BEYOND GDP FOR POLICY USE

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OECD
BETTER POLICIES FOR BETTER LIVES

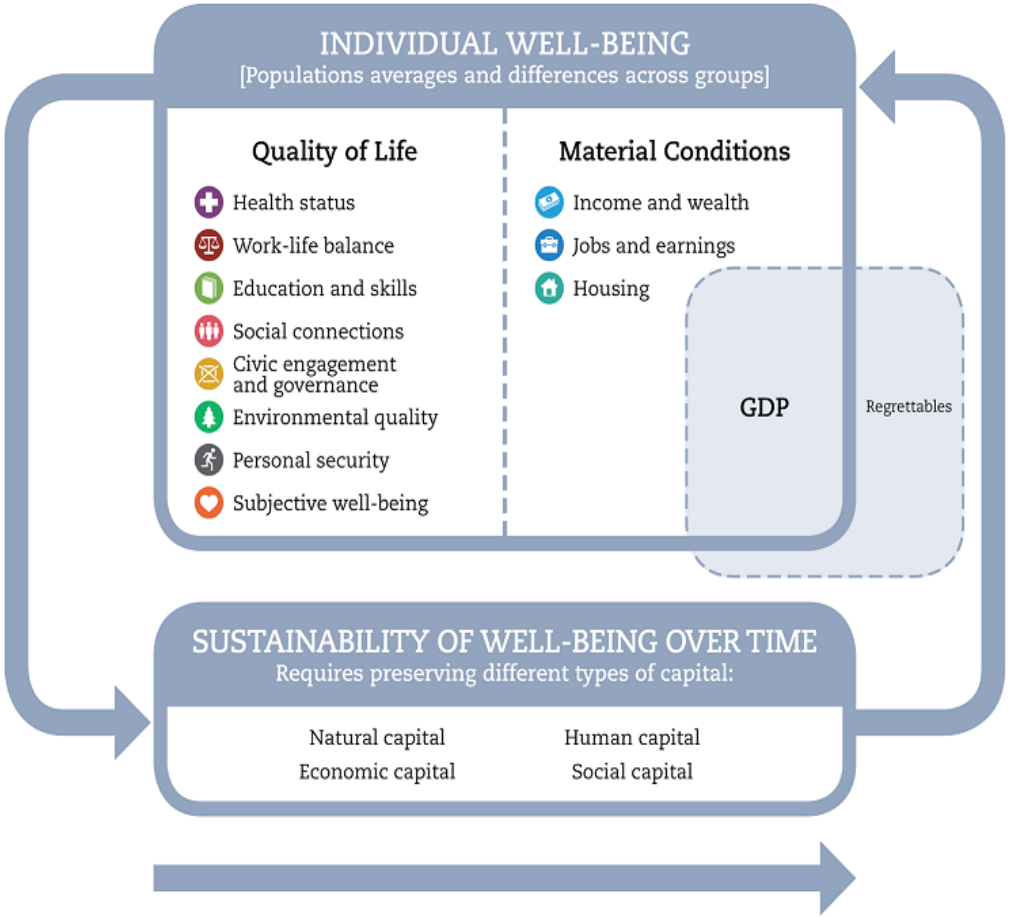
OUTLINE

- Policy motivation
- The setup
- Key findings
- Welfare evaluation of policy reforms

POLICY MOTIVATION

The Dashboard Approach: OECD well-being framework

- The dashboard approach: comprehensive (all dimensions of WB)
- **Not helpful to assess policy trade-offs across dimensions**



Source: OECD, 2013

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The Synthetic Index Approach: HDI as a poor welfare index

- Policy need: a synthetic indicator W to assess policy trade-offs or budget allocation priority

$$\Delta W = \sum w_k \, \Delta X_k(\mathrm{P}) > ? < 0$$

- **HDI heavily criticized (Ravallion) as a synthetic indicator due to the ad-hoc choice of weights w_k** implying implausible 'exchange rates' between income, education, health, etc…
- HDI is good communication but not relevant for policy as it is poor welfare index

NZL CBAx: Social Cost Benefit Analysis

- Assess policy impacts on multiple well-being outcomes
- Monetise them with the help of an impact database
- Calculate a **Social ROI**

https://treasury.govt.nz/information-and-services/state-sector-leadership/investment-management/plan-investment-choices/cost-benefit-analysis-including-public-sector-discount-rates/treasurys-cbax-tool

Goal: Building a Welfare Index

- **A multi-dimensionality problem:**
  - A bundle of well-being outcomes X^k matter
  - They need to be measured on a common scale (monetary) via exchange rates or **shadow prices** w_i^k
  - The monetary aggregate at individual level is **equivalent income**:

$$y_i^* = \sum w_i^k \, X_i^k$$

- **An inequality problem**:

Individual equivalent incomes are aggregated at societal level with a **social welfare function** that depends on aversion to inequality τ

$$W_t = \overline{y_{i,t}^*} - \overline{y_{i,t}^*}.\, I(y_{i,t}^*; \tau)$$

SETUP

A weight is defined as a shadow price that reflects an actual preference

- **A shadow price is the monetary equivalent of one unit of a non-monetary good**
- 'Monetary equivalent' in the sense of **equal preference for people** (same utility): **no ethical judgement** ('the price of life')

$$U(y, m) = U(y - \delta, m^*)$$

$$w = \frac{\delta}{m^* - m}$$

- **Equivalent income to (y, m) situation** is

$$y^* = y - \delta = y - w.(m^* - m)$$

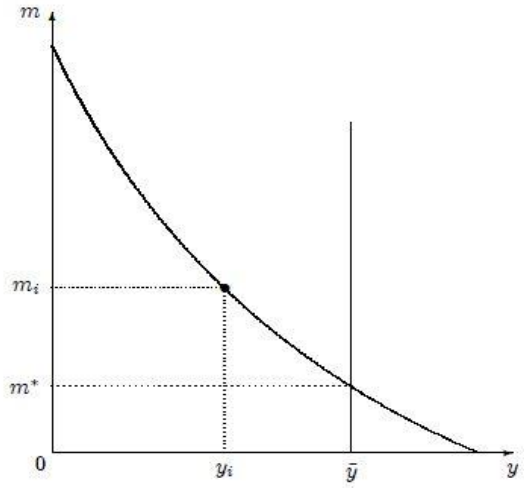

Figure 4.3: Equivalent income

How to calculate a shadow price?

- **A shadow price is a marginal utility, so one needs to infer the utility function**
- **Calibrate a theoretical utility function:** Becker et al. (2005), Jones-Klenow (2019)
- **Assume that instantaneous utility is proxied by life satisfaction:** hedonic regression literature
- Murtin et al. (2017) show that **both approaches can be reconciled to some extent** (with a complex utility function)
- **Boarini et al. (2021) mix the two approaches:**
  - A model to price longevity
  - Hedonic regressions to price (un)employment
  - Heterogeneous preferences across groups

Estimating Subjective Shadow Prices (Murtin et al., 2017)

- Using Gallup data (2005-2010, 32 countries). Life satisfaction regressions at country-level with average disposable income and life satisfaction of an average household (from NSOs)
- **1ppt UNR=2% GDP on average across countries and time (but varies)**
- **1 yr of LE = 5% GDP on average across countries and time**
- **One issue is lack of robustness: longevity not always significant in those regressions**

$$ls_{j,t} = a_j + d_t + \alpha \log y_{j,t} + \beta^T T_{j,t} + \beta^U U_{j,t} + \varepsilon_{j,t}$$

	Actual series			Smoothed series		
	Dependent variable is average life satisfaction					
Subjective price of one unemployment percentage point (% income)	**5.1**	**5.2**	**1.8**	**5.1**	**5.0**	**1.6**
Subjective price of one year of life expectancy (% income)	**4.4**	**4.4**	**5.3**	**4.5**	**4.5**	**7.8**
Time dummies	No	Yes	Yes	No	Yes	Yes
Country dummies	No	No	Yes	No	No	Yes

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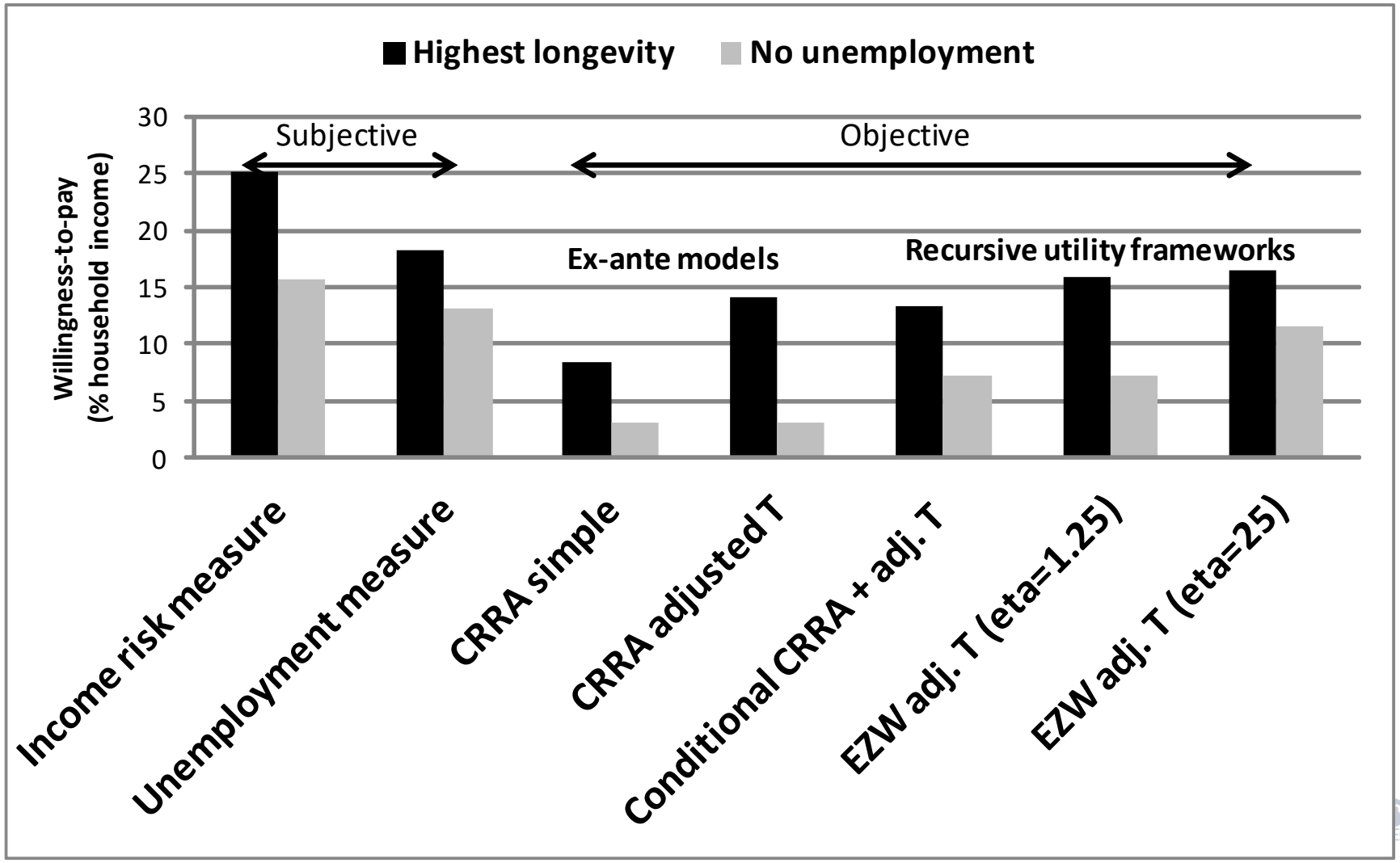
Reconciling subjective and model-based shadow prices

Murtin et al. (2017), 'Beyond GDP: Is there a law of one shadow price?', *European Economic Review*



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Boarini et al. (2021) model (I): general setup

- As in Becker et al. (2005), perfect annuity market, $r = \rho \rightarrow c = y$ and indirect utility is the **separable** product of instantaneous utility and an actualization factor that is a function of LE:

$$V(y_i, T, X_i) = \frac{u(y_i, X_i)}{r + 1/T}$$

- Instantaneous utility is a CRRA with intercept with group-specific coefficients Γ_i

$$u(y_i, X_i) = \alpha \log\left(\frac{y_i}{\omega}\right) + X_i.\Gamma_i$$

- **Utility is normalised to 0 after death**. Parameter ω is the minimum consumption threshold at which people are indifferent between life and death
- It is calibrated on the Value of a Statistical Life equal to 6.3M in the US in 2004 (EPA benchmark)

$$VSL = -\frac{\partial V/\partial \pi}{\partial V/\partial y} \text{ with } \pi = 1/T$$

Boarini et al. (2021) model (II): identification

- We use life satisfaction regressions to estimate parameters (α, Γ_i), or rather their ratio Γ_i/α, in the instantaneous utility function

$$u(y_i, X_i) = \alpha \log\left(\frac{y_i}{\omega}\right) + X_i.\Gamma_i$$

- We assume that **LS is a linear transformation of utility**:

$$LS_i = \mu.u_i + \tau = \mu.\alpha \log(y_i) + \mu.X_i.\Gamma_i + \mu.\alpha \log(\omega) + \tau$$

- **This is different from confounding LS and u, which is too strong** (are people declaring LS=0 indifferent between life and death?)
  - Parameter ω cannot be identified from LS regression as τ unknown: the constant has no interpretation
  - μ remains unidentified but only the ratio Γ_i/α matters in the calculation of equivalent income so imposing μ=1 is fine

Boarini et al. (2021) model (III): econometrics

- Use of Gallup micro-data and the following regression:
$$LS_{i,j,t} = a_j + b_t + \pi . Z_i + \alpha . log(y_{i,j,t}) + (\gamma + W_i . \Lambda) . log(y_{j,t}) + \beta . U_i + \theta . U_{j,t} + \varepsilon_{i,j,t}$$
- Unemployment affects people well-being directly (when unemployed) and indirectly (via unemployment rate)
- Group-specific income elasticities ensure **heterogenous preferences** (shadow prices) for both longevity and unemployment, e.g.

$$\delta_{i,j}^{T} = 1 - \exp\left(- \frac{\alpha . log\left(\frac{y_{i,j}}{\omega}\right) + X_{i,j} . \Gamma_i}{\alpha + \gamma + W_i . \Lambda} . \left(1 - \frac{r + 1/T^*}{r + 1/T_j}\right)\right)$$

- **This closed-form formula accounts for preferences heterogeneity both within and between countries**
- **Overall, the mixed approach is more robust than the pure subjective approach (as LE is a poor determinant of LS) and richer than the model-based approach (preferences heterogeneity)**

Boarini et al. (2021) model (IV): aggregation

- Use of a **Social Welfare Function to calculate MDLS:**

$$MDLS = \left(\frac{1}{n}\sum_i (Y_i^*)^{1-\tau}\right)^{\frac{1}{1-\tau}} = \left(\frac{1}{n}\sum_i Y_i^*\right)(1-I), \quad (1)$$

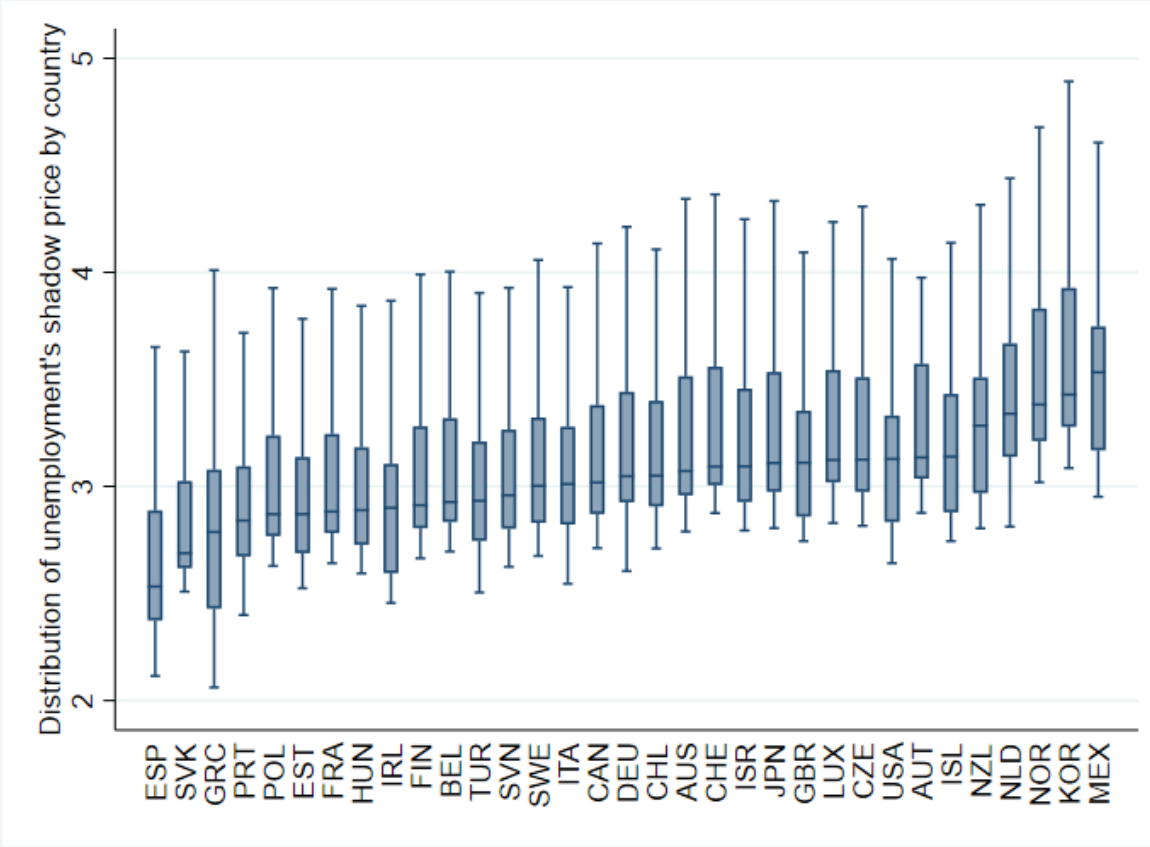
$$MDLS = \left(\frac{1}{n}\sum_i Y_i^*\right).(1-I) = \left(\frac{1}{n}\sum_i y_i.(1-\delta_i^T-\delta_i^U)\right).(1-I) \quad (17)$$

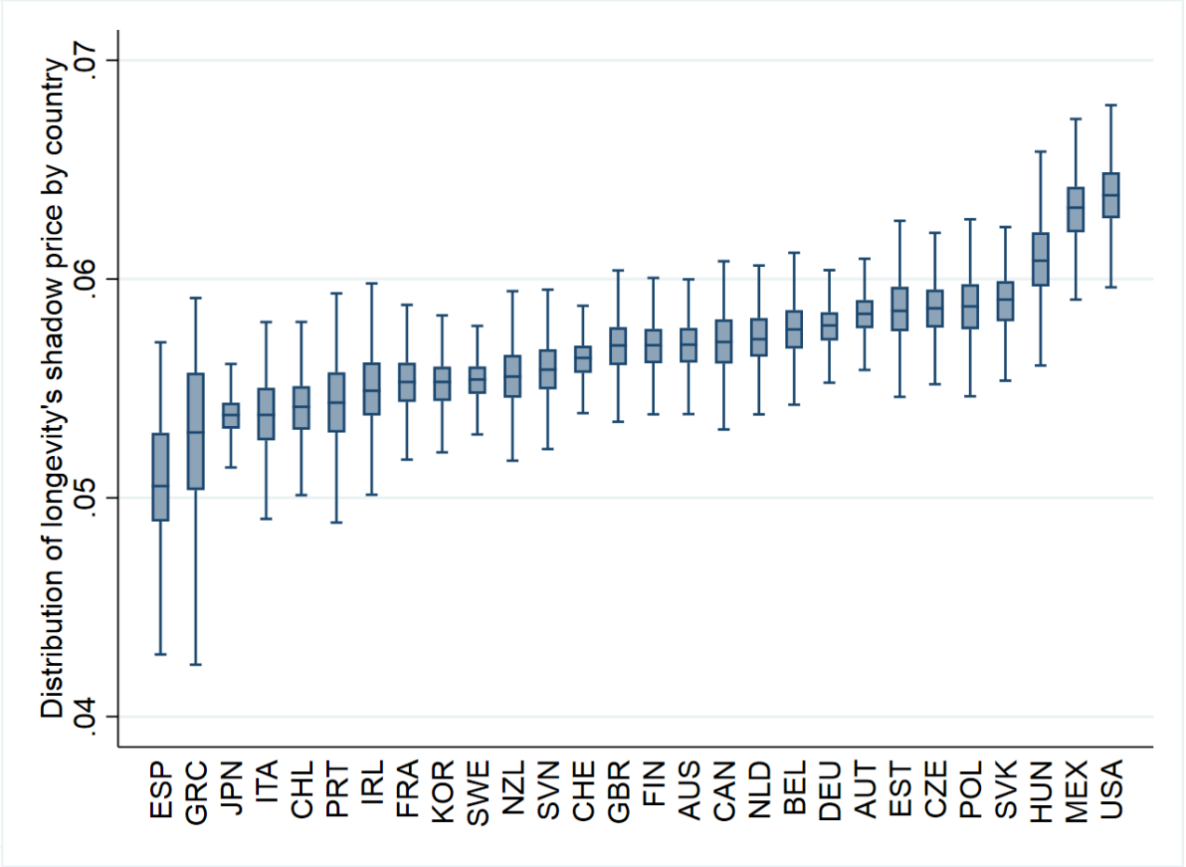
- **The calculation of equivalent income can be done at the micro level with micro shadow prices after matching with national income distribution, or at the macro level with average shadow prices and national income distribution (a proxy MDLS): there is almost no difference**

$$\widetilde{MDLS_j} = y_j.\left(1-\delta_j^T-\delta_j^U\right)(1-I) = y_j - y_j.\delta_j^T - y_j.\delta_j^U - I.y_j.\left(1-\delta_j^T-\delta_j^U\right) \quad (18)$$

KEY FINDINGS

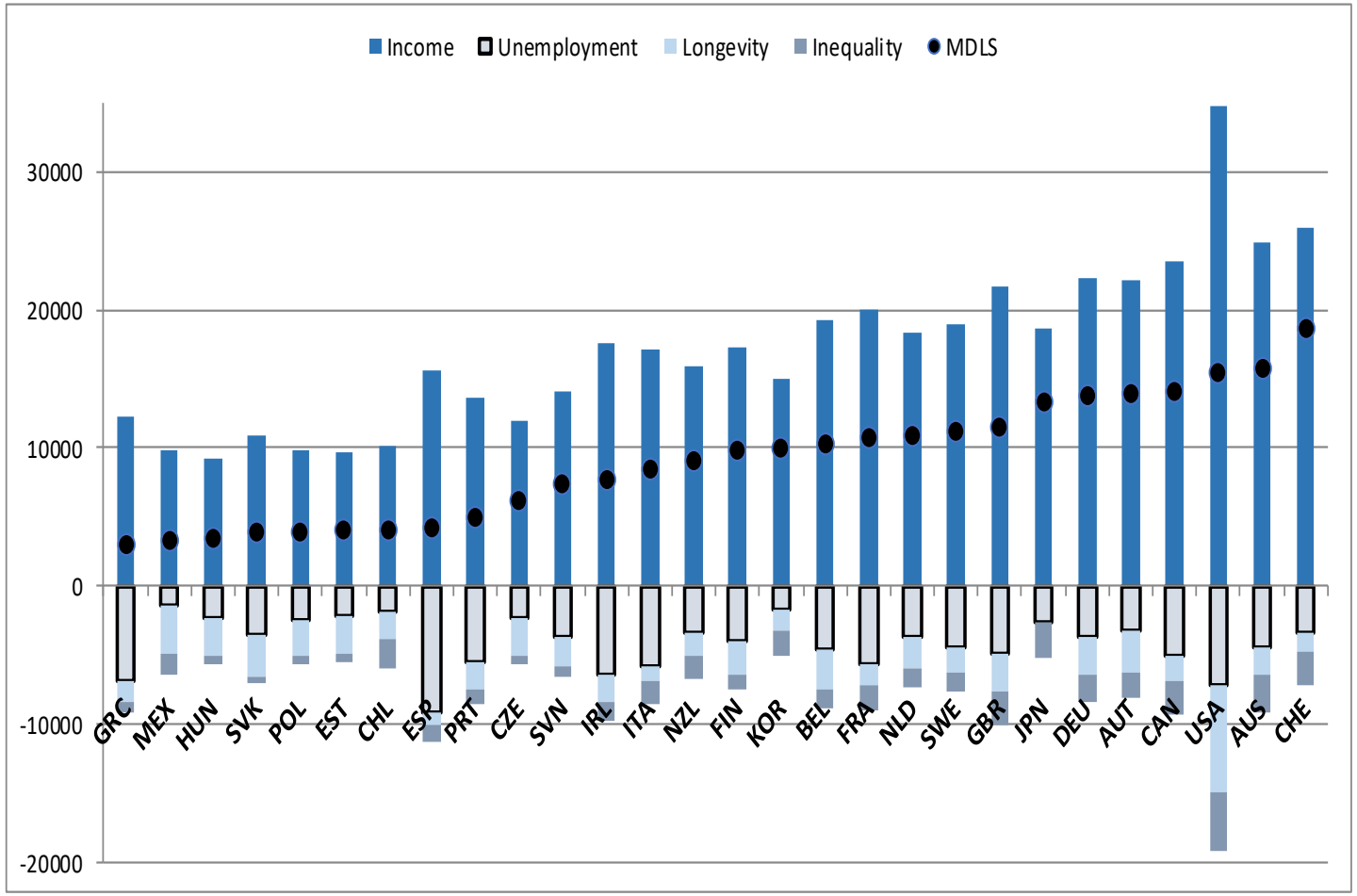
Distributions of shadow prices



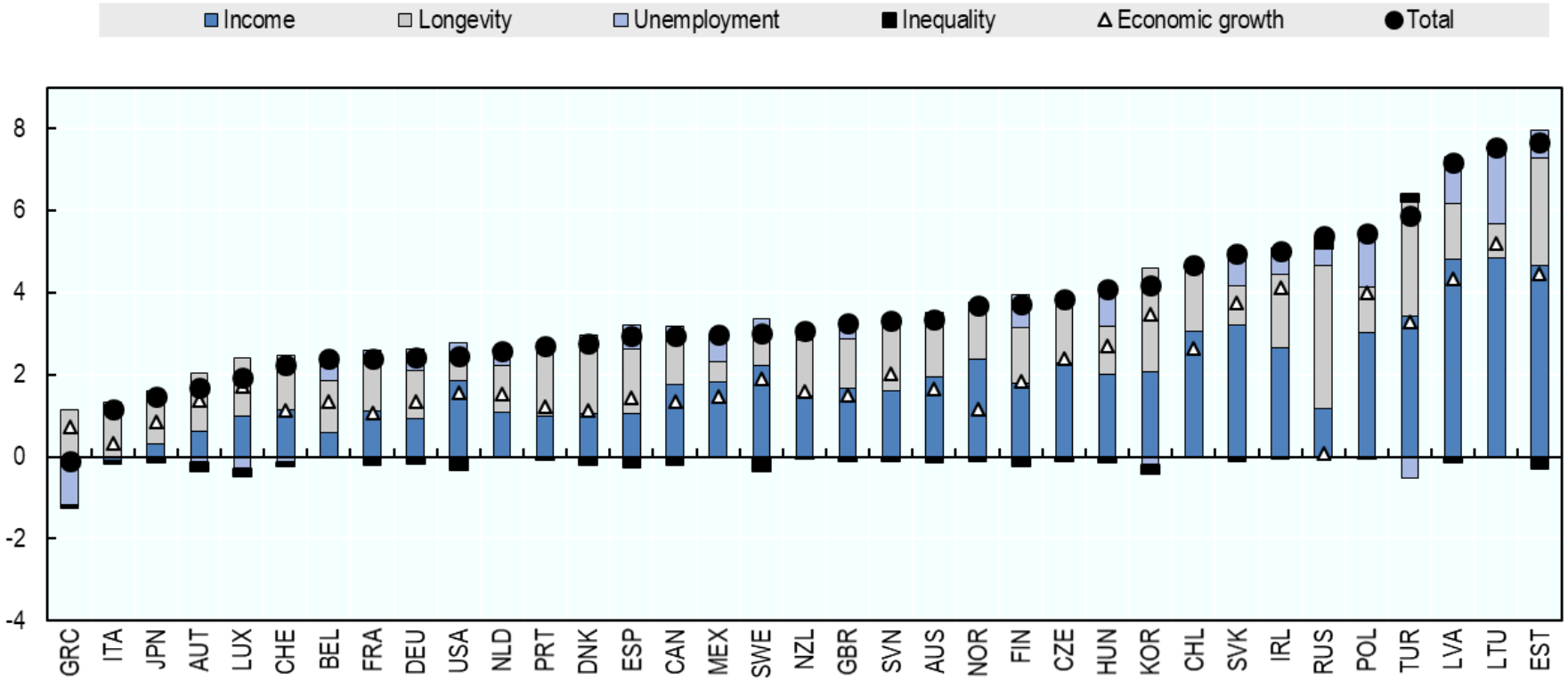


MDLS implies a different ranking than income

$$MDLS_c = y_c - w_c^U U_c - w_c^T \Delta T_c - I_c(\tau)$$



Progress in longevity is as important as economic growth 1995-2018



Economic growth	MDLS	Income	Longevity	Unemployment	Inequality
1.6	2.9	1.5	1.3	0.2	-0.1

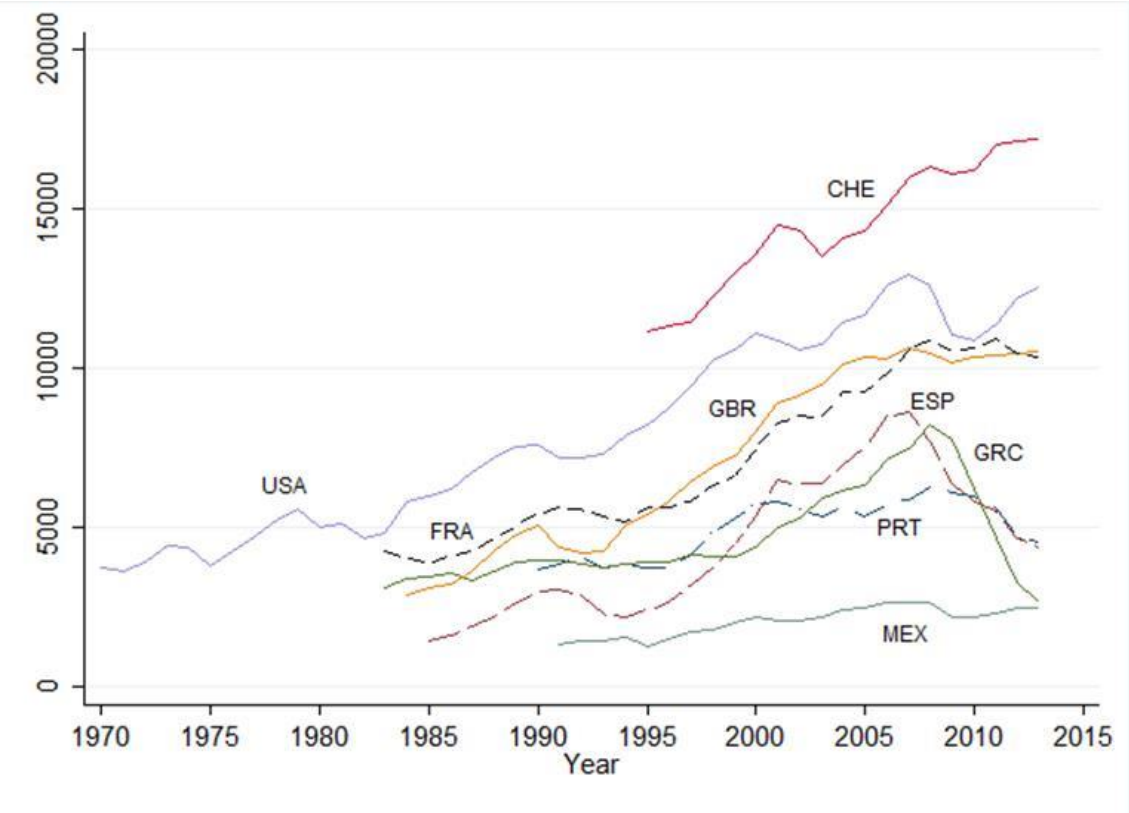
The welfare loss during the Great Recession has been enormous due to rising unemployment and inequality

2008-2013

	Economic growth Annual rate	Growth of living standards						
		Annual rate		Contributions				
							Inequality	
		Median (τ=0.89)	Percentile 20 (τ=3.36)	Average household income	Unemployment	Longevity	Median (τ=0.89)	Percentile 20 (τ=3.36)
Greece	-6.0	-26.5	-39.8	-9.2	-17.1	1.6	-1.7	-15.1
Ireland	-1.3	-8.0	-13.7	-1.9	-7.0	1.8	-0.8	-6.6
Italy	-2.0	-6.6	-9.8	-2.5	-4.7	1.1	-0.5	-3.7
Portugal	-1.4	-7.9	-13.0	-1.6	-7.6	1.8	-0.4	-5.6
Spain	-1.8	-14.7	-24.9	-1.9	-12.8	2.1	-2.0	-12.3

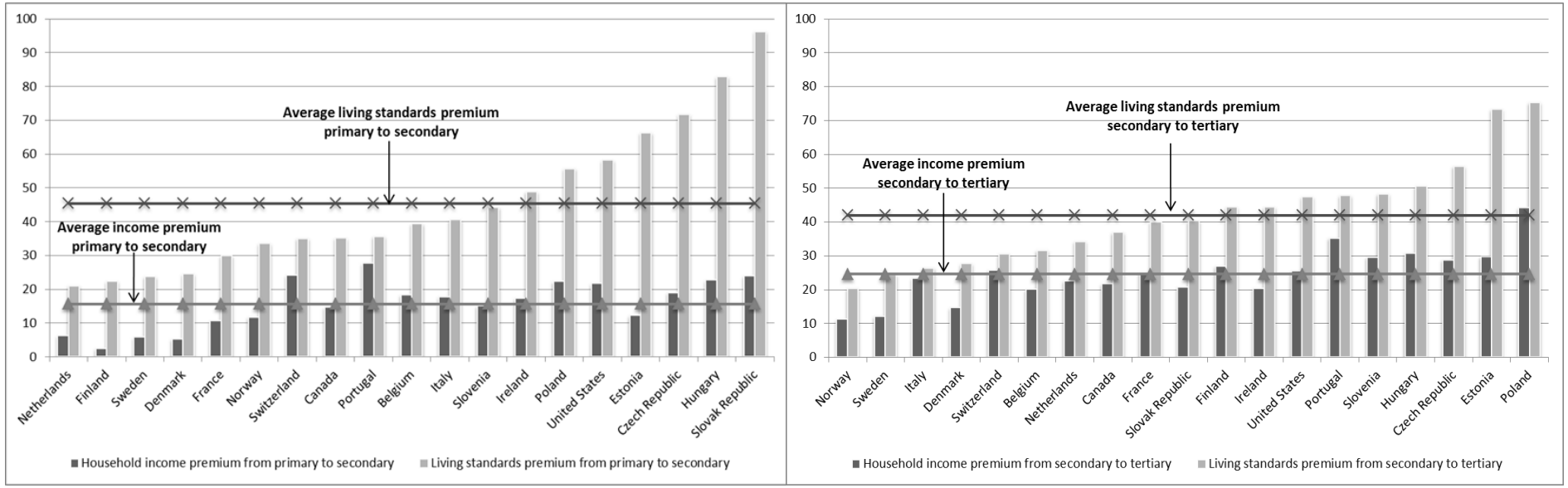
Time series

Compared to GDP, growth in MDLS is both stronger (LE) and more volatile (U)



The welfare return to education is at least twice larger than its monetary return

The average MDLS premium is **three times** larger than the average income premium when moving from primary to secondary education (from 16% to 45%), and **twice as large** when moving from secondary to tertiary (from 24% to 42%)



WELL-BEING EVALUATION OF POLICY REFORM

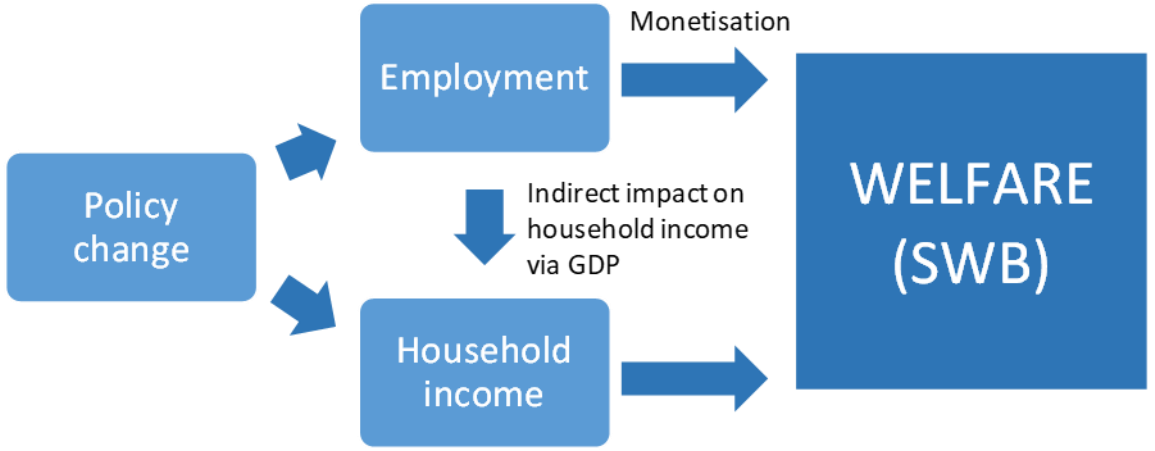
(FORTHCOMING OECD WKP 2022)

Overview of the model

- **Welfare is defined as the aggregate of average household income and monetized employment (no inequality effect):**

$$\Delta W_{j,t} = \Delta log(y_j) + p^{E}_{j,t} . \Delta E_{j,t}$$

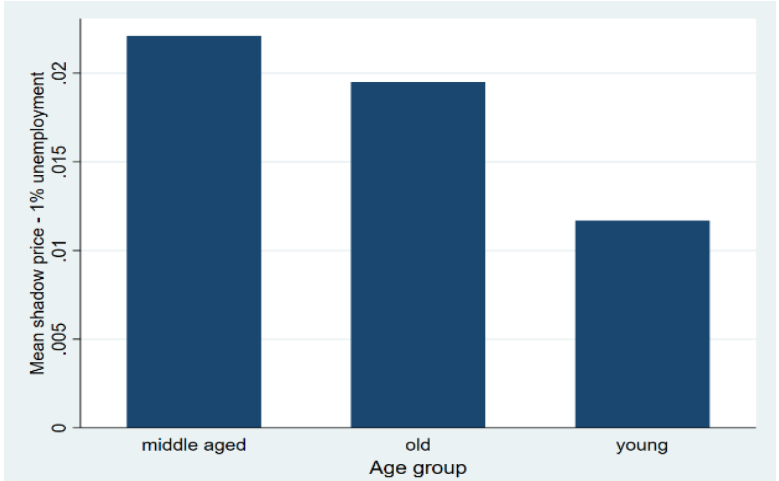
- **Policy changes have 3 impacts on welfare (i.e. defined as an aggregate of monetized dimensions of WB) as estimated by the QASR model from ECO:**
  - Impact on employment, which has a welfare value *per se* beyond income effects, and is being monetised
  - Direct impact on household income
  - Indirect impact on household income via employment and GDP

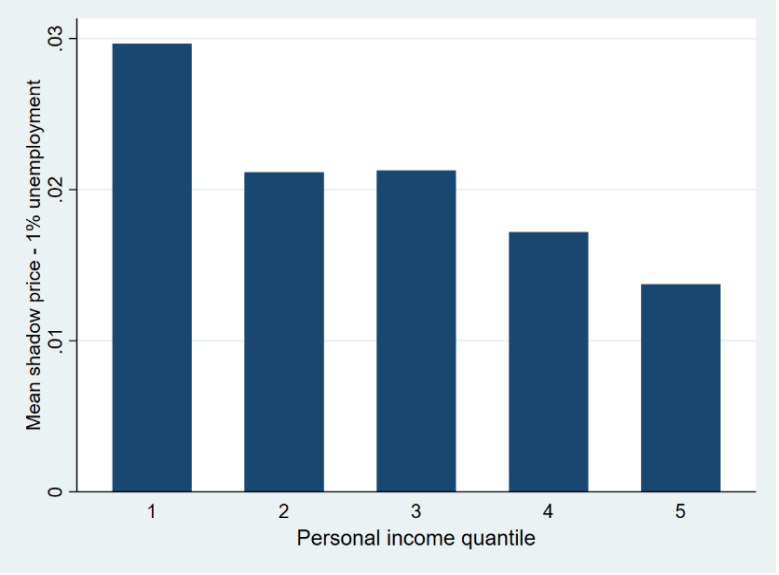


Key Take-aways

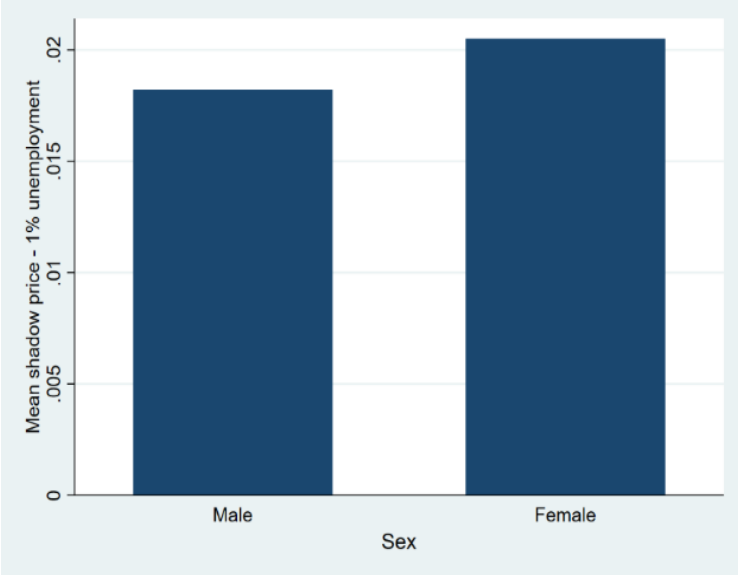
- **The shadow price of employment**, namely the monetary value that people confer to the increase of the employment rate by 1 ppt, **is on average equivalent to a gain of 3% of household income**, while the shadow price of a reduction in the unemployment rate by 1 ppt is equal to **2% of household income** (consistent as the two are related by the participation rate, on average equal to 0.77.
- The largest part of the employment's shadow price stems from the **employment rate of the prime-age population, especially females**.
- Overall, **no policy trade-off across employment and average household income emerges**.
- **The total potential welfare gain from structural reforms is large and equivalent to 12.4% of household income growth**.
- **The main channel of impact is the employment rate**, with a potential gain equivalent to 7.4% of household income growth, followed by the indirect income effect going through GDP (5.9%). The direct income effect is small (-0.9%).
- **The largest welfare impacts stem from** : i) a cut in regulation of the energy, transport and communication sectors; ii) an increase in ALMPs; iii) a cut in the average tax wedge on households; iv) a cut in the minimum wage; v) an increase in the number of weeks of maternity weeks; vi) a cut in the replacement rate of unemployment benefits.
- Only one policy reform implies a loss in welfare, namely a cut in corporate income tax, which benefits to GDP but decreases household income.

Estimated Shadow Prices (1)



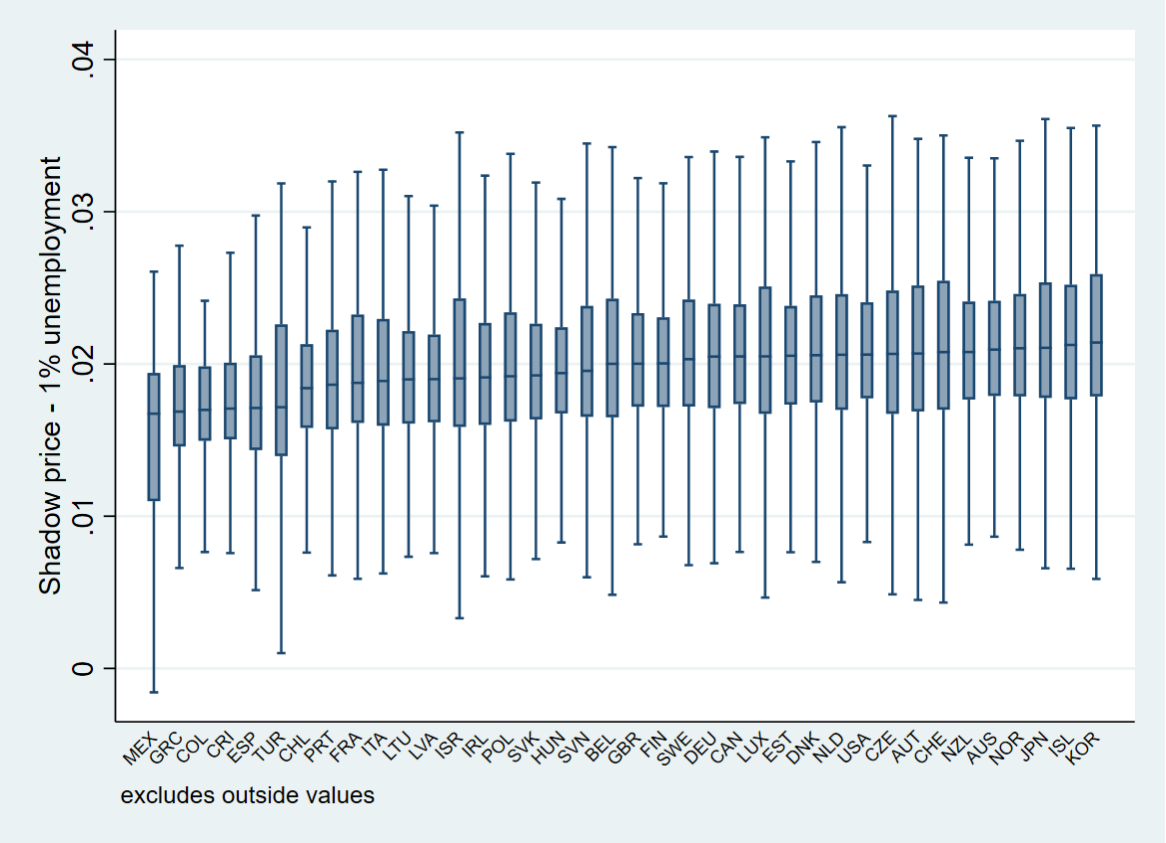


Shadow prices of unemployment are higher among the mid-age, lower income and female groups



Estimated Shadow Prices (2)

Shadow prices of unemployment are relatively lower among countries with younger population and higher unemployment rate



Estimated Shadow Prices (3)

The shadow price of employment can be used routinely for policy evaluation with the help of this table

country	Total 15-64	Total 15-24	Females 25-54	Males 25-54	Total 55-64
AUS	3.3	0.5	2.3	2.2	0.9
AUT	3.2	0.4	2.5	2.1	0.7
BEL	2.6	0.3	2.3	2.0	0.7
CAN	3.3	0.5	2.4	2.0	0.9
CHE	4.1	0.5	2.6	2.5	1.0
CHL	2.6	0.2	1.8	1.9	0.7
CZE	3.0	0.3	2.4	2.5	0.8
DEU	3.4	0.4	2.5	2.3	0.9
DNK	3.3	0.5	2.5	2.1	0.9
ESP	2.4	0.2	1.9	1.6	0.7
EST	3.2	0.4	2.5	2.2	0.9
FIN	3.1	0.5	2.6	2.2	1.0
FRA	2.7	0.3	2.4	2.1	0.7
GBR	3.1	0.4	2.3	2.1	0.8
GRC	2.1	0.3	1.8	1.8	0.7
HUN	2.6	0.4	2.3	2.2	0.8
IRL	2.7	0.3	2.0	1.8	0.7
ISL	4.7	0.5	2.7	2.2	1.0
ISR	2.6	0.1	2.0	1.6	0.7
ITA	2.3	0.3	1.8	1.9	0.7
JPN	3.6	0.4	2.1	2.6	1.0
KOR	2.7	0.3	1.9	2.2	0.9
LUX	2.8	0.3	2.4	2.3	0.7
MEX	2.3	0.0	1.5	1.9	0.5
NLD	3.5	0.5	2.5	2.2	0.9
NOR	3.5	0.5	2.7	2.2	1.1
NZL	2.8	0.5	2.4	2.3	1.1
POL	2.6	0.3	2.3	2.0	0.7
PRT	2.7	0.2	2.3	1.8	0.7
SVK	2.6	0.3	2.2	2.0	0.8
SVN	2.8	0.4	2.7	2.1	0.7
SWE	3.6	0.4	2.7	2.2	1.0
TUR	1.9	0.1	1.3	1.7	0.5
USA	3.0	0.5	2.2	2.0	0.9
Average	3.0	0.4	2.3	2.1	0.8

Results

- **Largest welfare impacts arise from employment**, then from income through GDP
- **No policy trade-off** across the two dimensions
- **Large gains from reforms of ETCR, ALMPs, hh tax wedge**

Policies	Scenario	Typical policy change	Impact on employment rate		Impact on average household income			Impact on welfare (SWB)	
					Direct effect	Indirect effect via GDP	Total effect		
		Change in percentage points	Change in percentage points	Monetised impact (in %, comparable to income growth)	Change in percent	Change in percent	Change in percent	Change in percent	% due to employment
Business R&D by private sector %GDP	increase	0.097	0.00	**0.00**	-0.13	0.27	**0.14**	**0.14**	0
Corporate income tax revenues % GDP	cut	-0.980	0.00	**0.00**	-1.37	0.62	**-0.76**	**-0.76**	0
Average tax wedge, single earner couple with 2 children	cut	-2.282	0.39	**1.09**	0.23	0.31	**0.54**	**1.63**	67
Unemployment benefit replacement rate	cut	-1.417	0.31	**0.88**	0.14	0.32	**0.46**	**1.33**	66
Total in-kind benefits % GDP	increase	0.109	0.16	**0.45**	0.24	0.16	**0.40**	**0.85**	53
ETCR indicator - overall	cut	-0.307	0.142	**0.40**	0	1.50	**1.50**	**1.90**	21
EPL - permanent contracts	cut	-0.295	0.253	**0.71**	0	0.48	**0.48**	**1.18**	60
ALMP spending	increase	3.180	0.225	**0.63**	0	1.08	**1.08**	**1.71**	37
Minimum wage	cut	-2.479	0.407	**1.14**	0	0.41	**0.41**	**1.55**	73
Excess coverage	cut	-1.890	0.103	**0.29**	0	0.10	**0.10**	**0.39**	73
Tax wedge - single earners	cut	-1.385	0.120	**0.34**	0	0.12	**0.12**	**0.46**	73
Maternity leave weeks	increase	4.829	0.403	**1.13**	0	0.41	**0.41**	**1.54**	73
Legal retirement age	increase	0.566	0.129	**0.36**	0	0.13	**0.13**	**0.49**	73
Total				**7.4**	**-0.9**	**5.9**	**5.0**	**12.4**	

Conclusion

- **This readily available tool allows the MoL to value reforms impacting on the employment rate (1ppt ER=2.8% income)**
- **The case-study based on QASR suggests that employment is a powerful channel of impact on welfare**
- **The framework can be extended to other WB outcomes and other models (e.g. Tax-Ben) in a potential extension of the project**

SUMMING-UP

Summing-up

- **Beyond GDP at national level: it is possible to correct GDP for U, LE and income inequality with a proper system of weights**

$$SWF = \left(\frac{1}{n} \sum \left(y_i - \delta_i^U - \delta_i^{LE} \right)^{1-\tau} \right)^{1/(1-\tau)}$$

- **Shadow prices as weights can also be used for ex-ante evaluation of policy reforms**