

# DOWNSIDE-RISK SHARING AND THE RENEWED CASE FOR A FISCAL UNION

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**Disclaimer:** The views expressed in this paper are those of the author and do not necessarily reflect those of the Bank of Italy.

# Introduction

- Debate on **European integration** was alive and well already before 2020. **Covid-19** and the Next Generation EU project boosted it.
- Merits of a potential fiscal union in Europe mainly based on **past research on US data**.
- **Consensus** emerged whereby US federal government does little to insure states' incomes. **Past research** suggests that private markets provide much more risk sharing.
- **Policy advice for Europe was:** push for deep capital markets integration, disregard fiscal integration.

# Contribution

- We are the first in focusing on **downside-risk sharing**, as that is the risk agents *really* want to hedge against.
- Drawing from a longstanding finance literature (Markowitz, 1959), we propose a **simple method** to compute it in our application.
- The paper provides the **first estimates** of fiscal downside-risk sharing for the US.
- By imposing reasonable assumptions, we obtain **state-level estimates of CFC**.
- We are the first in disentangling the **capital depreciation channel** of income smoothing for the US.

# Results

- The federal system of taxes and transfers **hedges on average 30.8%** of *idiosyncratic* fluctuations in labor income growth. Many previous papers (which yet did not focus on downside-risk) pointed at  $\approx 10\%$ .
- Contrary to previous papers, we do find **clear evidence** of increased fiscal risk sharing over a long sample.
- The implicit inclusion of a **capital depreciation effect** is responsible for the classic result whereby the **capital market channel** smoothes a large share of income growth.
- Once we take this into account, we find a **negligible role** of the capital market channel within traditional models.

## Related Literature

- Our **methodology** is closest to Athanasoulis and Van Wincoop (2001).
- Asdrubali et al. (1996): **landmark contribution**, the authors are the first to jointly estimate capital market, credit market, and fiscal channels with a simple GDP variance decomposition.
- **Earlier literature**: Sala-i-Martin and Sachs (1992), Von Hagen (1992), Bayoumi and Masson (1995).
- Mélitz and Zumer (1999), Asdrubali and Kim (2004): follow ASY but more **controls/dynamics**.
- Mélitz and Zumer (2002): they find fiscal risk sharing channel results depend on whether one benchmarks personal income as opposed to GDP stabilization.
- Alcidi et al. (2017), Nikolov and Pasimeni (2019): update of ASY, find similar results.

# Athanasoulis and van Wincoop (2001)

**Only paper** that explicitly treats risk with an ex-ante concept.

- Let  $g_{t,t+h}^i = \log w_{t+h}^i - \log w_t^i$  be the **growth rate** of income.

$$g_{t,t+h}^i - g_{t,t+h}^{US} = \alpha + \beta'_h (x_t^i - x_t^{US}) + \epsilon_{t,t+h}^i,$$
$$\epsilon_{t,t+h}^i \stackrel{iid}{\sim} (0, \sigma_h).$$

- $\sigma_h$  is a measure of **diversifiable risk**.
- Risk sharing measure:

$$RS_h^0 = 1 - \frac{\hat{\sigma}_h^a}{\hat{\sigma}_h^b}$$

- **Nonoverlapping intervals** of length  $h$  to ensure i.i.d. errors.
- We restrict  $h \in [1, 8]$  (**business cycle frequencies**).
- **Controls**: log of per capita income at the beginning of each interval; five-year lagged population growth; gov. expenditure to GDP; one-year lagged growth rate of per capita income.

# Accounting for Residual Variation

- Problem with AVW: they do not account for **residual variation**.
- When e.g.  $R^2$  very high, we could also have very high risk-sharing estimates, but that would be irrelevant. This is a **limitation** in AVW.
- We then propose to **adjust** for the share of residual variation:

$$RS_h = RS_h^0 \frac{\hat{\sigma}_h^b}{\hat{\sigma}_h^{b,tot}} = \frac{\hat{\sigma}_h^b - \hat{\sigma}_h^a}{\hat{\sigma}_h^{b,tot}}$$

- This is equivalent to **normalize by the sample standard deviation** as opposed to residual standard deviation.
- We **bootstrap** our estimates as in Kapetanios (2008).



# Markowitz' Semi-Variance

- **Markowitz (1959)** introduces the concept of **semi-variance**.
- Stocks that have some very high *positive* returns have (ceteris paribus) a higher variance.
- Standard portfolio optimization techniques aimed at **minimizing risk** (measured by **variance**). In practice, actual investors aim at minimizing *downside* risk only.
- Define **conditional returns** as  $r^- = \min(r, 0)$ .
- Then, **semi-variance** is computed as the variance of  $r^-$ .
- Returns distributions are **skewed**, meaning the two metrics won't coincide.

# Semi-Variance in a Macro-Forecasting Setting

- As it happens in finance, **government** and **households** are also interested in containing downside risk only.
- We define **conditional forecast errors** as

$$\hat{\epsilon}_{t,t+h}^{-,i} = \min(\hat{\epsilon}_{t,t+h}^i, 0)$$

- We then compute the **residual standard deviation**  $\hat{\sigma}_h^{-}$  on those conditional errors.
- Our **downside-risk sharing** measure:

$$DRS_h = \frac{\hat{\sigma}_h^{b,-} - \hat{\sigma}_h^{a,-}}{\hat{\sigma}_h^{b,-,tot}}$$

# Dataset

- We focus on *labor* income as in Duwicquet and Farvaque (2018), not on total (i.e. personal + corporate + government) income as in ASY and others.
- We are interested in the **average US citizen**, not on the average US state, so ideally one would want to work with **household-level data**, which would ensure no **aggregation bias**.
- Focusing on labor income alone reduces a lot this bias as capital income is **extremely concentrated**.
- The non-labor share of GDP (NOS, CFC, taxes on production and imports less subsidies) goes **largely unsmoothed** by the federal government.

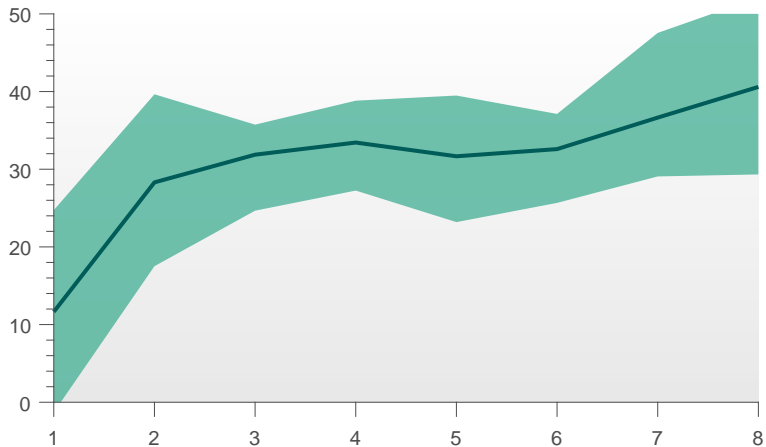
# Congressional Budget Office (2017)

Percent	Labor	Capital	Social insurance
Lowest quintile	81.9	18.1	33.9
Middle three quintiles	81.3	18.7	19.8
81 <sup>st</sup> – 99 <sup>th</sup> prct	73.6	26.4	5.2
99 <sup>th</sup> – 99.9 <sup>th</sup> prct	44.8	55.2	1.0
99.9 <sup>th</sup> – 99.99 <sup>th</sup> prct	28.5	71.5	0.0
Top 0.01 percent	13.3	86.7	0.0

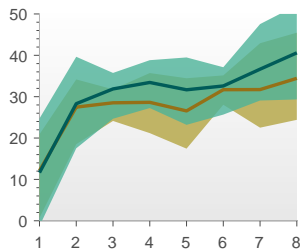
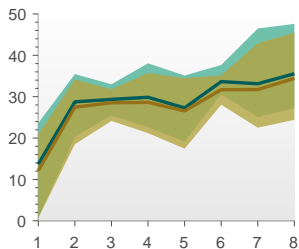
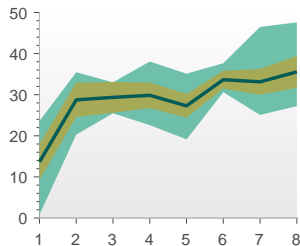
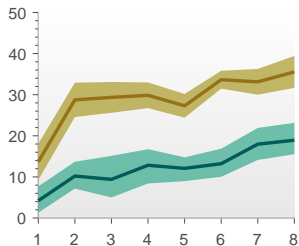
# Income Before and After Federal Intervention

- $W^b$  = wages and salaries
- Federal fiscal flows = federal personal transfers +
  - employee and self-employed contributions +
  - pers. current taxes to the federal government
- $W^a = W^b +$  federal fiscal flows
- **Data from 1997 to 2018**

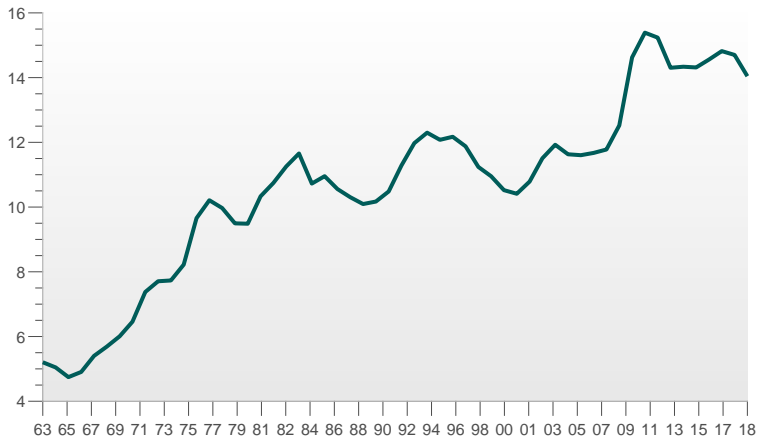
# Baseline estimates



# A Dissection of Our Results

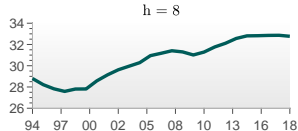
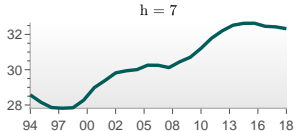
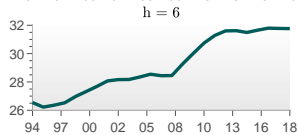
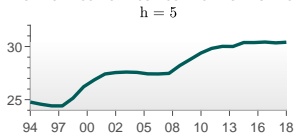
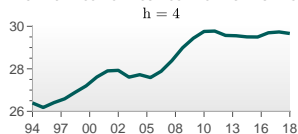
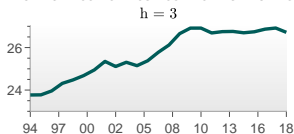
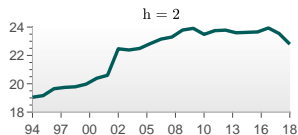
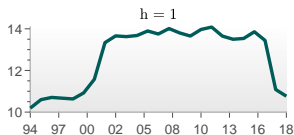


# Federal Payments to Individuals - Percent of GDP

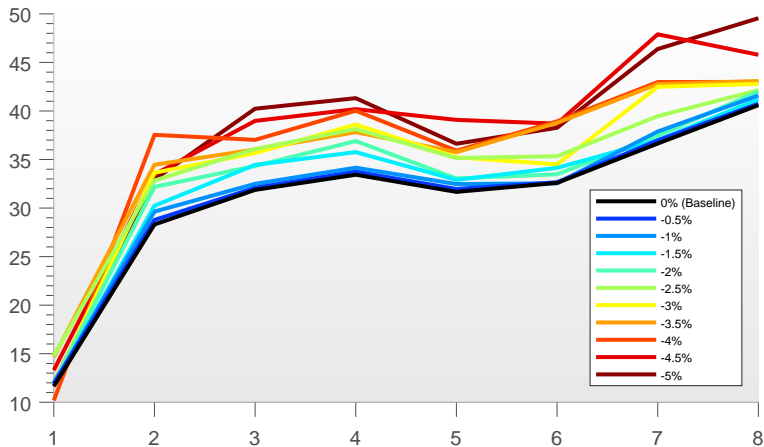




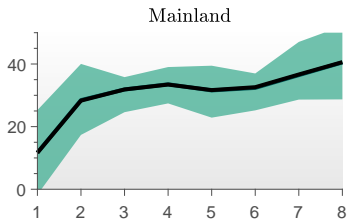
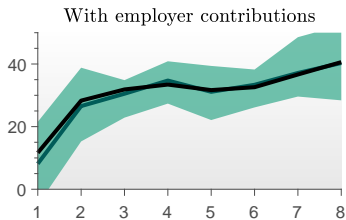
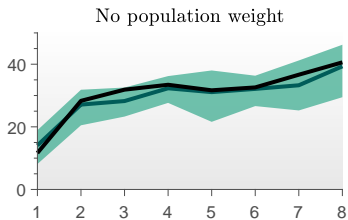
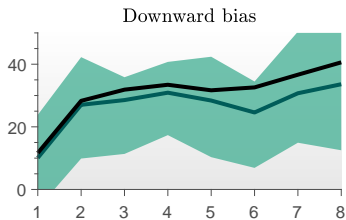
# Expanding Windows



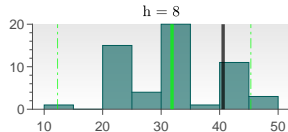
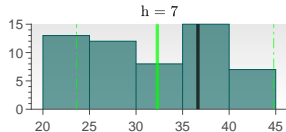
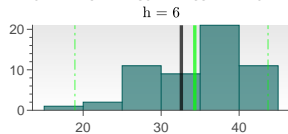
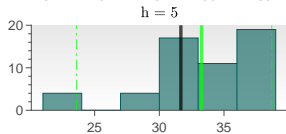
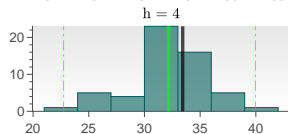
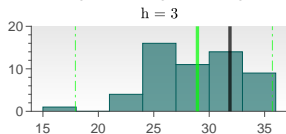
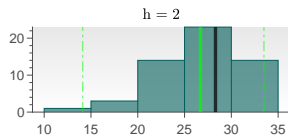
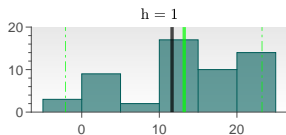
# Different Thresholds



# Sensitivity analysis



# Sensitivity analysis



## Asdrubali et al. (1996) - A Quick Review

Some definitions from Asdrubali et al. (1996):

- $GDP^i$ : **Gross Domestic Product** for state  $i$
- $SI = GDP + \text{Net Factor Income}$ : **State Income**
- $DSI = SI + \text{Net Fiscal Flows}$ : **Disposable State Income**
- $C$ : **State Consumption**
- $DSI - C$ : **Savings**

Define  $x = \Delta \log X$ , with  $\Delta$  being one-year difference. Now:

- If full income smoothing after **capital market flows**, we should have that  $\text{cov}(si, gdp) = 0$ . Otherwise, fiscal channel can play a role.
- If full income smoothing after **capital+fiscal**, then  $\text{cov}(dsi, gdp) = 0$ . Otherwise, credit channel can play a role.
- If full income smoothing after **capital+fiscal+credit**, then  $\text{cov}(c, gdp) = 0$ . Otherwise, some  $gdp$  variance is left unsmoothed.

## Asdrubali et al. (1996) - Equations

Starting from the **identity**

$$GDP^i = \frac{GDP^i}{SI^i} \frac{SI^i}{DSI^i} \frac{DSI^i}{C^i} C^i,$$

one can get to

$$\begin{aligned} \text{var}(gdp) = & \text{cov}(gdp, gdp - si) + \\ & \text{cov}(gdp, si - dsi) + \\ & \text{cov}(gdp, dsi - c) + \\ & \text{cov}(gdp, c), \end{aligned}$$

which dividing by  $\text{var}(gdp)$  yields

$$1 = \beta_K + \beta_F + \beta_C + \beta_U,$$

which are **OLS coefficients** obtained from regression of right element in  $\text{cov}(gdp, \cdot)$  onto  $gdp$ .

# The Neglected Role of Capital Depreciation

Corrected definitions:

- $GDP^i$ : **Gross Domestic Product** for state  $i$
- $NDP = GDP - CFC$ : **Net Domestic Product**
- $SI = NDP + \text{Net Factor Income}$ : **State Income**

Now:

- In *international* risk sharing models like Sørensen and Yosha (1998), one separates the capital depreciation channel from the capital market one by using **GNP** statistics.
- In a US *intranational* risk sharing model, no state-level GNP data exists.
- Past research has implicitly included **CFC** and **corporate savings** into capital income flows.
- We provide estimates of state-level CFC and disentangle the **capital depreciation channel** from the capital market one.

# Choice of State Weights

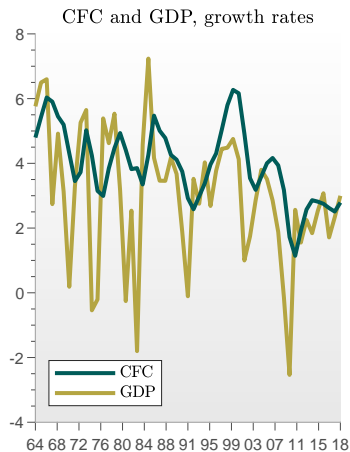
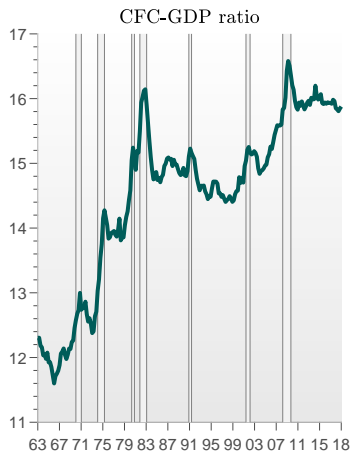
$$\text{CFC} = \text{GOS} - \text{NOS} - \text{SD}$$

- state-level GOS exists.
- We then only need **state-level estimates of NOS** (and SD).

Item	2018	%	Allocation weights
<b>Net Operating Surplus (NOS)</b>	5,063	100	
Proprietors' income with IVA and CCAdj	1,586	31	Proprietors' inc.
Rental income of persons with CCAdj	759	15	Rental inc. pers.
Business current transfer payments (net)	157	3	GDP
Current surplus of government enterprises	-6	-0	GDP
Corp. profits with IVA and CCAdj, d.i.	1,730	34	PCE
Net interest and misc. payments, d.i.	836	17	Monetary int. rec.



# Consumption of Fixed Capital - US



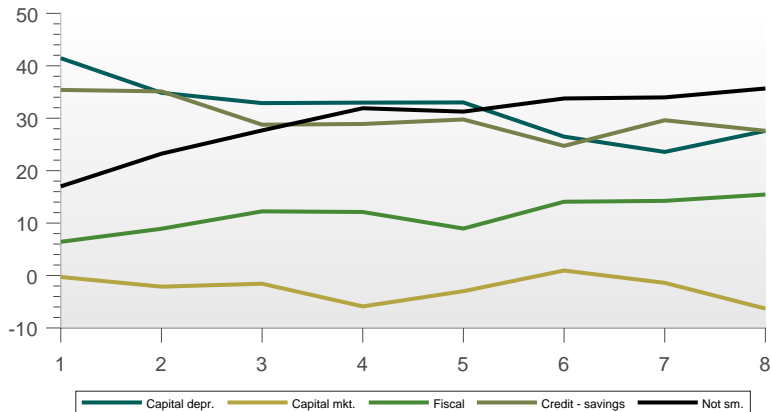
## Asdrubali et al. (1996) - Modified Model

$$\begin{aligned}\Delta \log GDP_t^i - \Delta \log NDP_t^i &= \mu_{D,t} + \beta_D \Delta \log GDP_t^i + u_{D,t}^i, \\ \Delta \log NDP_t^i - \Delta \log SI_t^i &= \mu_{K,t} + \beta_K \Delta \log GDP_t^i + u_{K,t}^i, \\ \Delta \log SI_t^i - \Delta \log DSI_t^i &= \mu_{F,t} + \beta_F \Delta \log GDP_t^i + u_{F,t}^i, \\ \Delta \log DSI_t^i - \Delta \log C_t^i &= \mu_{C,t} + \beta_C \Delta \log GDP_t^i + u_{C,t}^i, \\ \Delta \log C_t^i &= \mu_{U,t} + \beta_U \Delta \log GDP_t^i + u_{U,t}^i,\end{aligned}$$

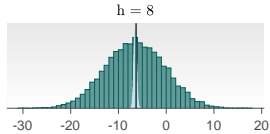
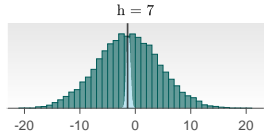
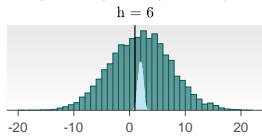
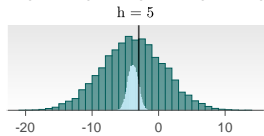
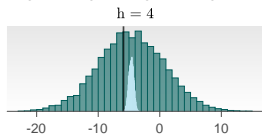
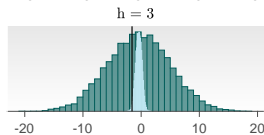
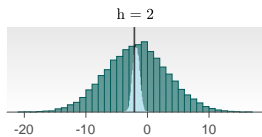
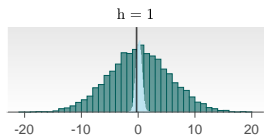
# Regression Results - One-Year Horizon

Model	(1)	(2)	(3)	(4)	(5)	(6)
$\hat{\beta}_D$ (Capital depreciation)			41.4 (1.6)	38.3 (1.5)	42.3 (1.7)	42.9 (1.8)
$\hat{\beta}_K$ (Capital flows)	40.4 (2.5)	41.2 (2.5)	-0.3 (2.0)	2.9 (1.7)	-0.1 (2.1)	4.8 (2.5)
$\hat{\beta}_F$ (Fiscal flows)	7.2 (0.6)	6.4 (0.6)	6.4 (0.6)	6.4 (0.6)	6.0 (0.6)	9.8 (0.7)
$\hat{\beta}_C$ (Credit and savings)	35.4 (2.6)	35.4 (2.6)	35.4 (2.6)	35.4 (2.6)	36.1 (2.7)	24.8 (3.1)
$\hat{\beta}_U$ (Unexplained)	17.0 (1.2)	17.0 (1.2)	17.0 (1.2)	17.0 (1.2)	15.8 (1.2)	17.6 (1.3)
PCE weights	No	Yes	Yes	Yes	Yes	Yes
Population weights	No	No	No	No	No	Yes
State Fixed Effects	No	No	No	No	Yes	No

# Regression Results - Different Horizons



# Sensitivity Analysis



# Conclusions

- We develop a new methodology that provides the first estimates of **downside-risk sharing**.
- We **revisit the case for a fiscal union** by showing that its beneficial effects are largely higher than previously calculated.
- While some of the **past research** suggested the fiscal channel could absorb only about 10% of idiosyncratic income fluctuations, we estimate this number to sit at **around 30%**.
- As soon as **2020** and later data will become available, our evidence suggests that estimates will only get **larger**.
- The classic result which assigns a great role to the capital market channel is instead **entirely driven** by the implicit inclusion of **capital depreciation** in US estimates.

## Policy considerations

- **Political efforts** towards establishing a well-designed **European federal government** within the Euro area would be **worth the candle**.
- In light of the recent large **uncertainty** literature, costs of redistribution must be weighed against **first-moment** improvements stemming from generalized **second-moment** reductions.
- We still believe that further steps towards **integrated capital markets** and the completion of the **banking union** remain key objectives.
- Yet, it is likely that **different empirical approaches** could be needed to correctly evaluate the strength of the capital market channel of risk sharing. We leave this for **future research**.

*...Thank you!*