

# Factor Income Shares and Capital Accumulation in Peru: 1940-2019

Multidisciplinary Seminar - Stone Center on Socio Economic  
Inequality

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**THE NEW SCHOOL  
FOR SOCIAL RESEARCH**

- National Accounts and Factor Income Shares in Peru
  - Problems with the Peruvian National Accounts
  - Methodological summary
- Main results: Reconstruction of the Peruvian Factor Income Shares
- Applications
  - Stylized facts and international comparison
  - Political Economy Analysis: Wage share decomposition and rate of profit
  - Complement existing methods: labor and capital shares, and the mixed income
- Further steps
- Conclusions

# National Accounts and Factor Income Shares in Peru

## Main Problems

### Problems with the Peruvian National Accounts:

- Scattered sources among different technical reports: discontinuity in the series of factor income shares
- Different accounting templates for their construction: misclassification and risk of double accountability
- High presence of informal and non-salaried employment since the beginning of the 1980s

Wage share - Sources

Profit share - Sources

Different Accounting Templates

# National Accounts and Factor Income Shares in Peru

## Central Bank - National Income Technical Report

RENTA NACIONAL AL COSTO DE LOS FACTORES (en miles de soles)										
R U E B R O S	1942	1943	1944	1945	1946	1947	1948	1949		
1. Sueldos .....	297,332	311,566	341,920	563,228	510,304	752,663	905,648	1,170,610		
2. Salarios .....	493,281	512,350	709,800	727,069	890,648	1,130,347	1,249,715	1,674,312		
3. Sueldos y salarios del Gobierno .....	260,610	277,872	346,373	361,180	428,349	424,853	502,619	940,247		
4. Total sueldos y salarios .....	1,041,223	1,101,728	1,401,095	1,651,423	1,829,301	2,316,947	2,657,982	3,785,169		
5. Participación patronos, colaboradores, independientes y otros .....	962,928	902,486	980,600	1,291,065	1,331,768	1,852,402	3,014,804	3,795,221		
6. Renta predial .....	124,670	139,141	160,040	187,127	205,119	233,790	270,152	344,006		
7. Utilidades (con impuestos) .....	347,882	440,642	563,216	562,977	827,427	952,783	1,123,532	1,402,374		
8. Intereses .....	60,749	65,685	69,031	72,922	83,693	93,461	102,484	148,948		
9. Gobiernos: ingresos por monopolio, explotaciones y otros, menos gastos de material .....	—	28,236	35,559	39,500	39,845	23,416	21,832	48,186	—	81,961
10. Renta nacional al costo de los factores ..	2,509,216	2,614,123	3,134,482	3,665,669	4,373,882	5,447,531	7,129,268	9,209,757	R	
Más:										
11. Impuestos deducibles (indirectos), pagos de transferencia y depreciación estadística	264,512	281,301	283,793	326,389	353,064	570,834	644,200	715,316		
12. Valor neto agregado a producto nacional neto .....	2,713,528	2,895,424	3,418,375	3,992,058	4,626,946	6,018,365	7,764,468	10,105,973		
13. Depreciación a inversiones cargadas al costo .....	258,580	345,229	410,643	462,562	663,839	797,967	859,542	1,968,146		
14. Valor agregado total o producto nacional bruto .....	2,952,108	3,240,653	3,828,918	4,454,629	5,290,785	6,816,332	8,624,010	12,074,219		



# National Accounts and Factor Income Shares in Peru

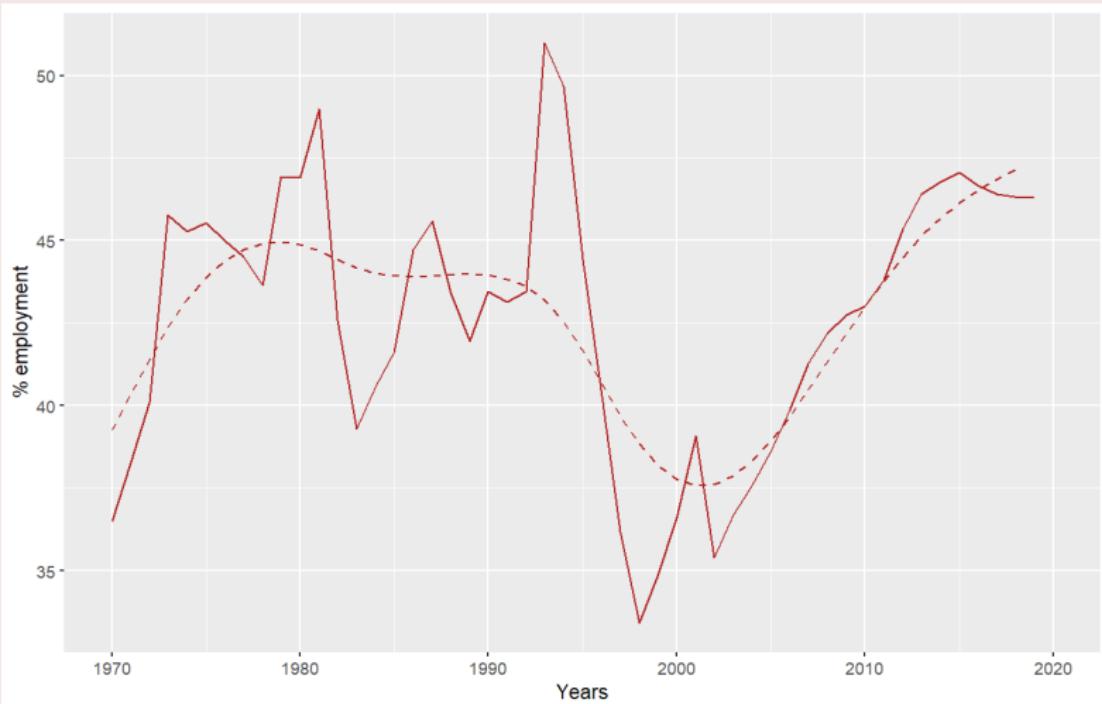
## INE - National Accounts

LAS CUATRO CUENTAS CONSOLIDADAS DE LA NACION (CONT.)			
VALORES A PRECIOS CORRIENTES (MILLONES DE SOLES)			
AÑO 1970			
CUENTA: INGRESO NACIONAL DISPONIBLE Y SU ASIGNAC.			CUENTA: FINANCIACION DEL CAPITAL
12.GASTO PRIV. DE CONSUMO FINAL (6)	191716	15.REMUNERACION DE LOS ASALA- RIADOS (1)	122.VARIACION DE EXISTENC. (8)
13.GASTO CONSU- MO FINAL DEL GOBIERNO(7)	30372	16.REM. DE LOS ASALARIADOS NETA PROCED. RESTO DEL MUNDO (33-37)	126.AHORRO -190 (14) 28599
14.AHORRO (26)	28599	17.EXCEDENTE DE EXPLOTAC. (2)	127.CONSUMO DE CAPITAL 35601 FIJO (3) 15120
		18.RENTA D PROP. DE LA EMPRESA NETA PROCED. DEL RESTO DEL MUNDO (34-38)	128.TRANS.NETA CAP.PROC.R MUNDO (42) -
		19.IMPUESTOS INDIRECTOS(4)	125.PREST.NETO AL RESTO D MUNDO (30) 8308
		20.MENOS: SUBSIDIOS (5)	129.ADUQUIS.NETA D ACTIV.FINANC. (45+31-43) ***
		21.OTRAS TRANS- FERENC. CORR. NETAS PROCED. DEL RESTO DEL MUNDO (35-39)	130.PREST.NETO AL RESTO D MUNDO (25) 6308
ASIGNACION DEL INGRESO NACIO- NAL DISPONIBLE	250687	INGRESO NACIONAL DISPONIBLE	131.EMISION NET.PASIVO (43+29-45) ***
		250687	132.EMISION NETA DE PASIV.MAS ADQUISICION NETA DE ACTIVOS FINANCIEROS ***
			133.PRESTAMO NE- TO AL RESTO DEL MUNDO ***

# National Accounts and Factor Income Shares in Peru

## Predominance of Non-Salaried Employment

### Salaried employment rate (1970-2019)



# National Accounts and Factor Income Shares in Peru

## Relevance Mixed Income Share

### Factor Income Shares for Peruvian Households (2004-2019)



Figure: Source: Instituto Nacional de Estadística e Informática (INEI) (2004-2019)

# National Accounts and Factor Income Shares in Peru

## Political Economy and Policy Regimes

- Political economy reasons:
  - Non well-defined ownership categories: "Indigenous question" and the agriculture mixed income
  - Fiscal revenues relying on indirect taxation (VAT, custom duties) = lack of interest in accounting national income
  - Economic dependence: balance of payments is more important than the national accounts
- Structural Reasons= hyperinflation process 1988-1992 (1989: 3398%, 1990: 7482%, 1991: 409.5%)
- Ideological reasons:
  - Political changes of the 1980s-1990s: state policies lose legitimacy because of the crisis
  - Implementation of neoliberal policies: "Fujishock"

## Methodology

# National Accounts and Factor Income Shares in Peru

## Methodological summary

**Accounting template for the reconstruction - DINA guidelines (Blanchet, Chancel, Flores, Morgan et al. 2021):**

$$GDP_t = Wages_t + \Pi_t + MixInc_t + CFC_t + T\_P_t$$

$$NNI_t = GDP_t + NFI_t - CFC_t$$

$$PTDI_t = NNI_t - T\_P_t - T\_Dir_t + Net\_Soc\_Transf_t - Soc\_Benef_t$$

$$T\_P_t = T\_Cons_t + T\_Prod_t + T\_X_t + Custom\_Duties_t$$

$$T\_Dir_t = T\_Income_t + T\_Wealth_t$$

$$Net\_Soc\_Transf_t = Soc\_Transf_t - Soc\_Contr_t$$

- GDP shares:

$$Wage\_share_t = \frac{Wages_t}{GDP_t}$$

$$MixInc\_share_t = \frac{MixInc_t}{GDP_t}$$

$$Profit\_share_t = \frac{\Pi_t}{GDP_t}$$

### Methodology for the data reconstruction

- Overlapping scattered time series in levels following Pedagua (2009).

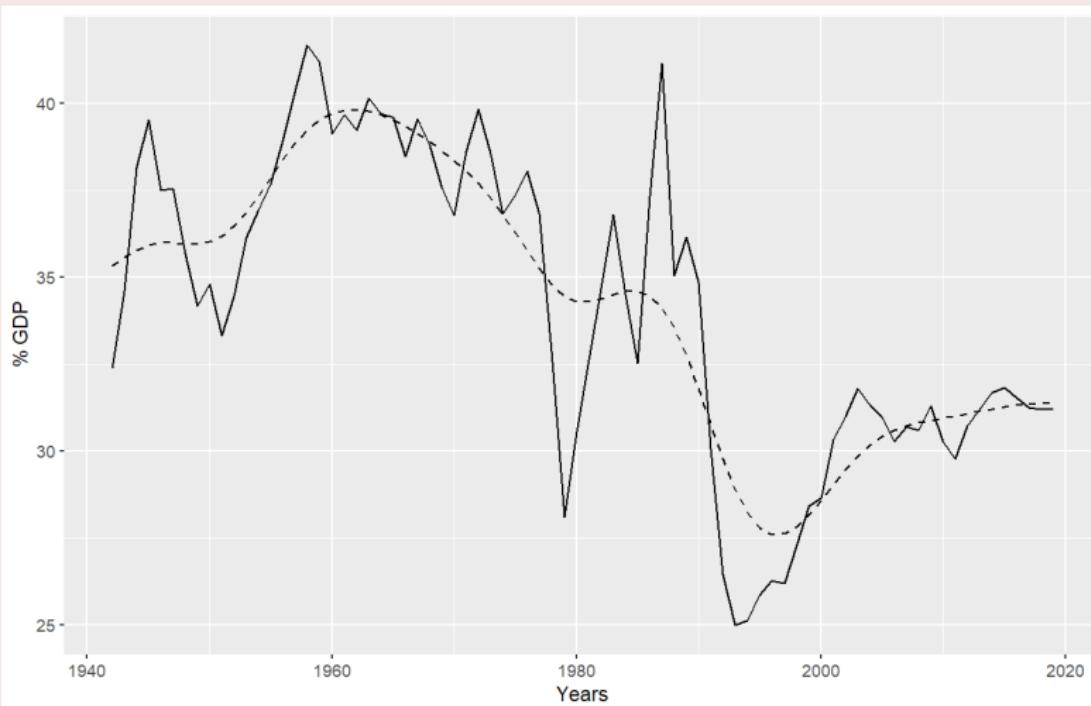
$$\hat{y}_{t-n,base_{t_1}} = y_{t-n,base_{t_0}} * \epsilon_{t_1,t_0}^{\frac{(t-n)-t_0}{t_1-t_0}}; \text{ where } \epsilon_{t_1,t_0} = \frac{y_{t,base_{t_1}}}{y_{t,base_{t_0}}}$$

- Obtaining merged time series for the nominal GDP and taking care of the I-O base years for Peru (1963, 1973, 1979, 1994, 2007).
- Profit share as a residual after reconstructing the wage share, the mixed-income share, and the net taxes on products accounts.

## Main Results

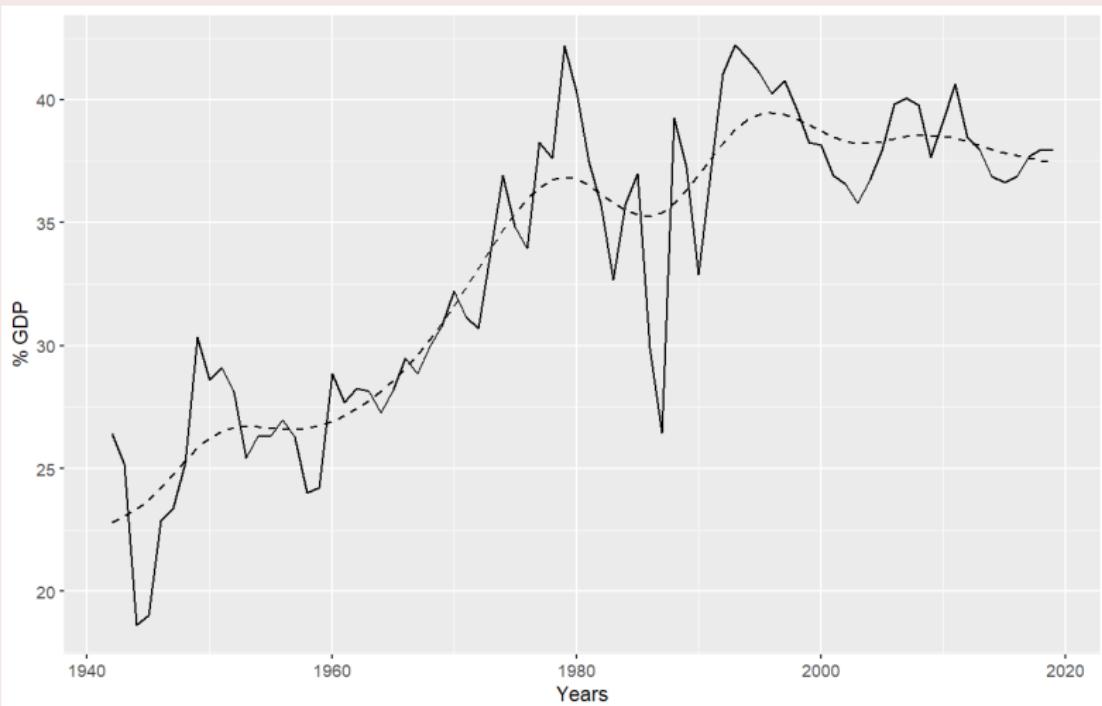
# Factor Income Shares in Peru: main results

## Wage share (1942-2019)



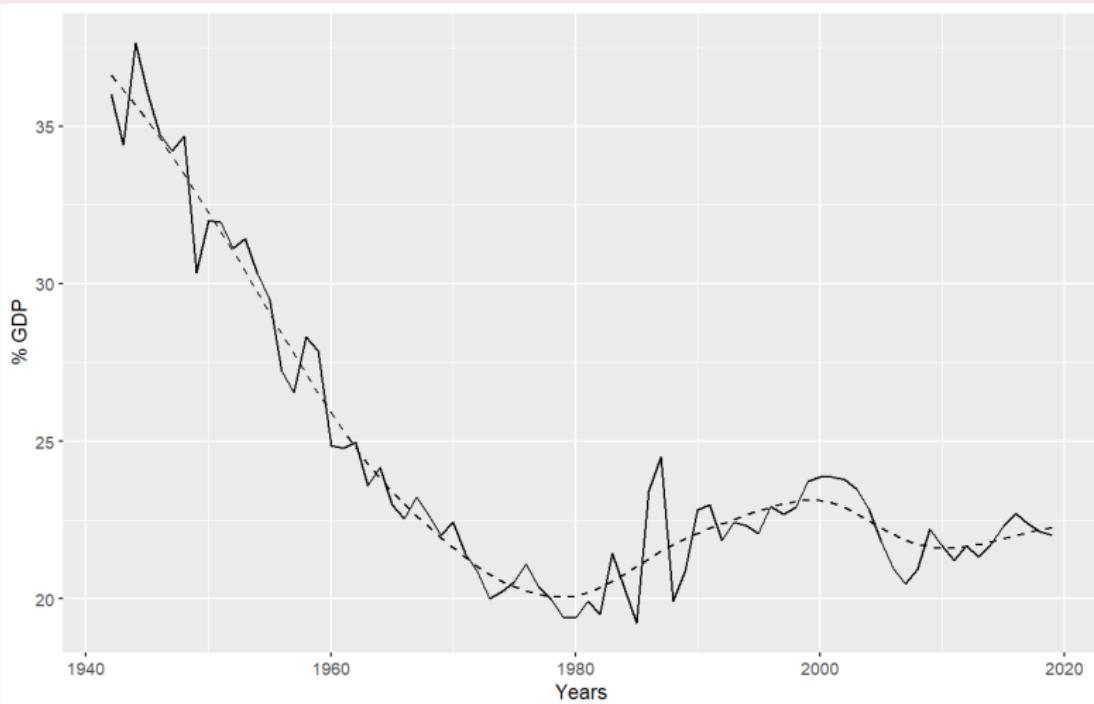
# Factor Income Shares in Peru: main results

## Profits share (1942-2019)



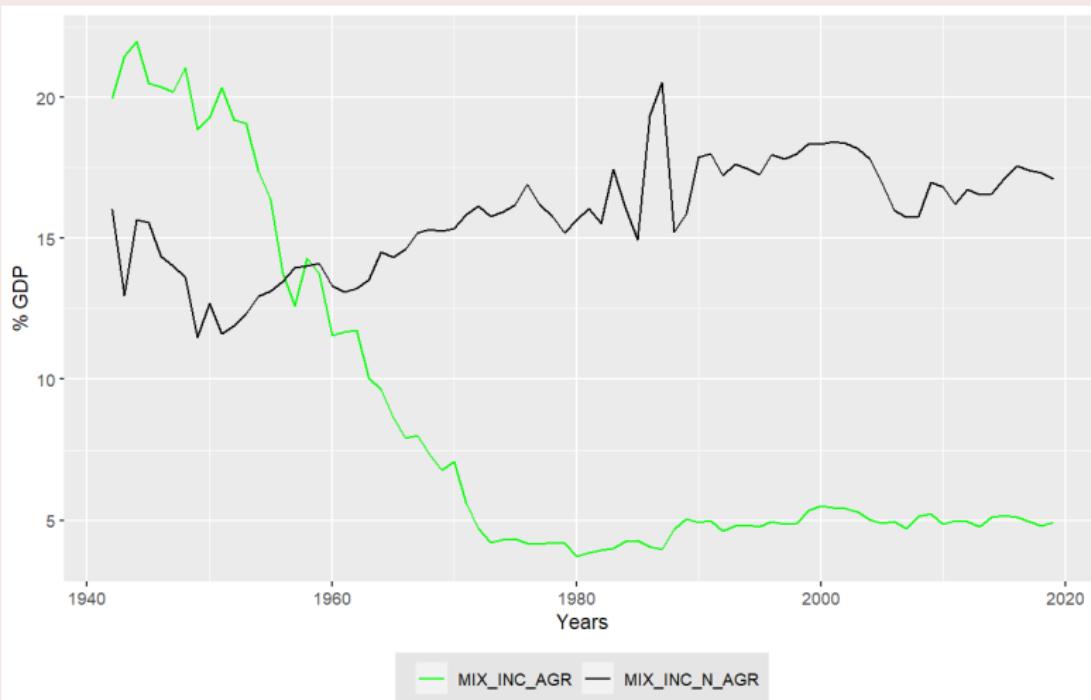
# Factor Income Shares in Peru: main results

## Mixed-income share (1942-2019)



# Factor Income Shares in Peru: main results

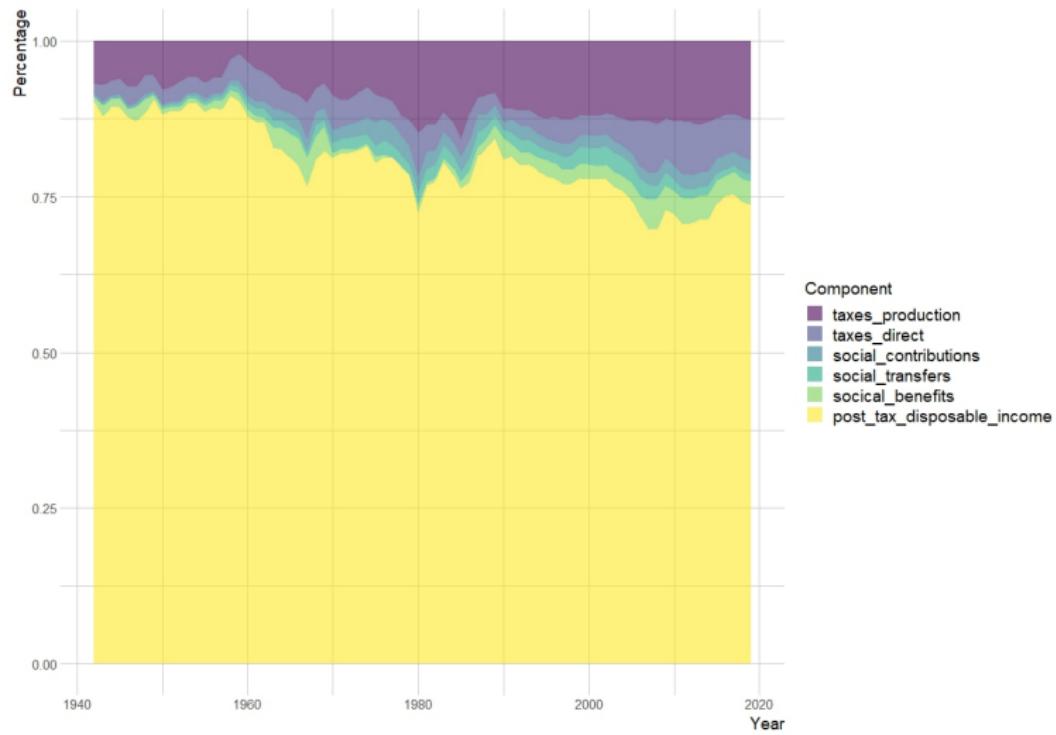
## Agriculture and non-agriculture mixed income shares (1942-2019)



## Applications (I): Net National Income and International Comparison

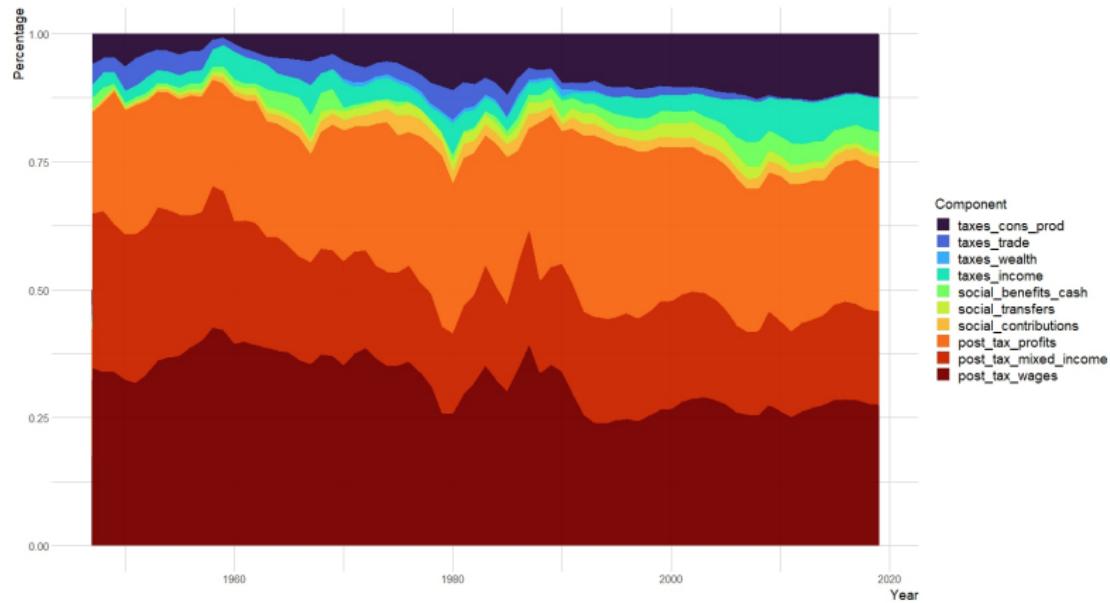
# Stylized Facts and International Comparison

## Net National Income Composition (1942-2019)



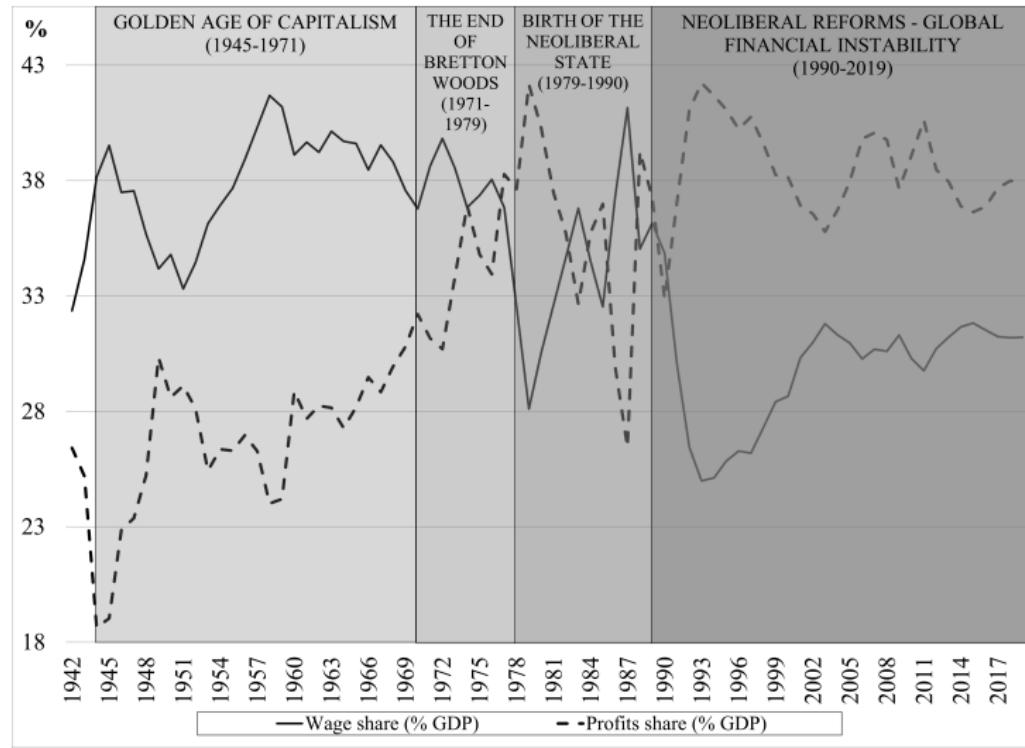
# Stylized Facts and International Comparison

## Net National Income Composition (1947-2019)



# Stylized Facts and International Comparison

Peruvian factor income shares (% GDP) and global capitalism, 1942-2019



# Stylized Facts and International Comparison

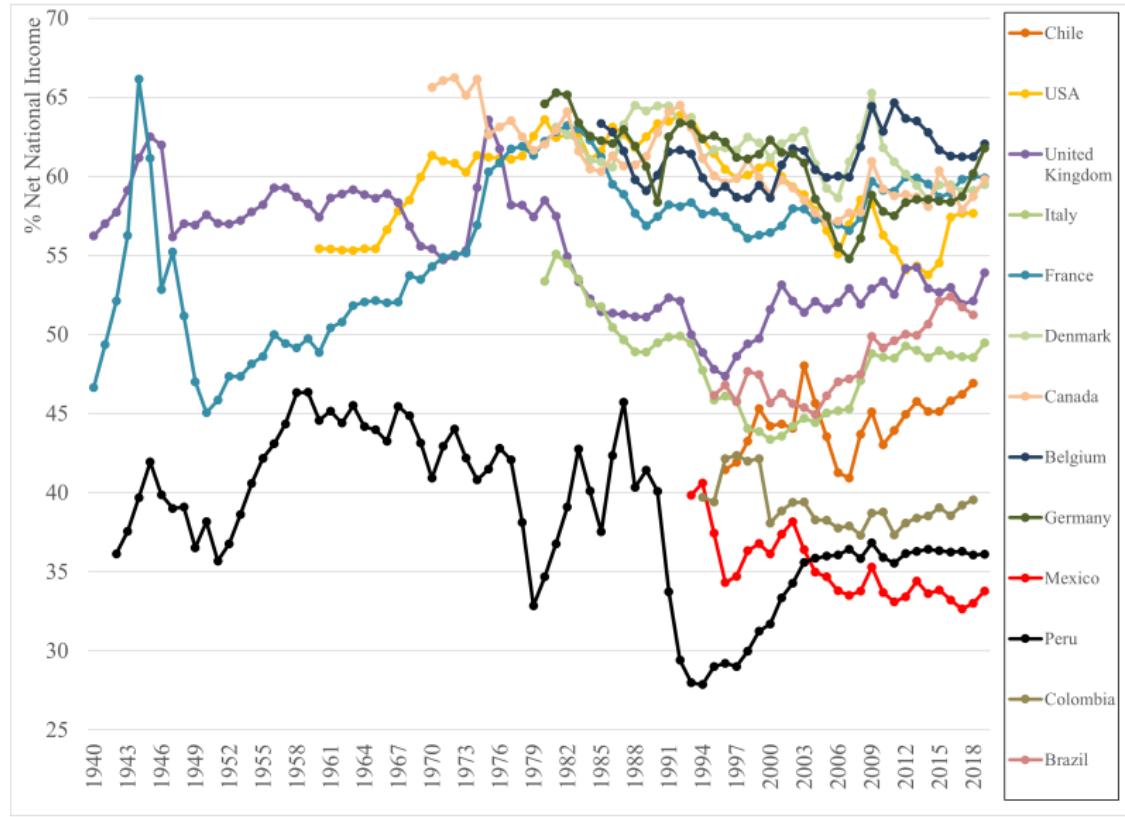
## Aggregate demand components and factor income shares (1942-2019)

Main relations	Full period 1942-2019	Oligarchic State 1942-1956	Crisis of the Oligarchic State 1956-1968	Interventionist State 1968-1990	Neoliberal State 1990-2019
Consumption (% GDP)	65.55%	71.84%	69.92%	67.62%	64.04%
Exports (% GDP)	23.14%	14.90%	18.43%	16.95%	26.37%
Non-traditional /traditional exports (%)	31.33%	20.63%	8.81%	22.49%	36.52%
Imports (% GDP)	19.70%	10.25%	14.46%	13.97%	22.88%
Private investment (% GDP)	14.91%	7.64%	11.54%	10.54%	17.28%
Wage share (% GDP)	34.16%	36.12%	39.72%	35.92%	29.77%
Gross profit share (% GDP)	33.35%	25.46%	27.55%	34.65%	38.48%

Table: Source: World Bank; Central Reserve Bank of Peru (BCRP); National Institute of Statistics and Informatics (INEI); National Institute of Statistics (INE); and Ministry of Finance and Commerce. Political regimes according to Pease and Romero (2014)

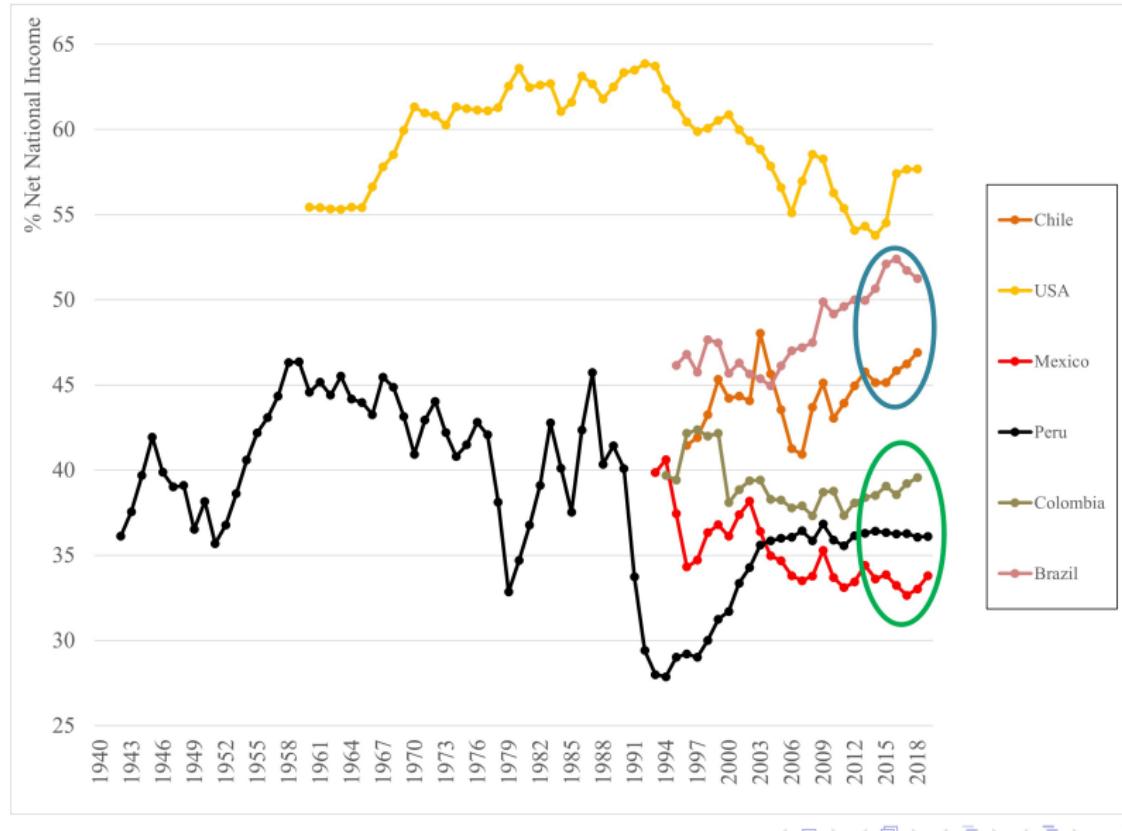
# Stylized Facts and International Comparison

Wage shares (% NNI) in comparative perspective 1942-2019: The Americas and OECD



# Stylized Facts and International Comparison

Wage shares (% NNI) in comparative perspective 1942-2019: The Americas



## Applications (II): Wage and Profits share decompositions

# Decomposing Wages and Profits Shares

## Wage share decomposition

Following Graña and Kennedy (2008) to obtain the real average wage or the average labor cost ( $alc$ ), the average labor productivity ( $q$ ), and the salaried employment rate ( $I_{sal}$ ).

$$\frac{W}{Y} = \frac{w * AP_{salaried}}{Y}$$

$$\frac{W}{Y} = \frac{\frac{w}{deflator} * AP_{salaried}}{\frac{GDP}{deflator}} * \frac{AP_{employed}}{AP_{employed}}$$

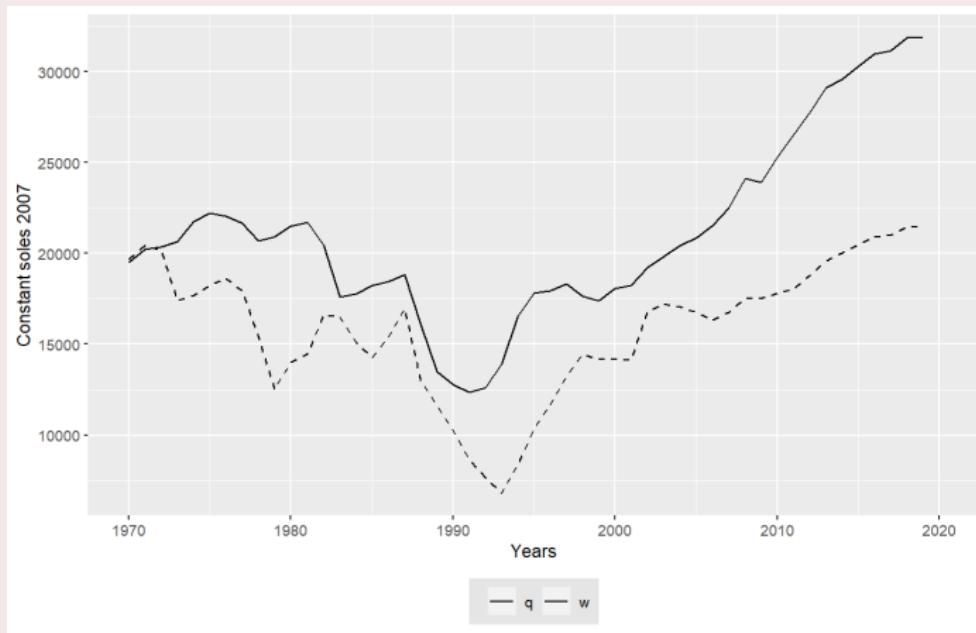
$$\frac{W}{Y} = \frac{w}{deflator} * \frac{1}{\frac{GDP}{deflator * AP_{employed}}} * \frac{AP_{salaried}}{AP_{employed}}$$

$$\frac{W}{Y} = alc * \frac{1}{q} * I_{sal}$$

# Wage share decomposition and the rate of profit

## Wage share decomposition

Average real wage ( $w$ ) and average productivity of labor ( $q$ )  
(1970-2019)



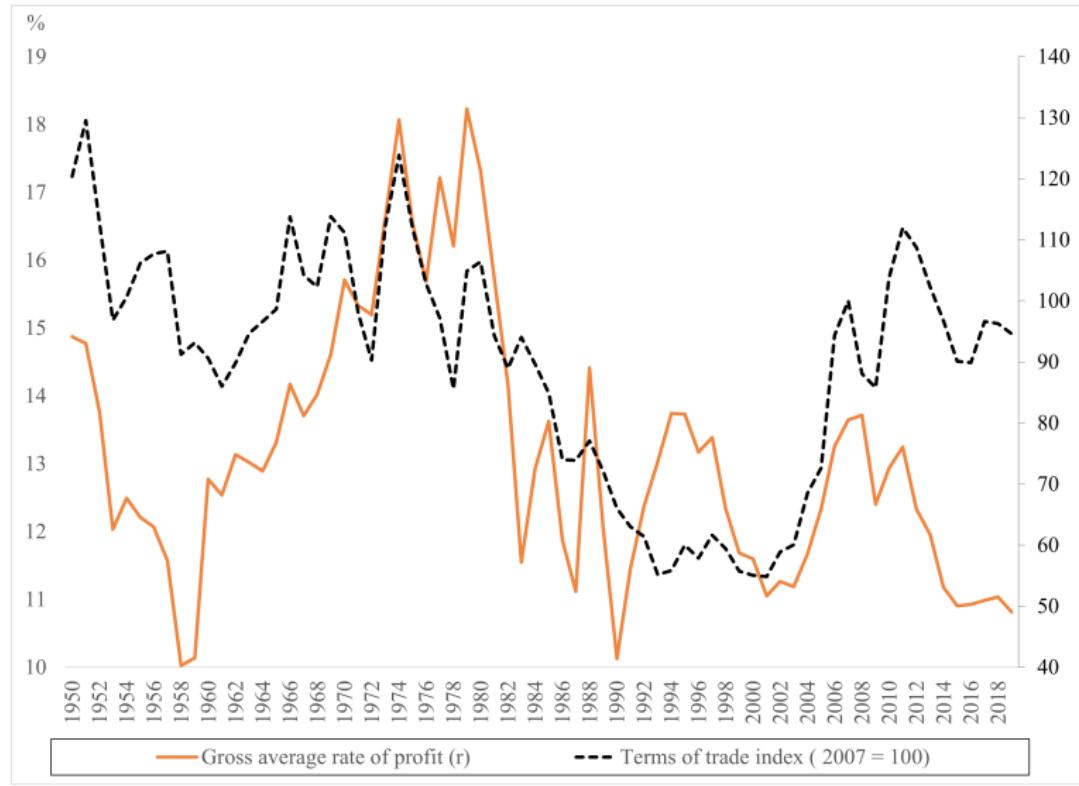
# The rate of profit

- Average rate of profit ( $r$ ) (Bhaduri and Marglin 1990, Basu et. al. 2022) : the product of the profit share times the output-capital ratio.

$$r = \frac{\Pi}{Y} * \frac{Y}{K}$$

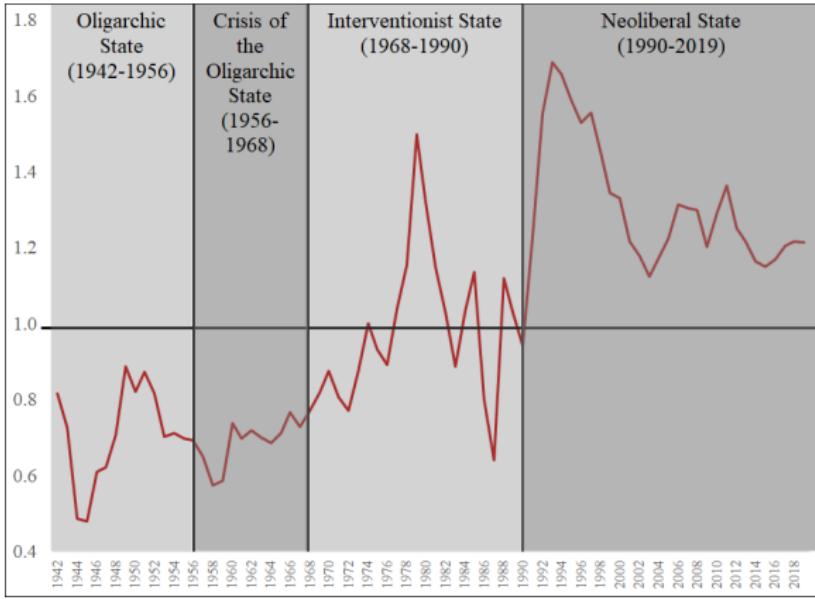
- Output-capital ratio does not include natural capital.
- This "r" is different of the rate of return on capital of Piketty (2014) because uses GDP.
- In a similar spirit as Prebisch's (1950) "The Economic Development of Latin America and Its Principal Problems" scholars as Hausmann, Hwang, and Rodrik (2007) and Ocampo (2017) emphasize the perils of economic dependence from commodity-exporter economies.
- In countries like Peru, profitability evolves in tandem with the terms of trade.

# Gross rate of profit and the terms of trade index (2007=100) (1950-2019)



# Exploitation rate

$$e = \frac{\Pi}{W} = \frac{Surplus - value}{Value Labour Power} = \frac{Unpaid Labor}{Paid Wages}$$



Assumptions: it is not necessary to transform market prices into value terms and excludes any caveat regarding the Marxian transformation problem.

## Applications (III): Re-Allocating the Mixed Income Share

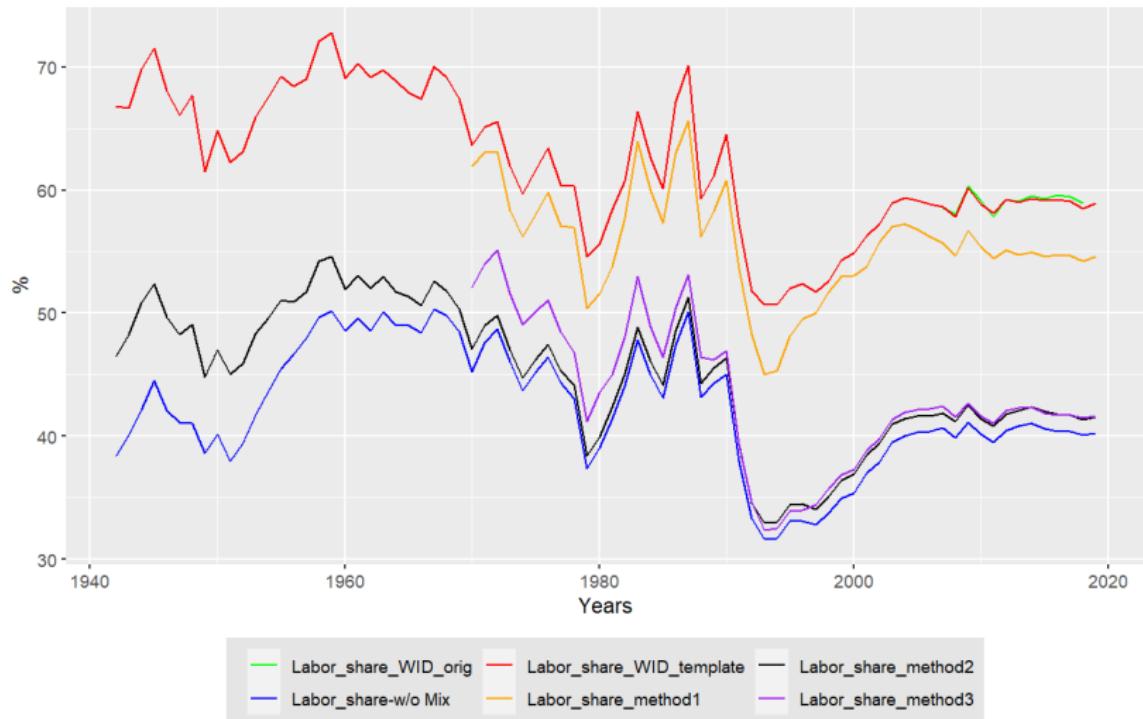
Basic template (DINA guidelines):

$$\text{Labor\_share}_t = \frac{\text{Wages}_t + 0.7 * \text{MixInc}_t}{\text{NNI}_t - T\_P_t}$$
$$\text{Capital\_share}_t = 1 - \text{Labor\_share}_t$$

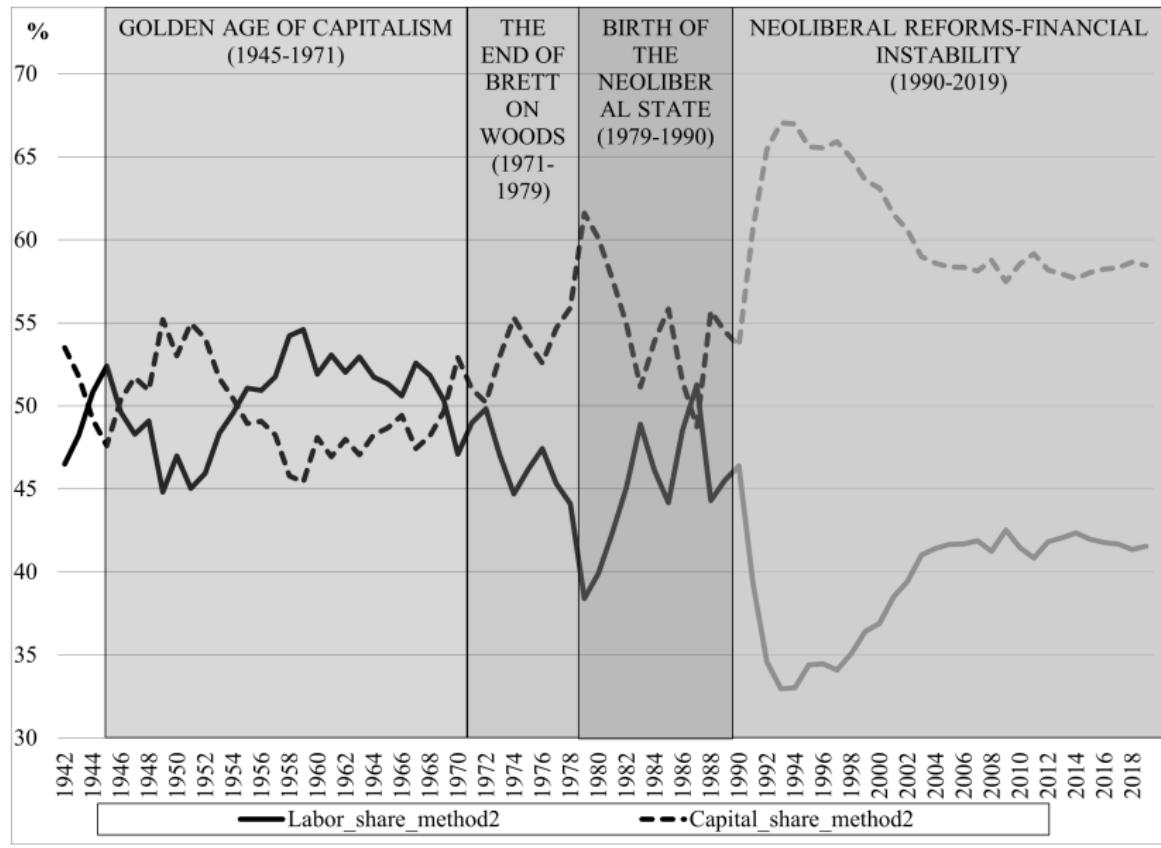
Alternative templates (Abeles, Amarante and Vega 2014):

- Method 1:  $\text{Labor\_share}_t = \frac{\text{Wages}_t + \text{Self\_emplt}\% * \text{MixInc}_t}{\text{NNI}_t - T\_P_t}$
- Method 2:  $\text{Labor\_share}_t = \frac{\text{Wages}_t + \text{Agr\_MixInc}_t\% * \text{MixInc}_t}{\text{NNI}_t - T\_P_t}$
- Method 3:  $\text{Labor\_share}_t = \frac{\text{Wages}_t + \text{Self\_emplt} * \text{Minimum\_wage}_t}{\text{NNI}_t - T\_P_t}$

# Labor and capital shares, and the mixed income



# Labor and capital shares, and the mixed income



- Reconstructed factor income shares are complementary sources for the analysis of income inequality
  - Find taxation data
  - Construction of social tables?
- Estimate time series models for economic growth regimes as in Naastepad and Storm (2006), Lavoie and Stockhammer (2012), Hein and Martschin (2022).
  - Propensities of consumption are different for each class
  - Aggregate demand functions in terms of distributive components:  $C = f(W)$ ,  $I = f(\Pi)$ ,  $X = f(W)$

# Economic Growth Regime Evaluation Model (example)

Equation system based on Naastepad and Storm (2006), Lavoie and Stockhammer (2013), Alarco (2016), and Alarco and Castillo García (2019)

$$Y = C + I + G + X - M \cdots (1)$$

$$V = \frac{W}{P}(\gamma^{-1}) = w\gamma^{-1} \cdots (2)$$

$$\Pi = 1 - w\gamma^{-1} = 1 - V \cdots (3)$$

$$C = [(\delta_w V + \delta_\pi \Pi) Y]$$

$$C = [(\delta_w V + \delta_\pi (1 - V)) Y] \cdots (4)$$

$$M = a_0 + a_1 Y \cdots (5)$$

$$I = f(\pi, Y) = A_I + \theta_0 \pi + \theta_1 Y \cdots (6)$$

$$X = g(Z, \pi) = A_X + \epsilon_0 Z + \epsilon_1 \pi \cdots (7)$$

# Economic Growth Regime Evaluation Model (example)

Elasticity of the GDP regarding the wage share in (8')

$$E_{YV} = \frac{C}{Y} E_{CV} + \frac{I}{Y} E_{IV} + \frac{X}{Y} E_{XV} - \alpha_1 E_{YV} \cdots (8)$$

$$\frac{C}{Y} E_{CV} = (\delta_w + \delta_\pi) \frac{W}{Y} + \delta_\pi E_{YV}$$

$$\frac{I}{Y} E_{IV} = (\theta_0 + \theta_1) E_{YV} - \theta_0 \frac{W}{Y}$$

$$\frac{X}{Y} E_{XV} = \epsilon_1 E_{YV} - \epsilon_1 \frac{W}{Y}$$

$$\frac{M}{Y} E_{MV} = \alpha_1 E_{YV}$$

$$E_{YV} = \left( \frac{1}{1 - \delta_\pi - (\theta_0 + \theta_1) - \epsilon_1 + \alpha_1} \right) [(\delta_w - \delta_\pi) - \theta_0 - \epsilon_1] \frac{W}{Y} \cdots (8')$$

- Reconstruct income shares for Peru requires the combination of multiple sources that were already prepared by the official agencies. Yet, the Peruvian statistics system lacks a procedure for merging the scattered results.
- The reconstructed data shows Peruvian factor income shares follow structural patterns of global capitalism (changes in regimes of accumulation).
- Results of wage share decomposition show a gap between labor productivity and average wage for the Peruvian salaried workers since the 1970s, which can explain the reduction of the labor income share in the former decade
- Average profit rate for the Peruvian economy moves according to the terms of trade, suggesting that the evolution of Peruvian capital is still pegged to the foreign sector.



**THAT'S ALL FOLKS**

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# References I

-  Alarco, Germán (2016). "Factor income distribution and growth regimes in Latin America, 1950–2012". In: *International Labour Review* 155(1), pp. 73–95. DOI: <https://doi.org/10.1111/ilr.12006>. eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/ilr.12006>. URL: <https://onlinelibrary.wiley.com/doi/abs/10.1111/ilr.12006>.
-  Alarco, Germán and César Castillo García (2019). "Functional distribution of income and growth regime in Peru, 1942- 2013". In: *CEPAL Review, August 2018*( 125), pp. 211–227.
-  BCRP (1951). *Renta nacional del Perú 1942-1949*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1952). *Renta nacional del Perú 1942-1951*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1959). *Renta nacional del Perú 1942-1957*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1962). *Renta nacional del Perú 1942-1960*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1966). *Cuentas Nacionales del Perú 1950-1965*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1968). *Cuentas Nacionales del Perú 1950-1967*. Tech. rep. Banco Central de Reserva del Perú.

## References II

-  BCRP (1970). *Cuentas Nacionales del Perú 1960-1969*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1974). *Cuentas Nacionales del Perú 1960-1973*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1976). *Cuentas Nacionales del Perú 1960-1974*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1984). *Memoria anual 1983*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1987). *Memoria anual 1986*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1990). *Memoria anual 1989*. Tech. rep. Banco Central de Reserva del Perú.
-  BCRP (1991). *Memoria anual 1990*. Tech. rep. Banco Central de Reserva del Perú.
-  García, Norberto (2013). "Fast economic growth and income distribution (Peru 1990-2010)". In: *Economie Appliquée* 1.
-  Graña, Juan M and Damián Kennedy (2008). *Salario real, costo laboral y productividad, Argentina 1947-2006: Análisis de la información y metodología de estimación*. Tech. rep. Documentos de Trabajo.
-  INE (1980). *Cuentas nacionales del Perú 1950-1979*. Tech. rep. Instituto Nacional de Planificación, Oficina Nacional de Estadística.

# References III

-  INE (1981). *Cuentas nacionales del Perú 1950-1980*. Tech. rep. Instituto Nacional de Planificación, Oficina Nacional de Estadística.
-  INE (1990). *Cuentas nacionales del Perú 1981-1990*. Tech. rep. Instituto Nacional de Estadística. Dirección General de Cuentas.
-  INEI (2013). *Oferta y demanda global 1991-2012. Año base 1994*. Tech. rep. Instituto Nacional de Estadística. Dirección General de Cuentas.
-  INEI (2021). *Series nacionales*. URL:  
<http://webapp.inei.gob.pe:8080/sirtod-series/>. (accessed: 11.31.2021).
-  Lavoie, Marc and Engelbert Stockhammer (2013). *Wage-led growth: An Equitable Strategy for Economic Recovery*. Palgrave MacMillan.
-  Ministerio de Hacienda y Comercio (1951). *Anuario estadístico del Perú 1948-1949*. Tech. rep. Ministerio de Hacienda y Comercio- Dirección Nacional de Estadística y Censos.
-  Ministerio de Hacienda y Comercio (1959). *Anuario estadístico del Perú 1956-1957*. Tech. rep. Ministerio de Hacienda y Comercio- Dirección Nacional de Estadística y Censos.
-  Ministerio de Hacienda y Comercio (1969). *Anuario estadístico del Perú 1966*. Tech. rep. Ministerio de Hacienda y Comercio- Dirección Nacional de Estadística y Censos.

## References IV

-  Naastepad, CWM and Servaas Storm (2006). "OECD demand regimes (1960-2000)". In: *Journal of Post Keynesian Economics* 29(2), pp. 211–246.
-  Pedagua, Luis (2009). "Alternativas metodológicas para el empalme estadístico de series temporales: caso Venezuela 1950-2005". In: *Temas de Coyuntura*( 59), pp. 7–38.

## Different accounting templates<sup>1</sup>:

- National Income - technical reports:

$$GNP_t = W_t + MixInc_t + \Pi_{pub} + \Pi_{priv} + T\_P_t + Depreciation_t$$

- Central Bank National Accounts:

$$GDP_t = W_t + MixInc_t + \Pi_t + T\_P_t + Depreciation_t$$

- INE National Accounts:

$$GDP_t = W_t + \Pi_t^* + T\_P_t + Depreciation_t$$

- INEI National Accounts:

$$GDP_t = W_t + MixInc_t + \Pi_t'' + T\_P_t$$

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<sup>1</sup>\* includes Mixed Income, " includes Consumption of Fixed Capital



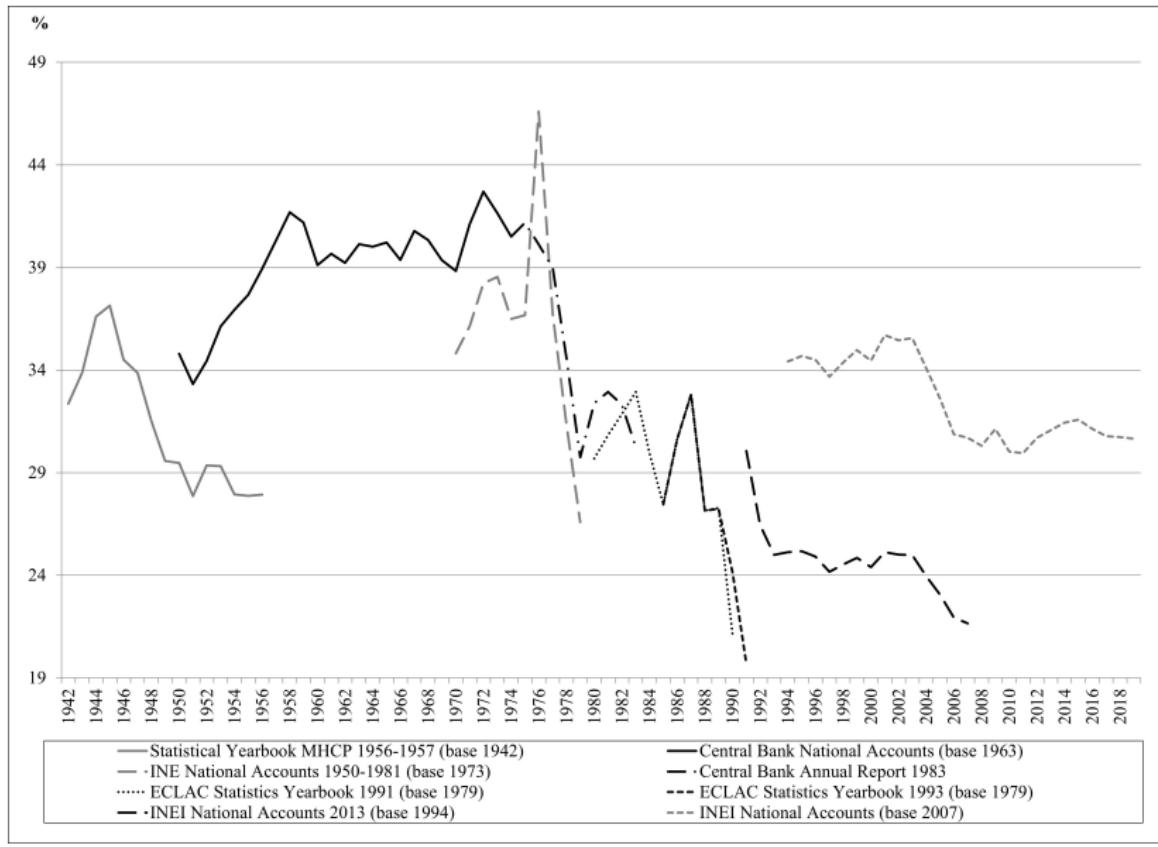
# National Accounts and Factor Income Shares in Peru

## Factor income shares: data availability

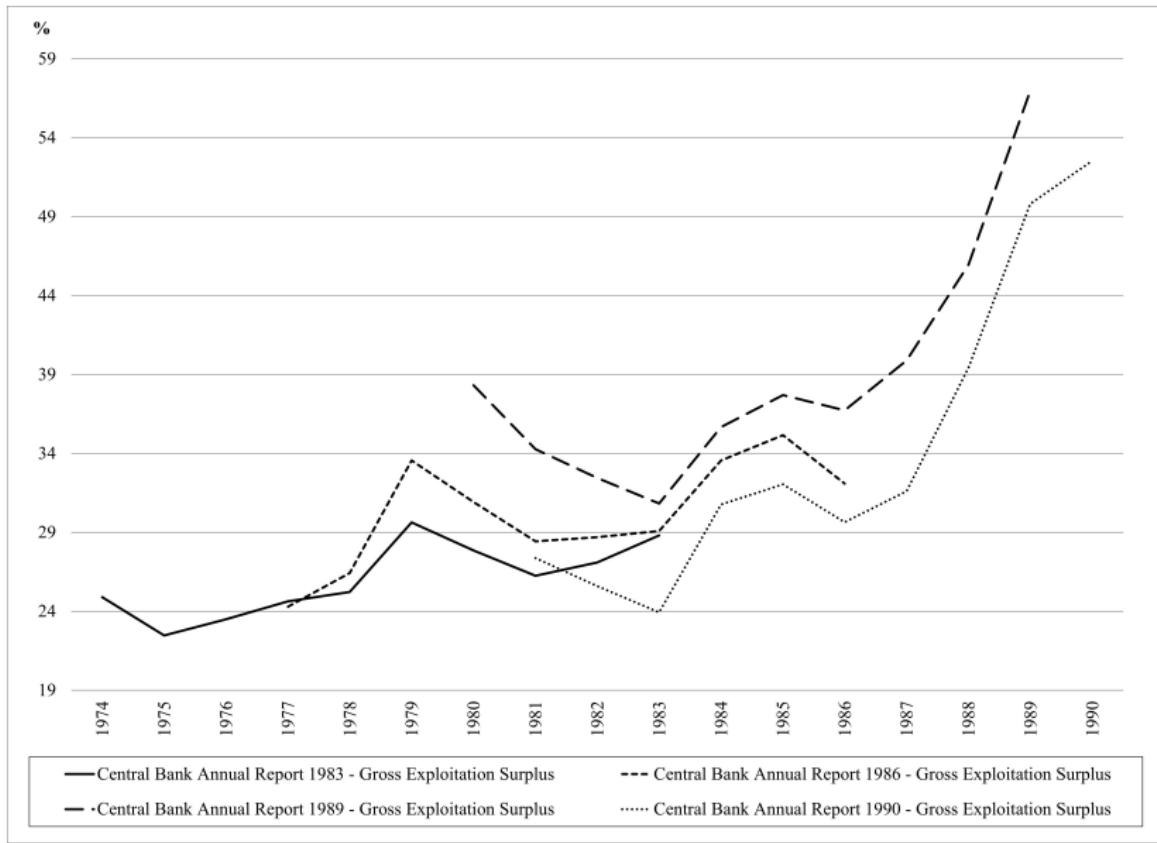
Technical reports	Wage share	Profits share	Mixed-income share
National Income of Peru (1951, 1961)	1942-1961	1942-1961	1942-1961
Peru National Accounts Report 1950-1965, 1950-1967, 1960-1969, 1960-1973, 1960-1974	1950-1974	1950-1974	1950-1974
BCRP Yearly Reports (1983, 1986, 1989, 1990)	1974-1990	1974-1990	1974-1990
National Accounts INE (1981)	1970-1981	1970-1981	
Aggregate Supply and Demand 2012 INEI (2013)	1991-2006	1991-2006	
Norberto García (2013), mixed income estimates	1990-2010	1990-2010	1990-2010
INEI National Accounts Report (2013-2021)	1990-2019	1990-2019	1990-2019

Table: Source: BCRP (1951), BCRP (1952), BCRP (1959), BCRP (1962), BCRP (1966), BCRP (1968), BCRP (1970), BCRP (1974), BCRP (1976), BCRP (1984), BCRP (1987), BCRP (1990), BCRP (1991), García (2013), INE (1980), INE (1981), INE (1990), INEI (2013), INEI (2021), Ministerio de Hacienda y Comercio (1951), Ministerio de Hacienda y Comercio (1959), Ministerio de Hacienda y Comercio (1969).

# Wage share - Sources



# Profits share - Sources (hyperinflation)



# Economically active population and employment estimations

## Methodology

Sources	Period	Concept
De Vries and Timmer (2007), Seminario (2015)	1960-2005	Economically Active Population
INEI (2021), Seminario (2015)	2005-2019	Economically Active Population
OIT (2015)	1970-1980	Unemployment rates (% EAP)
ECLAC (2015)	1980-1998	Unemployment rates (% EAP)
Peru Economic Census (1972, 1981, 1993)	1972, 1981, 1993	Unemployment rates (% EAP)
Nunura (2001)	1998-2000	Unemployment rates (% EAP)
INEI (2021)	2001-2019	Employed population

- Estimate the economically active population from the main sources
- Take the official statistics of the employed population since 2001
- Indirectly estimate the employed population: applied unemployment rates to the EAP.
- Combine the official series and the estimated employed population.

# Self-employees vs. salaried employees

Sources	Period	Concept
Method 1, Garavito (1997, 1999)	1970-1988	Salaried employees index
Method 2, Garavito (1999)	1988-1998	Salaried employees index
Method 3, INEI (2021) and MTPE (2014)	1998-2001	Salaried employment growth rate (%)
INEI (2021)	2001-2019	Salaried employees

- Method 1: replicate the movement of the yearly index of employment in manufacturing firms with more than 100 workers in Lima (1974=100)
- Method 2: replicate the movement of the yearly index of employment in Lima (1974=100)
- Method 3: using sum of wages of INEI (2021) and the average wage of 1998-2001 from (MTPE 2014)

$$L_{sal,t} = (1 + \gamma_t) * L_{sal,t-1}$$

$$\hat{L}_{sal,t-1} = \left( \frac{W_{t-1}}{W_t} * \frac{w_t}{w_{t-1}} \right) * L_{sal,t}$$

$$\gamma_t = \frac{W_t}{W_{t-1}} * \frac{w_{t-1}}{w_t} - 1$$

- Combine the official series with the produced growth rates and indices.