

# Supplementary Material:

## Leveraging deep neural networks to estimate age-specific mortality from life expectancy at birth

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### 1 Smoothed vs. no-smoothed

Table 1: Out-of-sample test: MAE and RMSE for DNN(Smoothed) and DNN estimation by country. Forecasting periods: 1981-1995, 1991-2005, and 2001-2015. Females.

Country	Model	1981-1995		1991-2005		2001-2015	
		MAE	RMSE	MAE	RMSE	MAE	RMSE
<i>Italy</i>	DNN(Smoothed)	0.1672	0.2017	0.1038	0.1418	0.1210	0.1591
	DNN	0.1692	0.2040	0.1054	0.1438	0.1234	0.1614
<i>Japan</i>	DNN(Smoothed)	0.1730	0.2055	0.1182	0.1532	0.1137	0.1436
	DNN	0.1736	0.2070	0.1206	0.1560	0.1140	0.1444
<i>USA</i>	DNN(Smoothed)	0.0572	0.0788	0.0873	0.1119	0.0944	0.1206
	DNN	0.05955	0.08066	0.08786	0.1135	0.09538	0.1218
<i>Russia (2014)</i>	DNN(Smoothed)	-	-	0.1714	0.2544	0.1670	0.2393
	DNN	-	-	0.1764	0.2573	0.1682	0.2402

Table 2: Out-of-sample test: MAE and RMSE for DNN(Smoothed) and DNN estimation by country. Forecasting periods: 1981-1995, 1991-2005, and 2001-2015. Males.

Country	Model	1981-1995		1991-2005		2001-2015	
		MAE	RMSE	MAE	RMSE	MAE	RMSE
<i>Italy</i>	DNN(Smoothed)	0.1419	0.220	0.1107	0.1493	0.1194	0.1566
	DNN	0.1430	0.2214	0.1124	0.1506	0.1212	0.1580
<i>Japan</i>	DNN(Smoothed)	0.1049	0.1241	0.0943	0.1264	0.09952	0.1266
	DNN	0.1053	0.1249	0.09575	0.1281	0.0986	0.1254
<i>USA</i>	DNN(Smoothed)	0.0746	0.1088	0.0730	0.0907	0.0955	0.1127
	DNN	0.0765	0.111	0.07902	0.10001	0.09724	0.1147
<i>Russia (2014)</i>	DNN(Smoothed)	-	-	0.1989	0.2366	0.1497	0.2412
	DNN	-	-	0.2000	0.2379	0.1505	0.2420

Figure 1:  $\Delta_{a,t}$  - No smoothed estimations. Validation period: 2001-2015.

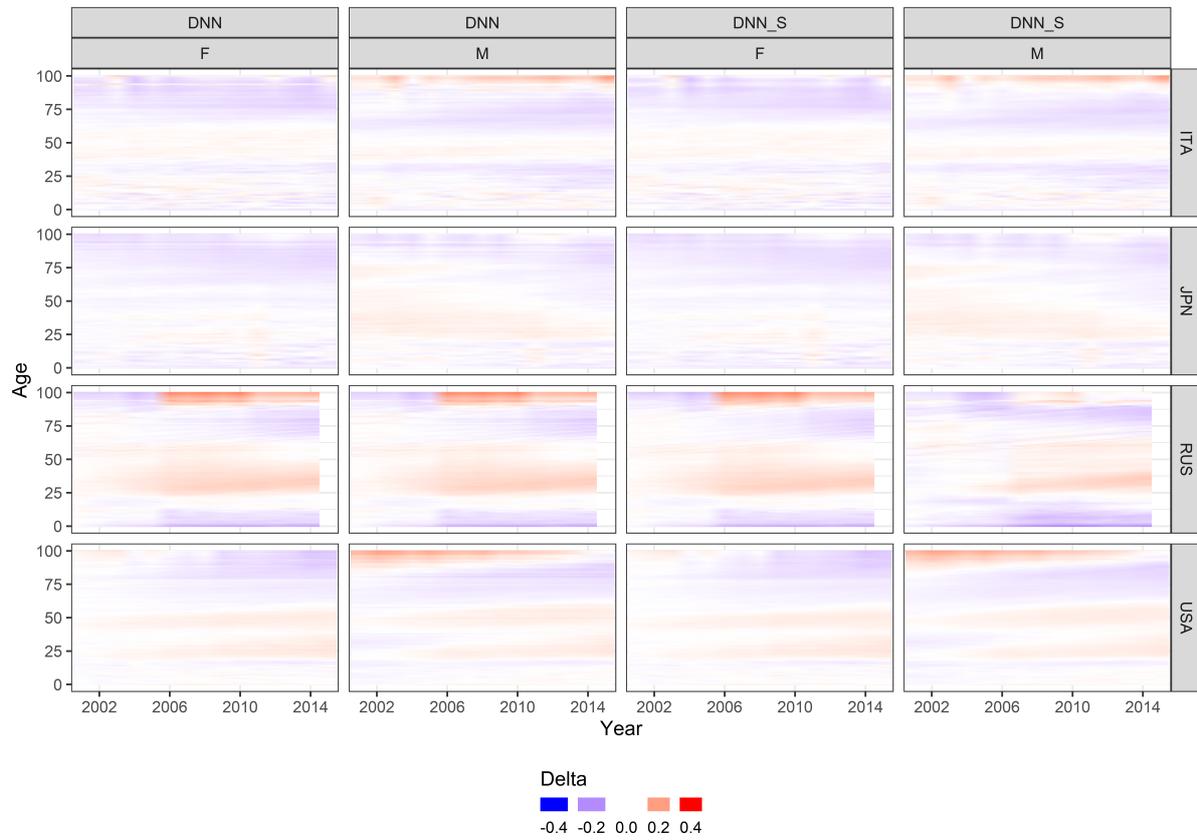


Figure 2:  $\Delta_{a,t}$  - No smoothed estimations. Validation period: 1991-1995.

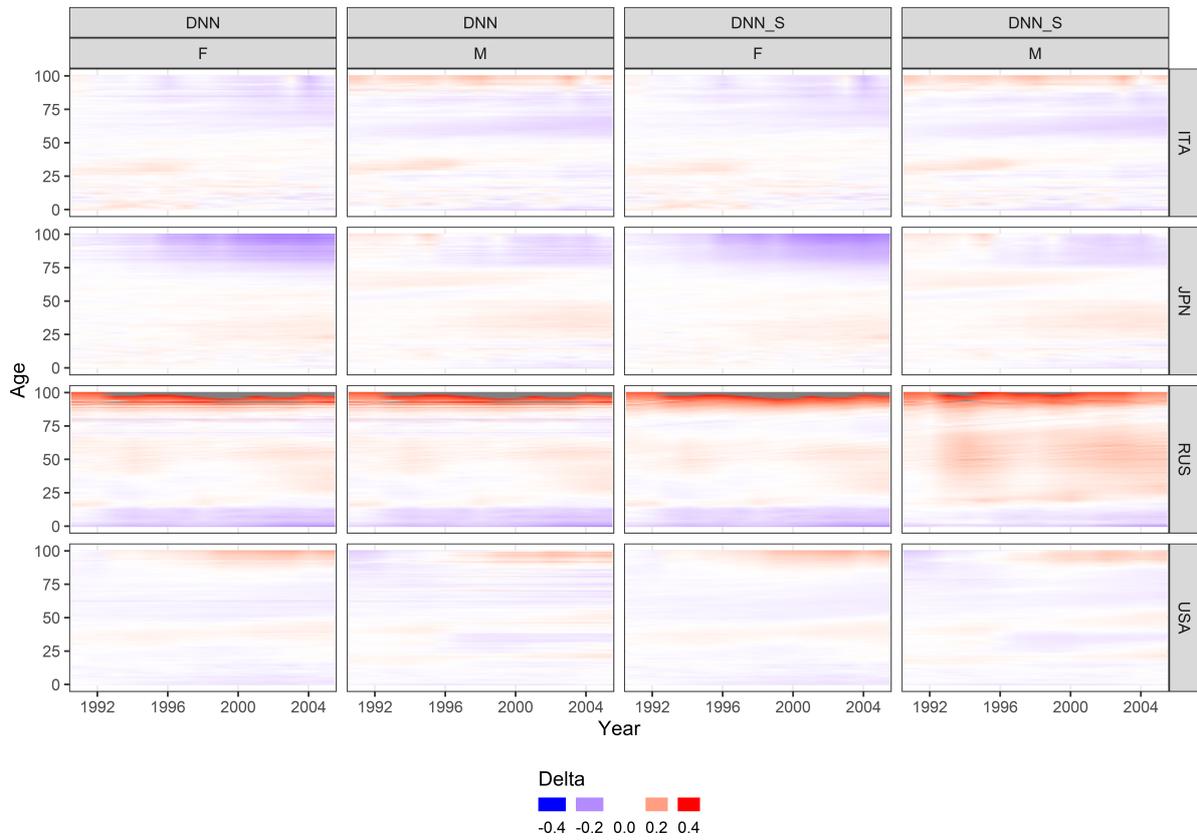
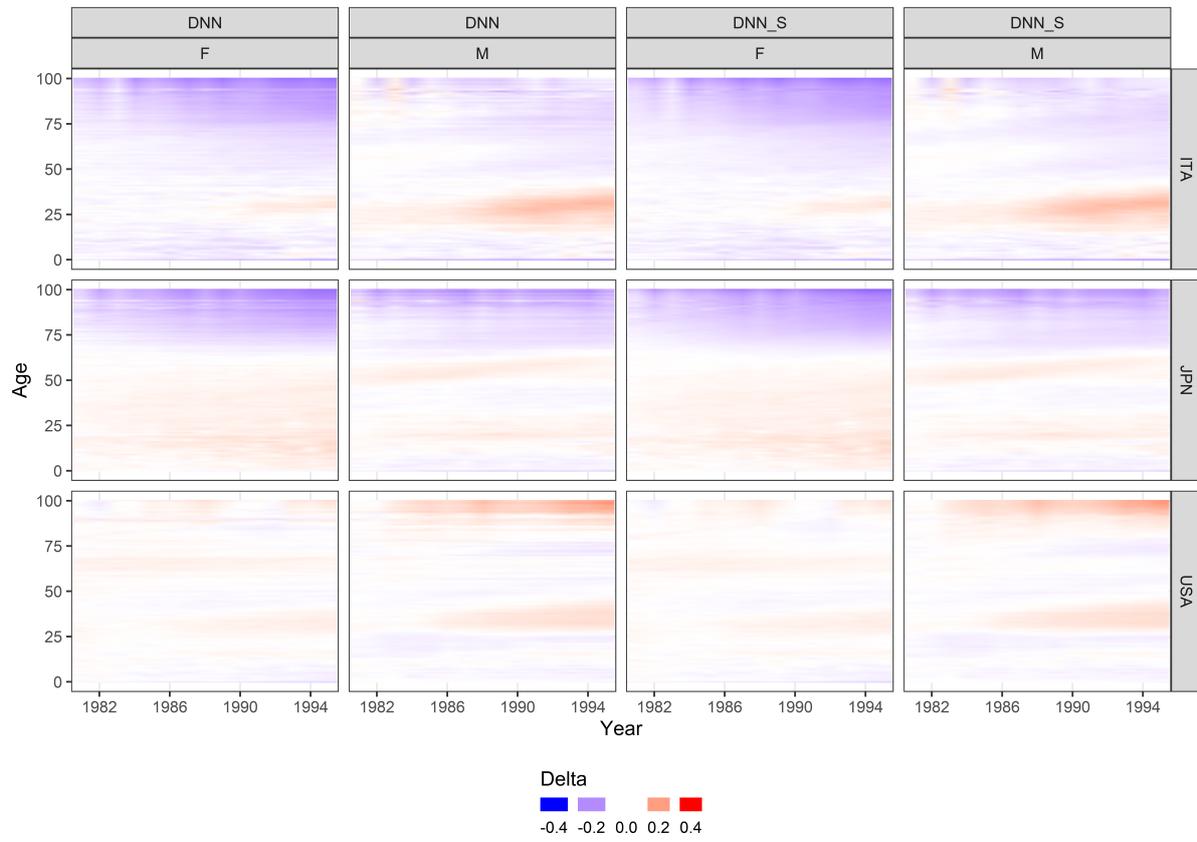


Figure 3:  $\Delta_{a,t}$  - No smoothed estimations. Validation period: 1981-1995.



## 2 Age profile

### 2.1 1960

Figure 4:  $\log(m_{a,t})$  - No smoothed estimations. Training period: 1970–2000. Males

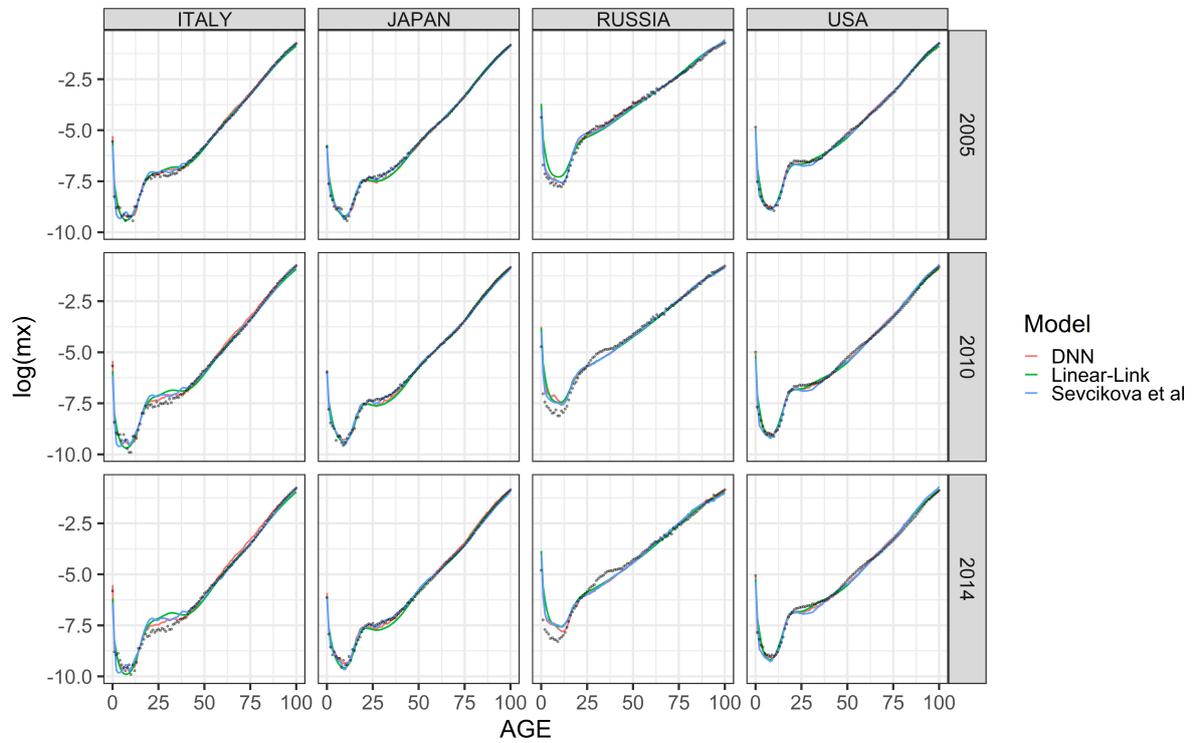
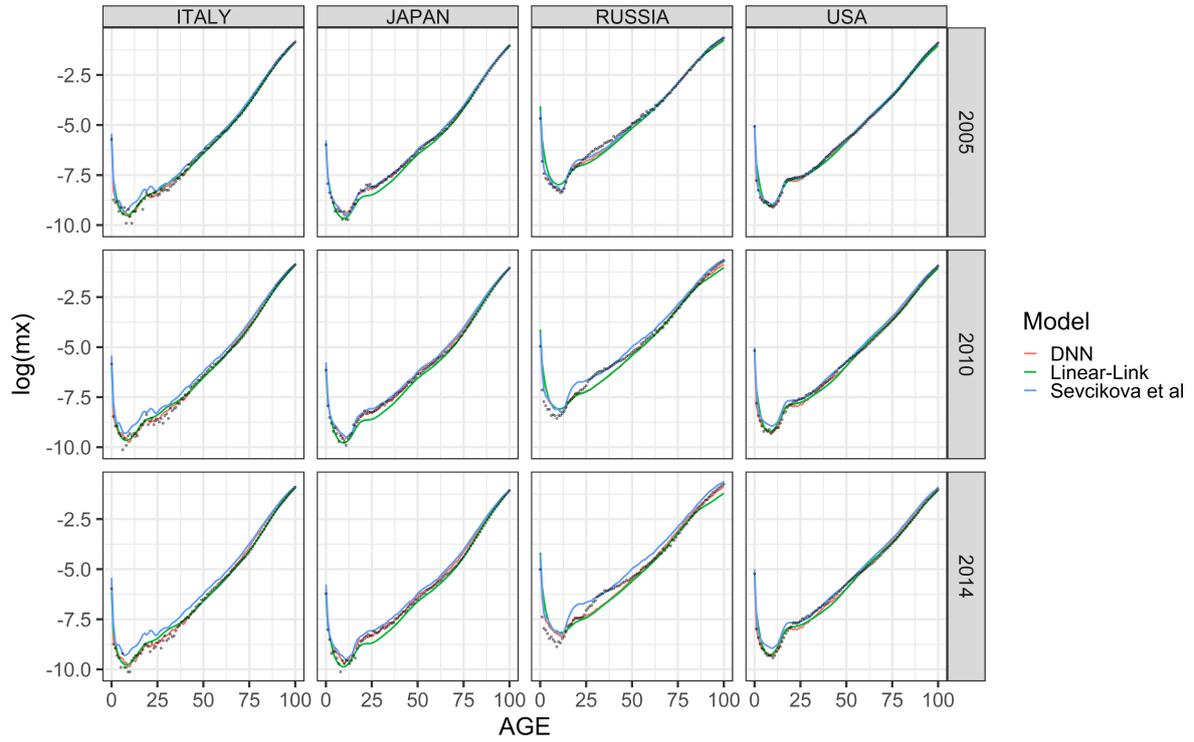


Figure 5:  $\log(m_{a,t})$  - No smoothed estimations. Training period: 1970–2000. Females



## 2.2 1970

Figure 6:  $\log(m_{a,t})$  - No smoothed estimations. Training period: 1960–1990. Males

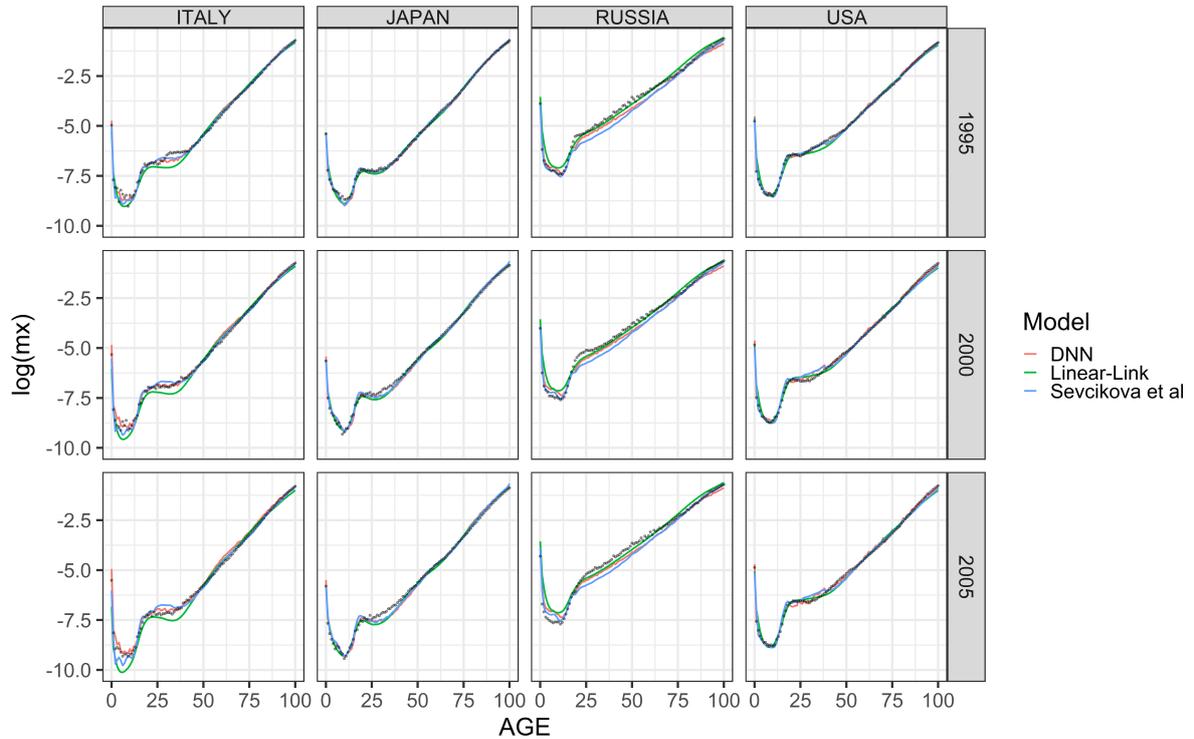
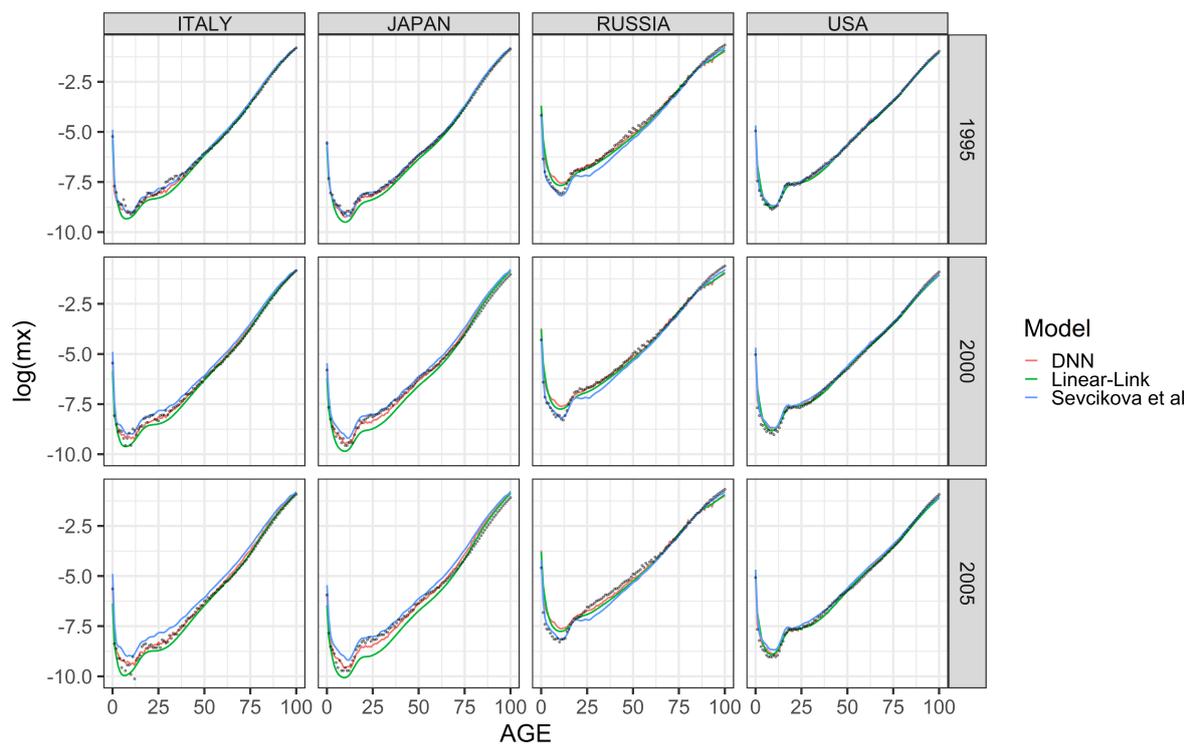


Figure 7:  $\log(m_{a,t})$  - No smoothed estimations. Training period: 1960–1990. Females



### 2.3 1950

Figure 8:  $\log(m_{a,t})$  - No smoothed estimations. Training period: 1950–1980. Males

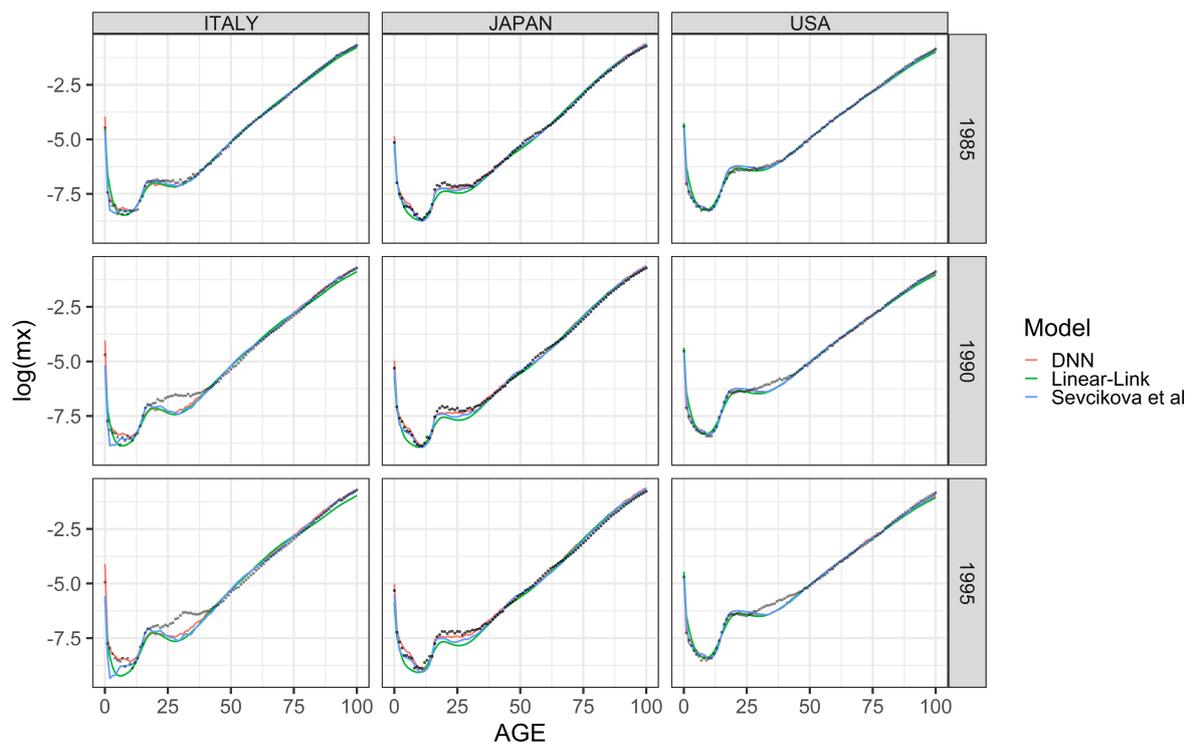


Figure 9:  $\log(m_{a,t})$  - No smoothed estimations. Training period: 1950–1980. Females

