

Understanding Belief Formation: Evidence from Pension Reform in Europe

Emanuele Ciani

Bank of Italy

Ben Etheridge

University of Essex

Adeline Delavande

University of Essex

Marco Francesconi

University of Essex

14–15 Sep 2017, AIEL

What?

1. How do beliefs/expectations get formed?

What?

1. How do beliefs/expectations get formed?
2. Do expectations respond to changes in the environment in which people make decisions (e.g., reforms and/or announcements of reforms)?
3. Are there specific **characteristics** (e.g., education, numeracy, optimism) or **channels** (e.g., internet searches) underlying the relationship between beliefs and changes in individuals' information set?

What?

1. How do beliefs/expectations get formed?
2. Do expectations respond to changes in the environment in which people make decisions (e.g., reforms and/or announcements of reforms)?
3. Are there specific **characteristics** (e.g., education, numeracy, optimism) or **channels** (e.g., internet searches) underlying the relationship between beliefs and changes in individuals' information set?
4. Salience: Do beliefs affect expected behavior? Does expected behavior affect actual behavior? Do beliefs affect behavior directly?

How?

- (a) Use data from five waves of the Survey of Health, Ageing and Retirement in Europe (**SHARE**) on 10 European countries between observed between 2004 and 2015
- (b) Focus on events (**pension reforms**) which a single individual has no control over. Thus, limit for private information to play a role
- (c) Take advantage of **variation** by country across time
- (d) Construct proxy for individuals' **information set** based on
 - public governmental announcements
 - actual reforms
 - *Google Trends* (rough measure for intensity about which social networks talk about pension reform)

Knowing how individuals form their beliefs is extremely important for

- ★ **policy purposes**, e.g., design of pension schemes, provision of pension benefits, and retirement age
- ★ **model building** and **testing** (rational expectations, Bayesian updating, consumption/saving and permanent income hypothesis, labor supply in old age, retirement consumption, annuity and bequests)

Literature (1)

1. Literature on belief formation related to, and evolution of, expectations about pension reform is relatively **scant**
2. Large body of work on revision of expectations refers to events for which **private information** is likely to be important, e.g.
 - Viscusi and O'Connor (1984) – risk on the job; Bernheim (1990) – social security benefits; Dominitz (1998) – earnings; Cameron (2005) – climate change; Delavande (2008) – efficacy of contraception methods; Wiswall and Zafar (2015) and Delavande and Zafar (2017) – college major and expected earnings; Hurd and McGarry (2002) – survival (e.g., onset of cancer or death of parent \Rightarrow \downarrow in subjective probability of own survival)

3. Other studies in which individuals cannot have salient private information are **not** on pension reform but refer to:
- inflation expectations – Armantier et al. (2013, 2015, 2016)
 - equity returns – Dominitz and Manski (2011)
 - housing price – Armona, Fuster, Zafar (2016)

3. Other studies in which individuals cannot have salient private information are **not** on pension reform but refer to:
 - inflation expectations – Armantier et al. (2013, 2015, 2016)
 - equity returns – Dominitz and Manski (2011)
 - housing price – Armona, Fuster, Zafar (2016)
4. Somewhat close to our work is the paper by Bottazzi, Jappelli, and Padula (2006, JPubE)
 - which estimates the effect of pension reform on households' expectations of retirement and private wealth accumulation decisions in Italy (for us it is belief formation and Europe)

3. Other studies in which individuals cannot have salient private information are **not** on pension reform but refer to:
 - inflation expectations – Armantier et al. (2013, 2015, 2016)
 - equity returns – Dominitz and Manski (2011)
 - housing price – Armona, Fuster, Zafar (2016)
4. Somewhat close to our work is the paper by Bottazzi, Jappelli, and Padula (2006, JPubE)
 - which estimates the effect of pension reform on households' expectations of retirement and private wealth accumulation decisions in Italy (for us it is belief formation and Europe)
 - and finds that workers revise expectations in the direction suggested by the reform and that there is substantial offset between private wealth and perceived pension wealth
5. Even closer is Giavazzi and McMahon (2012, REStat)
 - which analyzes how households respond to increase in uncertainty in the run-up to the 1998 German elections

3. Other studies in which individuals cannot have salient private information are **not** on pension reform but refer to:
 - inflation expectations – Armantier et al. (2013, 2015, 2016)
 - equity returns – Dominitz and Manski (2011)
 - housing price – Armona, Fuster, Zafar (2016)
4. Somewhat close to our work is the paper by Bottazzi, Jappelli, and Padula (2006, JPubE)
 - which estimates the effect of pension reform on households' expectations of retirement and private wealth accumulation decisions in Italy (for us it is belief formation and Europe)
 - and finds that workers revise expectations in the direction suggested by the reform and that there is substantial offset between private wealth and perceived pension wealth
5. Even closer is Giavazzi and McMahon (2012, REStat)
 - which analyzes how households respond to increase in uncertainty in the run-up to the 1998 German elections
 - and finds that households increase their saving significantly

5. Our piece is also related to studies that analyze how (macro) information influences attitudes and behaviour (although this is mostly in the political domain)

5. Our piece is also related to studies that analyze how (macro) information influences attitudes and behaviour (although this is mostly in the political domain)
 - Growing literature on the role of **media exposure** on political attitudes and behavior (in the field and in the lab), e.g.
 - Ansolabehere and Iyengar (1995); Gentzkow and Shapiro (2006) – media bias and reputation; DellaVigna and Kaplan (2007, 2010) – Fox News effects and voting; Gerber, Karlan, and Bergan (2009) – effect of newspapers on voting behavior; Delavande and Zafar, (2017) – information and anti-American attitudes

- Data come from SHARE
 - 5 waves: 2004/05, 2006/07, 2011, 2013, 2015; so wave 3 (2008/09) is out, as it collects retrospective information on respondents' life

- Data come from SHARE
 - 5 waves: 2004/05, 2006/07, 2011, 2013, 2015; so wave 3 (2008/09) is out, as it collects retrospective information on respondents' life
- Focus on **two** expectations questions (asked only to those employed or self-employed, and are recorded from 0 to 100):
 - ★ *What are the chances that before you retire the government will **reduce the pension** which you are entitled to?*
 - ★ *What are the chances that before you retire the government will **raise your retirement age**?*

- Issues related to data collection, e.g.
 - expectations information not elicited in waves 4 and 6 for longitudinal respondents, but only for refresher samples
 - Germany and Sweden: no refresher samples in wave 4
 - Netherlands: no survey in wave 6
 - Austria, Germany, Sweden, Spain and Switzerland: few non-longitudinal respondents in wave 6

- Issues related to data collection, e.g.
 - expectations information not elicited in waves 4 and 6 for longitudinal respondents, but only for refresher samples
 - Germany and Sweden: no refresher samples in wave 4
 - Netherlands: no survey in wave 6
 - Austria, Germany, Sweden, Spain and Switzerland: few non-longitudinal respondents in wave 6
- 10 countries over waves 1, 2, 4, 5, 6: Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland
- **Final sample**: employed and self-employed, men and women aged [50, 64] with non-missing information on beliefs and covariates: ~ 28,000 person wave observations

Data (3)

Using comprehensive information from the European Union and the OECD, we can time the date (year and month) of each reform in each of the countries in the sample, and distinguish between

- reforms that increase the national retirement age and
- reforms that reduce pension benefits

Data (3)

Using comprehensive information from the European Union and the OECD, we can time the date (year and month) of each reform in each of the countries in the sample, and distinguish between

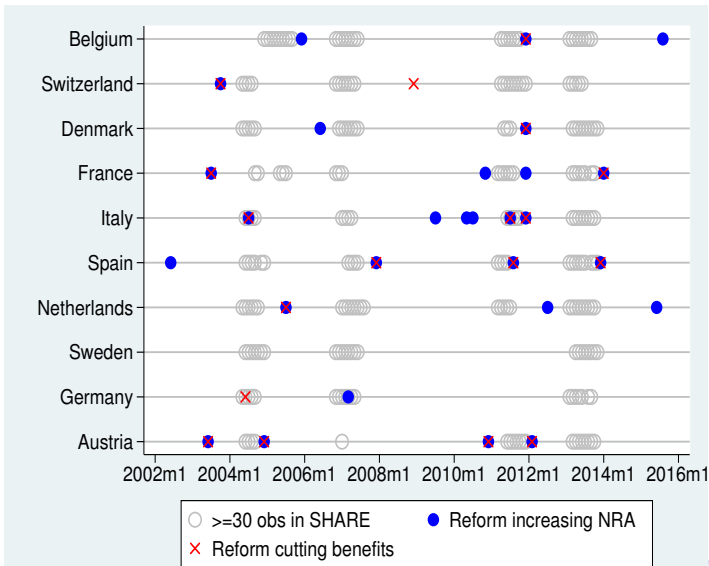
- reforms that increase the national retirement age and
- reforms that reduce pension benefits

Since we know year of month of interview, we can build a new variable proximity to reform which

- is equal to 25 in the month of the reform and decreases one-to-one with distance in months away to/from the reform,
- and thus equal to 0 in all periods that are distant from the reform (both with respect to the future and to the past) more than 24 months

Data (4)

Timing of Reforms by Country



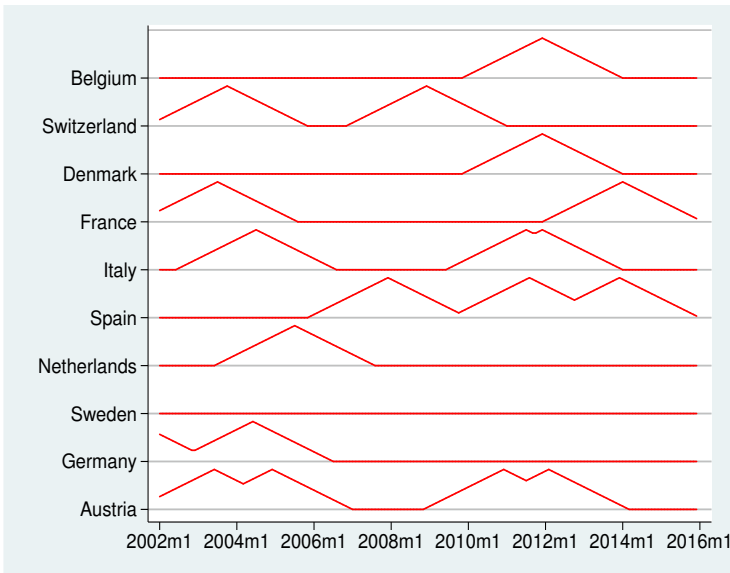
Data (5)

Proximity to Reform – (a) Reform increasing national retirement age



Data (6)

Proximity to Reform – (b) Reform decreasing pension benefits



Descriptives (1)

The next two figures display the distribution of beliefs by reform type in the sample

Descriptives (1)

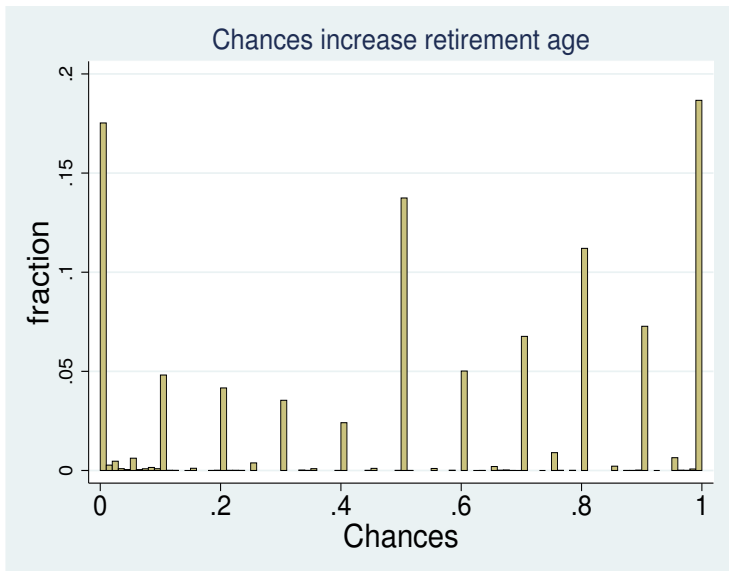
The next two figures display the distribution of beliefs by reform type in the sample

They both show:

- (a) high dispersion in beliefs
- (b) heaps at multiples of 10
- (c) large fraction of individuals with highest uncertainty (at 0.5)
- (d) many individuals report certainty, i.e. 0 = no change, or 1 = certainty of a reform
- (e) dispersion remains large even after controlling for a wide set of covariates, which explain only about 10–15% of the variance in the chances of a reform that reduces benefits or increases age at retirement

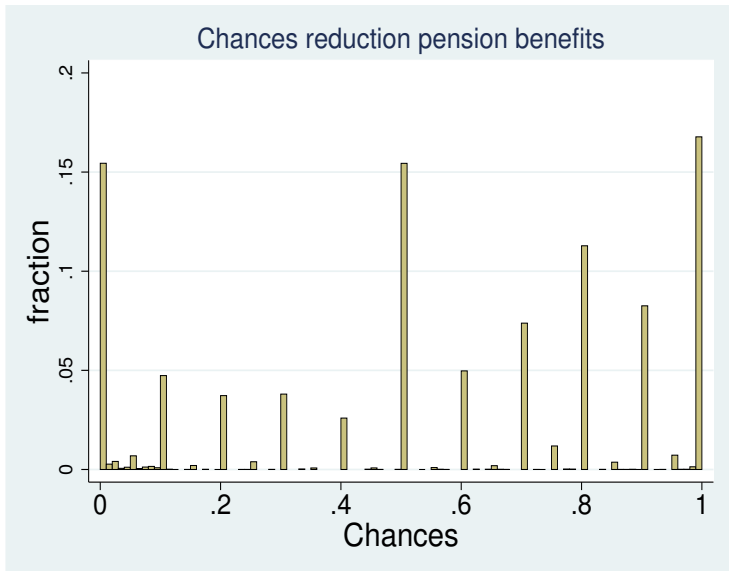
Descriptives (2)

Distribution of beliefs about increases in retirement age



Descriptives (3)

Distribution of beliefs about reduction in pension benefits



Descriptives (4)

The next figure displays the average expectations in the sample

Descriptives (4)

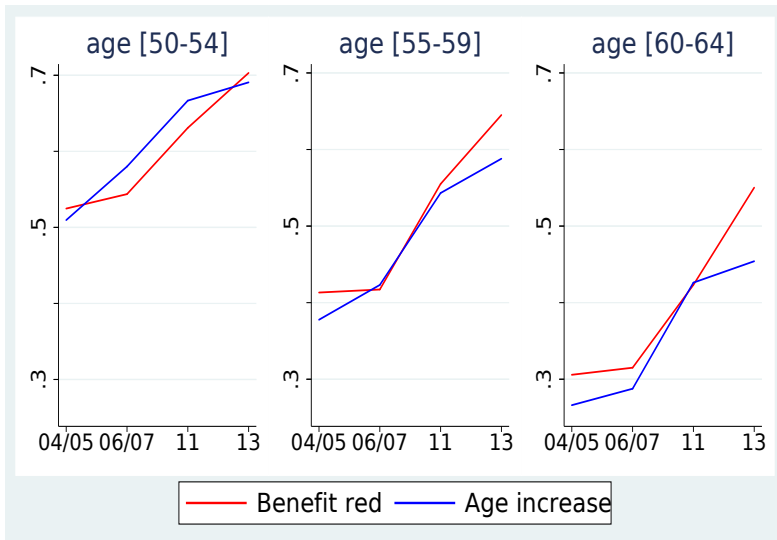
The next figure displays the average expectations in the sample

It shows that:

- (a) beliefs about a reform are broadly consistent with changes in the macroeconomic environment
- (b) During economic downturns, average expectations of a reform go up
- (c) At younger ages, average beliefs move away from the largest uncertainty to an average level of 70%
- (d) Expectations of a reform are lower for older people, since the remaining time span before retirement is shorter and thus there are fewer chances that a reform can actually take place

Descriptives (5)

Average beliefs over time and by age



Results: Beliefs and Reforms (1)

- Use *proximity to reform* to see how beliefs about the likelihood of a reform evolve around the time to/from an actual reform

Results: Beliefs and Reforms (1)

- Use *proximity to reform* to see how beliefs about the likelihood of a reform evolve around the time to/from an actual reform
- Focus first on: six months (panel A) and one year (panel B) before/after a reform, with dummy variables.

Results: Beliefs and Reforms (1)

- Use *proximity to reform* to see how beliefs about the likelihood of a reform evolve around the time to/from an actual reform
- Focus first on: six months (panel A) and one year (panel B) before/after a reform, with dummy variables. The notation is:
 - $I(-6,-1)$ or $I(-12,-1)$: six months *before* or 12 months *before*
 - $I(0,6)$ or $I(0,12)$: six months *after* or 12 months *after*

Results: Beliefs and Reforms (1)

- Use *proximity to reform* to see how beliefs about the likelihood of a reform evolve around the time to/from an actual reform
- Focus first on: six months (panel A) and one year (panel B) before/after a reform, with dummy variables. The notation is:
 - $I(-6,-1)$ or $I(-12,-1)$: six months *before* or 12 months *before*
 - $I(0,6)$ or $I(0,12)$: six months *after* or 12 months *after*
- Then, turn to the liner specification [25 is max value declining to 0 before/after the reform] (panel C).

Results: Beliefs and Reforms (1)

- Use *proximity to reform* to see how beliefs about the likelihood of a reform evolve around the time to/from an actual reform
- Focus first on: six months (panel A) and one year (panel B) before/after a reform, with dummy variables. The notation is:
 - $I(-6,-1)$ or $I(-12,-1)$: six months *before* or 12 months *before*
 - $I(0,6)$ or $I(0,12)$: six months *after* or 12 months *after*
- Then, turn to the liner specification [25 is max value declining to 0 before/after the reform] (panel C). The notation is:
 - $PtR(\text{before})$: proximity to reform *before* the reform is implemented
 - $PtR(\text{after})$: proximity to reform *after* the reform is implemented

Results: Beliefs and Reforms (1)

- Use *proximity to reform* to see how beliefs about the likelihood of a reform evolve around the time to/from an actual reform
- Focus first on: six months (panel A) and one year (panel B) before/after a reform, with dummy variables. The notation is:
 - $I(-6,-1)$ or $I(-12,-1)$: six months *before* or 12 months *before*
 - $I(0,6)$ or $I(0,12)$: six months *after* or 12 months *after*
- Then, turn to the liner specification [25 is max value declining to 0 before/after the reform] (panel C). The notation is:
 - $PtR(\text{before})$: proximity to reform *before* the reform is implemented
 - $PtR(\text{after})$: proximity to reform *after* the reform is implemented
- Dependent variable (chances): measured on a [0–1] scale
- **s.e.** clustered by country \times month of interview (> 200 groups)

Beliefs and Reforms (2)

	Chances Govt Raises Retirement Age before resp. retires		Chances Govt Reduces Pension Benefits before resp. retires
Panel A			
I(-6,-1)	0.078***		0.085***
I(0,6)	-0.012		0.093***
Panel B			
I(-12,-1)	0.096***		0.085***
I(0,12)	-0.029**		0.078***
Panel C			
<i>PtR</i> (before)	0.005***		0.005***
<i>PtR</i> (after)	-0.003**		0.005***

Note: Controls for household income and net wealth, age, gender, education, private/public sector, self-employment, part-time employment, citizen, health status, marital status, household size, country, survey year, time of interview in months.

Results: Beliefs and Reforms (3)

- The **length of time** to/from a **reform** matters for the formation of beliefs

Results: Beliefs and Reforms (3)

- The **length of time** to/from a **reform** matters for the formation of beliefs
- The time that precedes a reform (up to 24 months before) is as relevant as the time that follows the reform in the case of beliefs about *benefit reductions*
 - The expectation of a reform (that reduces pension benefits) 6-12 months **before** the implementation increases the belief that pension benefits will decline by about **9 percentage points**
 - The implementation of the same reform increases the same beliefs 6-12 months **after** by a **8–9 percentage points**
 - When taking the 24-month period, the impact is about **10 percentage points** both before and after the reform

Results: Beliefs and Reforms (3)

- The **length of time** to/from a **reform** matters for the formation of beliefs
- The time that precedes a reform (up to 24 months before) is as relevant as the time that follows the reform in the case of beliefs about *benefit reductions*
 - The expectation of a reform (that reduces pension benefits) 6-12 months **before** the implementation increases the belief that pension benefits will decline by about **9 percentage points**
 - The implementation of the same reform increases the same beliefs 6-12 months **after** by a **8–9 percentage points**
 - When taking the 24-month period, the impact is about **10 percentage points** both before and after the reform
- **Asymmetry** in the case of reforms that *increase the national retirement age (NRA)*:
 - Large impact on beliefs **before** the reform, 8–10 percentage point increase
 - Smaller impact **after** the reform, 3–7 percentage point reduction

Results: Beliefs and Reforms (4)

- Results are **robust** to individual **fixed effects**
 - The size of the estimates of the time span *before* a reform is just slightly smaller
 - But the (negative) estimates *after* become significant in the case of beliefs about increases in NRA

Results: Beliefs and Reforms (4)

- Results are **robust** to individual **fixed effects**
 - The size of the estimates of the time span *before* a reform is just slightly smaller
 - But the (negative) estimates *after* become significant in the case of beliefs about increases in NRA
- Results are also robust to different **time windows**, e.g.:
 - changing the length up to 18 months before and after
 - having times before and after the reform included separately
 - having times split in subgroups (e.g. 0–6 months and 6–12 months in the same regression)

Beliefs, Reforms, and Announcements (1)

- Does the reform itself generate the information that individuals value and use to form their expectations and behavior?

Beliefs, Reforms, and Announcements (1)

- Does the reform itself generate the information that individuals value and use to form their expectations and behavior?
- Or is it the case that the large effects before reforms are driven by **announcements**?

Beliefs, Reforms, and Announcements (1)

- Does the reform itself generate the information that individuals value and use to form their expectations and behavior?
- Or is it the case that the large effects before reforms are driven by **announcements**?
 - People may adjust their expectations (and eventually behavior) when reforms are announced, i.e., well before the reform (between announcement and implementation)

Beliefs, Reforms, and Announcements (1)

- Does the reform itself generate the information that individuals value and use to form their expectations and behavior?
- Or is it the case that the large effects before reforms are driven by **announcements**?
 - People may adjust their expectations (and eventually behavior) when reforms are announced, i.e., well before the reform (between announcement and implementation)
 - This is what we explore next
 - Notation: $I^U(-12, -1)$ and $I^A(-12, -1)$: 12-to-1 months *before* an unannounced (U) and announced (A) reform, respectively

Beliefs, Reforms, and Announcements (2)

	Chances Govt Raises Retirement Age before resp. retires	Chances Govt Reduces Pension Benefits before resp. retires
Panel A		
$I^U(-12, -1)$	0.091***	0.086***
$I^A(-12, -1)$	0.109***	0.082**
$I(0,12)$	-0.029**	0.078***
Panel B		
$I^U(-18, -1)$	0.096***	0.083***
$I^A(-18, -1)$	0.117***	0.057***
$I(0,12)$	-0.021	0.083***

Note: Controls for household income and net wealth, age, gender, education, private/public sector, self-employment, part-time employment, citizen, health status, marital status, household size, country, survey year, time of interview in months.

Beliefs, Reforms, and Announcements (3)

- (a) Prior to reforms, impact on beliefs of unannounced reforms is very similar to that of announced reforms

Beliefs, Reforms, and Announcements (3)

- (a) Prior to reforms, impact on beliefs of unannounced reforms is very similar to that of announced reforms
- (b) Relative to unannounced reforms, announcements:
- increase expectations in the case of reforms that raise NRA by about 2 percentage points
 - decrease expectations in the case of reforms that reduce pension benefits by 2.5 points when the time span is 18 months before the reform implementation

Beliefs, Reforms, and Announcements (3)

- (a) Prior to reforms, impact on beliefs of unannounced reforms is very similar to that of announced reforms
- (b) Relative to unannounced reforms, announcements:
- increase expectations in the case of reforms that raise NRA by about 2 percentage points
 - decrease expectations in the case of reforms that reduce pension benefits by 2.5 points when the time span is 18 months before the reform implementation
- (c) Announcements are quantitatively important but cannot be the whole story. Indeed, individuals
- keep **revising** their expectations even after the implementation of a given reform, and
 - have **similar** responses even when reforms are unannounced

Beliefs and Online Search (1)

- Could it be that individuals update their information set (before and after the introduction of reforms) through **social networks**?
- We proxy the strength of social networks with **online search**,

Beliefs and Online Search (1)

- Could it be that individuals update their information set (before and after the introduction of reforms) through **social networks**?
- We proxy the strength of social networks with **online search**,
- which is observed at the aggregate monthly level through *Google Trends*.

Beliefs and Online Search (1)

- Could it be that individuals update their information set (before and after the introduction of reforms) through **social networks**?
- We proxy the strength of social networks with **online search**,
- which is observed at the aggregate monthly level through *Google Trends*. In particular:
 - ★ over the sample period we look at search intensity, which is measured on a [0–1] scale
 - ★ for each country, we look at monthly searches only for the words “pension reform” (translated in each country’s language)
 - ★ intensity is equal to 1 in the month in which there are most country-specific users searching for the words “pension reforms”, any number between 0 and 1 in all the other cases in which there is search activity, and 0 if there is no search

Beliefs and Online Search (2)

	Chances Govt Raises Retirement Age before resp. retires	Chances Govt Reduces Pension Benefits before resp. retires
<i>Google Trends</i>	0.129**	0.164***

Beliefs and Online Search (2)

	Chances Govt Raises Retirement Age before resp. retires	Chances Govt Reduces Pension Benefits before resp. retires
<i>Google Trends</i>	0.129**	0.164***
<i>Google Trends</i> over past 6 months	0.306***	0.525***
<i>Google Trends</i> over past 12 months	-0.202	0.428***

Beliefs and Online Search (3)

- (a) On average, a 1 standard deviation increase in the number of monthly searches is associated with
- a 2.2 percentage point increase in the belief that the government would raise the NRA (or 4% increase at the mean of beliefs) and
 - a 2.8 percentage point increase in the belief that the government would reduce pension benefits (or 5.3% increase at the mean of beliefs)

Beliefs and Online Search (3)

- (a) On average, a 1 standard deviation increase in the number of monthly searches is associated with
- a 2.2 percentage point increase in the belief that the government would raise the NRA (or 4% increase at the mean of beliefs) and
 - a 2.8 percentage point increase in the belief that the government would reduce pension benefits (or 5.3% increase at the mean of beliefs)
- (b) Thus, online search seems to be an important source of information that affects people's information set

Beliefs and Online Search (3)

- (a) On average, a 1 standard deviation increase in the number of monthly searches is associated with
- a 2.2 percentage point increase in the belief that the government would raise the NRA (or 4% increase at the mean of beliefs) and
 - a 2.8 percentage point increase in the belief that the government would reduce pension benefits (or 5.3% increase at the mean of beliefs)
- (b) Thus, online search seems to be an important source of information that affects people's information set

Que: Is online search an alternative to announcements for individuals to obtain information and shape up their beliefs?

Beliefs and Online Search (3)

- (a) On average, a 1 standard deviation increase in the number of monthly searches is associated with
- a 2.2 percentage point increase in the belief that the government would raise the NRA (or 4% increase at the mean of beliefs) and
 - a 2.8 percentage point increase in the belief that the government would reduce pension benefits (or 5.3% increase at the mean of beliefs)
- (b) Thus, online search seems to be an important source of information that affects people's information set

Que: Is online search an alternative to announcements for individuals to obtain information and shape up their beliefs?

This is what we see next

Beliefs and Online Search (3)

- (a) On average, a 1 standard deviation increase in the number of monthly searches is associated with
- a 2.2 percentage point increase in the belief that the government would raise the NRA (or 4% increase at the mean of beliefs) and
 - a 2.8 percentage point increase in the belief that the government would reduce pension benefits (or 5.3% increase at the mean of beliefs)
- (b) Thus, online search seems to be an important source of information that affects people's information set

Que: Is online search an alternative to announcements for individuals to obtain information and shape up their beliefs?

This is what we see next [*Google Trends* over past 6 months: $GT(-6)$]

Beliefs, Reforms, Announcements, and Online Search (1)

	Chances Govt Raises Retirement Age before resp. retires	Chances Govt Reduces Pension Benefits before resp. retires
$I^A(-6, -1)$	0.267***	0.183***
$GT(-6)$	0.232***	0.642***
$I^A(-6, -1) \times GT(-6)$	-0.608***	-0.619***
$I^U(-12, -1)$	0.038**	0.042***
$I^U(-12, -1) \times GT(-12)$	0.721***	0.514***
$I(0, 12)$	-0.038***	0.105***
$I(0, 12) \times GT(+12)$	-0.140	-0.300**

- (a) Both reform announcements and social interactions about reforms affect beliefs **positively** and **strongly**

Beliefs, Reforms, Announcements, and Online Search (2)

- (a) Both reform announcements and social interactions about reforms affect beliefs **positively** and **strongly**
- (b) Announcements and online search are **substitutes** in the formation of beliefs about pension reforms

Beliefs, Reforms, Announcements, and Online Search (2)

- (a) Both reform announcements and social interactions about reforms affect beliefs **positively** and **strongly**
- (b) Announcements and online search are **substitutes** in the formation of beliefs about pension reforms
- (c) Instead unannounced reforms and online search are **complements**:
 - gathering information online (and possibly through other social interactions, peers, etc.) is a crucial channel for belief formation when there is no formal announcement of reform

Beliefs, Reforms, Announcements, and Online Search (2)

- (a) Both reform announcements and social interactions about reforms affect beliefs **positively** and **strongly**
- (b) Announcements and online search are **substitutes** in the formation of beliefs about pension reforms
- (c) Instead unannounced reforms and online search are **complements**:
 - gathering information online (and possibly through other social interactions, peers, etc.) is a crucial channel for belief formation when there is no formal announcement of reform
- (d) Implementation of a reform that raises NRA reduces beliefs in a subsequent reform, and online search does **not** affect beliefs with the implementation
- (e) But implementation of reform that reduces PB **increases** the expectations of a future reform, while implementation and online search are **substitutes**

Belief Dispersion, Reforms, and Announcements (1)

- Reform implementations and announcements raise average beliefs

Belief Dispersion, Reforms, and Announcements (1)

- Reform implementations and announcements raise average beliefs
- One may wonder if they also lead to **convergence of beliefs** across individuals

Belief Dispersion, Reforms, and Announcements (1)

- Reform implementations and announcements raise average beliefs
- One may wonder if they also lead to **convergence of beliefs** across individuals
- Important to gauge the relationship of reform implementations and announcements with *belief dispersion*, since policy makers can better fine tune their interventions if they intend to expand people's information sets and/or curb noise to signal

Belief Dispersion, Reforms, and Announcements (1)

- Reform implementations and announcements raise average beliefs
- One may wonder if they also lead to **convergence of beliefs** across individuals
- Important to gauge the relationship of reform implementations and announcements with *belief dispersion*, since policy makers can better fine tune their interventions if they intend to expand people's information sets and/or curb noise to signal
- We do this next, taking as our dependent variable the square of the residuals from earlier regressions (Panel B slide 20, and Panel A slide 24)

Belief Dispersion, Reforms, and Announcements (2)

	Square of Residuals Chances Govt Raises Retirement Age before resp. retires	Square of Residuals Chances Govt Reduces Pension Benefits before resp. retires
Panel A		
$I(-12, -1)$	0.009**	-0.000
$I(0, 12)$	0.017***	-0.008
Panel B		
$I^U(-12, -1)$	0.003	-0.002
$I^A(-12, -1)$	0.026**	0.005
$I(0, 12)$	0.017***	-0.009

Note: Controls for household income and net wealth, age, gender, education, private/public sector, self-employment, part-time employment, citizen, health status, marital status, household size, country, survey year, time of interview in months.

Belief Dispersion, Reforms, and Announcements (3)

- In the case of reforms that increase NRA, we find that:
 - Up to 12 months before reforms, especially if they are announced, individual beliefs become **more dispersed**
 - Belief dispersion also increases within the 12 months **after** the implementation of reforms
- In the case of reforms that reduce pension benefits, we find no effect on belief dispersion

Belief Dispersion, Reforms, and Announcements (3)

- In the case of reforms that increase NRA, we find that:
 - Up to 12 months before reforms, especially if they are announced, individual beliefs become **more dispersed**
 - Belief dispersion also increases within the 12 months **after** the implementation of reforms
- In the case of reforms that reduce pension benefits, we find no effect on belief dispersion
- So there is **not much belief convergence**. If anything, belief dispersion increases when a reform is approaching or after its implementation

Belief Dispersion, Reforms, and Announcements (3)

- In the case of reforms that increase NRA, we find that:
 - Up to 12 months before reforms, especially if they are announced, individual beliefs become **more dispersed**
 - Belief dispersion also increases within the 12 months **after** the implementation of reforms
- In the case of reforms that reduce pension benefits, we find no effect on belief dispersion
- So there is **not much belief convergence**. If anything, belief dispersion increases when a reform is approaching or after its implementation
- This suggests there is a room for a lot of **heterogeneity**

Heterogeneity (1)

- Not only are people's beliefs correlated with a number of individual characteristics, they may also differ widely along the same characteristics

Heterogeneity (1)

- Not only are people's beliefs correlated with a number of individual characteristics, they may also differ widely along the same characteristics
- We explore **heterogeneity** along a number of cues: (a) education; (b) numeracy; (c) age; (d) optimism; (e) anchoring

Heterogeneity (1)

- Not only are people's beliefs correlated with a number of individual characteristics, they may also differ widely along the same characteristics
- We explore **heterogeneity** along a number of cues: (a) education; (b) numeracy; (c) age; (d) optimism; (e) anchoring
 - Optimism: obtained from difference between reported probability of being alive at age 75 and the one reported by mortality tables (source: Eurostat); this has then been regressed on covariates and we use the residuals. Scale: $[-1,1]$ (after censoring the 1st percentile to avoid a long lower tail)

Heterogeneity (1)

- Not only are people's beliefs correlated with a number of individual characteristics, they may also differ widely along the same characteristics
- We explore **heterogeneity** along a number of cues: (a) education; (b) numeracy; (c) age; (d) optimism; (e) anchoring
 - Optimism: obtained from difference between reported probability of being alive at age 75 and the one reported by mortality tables (source: Eurostat); this has then been regressed on covariates and we use the residuals. Scale: $[-1,1]$ (after censoring the 1st percentile to avoid a long lower tail)
 - Anchoring: defined as proportion of answers equal to 0, 50, or 100 to the questions “What do you think the chances are that it will be sunny tomorrow?” and “Thinking about the next ten years, what are the chances that you will receive any inheritance, including property and other valuables?”

Heterogeneity – Reforms (2)

	University degree	Numeracy	Age-50	Optimism	Anchoring
Chances that government increases NRA					
Cue	0.007	0.003	-0.000***	0.069***	-0.001
I(-12,-1)	0.028**	-0.002	0.008***	0.020	-0.072**
I(0,12)	0.001	0.001	0.007***	0.000	0.069***
Chances that government reduces pension benefits					
Cue	0.023**	0.008***	-0.000***	0.032*	0.005
I(-12,-1)	0.005	-0.009	0.005**	0.016	-0.128***
I(0,12)	0.036**	0.026**	-0.001	0.126*	0.001

Note: Each coefficient in the bottom two rows of each block is the interaction between the proximity-to-reform indicator with the corresponding cue

Heterogeneity – Announcements (3)

	University degree	Numeracy	Age-50	Optimism	Anchoring
Chances that government increases NRA					
Cue	0.007	-0.008	-0.000***	0.069***	-0.001
$I^U(-12, -1)$	0.011	-0.002	0.009***	0.036	-0.063**
$I^A(-12, -1)$	0.086***	0.018	0.006	-0.035	-0.116
$I(0,12)$	0.001	0.001	0.007***	-0.000	0.056*
Chances that government reduces pension benefits					
Cue	0.023**	0.008***	-0.000***	0.032*	0.004
$I^U(-12, -1)$	-0.007	-0.012*	0.005*	0.037	-0.106***
$I^A(-12, -1)$	0.048**	0.001	0.006	-0.048	-0.200***
$I(0,12)$	0.036**	0.026**	-0.001	0.126*	0.002

Note: Each coefficient in the bottom three rows of each block is the interaction between the proximity-to-reform indicator with the corresponding cue

Heterogeneity – *Google Trends* (3)

	University degree	Numeracy	Age-50	Optimism	Anchoring
Chances that government increases NRA					
Cue	0.020*	0.002	-0.000***	0.067***	0.004
<i>Google Trends</i>	0.007	0.016	0.022***	0.077	-0.126**
Chances that government reduces pension benefits					
Cue	0.044***	0.008***	-0.000***	0.038**	-0.013
<i>Google Trends</i>	0.004	0.014	0.011*	0.139	-0.063

Note: Each coefficient is the interaction between the *Google Trend* intensity measure with the corresponding cue

Heterogeneity — Summing up (4)

1. Older individuals tend to hold **lower expectations** of reforms (shorter time horizon), while

Heterogeneity — Summing up (4)

1. Older individuals tend to hold **lower expectations** of reforms (shorter time horizon), while
2. university educated, numeracy more able, and optimistic individuals tend to hold **greater beliefs** of reform

Heterogeneity — Summing up (4)

1. Older individuals tend to hold **lower expectations** of reforms (shorter time horizon), while
2. university educated, numeracy more able, and optimistic individuals tend to hold **greater beliefs** of reform
3. But up to 12 months before a (unannounced) reform and 12 months after the implementation, **older** individuals generally adjust their beliefs up and search more online, while

Heterogeneity — Summing up (4)

1. Older individuals tend to hold **lower expectations** of reforms (shorter time horizon), while
2. university educated, numeracy more able, and optimistic individuals tend to hold **greater beliefs** of reform
3. But up to 12 months before a (unannounced) reform and 12 months after the implementation, **older** individuals generally adjust their beliefs up and search more online, while
4. individuals with **lower judgement sophistication** (those who anchor their beliefs at 0, .5, or 1) typically revise down their beliefs before reforms and search less

External Validity (1)

- An issue most papers on expectations must face is related to whether the expectations information is **relevant for behavior**

External Validity (1)

- An issue most papers on expectations must face is related to whether the expectations information is **relevant for behavior**
- This is what we address next, and from underlinethree different perspectives

External Validity (1)

- An issue most papers on expectations must face is related to whether the expectations information is **relevant for behavior**
- This is what we address next, and from underlinethree different perspectives:
 1. Effect of **beliefs** on **expected** behavior

External Validity (1)

- An issue most papers on expectations must face is related to whether the expectations information is **relevant for behavior**
- This is what we address next, and from underlinethree different perspectives:
 1. Effect of **beliefs** on **expected** behavior
 2. Effect of **expected** behavior on **actual** behavior

External Validity (1)

- An issue most papers on expectations must face is related to whether the expectations information is **relevant for behavior**
- This is what we address next, and from underlinethree different perspectives:
 1. Effect of **beliefs** on **expected** behavior
 2. Effect of **expected** behavior on **actual** behavior
 2. Effect of **beliefs** on **actual** behavior

External Validity (2)

Preliminaries

- Notation:

Chances the government raises national retirement age before respondent retires \equiv Chances \uparrow NRA

Chances the government reduces pension benefits before respondent retires \equiv Chances \downarrow PB

External Validity (2)

Preliminaries

- Notation:

Chances the government raises national retirement age before respondent retires \equiv Chances \uparrow NRA

Chances the government reduces pension benefits before respondent retires \equiv Chances \downarrow PB

- Look at two outcomes for **expected** behavior:

(1) Probability that respondent works full time after age 63; Prob FT 63+

★ Sample of employed/self-employed, aged 50–60 (waves 2,4,5,6)

External Validity (2)

Preliminaries

- Notation:

Chances the government raises national retirement age before respondent retires \equiv Chances \uparrow NRA

Chances the government reduces pension benefits before respondent retires \equiv Chances \downarrow PB

- Look at two outcomes for **expected** behavior:

(1) Probability that respondent works full time after age 63; Prob FT 63+

★ Sample of employed/self-employed, aged 50–60 (waves 2,4,5,6)

(2) Expected age at collection of public pension benefits: $E(\text{Age})$ PB

★ Sample of employed/self-employed entitled to receive public pension, aged 50–64 (waves 1,2,4,5,6)

External Validity (2)

Preliminaries

- Notation:

Chances the government raises national retirement age before respondent retires \equiv Chances \uparrow NRA

Chances the government reduces pension benefits before respondent retires \equiv Chances \downarrow PB

- Look at two outcomes for **expected** behavior:

(1) Probability that respondent works full time after age 63; Prob FT 63+

★ Sample of employed/self-employed, aged 50–60 (waves 2,4,5,6)

(2) Expected age at collection of public pension benefits: $E(\text{Age})$ PB

★ Sample of employed/self-employed entitled to receive public pension, aged 50–64 (waves 1,2,4,5,6)

- Look at two outcomes for **actual** behavior:

(1) In work at time $t + 1$

(2) In full-time work at $t + 1$

External Validity (4)

Beliefs → Expected Behavior

	Prob FT 63+		$E(\text{Age})$ PB	
	OLS	FE	OLS	FE
Chances ↑ NRA	0.162***	0.120***	0.583***	0.177***
Chances ↓ PB	0.085***	0.073***	0.426***	0.213***

Note: OLS controls for household income and net wealth, age, gender, education, private/public sector, self-employment, part-time employment, citizen, health status, marital status, household size, country, survey year, country \times year; s.e. clustered at the household level.

External Validity (4)

Beliefs → Expected Behavior

	Prob FT 63+		$E(\text{Age})$ PB	
	OLS	FE	OLS	FE
Chances ↑ NRA	0.162***	0.120***	0.583***	0.177***
Chances ↓ PB	0.085***	0.073***	0.426***	0.213***

Note: OLS controls for household income and net wealth, age, gender, education, private/public sector, self-employment, part-time employment, citizen, health status, marital status, household size, country, survey year, country \times year; s.e. clustered at the household level.

- Same results hold for men and women separately
- FE estimates less precisely estimated for men in the case of $E(\text{Age})$ PB

External Validity (4)

Expected Behavior \rightarrow Actual Behavior

	In Work at $t + 1$		In FT Work at $t + 1$	
	OLS	FE	OLS	FE
$I[E(\text{Age}) \text{ PB}_t > \text{Age}_{t+1}]$	0.467***	0.406**	0.446***	0.392***
Prob FT 63+	0.159***	0.065***	0.179***	0.084***

Note: $I[E(\text{Age}) \text{ PB}_t > \text{Age}_{t+1}]$: indicator that the expected age at collection of public pension benefits at wave t exceeds the age in the following wave, $t + 1$. Sample of 50–64 year olds entitled to public pension, waves 1,2,4,5.

External Validity (4)

Expected Behavior \rightarrow Actual Behavior

	In Work at $t + 1$		In FT Work at $t + 1$	
	OLS	FE	OLS	FE
$I[E(\text{Age}) \text{ PB}_t > \text{Age}_{t+1}]$	0.467***	0.406**	0.446***	0.392***
Prob FT 63+	0.159***	0.065***	0.179***	0.084***

Note: $I[E(\text{Age}) \text{ PB}_t > \text{Age}_{t+1}]$: indicator that the expected age at collection of public pension benefits at wave t exceeds the age in the following wave, $t + 1$. Sample of 50–64 year olds entitled to public pension, waves 1,2,4,5.

- Same results hold for men and women separately

External Validity (5)

Beliefs → Actual Behavior

	In Work at $t + 1$		In FT Work at $t + 1$	
	OLS	FE	OLS	FE
Chances ↑ NRA	0.091***	0.061***	0.086***	0.062***
Chances ↓ PB	0.030***	0.034**	0.044***	0.032*

Note: t stands for wave.

External Validity (5)

Beliefs → Actual Behavior

	In Work at $t + 1$		In FT Work at $t + 1$	
	OLS	FE	OLS	FE
Chances ↑ NRA	0.091***	0.061***	0.086***	0.062***
Chances ↓ PB	0.030***	0.034**	0.044***	0.032*

Note: t stands for wave.

- Same results hold for men and women separately
- FE estimates less precisely estimated for men in the case of Chances ↓ PB

External Validity (6)

Beliefs → Actual Behavior — Other Outcomes

We look at a number of **other** outcomes

External Validity (6)

Beliefs → Actual Behavior — Other Outcomes

We look at a number of **other** outcomes

- We find that **stronger expectations** of a reform are associated with a greater propensity to provide
 - inter vivos care and (both up and downstream)
 - inter vivos financial transfers (both up and downstream)

External Validity (6)

Beliefs → Actual Behavior — Other Outcomes

We look at a number of **other** outcomes

- We find that **stronger expectations** of a reform are associated with a greater propensity to provide
 - inter vivos care and (both up and downstream)
 - inter vivos financial transfers (both up and downstream)
- But we also find **no effect** on the likelihood of having an occupational or private pension, the likelihood of providing care to grandchildren, and intended bequests

External Validity (7)

Strong evidence that beliefs have economic salience

External Validity (7)

Strong evidence that beliefs have economic salience

(a) **Beliefs** about pension reforms shape **expected behavior**

Strong evidence that beliefs have economic salience

- (a) **Beliefs** about pension reforms shape **expected behavior**, in particular:
- the probability of working FT at a certain (future) age
 - the expected age at collection of public pension benefits

Strong evidence that beliefs have economic salience

- (a) **Beliefs** about pension reforms shape **expected behavior**, in particular:
- the probability of working FT at a certain (future) age
 - the expected age at collection of public pension benefits
- (b) **Beliefs** also shape **actual behavior** directly

Strong evidence that beliefs have economic salience

- (a) **Beliefs** about pension reforms shape **expected behavior**, in particular:
- the probability of working FT at a certain (future) age
 - the expected age at collection of public pension benefits
- (b) **Beliefs** also shape **actual behavior** directly, in particular:
- future employment
 - future FT employment
 - inter vivos care and financial transfers

Conclusion (1)

- (a) **Reforms** and discussions of pension reforms (through formal **announcements**) are huge catalysts of belief formation

Conclusion (1)

- (a) **Reforms** and discussions of pension reforms (through formal **announcements**) are huge catalysts of belief formation
- ★ This is true not only in anticipation of a reform, i.e., in the time running up to the reform,

Conclusion (1)

- (a) **Reforms** and discussions of pension reforms (through formal **announcements**) are huge catalysts of belief formation
- ★ This is true not only in anticipation of a reform, i.e., in the time running up to the reform,
 - ★ but it is true also after the reform is implemented

Conclusion (1)

- (a) **Reforms** and discussions of pension reforms (through formal **announcements**) are huge catalysts of belief formation
 - ★ This is true not only in anticipation of a reform, i.e., in the time running up to the reform,
 - ★ but it is true also after the reform is implemented
- (b) **Online search** of salient information is an important factor that shapes individuals' beliefs
- (c) We find little evidence of belief convergence, and a fair amount of heterogeneity along a number of observable cues
- (d) Beliefs about reforms do **affect** expected behavior as well as actual behavior

Conclusion (2)

Where to go next?

Conclusion (2)

Where to go next?

- (a) Explore issues related to sample selection
- (b) Robustness: add more controls, consider different specifications, and explore alternative timings

Conclusion (2)

Where to go next?

- (a) Explore issues related to sample selection
- (b) Robustness: add more controls, consider different specifications, and explore alternative timings
- (c) Build a structural model in which we use expectations data to estimate deep parameters (Van der Klaauw and Wolpin 2008; DeNardi, French, and Jones 2010; French and Jones 2011; Haan and Prowse 2014)