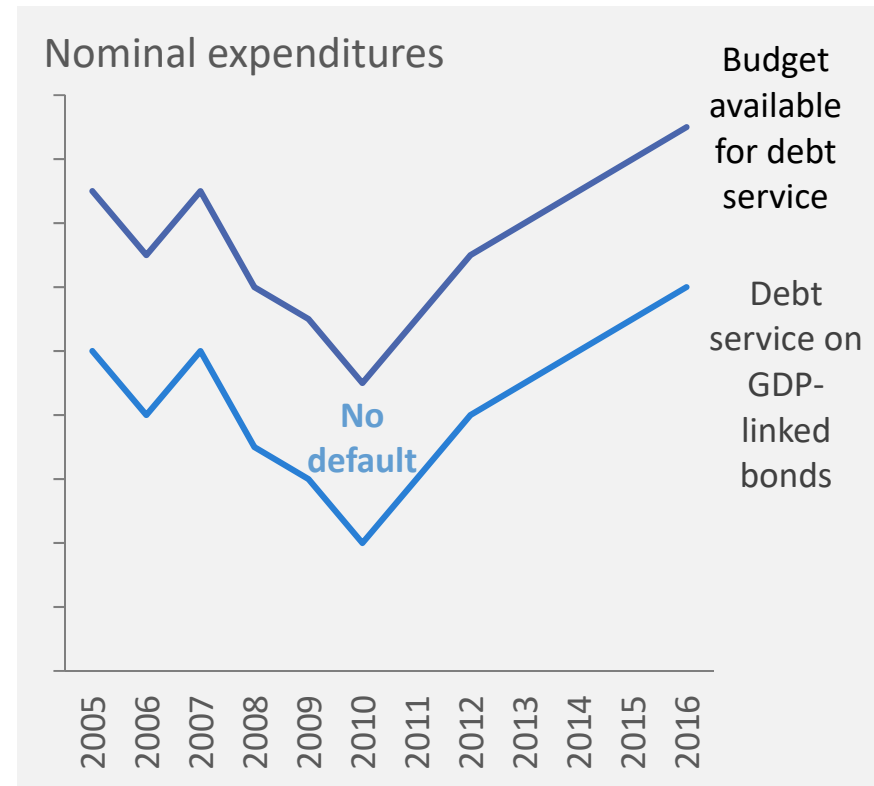
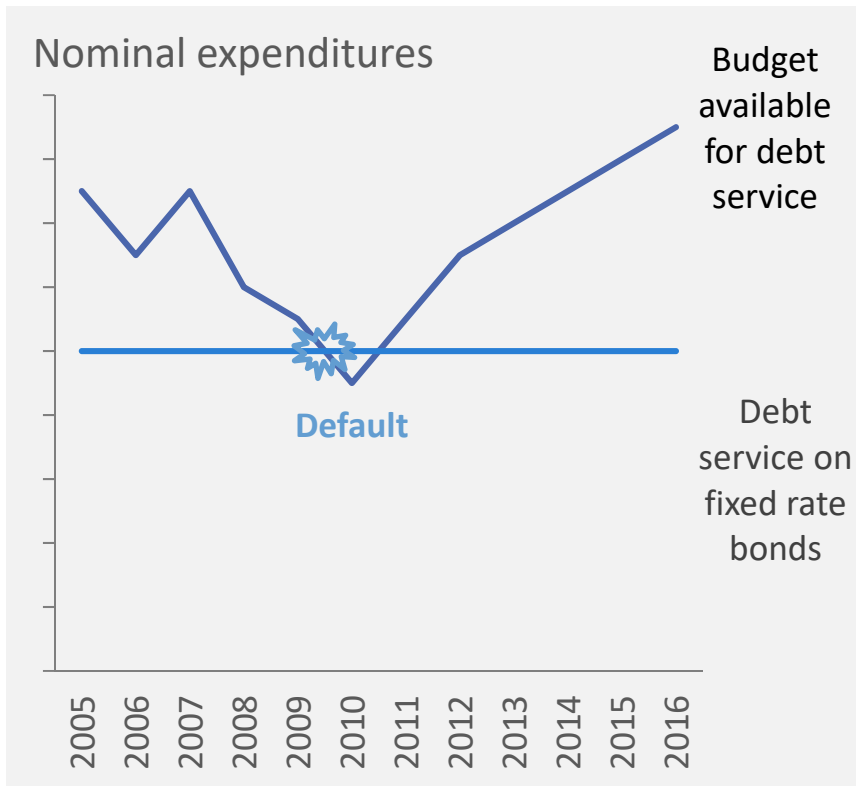


The case for GDP-linked securities

Christian Kopf
DG ECFIN – OECD Workshop
Brussels, 17 January 2017

This presentation draws on work ongoing by the London-based Ad Hoc Working Group on GDP-Linked Bonds comprising Starla Griffin (Slaney Advisers), Yannis Manuelides and Peter Crossan (Allen & Overy), David Beers, James Benford and Mark Joy (Bank of England) and Christian Kopf (Union Investment)

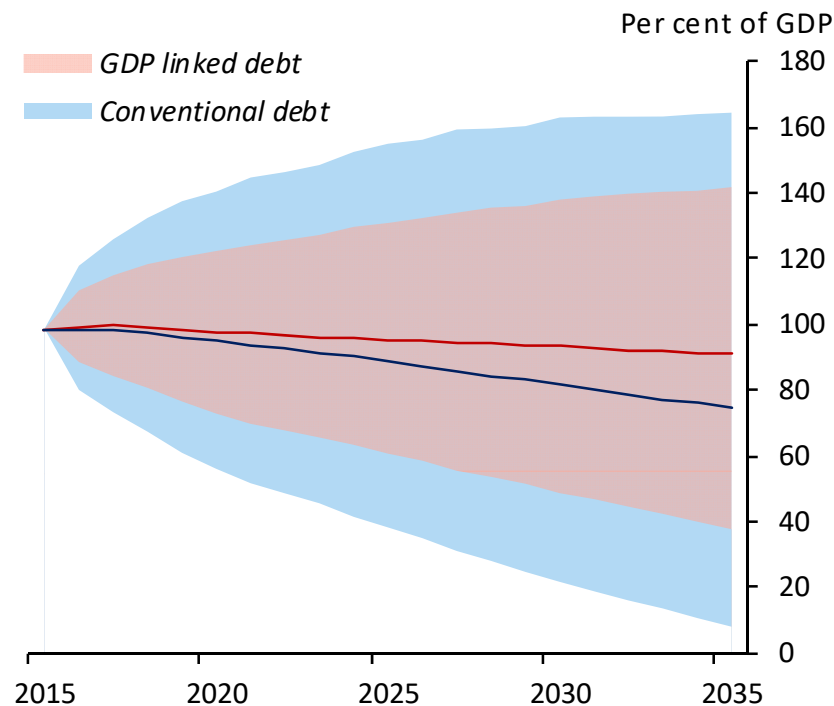
Sovereign GDP-linked securities freeze interest expenses relative to GDP



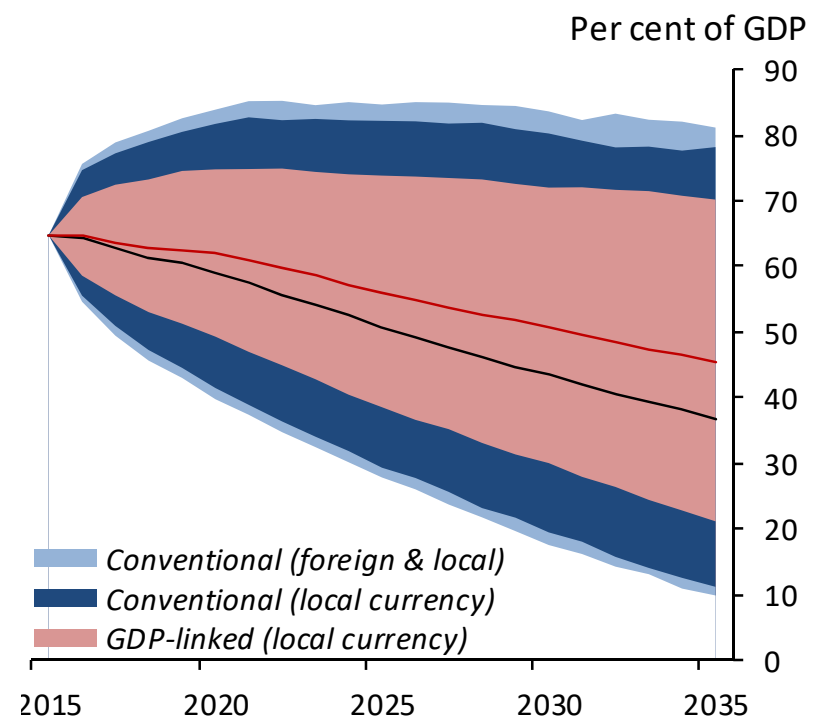
An instrument that aligns debt servicing costs with payment capacity,
thus rendering payment default unnecessary

A shift to GDP-linked issuance reduces the tail risk of explosive sovereign debt ratios

Indebted advanced economy simulated government debt ratios



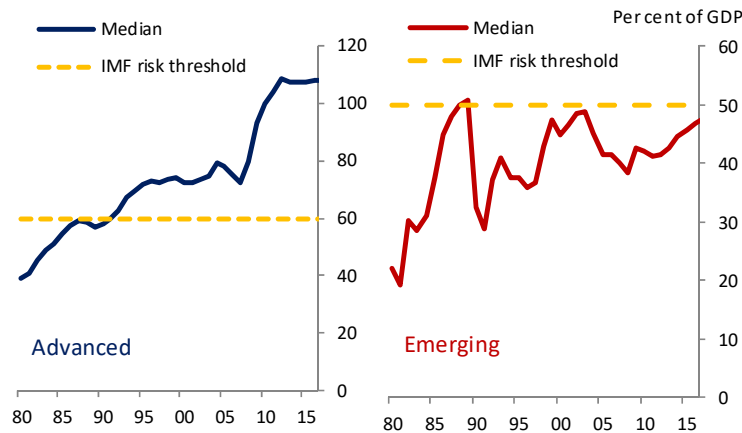
Indebted emerging economy simulated government debt ratios



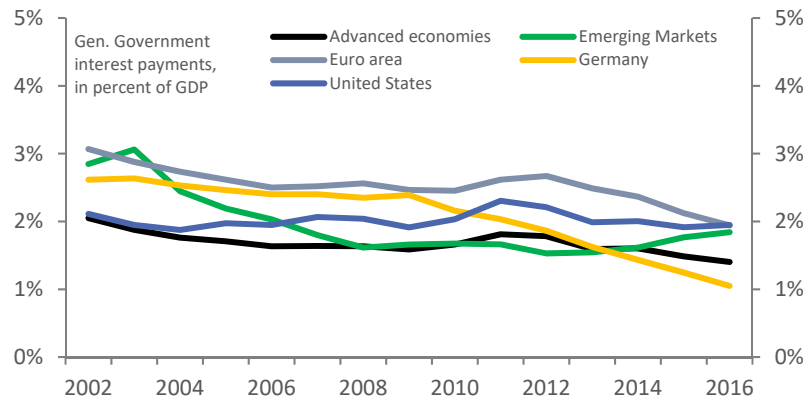
Simulation assumes GDP-risk premium of 100 bps over fixed rate government bonds. Source: Bank of England

Advantages for sovereign issuers

Elevated debt stocks leave little fiscal space to deal with economic and financial stress



But debt servicing costs are still very low



Debt reversal via inflation is implausible for most sovereign issuers

	Debt denominated in foreign currency	Debt denominated in domestic currency
Ability to generate substantial inflation	Emerging Economies with "original sin" (Argentina, Zambia)	Emerging Economies with domestic bond market (Brazil, South Africa)
Inability to generate substantial inflation	Euro area member states (France, Greece)	Advanced economies (UK, US, Sweden)

Sovereigns can buy insurance against the next downturn by locking in low debt servicing costs relative to GDP

Switching just a quarter of the outstanding public debt into GDP-linked securities lessens the need for fiscal consolidation by more than 0.1% of GDP for every 1% shock to economic output. Even a partial move from fixed rate debt into GDP-linked instruments creates fiscal space for the sovereign and significantly reduces the need for austerity policies in an economic downturn.

Advantages of GDP-linked securities

- **For sovereign issuers:** purchase insurance against economic downturn and loss of market access
- **For corporate issuers:** better align debt with payment capacity
- **For investors in advanced economies:** avoid insolvency from locking in negative real yields by gaining upside if growth recovers
- **For central banks:** avoid fiscal dominance by regaining the ability to raise interest rates without bankrupting sovereigns

Design of GDP-linked securities

A. Introducing bullet repayments

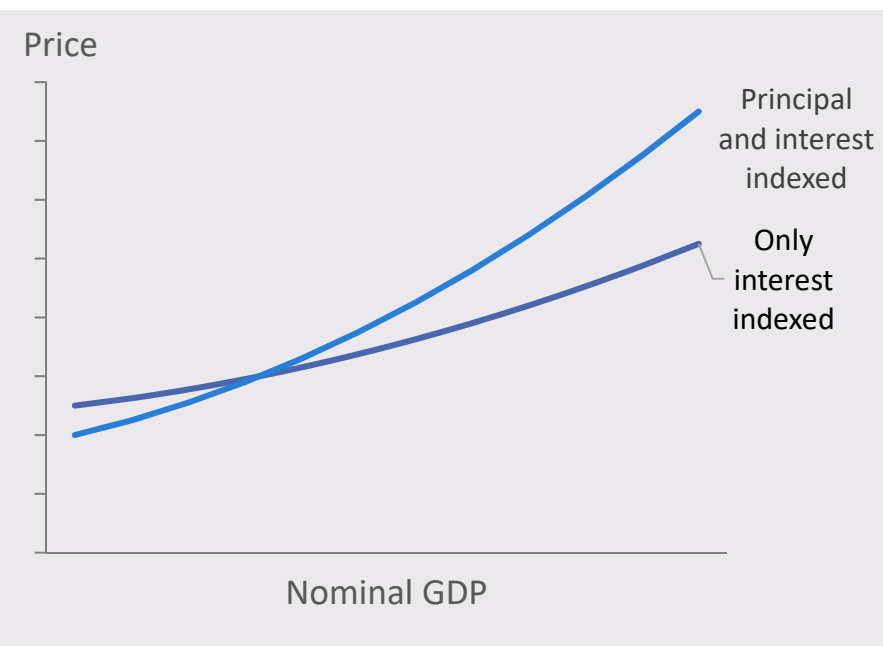
- Most GDP warrants in the market only offer a stream of annuity payments to investors, as in the cases of Argentina, Greece and Ukraine.
- Introducing a bullet repayment allows capital preservation over time and renders the bond into a store of value, which is important for most long-term investors.

B. Overcoming the problems of GDP warrants

From GDP warrants...	... to GDP linked bonds
Derivative instrument	Cash instrument
Bespoke and complex	Plain vanilla
One-sided risk sharing, asymmetrical pay-out profile	Two-sided risk sharing, symmetrical pay-out profile
Issued in restructuring (gone concern)	Issued in primary market (going concern)

C. Linking the principal to Nominal GDP

- Generates equity-like returns for investors, thereby offering a true alternative to fixed-rate bonds.
- Allows the issuer to stabilise debt as a portion of GDP in the face of a growth shock.



Basic payment structure

- Guiding principle: Payment structure needs to reflect the sovereign's capacity to pay, i.e. it's ability to tax
- Coupon *and* principal are indexed to GDP
- Indexation is to the *level* of GDP
 - Stabilising both flow *and* stock of debt as a portion of GDP
- Indexation is to *nominal* GDP
 - Buyer receives inflation protection
- Issued in *local* currency
 - Issuer receives exchange rate protection
- Long term maturities

Coupon and redemption value are indexed to the level of nominal GDP, such that the semi-annual coupon payment in period t and final principal repayment in period T , per 100 face value, given a coupon of c per cent and issuance in period 0, evolve according to the following formula:

$$\begin{aligned}\text{Coupon}_t &= c / 2 * 100 * \text{GDP}_t / \text{GDP}_0 \\ \text{Redemption}_T &= 100 * \text{GDP}_T / \text{GDP}_0\end{aligned}$$

For example, consider a GDP-linked bond issued on 18 May 2016 with coupon of 0.1 per cent and a maturity date of 18 May 2026. Say base level of nominal GDP is 105 and GDP in 2026 is 160, the final coupon and principal repayment per 100 face value will be:

$$\begin{aligned}\text{Coupon} &= 0.001 / 2 * 100 * 160 / 105 = 0.076 \\ \text{Redemption} &= 100 * 160 / 105 = 152.4\end{aligned}$$

Market pricing

Issuance of fixed rate bonds

- Example: tap of the France fixed rate bond 2.75% due 2027 by AFT
- Since the coupon rate is higher than the market yield, the bond will be issued at a price above par

Payment dates	Projected payments		
	Interest	Principal	Total
30/06/2016			-1,291,684
25/10/2016	27,500		27,500
25/10/2017	27,500		27,500
25/10/2018	27,500		27,500
25/10/2019	27,500		27,500
25/10/2020	27,500		27,500
25/10/2021	27,500		27,500
25/10/2022	27,500		27,500
25/10/2023	27,500		27,500
25/10/2024	27,500		27,500
25/10/2025	27,500		27,500
25/10/2026	27,500		27,500
25/10/2027	27,500	1,000,000	1,027,500
Market yield			0.29%

Market pricing

Issuance of inflation linked bonds

- Example: tap of the France inflation-linked bond 1.85% due 2027 by AFT
- The coupon rate is higher than the market yield, the coupon and the principal repayment are indexed to inflation
- The bond is priced at the yield of fixed rate bonds plus an inflation risk premium of 0.02%

Payment dates	Projected payments		
	Interest	Principal	Total
30/06/2016			-1,402,842
25/07/2016	19,815		19,815
25/07/2017	20,026		20,026
25/07/2018	20,226		20,226
25/07/2019	20,428		20,428
25/07/2020	20,633		20,633
25/07/2021	20,839		20,839
25/07/2022	21,047		21,047
25/07/2023	21,258		21,258
25/07/2024	21,470		21,470
25/07/2025	21,685		21,685
25/07/2026	21,902		21,902
25/07/2027	22,121	1,195,723	1,217,844
Market yield			0.31%

Market pricing

Issuance of GDP-linked securities

- Example: Issuance of a new 12-year GDP-linked bond with a base coupon of 1%
- Coupon and redemption are linked to nominal GDP, which is assumed to grow at 3% per annum
- The bond is priced at the yield of fixed rate bonds plus a GDP risk premium ϑ of 0.10%

Payment dates	Projected payments		
	Interest	Principal	Total
30/06/2016			-1,500,000
30/06/2017	10,300		10,300
30/06/2018	10,609		10,609
30/06/2019	10,927		10,927
30/06/2020	11,255		11,255
30/06/2021	11,593		11,593
30/06/2022	11,941		11,941
30/06/2023	12,299		12,299
30/06/2024	12,668		12,668
30/06/2025	13,048		13,048
30/06/2026	13,439		13,439
30/06/2027	13,842		13,842
30/06/2028	14,258	1,425,761	1,440,018
Market yield			0.41%

Market pricing

Important take-away

- The principal of GDP-linked securities rises every year by the growth rate of nominal GDP.
- GDP-linked securities have a variable step-up coupon that rises every year by the growth rate of nominal GDP.
- This results in higher cash flows than fixed-rate bonds.
- However, GDP-linked securities do not need to be more costly for the issuer, since expected cash flows are discounted using the respective nominal fixed-rate curve.

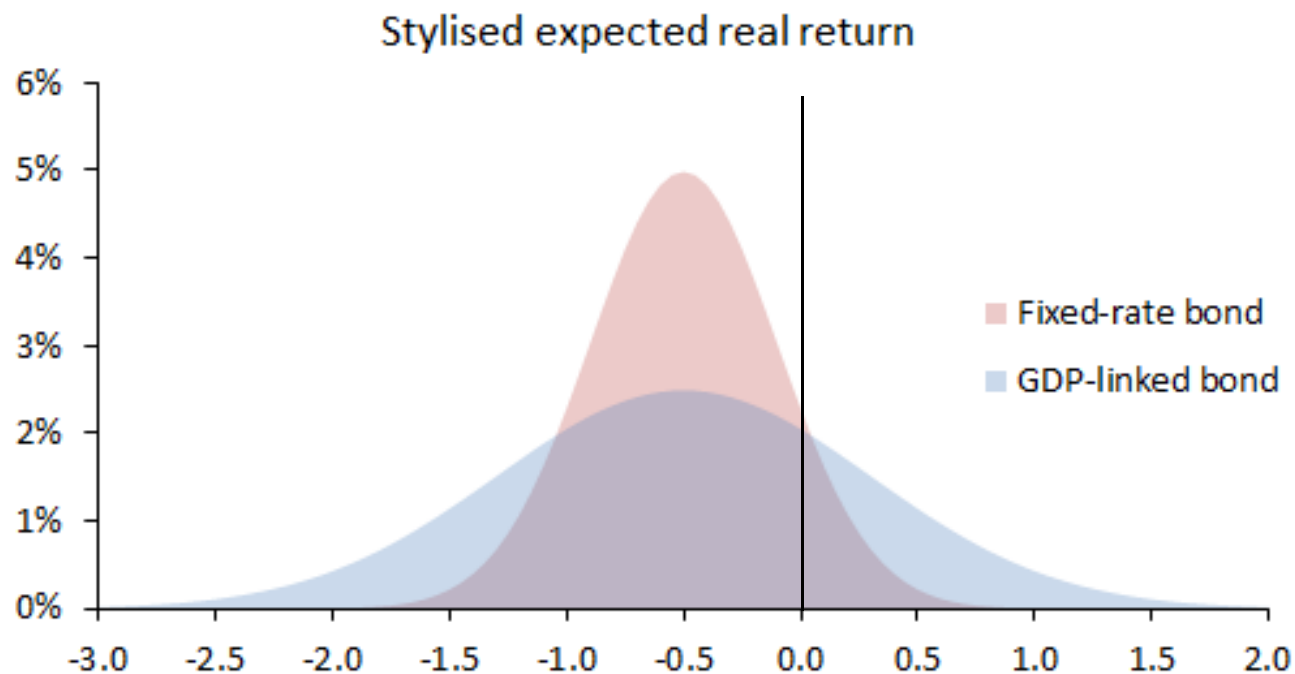
Market pricing

Determining the GDP risk premium ϑ

- Risk-averse investors will demand a risk premium ϑ for holding GDP-linked bonds over fixed rate bonds.
- The yield on GDP-linked bonds $i(t)$ is related to the yield on risk-free fixed rate bonds i^* and to trend nominal growth n^* such that $[1+i(t)] = [1+i^*]/[1+n^*-\vartheta]$
For instance, if the risk-free nominal rate is 3.4%, expected trend nominal growth is 2.1% and the nominal interest rate on GDP-linked bonds is 2.3%, then the GDP risk premium is 1%.
- While the interest rates on fixed rate and on GDP-linked bonds will be observable, ϑ can only be implied by relying on forecasts on nominal GDP growth n^* .
- ϑ is a function of the volatility of nominal GDP $\sigma(n)$, the elasticity of tax revenues relative to nominal GDP ϵ , the social cost of defaulting c and the liquidity differential.
- Estimates for ϑ range between 0.3% and 1.5%.
- Problem of **multiple equilibria**: investors will demand a high ϑ if there is only one issuer of GDP-linked bonds and a low ϑ if they can diversify away the volatility of an individual country's GDP by purchasing a large basket of claims on different countries (cf. Blanchard et al. 2016).
- GDP-linked bonds are particularly attractive for foreign residents, and this requires a market with several issuers.

GDP-linked securities serve as a better store of value than fixed-rate bonds

Example: $i^* = 1.5\%$, $\pi = 2.0\%$, $\vartheta = 0.0\%$, $\sigma(n) = 2 \times \sigma(\pi)$. Expected annual real return on both the nominal bond and the GDP-linked bond is -0.5% . Probability of losing purchasing power on fixed-rate bond is 88%, probability of losing purchasing power on inflation-linked bond is 72%. From the perspective of real returns, GDP-linked bonds may be less risky than fixed-rate bonds.



Interest in GDP-linked securities

- The IMF should “explore the technicalities, opportunities, and challenges of state-contingent debt instruments, including GDP-linked bonds”
G20 leaders’ communique, Hangzhou summit, 5 September 2016
- “...introducing GDP-linked bonds, if cleverly designed, could help reduce the risk of sovereign defaults.”
Jens Weidmann, December 2016
- Positive feedback from Swiss Re, Norwegian Sovereign Wealth Fund, Union Investment, Wellington and other institutional investors

Einaudi's dream

Caratteristica specie di trincea è il debito. Se non esistesse il contratto di mutuo, di capitali personali e materiali; se non fosse possibile investire i capitali ad un saggio determinato di interesse, ma tutti riscuotesero dividendi variabili in funzione del reddito netto dell'impresa; se non fosse possibile locare a stipendio o salario fisso il lavoro, ma tutti i lavoratori intellettuali e manuali fossero pagati con una quota del prodotto dell'impresa, perchè dovrebbe esserci crisi? Tutti parteciperebbero al risultato della produzione e, fossero alti o bassi i prezzi, ognuno riceverebbe la sua quota della torta.

Luigi Einaudi: "Debiti", in: La Riforma Sociale, 1934:

"What if the contract for loans, for personal and material capital did not exist; if it were impossible to invest capital at a fixed rate of interest, and everyone instead collected variable dividends depending on the net income of the firm; if it were impossible to hire labour at a fixed salary or wage, but all intellectual and manual workers were paid instead with a share of the firm's output? In this case, **why should there be crises?**"