

The Impact of Employment Protection on Income Inequality

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Introduction

Motivation

- During the last decades income inequality have increased in many advanced economies



Notes: Blue (red) line indicates Net (Gross) Gini coefficients.

Source: Solt(2020)

Traditional Explanations behind the rising trend of income inequality both across and within countries are:

- Trade Globalization
- Financial Globalization
- Technological Globalization

Stolper & Samuelson(1941), Jaumotte et al.(2013), Furceri & Loungani(2018), Furceri & Ostry(2019), Acemoglu & Autor(2010), Dabla-Norris et al. (2015))

→**Structural reforms** should be considered an important factor influencing inequality

Furceri & Ostry(2019)

Question:What extent do Employment Protection affect income inequality?

- 1 New evidences on the role of employment protection on income inequality
- 2 In a dynamic panel regression analysis, and recognizing **EPL** as a slowly changing variable, we adopt a two-stage estimation procedure for time-invariant regressors, including fixed effects Kripfganz & Schwarz(2019), Pesaran & Zhou(2018).
- 3 We expand the two-stage estimation procedure by handling potential endogeneity using an Instrumental Free approach (2sCOPE).
Yang et al.(2022)

Literature Review

- **Insider-Outsider Theory** (Lazear(1990)): Strict EPL \rightarrow Labor Market division between "Insider", typically well-protected/paid & "Outsiders", often lower-protected/paid \rightarrow Higher Income Inequality as strict EPL is in favor of insiders
- **Efficiency Wage Theory** (Shapiro & Stiglitz(1984)): Strict EPL \rightarrow encourage employers to increase wages to less skilled workers, maintain high productivity \rightarrow Lower Income Inequality
- **Human Capital Theory** (Becker(1964)): Strict EPL \rightarrow a wage premium for permanent workers due to higher productivity stemming from greater job security and the associated investments in specific skills. \rightarrow Lower income inequality between highly skilled and less-skilled workers
- **Equalizing Theory** (Rosen(1986)): Wage premium for workers under temporary contracts *as a compensation for working under less desirable labor contract* \rightarrow Lower income inequality between temporary and regular labor contract workers.

Literature Review - Empirical Studies

- Koeninger et. al.(2007), Checchi & Garcia-Penalosa (2014), Perugini & Pompei(2016):
 - ↑ EPL strictness \rightarrow **Decrease** Income Inequality Inequality.
- Fortuna & Neto (2021):
 - ↑ EPL strictness for temporary contracts \rightarrow **Decrease** Income Inequality Inequality
 - ↑ EPL strictness for regular contracts non-robust results.
- Bosio(2014):
 - ↑ EPL strictness for temporary contracts \rightarrow **Increase** Income Inequality
- Albanese & Galo(2020):
 - ↓ EPL strictness for temporary contracts \rightarrow **Decrease** Inequality (wage premium for temporary workers)
- Wiese et al.(2024):
 - Increase of about 0.5% in the disposable Gini index nine years post-reform of EPL

Empirical Analysis

Our baseline empirical specification model can be summarized by the following **Dynamic Panel regression model**:

$$\Upsilon_{it} = \lambda \Upsilon_{it-1} + \chi'_{it} \beta + \Theta'_{it} \gamma + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \alpha_i + v_t \quad (2)$$

with units $i=1,2,\dots,N$ and a fixed number of time periods $t=1,2,\dots,T$.

- χ_{it} is a $K_x > 1$ vector of time-variant explanatory variables,
- Θ'_{it} is a $K_\Theta > 1$ vector of time-invariant variables,
- α_i describes an unobserved individual specific effect.

Unbalanced panel of **32 OECD countries, Period: 1985 - 2019**

Dependent Variable	Source		
Gini Gross	SWIID		
Gini Net	SWIID		
Explanatory Variables			
Time Invariant Variables	Source	Time Variant Variables	Source
EPL Temporary	OECD	Log GDP per capita	PWT
EPL Regular	OECD	Log Human Capital	PWT
Democracy	Polity5	Financial Globalization	KOF
		Trade Globalization	KOF
		Unemployment	World Bank
		GDP Deflator	World Bank
		Government Consumption	World Bank
		Gross Investment % GDP	World Bank

Time-Invariant Estimation Procedure and Endogeneity

Problem 1: Estimating coefficients for time-invariant variables such as EPL and Democracy.

Solution: → **Two-stage estimation procedure**

- **Stage 1:** Estimates are computed for the coefficients of the time-varying variables and these estimates are used to filter out the time-varying effects.
- **Stage 2:** The residuals from the first stage panel regression are then averaged over time and used as a dependent variable in a cross-section OLS regression that includes an intercept and the vector of time-invariant regressors

This approach is based on the methodologies proposed by Kripfganz & Schwarz (2019) and Pesaran & Zhou (2018), which provide robust frameworks for handling endogeneity in panel data analysis.

Problem 2: Endogeneity problems arise in the first stage regression due to simultaneity issues

Solution: Instrumental Free approach (2sCOPE) following Yang et al.(2022).

- The 2sCOPE addresses endogeneity by adding residuals obtained by regressing latent copula data for each endogenous regressor (*i.e.*, *Unemployment and Human Capital*) on the latent copula data for the exogenous regressors (*i.e.*, *GDP*) as generated in the structural regression model.

Wiese et al.(2024) alternatively address endogeneity using the Augmented Inverse Probability Weighting (AIPW) methodology.

Step 1: Time-Varying Regression Model

$$\Upsilon_{it} = \lambda \Upsilon_{it-1} + X'_{1it} \beta_1 + X'_{2it} \beta_2 + \varepsilon_{it} \quad (3)$$

$$\varepsilon_{it} = \alpha_j + v_t \quad (4)$$

- Assump. 1: The structural error follows a normal distribution;
- Assump. 2: χ_{1it} and structural error v_t follow a Gaussian copula;
- Assump. 3: $E(\chi_{1it'}, v_t) \neq 0$
- Assump. 4: $E(\chi_{1it}, \chi_{2it'}) \neq 0$

The **2sCOPE** jointly models X'_{1t} , X'_{2t} and ε_t adopting a Gaussian copula model. Under the Gaussian Copula assumption (χ_{1t}^* , $\chi_{2t}^*, \varepsilon_t$) follows the multivariate normal distribution.

Time - Invariant Estimation Procedure and 2sCOPE

As a result, we derive the following system of equations:

$$\Upsilon_{it} = \lambda \Upsilon_{it-1} + X'_{1it} \beta_1 + X'_{2it} \beta_2 + \varepsilon_{it} \quad (5)$$

$$\chi_{1t}^* = \chi_{2t}^* \zeta + \eta_t \quad (6)$$

By adding the estimate of the error term η_t from the equation (6) as generated regressor to the outcome regression instead of using χ_{1t}^* and χ_{2t}^* .

The **Time-Variant regression** becomes:

$$\Upsilon_t = \lambda \Upsilon_{t-1} + \chi_{1t} \beta'_1 + \chi_{2t} \beta'_2 + \frac{\sigma_\varepsilon \varrho_{\chi_1 \varepsilon}}{1 - \varrho_{\chi_1 \chi_2}^2} \eta_t + \sigma_\varepsilon \sqrt{1 - \varrho_{\chi_1 \varepsilon}^2 - \frac{\varrho_{\chi_1 \chi_2}^2 \varrho_{\chi_1 \varepsilon}^2}{1 - \varrho_{\chi_1 \chi_2}^2}} w_{3t} \quad (7)$$

Step 2: Time-Invariant Regression Model

In a dynamic panel regression model that includes a lagged dependent variable, the OLS estimator is biased and inconsistent. To address this, we use IV - Anderson & Hsiao estimates(1981) and calculate FE residuals.

In **Step 2**, we then regress the time averages of the residuals ($\hat{\epsilon}_i$) on EPL measurements and Democracy index using OLS empirical estimates.

Time-Invariant Regression Model

$$\hat{\epsilon}_i = \delta + EPL_i' \gamma_1 + Democracy_i' \gamma_2 + \zeta_i \quad (8)$$

Monte Carlo Simulation

- **Question:** Does the Incorporation of 2sCOPE estimator deal with the problem of endogeneity issues
- ! Monte Carlo Simulation technique is used to investigate the extent to which the estimated parameters in the second stage are likely to be distorted when endogeneity is ignored in the first-stage regression using an artificial data set.

Uniform and t-distributions tested to explore robustness, under 1000 MC iterations.

- **Key Findings:**
- 2sCOPE effectively reduce bias and performs well even under distributional misspecifications.
- Endogeneity significantly impacts the accuracy of β estimates.
- Second stage regression results confirm the need to control for endogeneity.

The endogenous χ_{1it} follows a uniform distribution with parameters (-1,1)

Ignore Endogeneity of χ_{1it}									
N	T	BIAS			MSE			Mean Values	
		λ	β_1	β_2	λ	β_1	β_2	γ_0	γ_1
20	40	0.049	1.756	-0.311	0.005	3.126	0.104	-0.0007	1.555
20	100	0.073	1.715	-0.307	0.006	2.960	0.097	-0.0007	1.501
40	20	0.003	1.837	-0.312	0.003	3.416	0.105	0.0003	2.402
100	20	0.004	1.834	-0.309	0.001	3.381	0.099	-0.0008	3.828

Controlling for the Endogeneity of χ_{1it}									
20	40	0.048	0.173	-0.026	0.005	0.453	0.021	-0.001	0.860
20	100	0.072	0.140	-0.213	0.006	0.167	0.008	-0.002	0.816
40	20	0.0004	0.196	-0.017	0.003	0.812	0.023	-0.0004	1.383
100	20	0.0009	0.127	-0.002	0.001	0.192	0.009	-0.0002	2.118

Notes: The table presents average values of BIAS, MSE metrics of φ , β_1 , β_2 , and the mean values of γ_0 , γ_1 over 1000 iterations. Similar results are obtained when the endogenous χ_{1it} follows a t-distribution with $df=5$

Results

Time-Variant Regression (1st Stage)

VARIABLES	Gross Gini	Net Gini	Gross Gini	Net Gini
GDP per capita	-0.805 (1.579)	-3.108** (1.435)	-1.120 (1.592)	-3.175** (1.479)
GDP per capita (squared)	0.0534 (0.0766)	0.155** (0.0693)	0.0634 (0.0774)	0.151** (0.0718)
Human Capital (log)	-2.774*** (0.592)	-1.990*** (0.542)	-2.232*** (0.818)	-0.943 (0.758)
Financial Glob.	-0.00521** (0.00213)	-0.00517** (0.00202)	-0.00489** (0.00220)	-0.00485** (0.00208)
Trade Glob.	0.00228 (0.00249)	0.00677*** (0.00225)	0.00217 (0.00239)	0.00640*** (0.00220)
Unemployment	0.0329*** (0.00607)	0.0202*** (0.00555)	0.0243* (0.0133)	0.0257** (0.0122)
Inflation	0.000585 (0.00201)	0.000321 (0.00185)	0.000853 (0.00204)	0.000686 (0.00189)
Gov. Spendings	0.0866*** (0.00936)	0.0430*** (0.00867)	0.0854*** (0.00923)	0.0408*** (0.00855)
Tech Progress	0.00676 (0.00556)	0.00656 (0.00509)	0.00523 (0.00596)	0.00303 (0.00551)
resUnemploymentGDP			0.0281 (0.0520)	-0.0450 (0.0475)
resHumanCapitalGDP			-0.0739 (0.0700)	-0.141** (0.0648)
Observations	888	888	886	886
No Countries	32	32	32	32
Endogeneity Correction	NO	NO	YES	YES

Bootstrap std. errs. in brackets. *** 1%, ** 5%, * 10%.

Time-Invariant Regression (2nd Stage)

VARIABLES	Residuals gGini	Residuals nGini	Residuals gGini	Residuals nGini
EPL Temporary	-0.131** (0.0621)	-0.0860* (0.0519)	-0.129* (0.0677)	-0.0807* (0.0460)
EPL Regular	-0.214*** (0.0803)	-0.180** (0.0708)	-0.204** (0.0806)	-0.164*** (0.0577)
Democracy	-0.0295 (0.0462)	-0.0212 (0.0405)	-0.0311 (0.0396)	-0.0228 (0.0349)
No Countries	32	32	32	32
R-squared	0.444	0.436	0.435	0.408
2sCOPE	NO	NO	YES	YES
1st Stage				

*Bootstrap std. errs. in brackets. *** 1%, ** 5%, * 10%.*

We investigate if EPL policies help countries to converge to similar levels of income inequality. we estimate the following model:

■ Tobit Regression model

$$\frac{\hat{\epsilon}}{\max \hat{\epsilon}_i} = \delta + EPL'_i \gamma_1 + Democracy'_i \gamma_2 + \zeta_i \quad (9)$$

Time-Invariant Regression (2nd Stage) - TOBIT

VARIABLES	ratio gross	ratio net	ratio gross	ratio net
EPL Temp	-2.094** (1.023)	-0.476* (0.262)	-1.577** (0.793)	-0.444* (0.246)
EPL Reg	-3.418*** (1.254)	-0.994*** (0.322)	-2.503** (1.157)	-0.902** (0.363)
Democracy	-0.471 (0.765)	-0.117 (0.227)	-0.381 (0.526)	-0.125 (0.204)
No Countries	32	32	32	32
R-squared	0.444	0.436	0.436	0.408
Copula 1st Stage	NO	NO	YES	YES

Bootstrap standard errors in dynamic panel analysis and reported, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Robustness Checks

Problem Multicollinearity among a set of independent variables during the first step of regression

We adopt a principle component analysis (PCA)

→ We calculated a weighted average component for the first four components from a set of time-varying variables including:

- Logarithm term of human capital
- Government expenditures & GDP
- Unemployment
- Trade & Financial Openness
- Inflation
- Skill-biased Technological progress

PCA - Time Variant Regression - 1st Stage

VARIABLES	gGini	nGini	gGini	nGini
GDP per capita	-5.454*** (1.487)	-6.728*** (1.278)	-5.127*** (1.556)	-6.929*** (1.374)
GDP per capita (squared)	0.241*** (0.0730)	0.307*** (0.0623)	0.221*** (0.0772)	0.319*** (0.0680)
Weighted Component	0.194*** (0.0348)	0.102*** (0.0292)	0.285** (0.133)	0.0586 (0.119)
rescomponentgdpt			-0.0706 (0.0965)	0.0345 (0.0863)
Observations	888	888	886	886
No Countries	32	32	32	32
Endogeneity Correction	NO	NO	YES	YES

*Bootstrap std. errs. in brackets. *** 1%, ** 5%, * 10%.*

PCA - Time Invariant Regression - 2nd Stage

VARIABLES	residuals gGini	residuals nGini	residuals gGini	residuals nGini
EPL Temporary	0.0400 (0.0357)	-0.0153 (0.0325)	0.0408 (0.0404)	-0.0122 (0.0339)
EPL Regular	-0.122* (0.0626)	-0.1000* (0.0560)	-0.123** (0.0614)	-0.103* (0.0600)
Democracy	-0.0113 (0.0303)	0.0884*** (0.0321)	-0.0120 (0.0324)	0.0867** (0.0368)
Observations	32	32	32	32
R-squared	0.163	0.401	0.161	0.393
2sCOPE 1st Stage	NO	NO	YES	YES

*Bootstrap std. errs. in brackets. *** 1%, ** 5%, * 10%.*

Conclusions

Conclusions

- 1 The employment protection affects income distribution.
- 2 The effect is different depending on the labor contract.
EPL for regular labor contracts decreases income inequality
EPL for temporary labor contracts provides ambiguous results
- 3 There is a persistent pattern of income inequality reduction across the countries
- 5 Trade globalization, Unemployment, and Government spending increase income inequality whereas financial globalization and human capital is related negatively to income inequality. GDP per capita appears to have a U-shaped relationship with income inequality.