

# **Longitudinal Data Analysis of Age and Happiness**

Ning Li

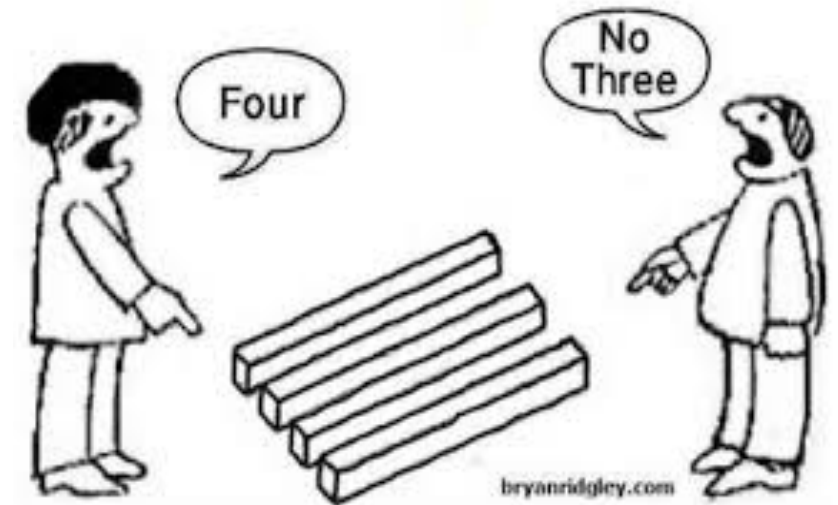
**Australian Mathematical Sciences Institute**

Oceania Stata Workshop/Conference

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# Age & Happiness

- Happiness is a good indicator of the quality of life
- Is Happiness Related to Age? How?
- Many Studies
- No Agreed Opinion

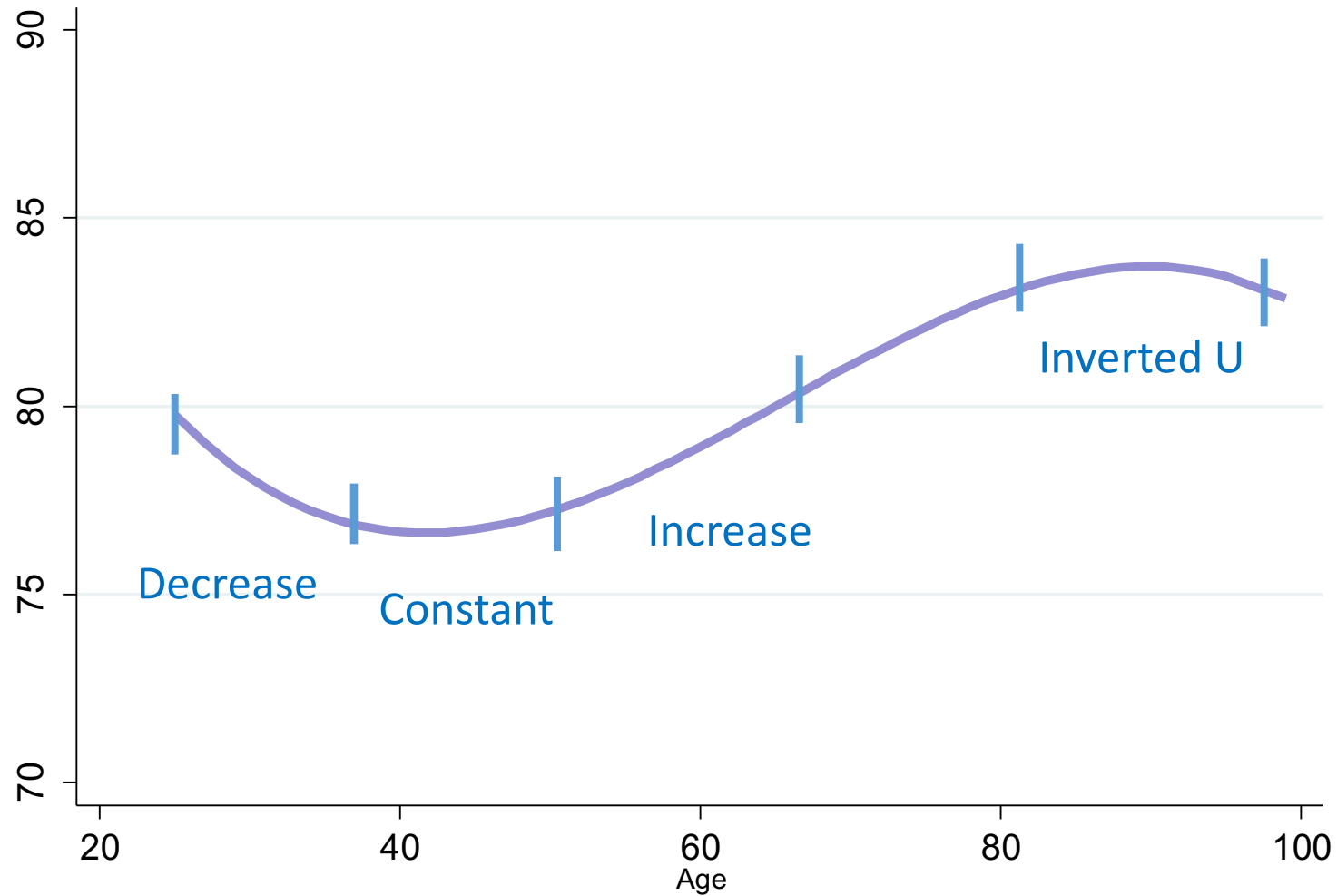


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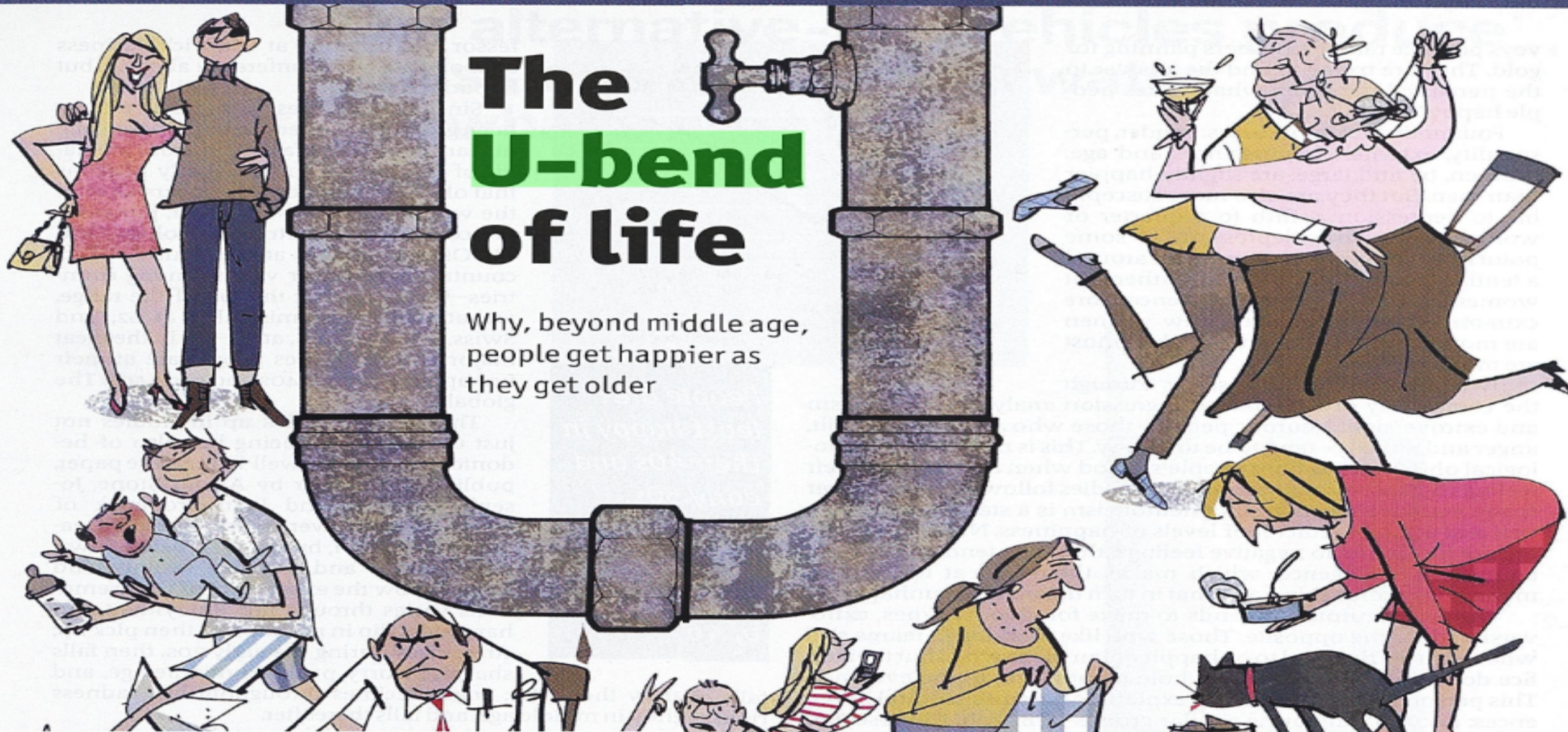
# Mixed Results

- **U** (Blanchflower & Oswald 2004 p1359, 2005 p311, 2008 p1733, 2009 p486, 2011 p9, ...)
- **Constant** (Costa et al. 1987 p54, Easterlin & Schaeffer 1999, Myers 2000 Fig5, Carstensen et al 2000 p651, ...)
- **Increasing** (Mroczek & Kolarz 1998 p1346, Lacey et al 2006 p167, ...)
- **Inverted U** (Mroczek & Spiro 2005 p154, Chen 2001 p57, ...)
- **Wave shape** (Horley & Lavery 1994 p277, Frijters & Beatton 2012, ...)
- **U in pooled OLS, decline in FE regression** (Ferrer-i-Carbonell & Frijters 2004 p655, Landeghem 2008 p1, Kassenboehmer & Haisken-DeNew 2012 p235, Frijters & Beatton 2012 p540, Wood & Li 2013, ... )
- **U in pooled OLS, U in FE OLS** (Clark 2007 p11, Kristoffersen 2013 p16, ...)

# Reconciling $U$ , $--$ , $\cap$ , $W$ Shapes







"The U-bend of life". *Economist* [London, England] 18 Dec. 2010: 33+. *The Economist Historical Archive, 1843-2013*. Web. 19 Aug. 2017



# The U-shape Debate

“Is well-being U-shaped over the life cycle?”

Blanchflower & Oswald (2008) *Social Science & Medicine* **66**, 1733-1749

**Yes. SWB is U-shaped over the Life Cycle.**

N. Glenn (2009) *Social Science & Medicine* **69**, 481-485

**No. The U-shape is a Result of the Use of Inappropriate Control Variables.**



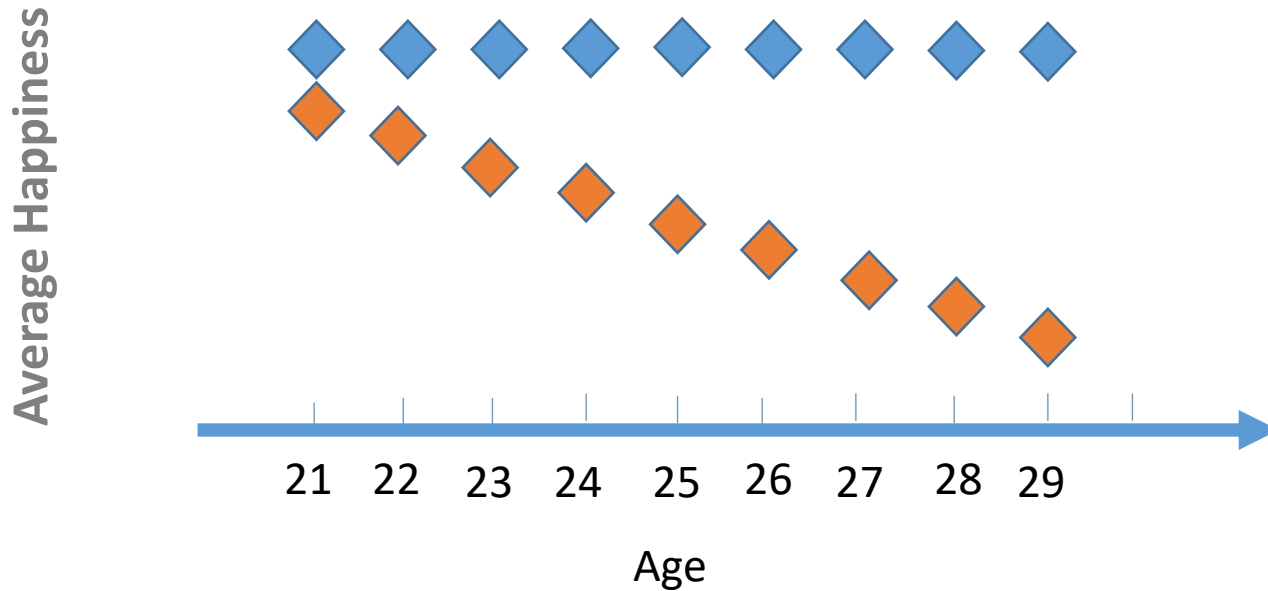
id	H	m21	m22	m23	m24	m25	m26	m27	m28	m29
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2	1	u	u	u	u	u	u	u	u	m
3	2	u	u	u	u	u	u	u	m	m
4	3	u	u	u	u	u	u	m	m	m
5	4	u	u	u	u	u	m	m	m	m
6	5	u	u	u	u	m	m	m	m	m
7	6	u	u	u	m	m	m	m	m	m
8	7	u	u	m	m	m	m	m	m	m
9	8	u	m	m	m	m	m	m	m	m
10	9	m	m	m	m	m	m	m	m	m
11	0	u	u	u	u	u	u	u	u	u
12	1	u	u	u	u	u	u	u	u	m
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15	4	u	u	u	u	u	m	m	m	m
16	5	u	u	u	u	m	m	m	m	m
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20	9	m	m	m	m	m	m	m	m	m
21	0	u	u	u	u	u	u	u	u	u
22	1	u	u	u	u	u	u	u	u	m
23	2	u	u	u	u	u	u	u	m	m
.	.	.	.	.	.	.	.	.	.	.
97	6	u	u	u	m	m	m	m	m	m
98	7	u	u	m	m	m	m	m	m	m
99	8	u	m	m	m	m	m	m	m	m
100	9	m	m	m	m	m	m	m	m	m

Happiness =  $\alpha + \beta$  Age

Happiness =  $\alpha + \beta$  Age  
 +  $\gamma$  (Marital Status)

# Glenn's Example

(SSM 69(2009), p482)



$$\text{Happiness} = \alpha + \beta \text{ Age}$$

**Observed Average Happiness**

**Estimated Average Happiness**

$$\begin{aligned} \text{Happiness} &= \alpha + \beta \text{ Age} \\ &+ \gamma \text{ (Marital Status)} \end{aligned}$$

# The U-shape Debate

“Is well-being U-shaped over the life cycle?”

Blanchflower & Oswald (2008) *Social Science & Medicine* **66**, 1733-1749

**Yes. SWB is U-shaped over the Life Cycle.**

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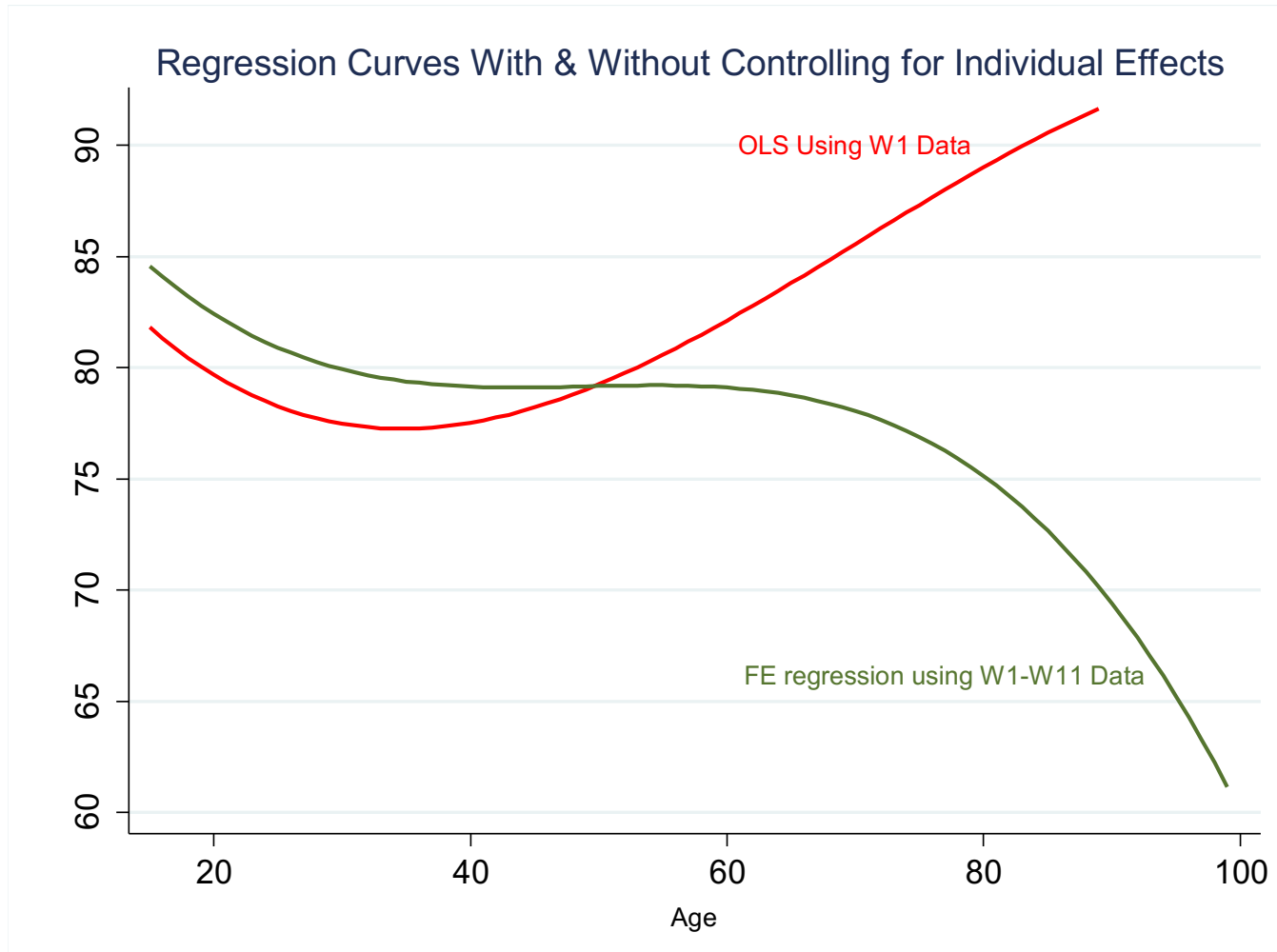
**No. The U-shape is a Result of the Use of Inappropriate Control Variables.**

Blanchflower & Oswald (2009) *Social Science & Medicine* **69**, 486-488

**The U-Shape Remains without any Controls.**



# The Age-Happiness Mystery



$$\begin{aligned} (\text{Happiness})_i & \\ &= \alpha + \beta (\text{Age})_i + \varepsilon_i \end{aligned}$$



$$\begin{aligned} (\text{Happiness})_{it} & \\ &= \alpha_i + \beta (\text{Age})_{it} + \varepsilon_{it} \end{aligned}$$

# Some Explanations in the Literature about the Mystery

*“The found effect of age in fixed-effect regressions is simply too large and too out of line with everything else we know to be believable.”* (Frijters & Beaton 2008, p22)

*“The data does not bear any useful information to support one conclusion but not the other.”*  
(Ree&Alessie 2011, p182)

*“...the negative relationship between happiness and age is a **misconception**”* (Lacey et al. 2012, p647)

*“The otherwise seemingly robust age U-shape effect on life satisfaction in pooled OLS regressions is refuted ... when controlling for panel fixed effects.”* (Kassenboehmera, S. C., & Haisken-DeNew 2012)

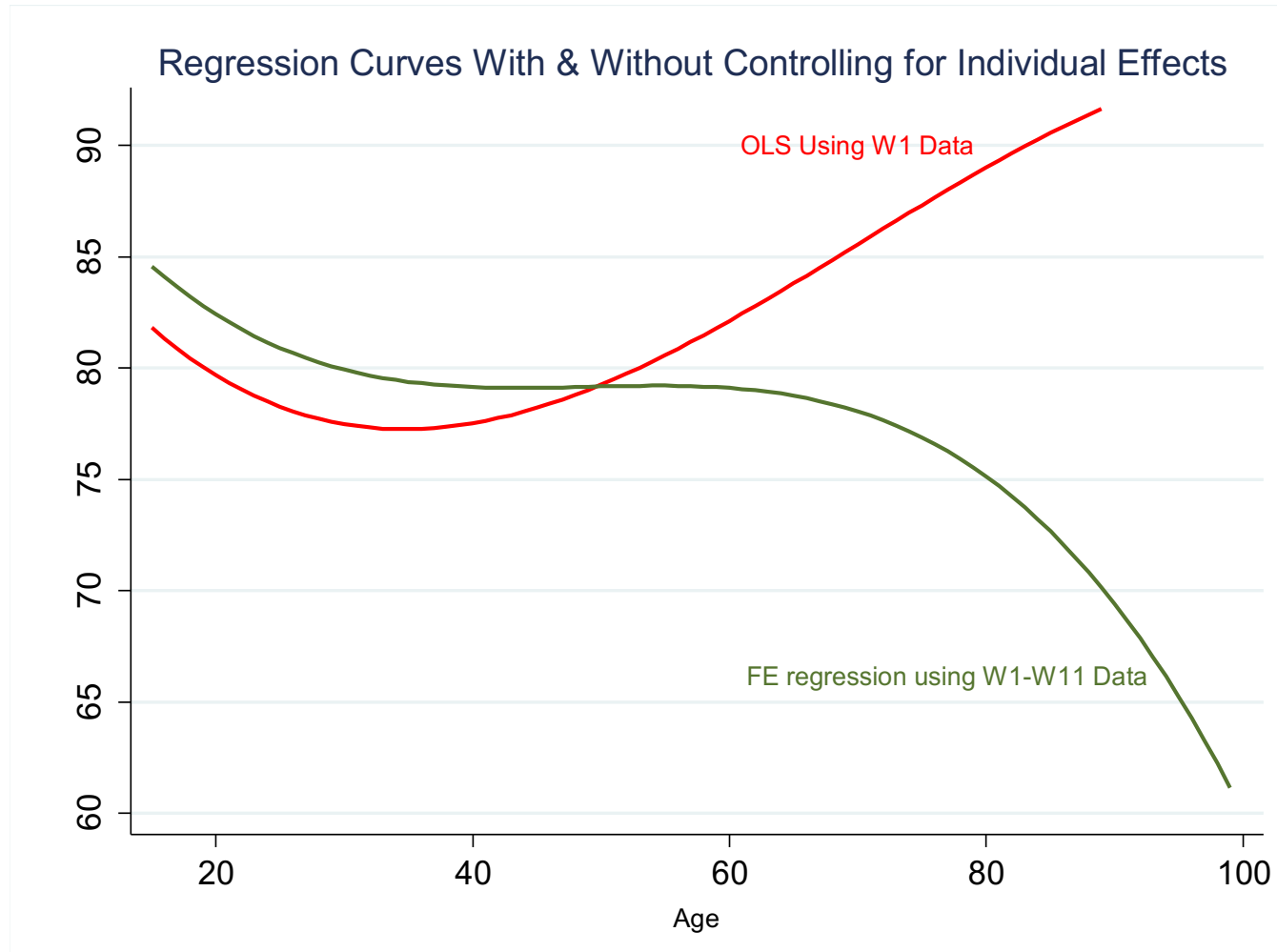
*“Something wrong in the data”* (Frijters & Beaton 2008, p18)

# A Statistical Explanation

- The U shape, found in the cross-section data, represents the average happiness of **various** groups of people at different stages of their lives.
- Happiness varies more between people than within people over time, hence the OLS result in pooled data resembles that in cross-section data.
- The decline pattern, found in the FE regression, represents the average happiness of the **same** group of people in their life course when they age.
- The yearly change from the fixed effects regression of happiness on age = or  $\approx$  the weighted average of yearly change in the observed data.



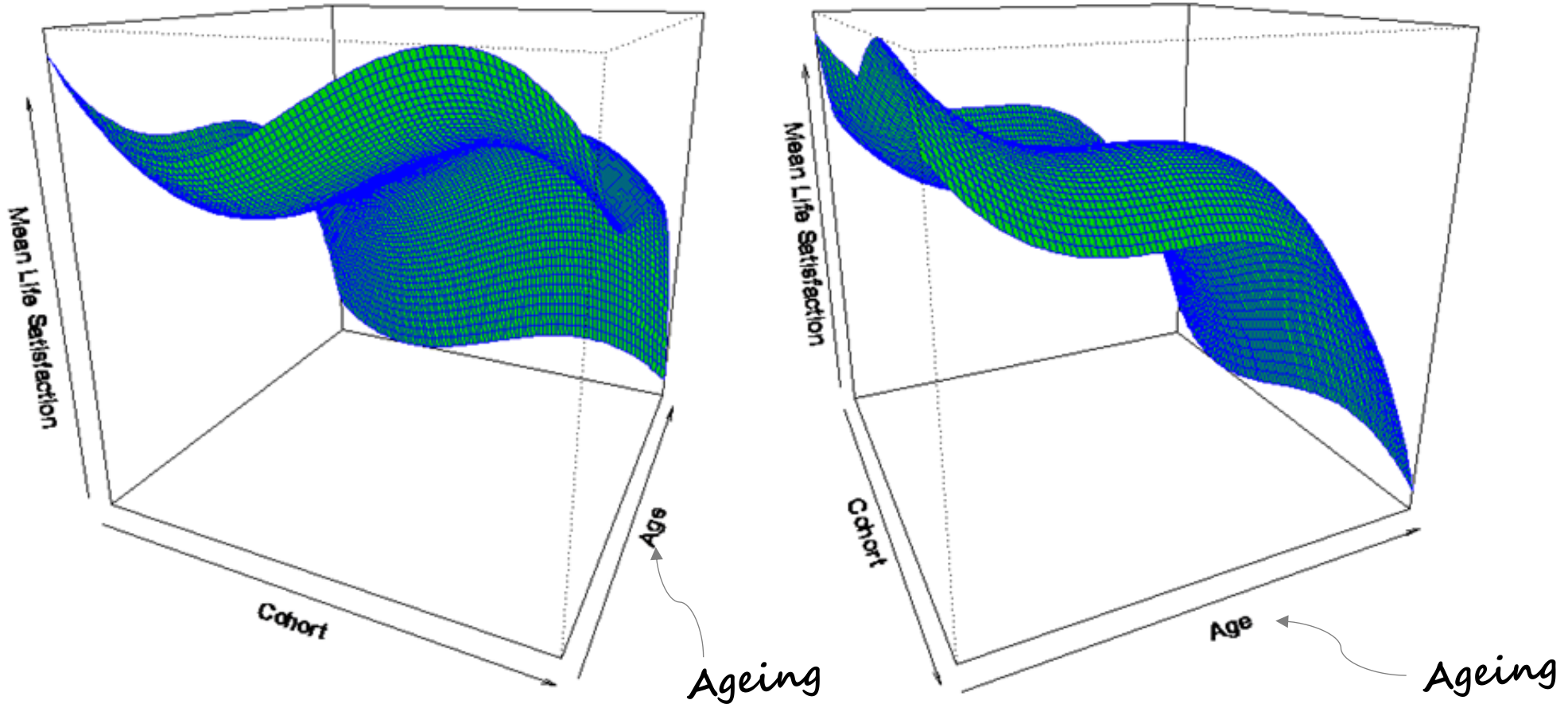
# A Graph With An Ambiguous Axis



$$\begin{aligned} (\text{Happiness})_i \\ = \alpha + \beta (\text{Age})_i + \varepsilon_i \end{aligned}$$

$$\begin{aligned} (\text{Happiness})_{it} \\ = \alpha_i + \beta (\text{Age})_{it} + \varepsilon_{it} \end{aligned}$$

# From (Age, Happiness) To (Cohort, Ageing, Happiness)



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*Thank you*

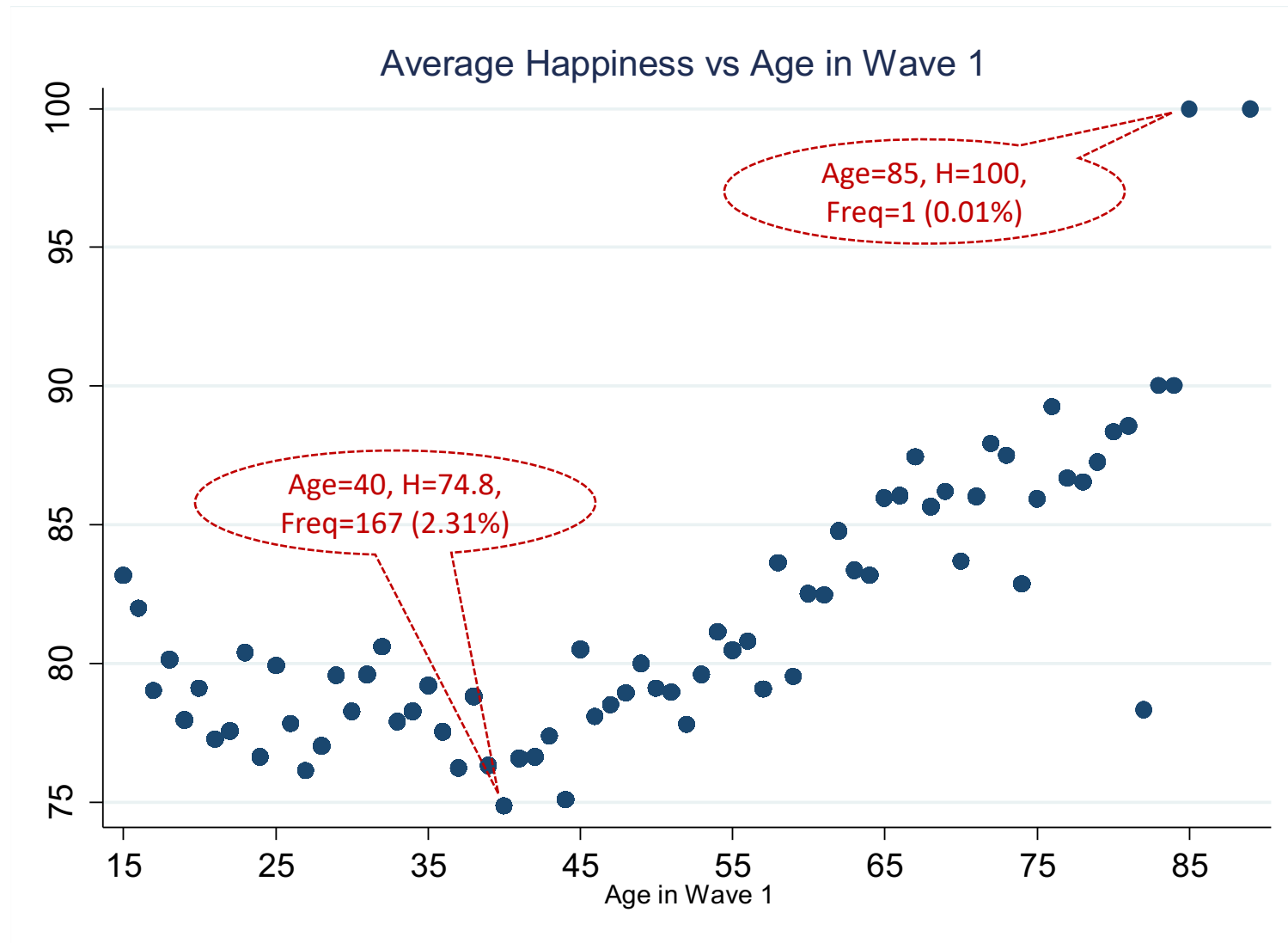


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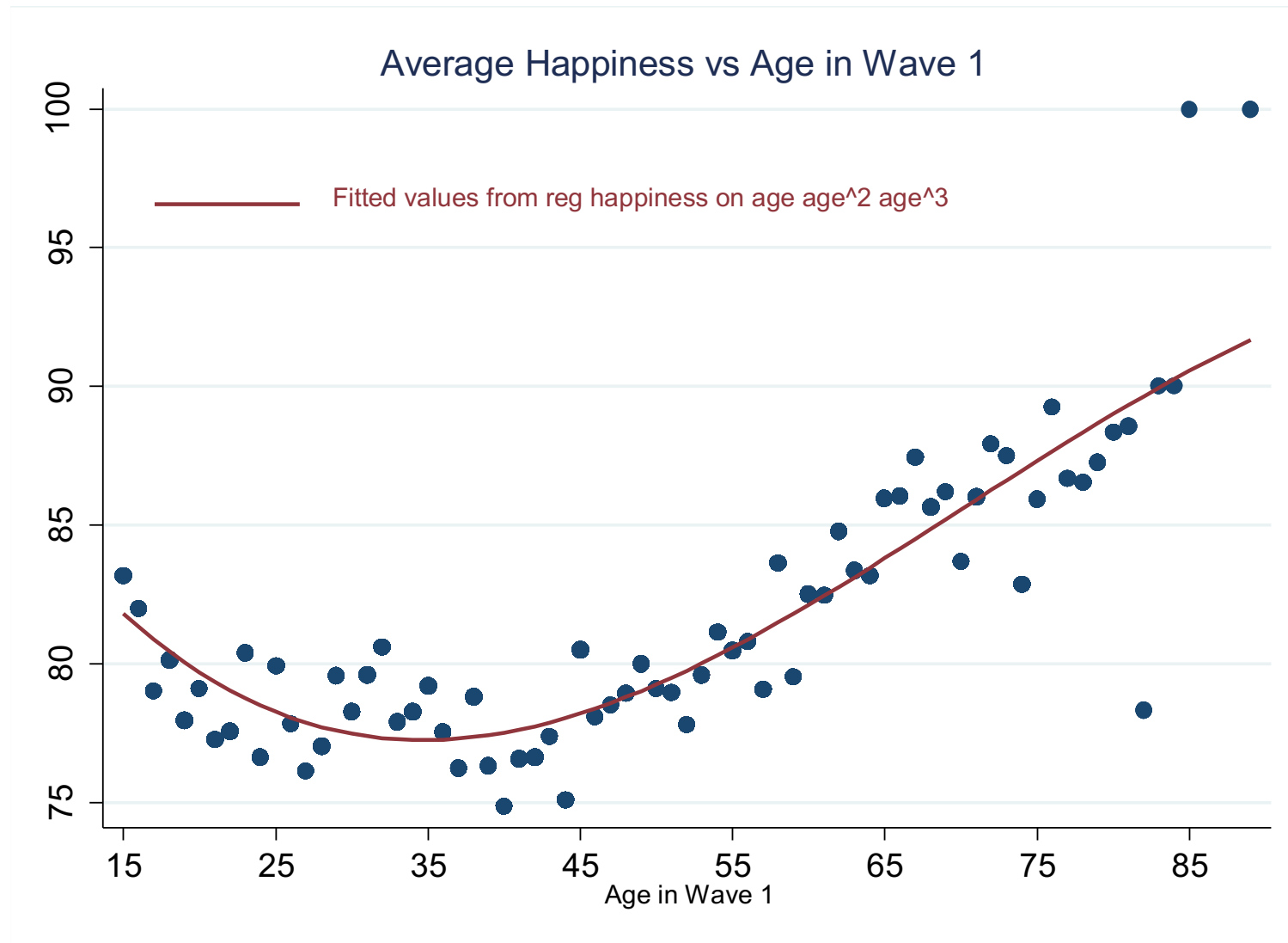
# Observed Average Happiness (HILDA W1)

Age in W1	Mean	Freq.	Percent	Age in W1	Mean	Freq.	Percent	Age in W1	Mean	Freq.	Percent
15	83.1	104	1.44	39	76.3	204	2.84	63	83.3	80	1.11
16	81.9	111	1.54	40	74.8	167	2.31	64	83.1	88	1.22
17	79.0	92	1.27	41	76.5	172	2.38	65	85.9	87	1.20
18	80.1	75	1.04	42	76.6	184	2.55	66	86.0	76	1.05
19	77.9	79	1.09	43	77.3	167	2.31	67	87.4	86	1.19
20	79.0	77	1.07	44	75.0	177	2.45	68	85.6	60	0.83
21	77.2	77	1.07	45	80.5	159	2.20	69	86.1	63	0.87
22	77.5	78	1.08	46	78.0	136	1.88	70	83.6	57	0.79
23	80.3	78	1.08	47	78.5	161	2.23	71	86.0	63	0.87
24	76.6	83	1.15	48	78.9	150	2.07	72	87.9	58	0.80
25	79.9	115	1.59	49	80.0	130	1.80	73	87.5	48	0.66
26	77.8	119	1.65	50	79.0	131	1.81	74	82.8	49	0.68
27	76.1	114	1.58	51	78.9	134	1.85	75	85.9	37	0.51
28	77.0	131	1.81	52	77.7	131	1.81	76	89.2	27	0.37
29	79.5	117	1.62	53	79.6	154	2.13	77	86.6	24	0.33
30	78.2	145	2.01	54	81.1	157	2.17	78	86.5	23	0.32
31	79.6	150	2.07	55	80.4	106	1.47	79	87.2	22	0.30
32	80.6	150	2.07	56	80.8	124	1.72	80	88.3	18	0.25
33	77.9	159	2.20	57	79.0	109	1.51	81	88.5	7	0.10
34	78.2	150	2.07	58	83.6	105	1.45	82	78.3	6	0.08
35	79.2	151	2.09	59	79.5	107	1.48	83	90.0	7	0.10
36	77.5	142	1.96	60	82.5	123	1.70	84	90.0	3	0.04
37	76.2	189	2.61	61	82.4	85	1.19	85	100.0	1	0.01
38	78.8	186	2.57	62	84.7	90	1.24	89	100.0	2	0.03
<b>Total</b>				<b>79.7</b>	<b>7227</b>	<b>100.00</b>					

# Observed Average Happiness (HILDA W1)



# Observed Average Happiness (HILDA W1)



# OLS of Happiness on Age Dummies = Observed Average Happiness

ls	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	Mean				
						Coh	W1	N	%	
_Iage_16	-1.191095	2.170139	-0.55	0.583	-5.445208	3.063019	15	83.1	104	1.44
_Iage_17	-4.151338	2.275956	-1.82	0.068	-8.612885	.310209	16	81.9	111	1.54
_Iage_18	-3.039744	2.408938	-1.26	0.207	-7.761974	1.682487	17	79.0	92	1.27
_Iage_19	-5.198393	2.373241	-2.19	0.029	-9.850646	-.5461403	18	80.1	75	1.04
_Iage_20	-4.082168	2.390692	-1.71	0.088	-8.768632	.6042959	19	77.9	79	1.09
_Iage_21	-5.90035	2.390692	-2.47	0.014	-10.58681	-1.213886	20	79.0	77	1.07
_Iage_22	-5.608974	2.381871	-2.35	0.019	-10.27814	-.9398039	21	77.2	77	1.07
_Iage_23	-2.788462	2.381871	-1.17	0.242	-7.457632	1.880709	22	77.5	78	1.08
_Iage_24	-6.546571	2.340516	-2.80	0.005	-11.13467	-1.958469	23	80.3	78	1.08
_Iage_25	-3.260033	2.151805	-1.52	0.130	-7.478207	.9581404	24	76.6	83	1.15
_Iage_26	-5.357951	2.134562	-2.51	0.012	-9.542323	-1.173579	25	79.9	115	1.59
_Iage_27	-7.032726	2.156282	-3.26	0.001	-11.25968	-2.805776	26	77.8	119	1.65
_Iage_28	-6.150176	2.088469	-2.94	0.003	-10.24419	-2.056159	27	76.1	114	1.58
_Iage_29	-3.600427	2.143053	-1.68	0.093	-7.801445	.6005906	28	77.0	131	1.81
_Iage_30	-4.897215	2.043363	-2.40	0.017	-8.90281	-.8916201	29	79.5	117	1.62
_Iage_31	-3.573077	2.029089	-1.76	0.078	-7.55069	.4045364	30	78.2	145	2.01
_Iage_32	-2.573077	2.029089	-1.27	0.205	-6.55069	1.404536	31	79.6	150	2.07
_Iage_33	-5.248549	2.005437	-2.62	0.009	-9.179798	-1.317299	32	80.6	150	2.07
( omitted )							33	77.9	159	2.20
_Iage_84	6.826923	9.312387	0.73	0.464	-11.42811	25.08195	( omitted )			
_Iage_85	16.82692	15.97807	1.05	0.292	-14.49482	48.14867	84	90.0	3	0.04
_Iage_86	0	(omitted)					85	100.0	1	0.01
_Iage_87	0	(omitted)					86		0	0.00
_Iage_88	0	(omitted)					87		0	0.00
_Iage_89	16.82692	11.35188	1.48	0.138	-5.426113	39.07996	88		0	0.00
_Iage_90	0	(omitted)					89	100.00	2	0.03
_Iage_91	0	(omitted)					-----			
_Iage_99	0	(omitted)							7229	100.00
_cons	83.17308	1.5593	53.34	0.000	80.11639	86.22977				



# Fixed Effects Regression of Happiness on Age => Ageing Effects

- Single Cohort Case

Want: how happiness changes from age 65 to 66 in the cohort

$$\Delta_{66} = (\text{average happiness in age 66}) - (\text{average happiness in age 65})$$

- Difference in Fitted Value b/w Successive Ages = Difference in Obs. Average Happiness b/w Successive Ages



# Fixed Effects Regression of Happiness on Age => Ageing Effects

FE Estimates of Happiness on Age Dummies & Observed Average Happiness -- Cohort Aged 65 in 2001

*Fitted values* →

Age	Fixed-Effects Estimates			Observed	
	Coef.	Coef.+_cons	Diff. btw successive age	Mean	Diff. btw successive age
65				85.977	
66	0.46	86.437		86.437	0.46
67	1.724	87.701	1.264	87.701	1.264
68	-0.575	85.402	-2.299	85.402	-2.299
69	1.034	87.011	1.609	87.011	1.609
70	-1.149	84.828	-2.184	84.828	-2.184
71	-2.414	83.563	-1.264	83.563	-1.264
72	-3.333	82.644	-0.92	82.644	-0.92
73	-1.954	84.023	1.379	84.023	1.379
74	-1.379	84.598	0.575	84.598	0.575
75	-3.793	82.184	-2.414	82.184	-2.414
_cons	85.977				

# Fixed-Effects Regression of Happiness on Age => Ageing Effects

- Multiple cohorts in the data (Cohorts 60 & 65)

Wanted:

$\Delta_{66}^{60}$  = (average happiness in age 66) – (average happiness in age 65), cohort 60

$\Delta_{66}^{65}$  = (average happiness in age 66) – (average happiness in age 65), cohort 65

$$y(66) - y(65) = \frac{\sum_{j \in \text{cohort } 60} \Delta_{66}^{60}}{N} + \frac{\sum_{j \in \text{cohort } 65} \Delta_{66}^{65}}{N}$$

- In the Fixed Effects Regression of Happiness on Age, the Estimated Yearly changes in Happiness = or  $\approx$  Weighted Average Yearly Changes in the Observed Data.

# Cohorts Aged 60 & 65 in 2001

FE Regression of Happiness on Age Dummies (Data: Cohorts Aged 60 & 65 in 2001 )

$$\frac{[(-0.73) \cdot 122 + (1.264) \cdot 87]}{(122 + 87)} = 0.096$$

Age	FE Estimates		Obs. Mean LS		Obs. Diff.		
	Coef.	Diff.	Cohort 60	Cohort 65	Cohort 60	Cohort 65	Average
60			82.787				
61	-1.885	-1.885	80.902		-1.885		-1.885
62	-0.082	1.803	82.705		1.803		1.803
63	0.328	0.410	83.115		0.410		0.410
64	-0.656	-0.984	82.131		-0.984		-0.984
65	0.028	0.683	83.197	85.977	1.066		1.066
66	0.028	0.000	82.869	86.437	-0.328	0.460	0.000
67	0.123	0.096	82.131	87.701	-0.738	1.264	0.096
68	-0.642	-0.766	82.459	85.402	0.328	-2.299	-0.766
69	0.219	0.861	82.787	87.011	0.328	1.609	0.861
70	-1.312	-1.531	81.721	84.828	-1.066	-2.184	-1.531
71	-2.922	-1.610		83.563		-1.264	1.066
72	-3.842	-0.920		82.644		-0.920	-0.920
73	-2.463	1.379		84.023		1.379	1.379
74	-1.888	0.575		84.598		0.575	0.575
75	-4.302	-2.414		82.184		-2.414	-2.414
_cons	84.327						
N			122	87			
Weight					0.584	0.416	



