.2	1.0
<i>Below the median</i>	2.9	2.9	2.6	2.3
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	1.0	0.9	0.8
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.8
<b>TOTAL</b>	4.8	4.6	4.3	4.0
<b>Percentage of vulnerable households over indebted households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	8.0	7.5	7.0
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.9	6.1	5.1
<i>Below the median</i>	14.6	14.7	13.5	12.1
50 <sup>th</sup> -75 <sup>th</sup> percentile	6.0	4.8	4.5	4.2
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.3	3.7	4.1
<b>TOTAL</b>	24.1	23.0	21.9	20.8
<b>Percentage of debt held by vulnerable households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.7	10.1	9.7
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	9.4	8.6	7.4
<i>Below the median</i>	19.7	19.9	18.3	16.9
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.7	6.5	6.1
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	9.4	9.6	9.7
<b>TOTAL</b>	37.5	35.9	34.1	32.8

## 1.6. Credit loans and 70 % of mortgages at adjustable rate

**Percentage of households with DSR>30%**



**Percentage of debt held by vulnerable households**



**Table 6**

	2012	2013	2014	2015
<b>Percentage of vulnerable households over total households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.6	1.6
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.3	1.2	1.1
<i>Below the median</i>	2.9	2.9	2.7	2.7
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	0.9	0.9	0.8
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.8
<b>TOTAL</b>	<b>4.8</b>	<b>4.5</b>	<b>4.4</b>	<b>4.4</b>
<b>Percentage of vulnerable households over indebted households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	7.4	6.8	6.6
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.2	5.1	4.5
<i>Below the median</i>	14.6	13.4	11.9	11.2
50 <sup>th</sup> -75 <sup>th</sup> percentile	6.0	4.2	3.8	3.3
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.0	3.1	3.3
<b>TOTAL</b>	<b>24.1</b>	<b>20.8</b>	<b>18.9</b>	<b>18.0</b>
<b>Percentage of debt held by vulnerable households</b>				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.4	9.6	9.2
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	8.9	7.8	6.9
<i>Below the median</i>	19.7	18.9	17.2	15.9
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.3	5.8	5.2
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	8.9	8.6	8.2
<b>TOTAL</b>	<b>37.5</b>	<b>34.2</b>	<b>31.3</b>	<b>29.3</b>

Note: we randomly assigned a fraction of individuals declaring a fixed rate mortgage to hold a variable rate mortgage so that about 70 per cent of the mortgages are at variable rate. We also assume that the credit loans are adjustable rate.



## 1.7. Income process estimated using the SHIW data from 2008 to 2012

**Table 7 Estimated mean and standard deviation for the income process (SHIW 2008-2012)**

	y <sup>d</sup> growth		y growth	
	$\mu^d$	$\sigma^d$	$\mu$	$\sigma$
1 <sup>st</sup> - 25 <sup>th</sup> percentile	-0.020	0.040	-0.028	0.032
25 <sup>th</sup> - 50 <sup>th</sup> percentile	-0.014	0.029	-0.016	0.025
50 <sup>th</sup> - 75 <sup>th</sup> percentile	-0.014	0.036	-0.014	0.025
75 <sup>th</sup> - 100 <sup>th</sup> percentile	-0.010	0.029	-0.011	0.001

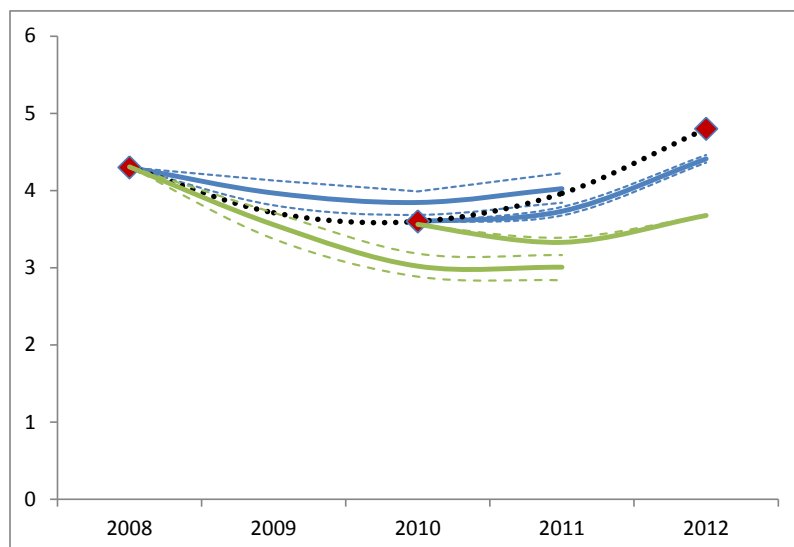
**Table 8**

	2012	2013	2014	2015
Percentage of vulnerable households over total households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	1.5	1.6	1.7	1.8
25 <sup>th</sup> -50 <sup>th</sup> percentile	1.4	1.4	1.3	1.2
<i>Below the median</i>	2.9	3.0	3.0	3.0
50 <sup>th</sup> -75 <sup>th</sup> percentile	1.2	0.9	0.9	0.8
75 <sup>th</sup> -100 <sup>th</sup> percentile	0.7	0.7	0.7	0.7
<b>TOTAL</b>	4.8	4.6	4.5	4.6
Percentage of vulnerable households over indebted households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	7.6	7.5	7.3	7.3
25 <sup>th</sup> -50 <sup>th</sup> percentile	7.0	6.4	5.5	4.9
<i>Below the median</i>	14.6	13.9	12.8	12.4
50 <sup>th</sup> -75 <sup>th</sup> percentile	6.0	4.4	3.8	3.4
75 <sup>th</sup> -100 <sup>th</sup> percentile	3.5	3.0	2.9	3.0
<b>TOTAL</b>	24.1	21.4	19.6	18.9
Percentage of debt held by vulnerable households				
1 <sup>st</sup> -25 <sup>th</sup> percentile	9.5	10.5	10.0	9.8
25 <sup>th</sup> -50 <sup>th</sup> percentile	10.2	9.3	8.5	7.5
<i>Below the median</i>	19.7	19.7	18.4	17.1
50 <sup>th</sup> -75 <sup>th</sup> percentile	7.9	6.2	5.7	5.1
75 <sup>th</sup> -100 <sup>th</sup> percentile	9.8	9.1	7.8	7.8
<b>TOTAL</b>	37.5	35.0	32.0	30.2

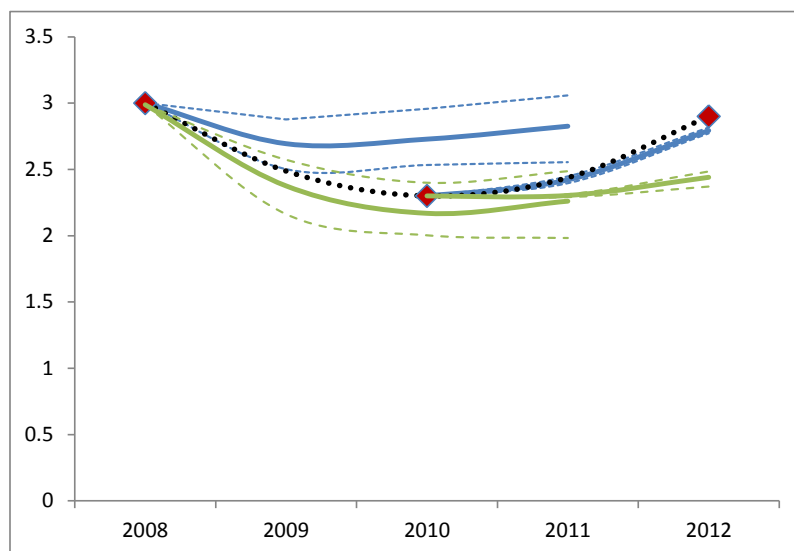
Note: we randomly assigned a fraction of individuals declaring a fixed rate mortgage to hold a variable rate mortgage so that about 70 per cent of the mortgages are at variable rate. We also assume that the credit loans are adjustable rate.

## 2. COMPARISON OF BACKTESTING EXERCICES UNDER DIFFERENT AMORTIZATION HYPOTHESES

**Figure 2.2 Percentage of vulnerable households over total population**



**Figure 2.2 Percentage of vulnerable households with income below the median over total population**



Note: The blue lines represent projections assuming a French amortization schedule; the green lines are projections assuming a fixed share of principal on current credit balance.