Ministerstwo Finansów

Personal Income Tax: Foundations

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Personal Income Tax: Foundations

- Tax systems are primarily aimed at financing public expenditures,
- and used to promote equity, to address social and economic concerns.
- They need to be set up to minimise taxpayers' compliance costs and government's administrative cost, while also discouraging tax avoidance and evasion.

- Taxes also affect **households' decisions to save**, **supply labour** & **invest in human capital**,
- the **decisions of firms to produce, create jobs, invest** and **innovate**,
- the **choice of savings channels and assets by investors**.

- What matters for these decisions is not only the level of taxes but also the way in which different tax instruments are designed and combined to generate revenues (***tax structures***).

PIT is a major revenue source for governments

- In 2017, **PIT contributed 23% to the total tax revenue of European OECD countries** (OECD 2019), which makes it one of the most important sovereign revenue sources.
- Germany raised 27% of its tax revenue through PIT, the United Kingdom 26%, Italy 26%, and France 19%.
- The United States, as a comparison, raised 35% of its total tax revenues through PIT in 2017.
- PIT is thus, next to VAT, the most important tax revenue source of all OECD countries, surpassing corporate or payout taxes.

- The consumption-based explanation would refer to PIT paid by all consumers, e.g., including self-employed, the PIT for employees and consumers may differ, for example, due to deductions available only to self-employed.

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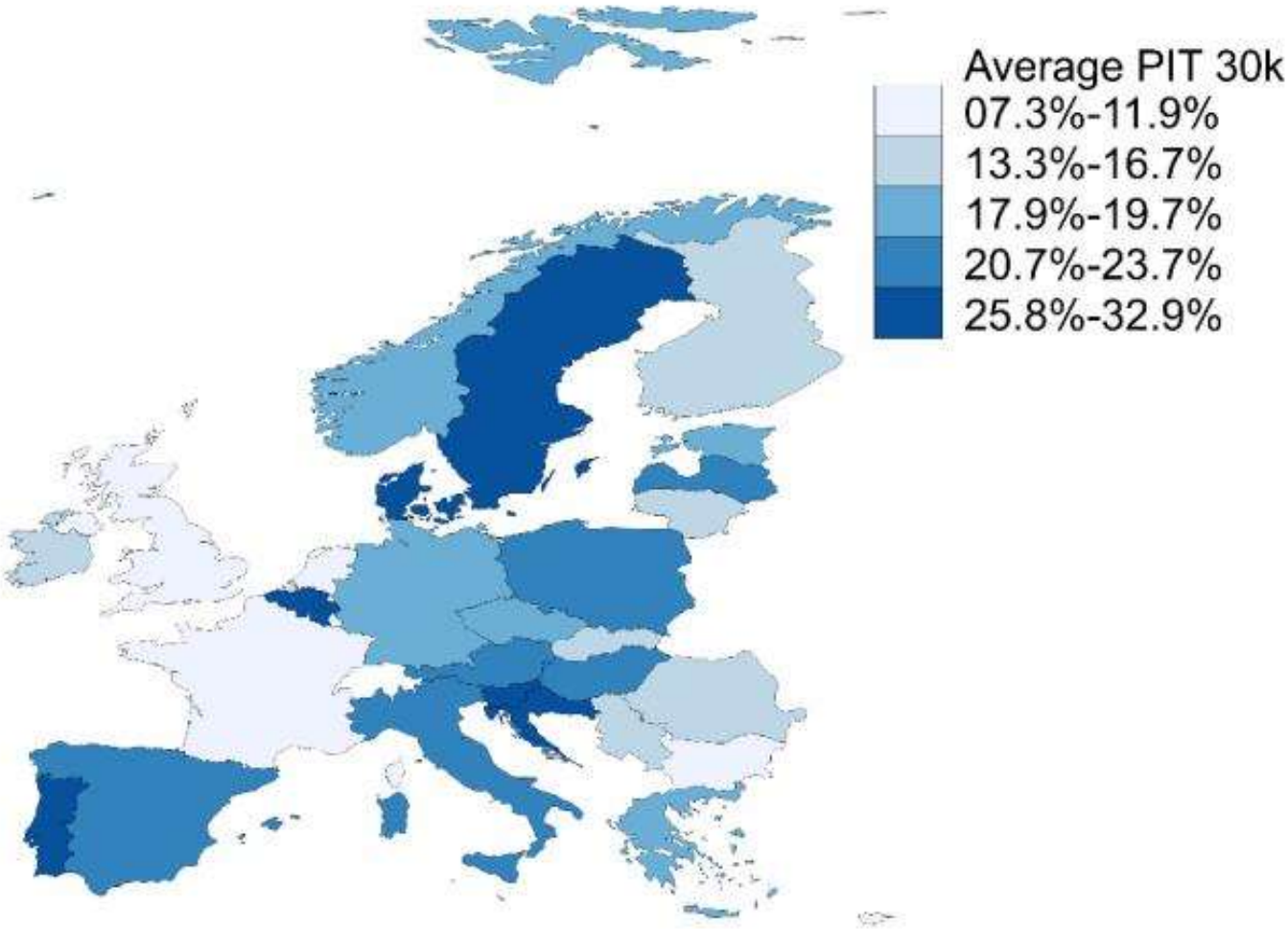
Figure A.5: Average Personal Income Tax Rates

This figure shows the average PIT for incomes of EUR 30,000 from 2006 to 2018.



Personal Income Tax: Foundations

- The effects of tax levels and tax structures on agents' economic behaviour are likely to be reflected in **overall living standards**.
- Recognising this, over the past decades many OECD countries have undertaken structural reforms in their tax systems.
- Most of **the personal income tax reforms** have tried to create a fiscal environment that **encourages saving, investment, entrepreneurship & provides increased work incentives**.

- Likewise, most corporate tax reforms have been driven by the desire to **promote competition and avoid tax-induced distortions**.

- Almost all of these tax reforms can be characterised as **involving rate cuts and base broadening in order to improve efficiency**, while at the same time **maintain tax revenues**.

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Figure A.6: Development of Average PIT over Time

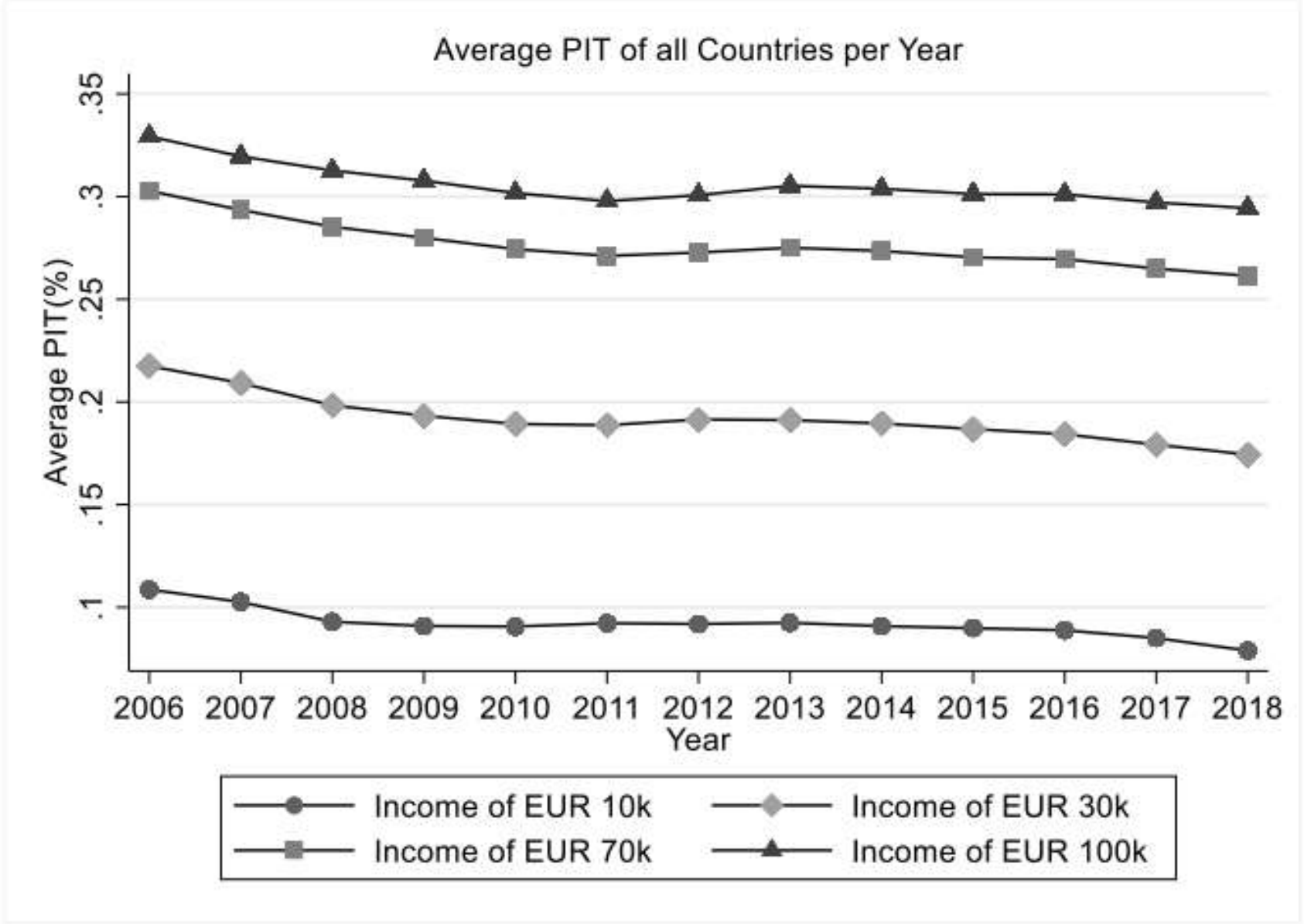

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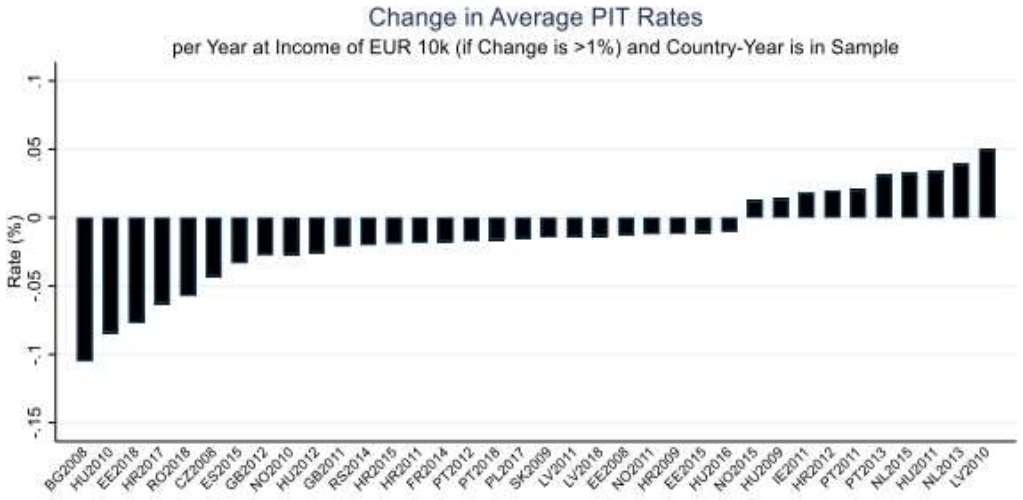
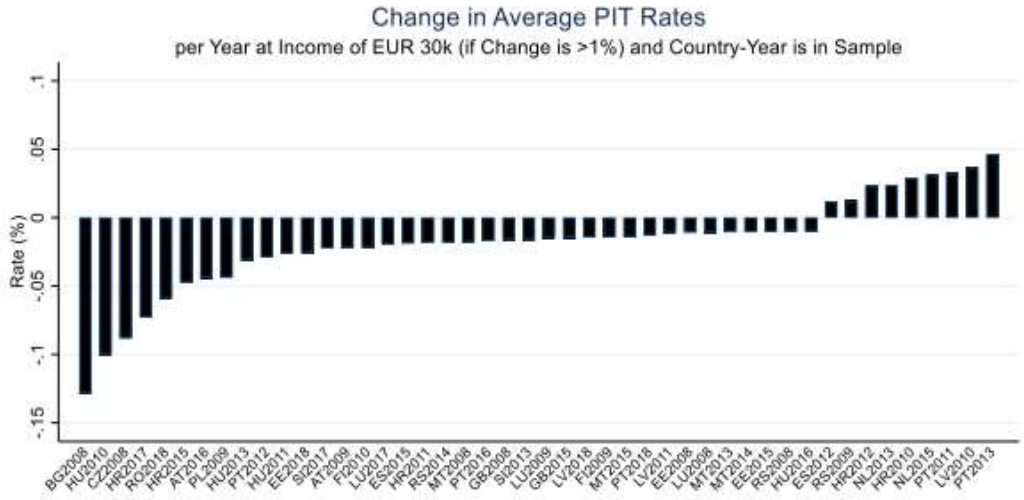
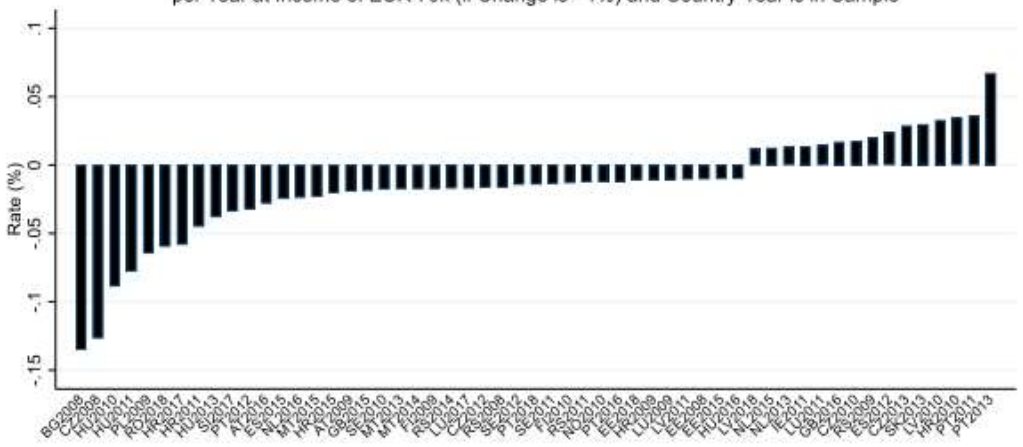
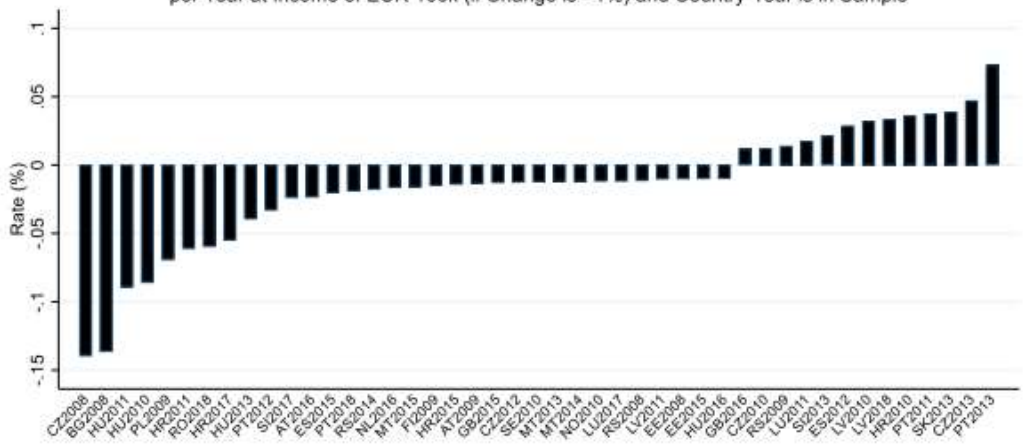
Figure A.3: Country–Year Changes in PIT

This figure shows the magnitude of changes (if larger than 1%) to the average PIT rates from 2006 to 2018.









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Personal Income Tax: Foundations

- In many OECD countries a change towards **flatter personal income tax schedules** has occurred, with one of the most pronounced changes in personal income taxation being **the reduction in the top statutory income tax rates**.
- In contrast, **average workers have not seen their taxes being cut to the same extent**. A number of countries have introduced various in-work tax measures to encourage work incentives of marginal workers.
- The reduction in the personal income tax rates has been accompanied by cuts in the corporate income tax rate, partly financed by base broadening in many countries. Likewise, the overall top marginal rate on dividends has decreased mainly as a result of the reduction in the corporate income tax rate. Several countries have introduced tax incentives for investment in research and development R&D.
- relying less on corporate income relative to personal income taxes could increase efficiency. However, lowering the corporate tax rate substantially below the top personal income tax rate can jeopardize the integrity of the tax system as **high-income individuals will attempt to shelter their savings within corporations**.
- Flattening the tax schedule could be beneficial for GDP per capita by **favouring entrepreneurship**. But this implies a **trade-off between growth and equity**.

Personal Income Tax: Foundations

- In open economies the design of a national tax system will need to consider the design of tax systems in other countries, since **countries are increasingly using their tax systems to improve their ability to compete in global markets**.
- Globalisation may also **increase the opportunities for tax avoidance and evasion** especially as concerns **mobile capital income tax bases**.
- Therefore, the mobility of the tax base plays some role in the design of tax reforms at the national level, and increased international tax policy cooperation among countries may allow for efficiency gains in some areas.

*The primary independent variable is **Net-of-PIT**, one minus the average PIT value, as the natural logarithm decrease increase*

Table 6: PIT and Investment, Examination at Border Regions

This table presents our results when we include only observations for firms that are located in a two-digit postal code bordering another sample country (*Domestic Country*). We control for the PIT of the country that is located at the border on the two-digit postal code (*Neighbor Country*). The dependent variable is *Capital Investment*. All country-level controls from the neighbor country are also included. Controls and industry–year–GDP quartile FE are included in all the regressions. We report robust standard errors clustered at the country–industry level in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	**ΔCapital Investment**			
Income p.a. for PIT Calculation	EUR 10k	EUR 30k	EUR 70k	EUR 100k
	(1)	(2)	(3)	(4)
ΔNet-of-avg.-PIT$_t$	0.3881***	0.3057***	0.2662***	0.2321***
(Domestic Country)	(0.1203)	(0.0729)	(0.0594)	(0.0508)
ΔNet-of-avg.-PIT$_t$	-0.1283**	-0.1052**	-0.0636*	-0.0519
(Neighbor Country)	(0.0624)	(0.0435)	(0.0349)	(0.0326)
Controls & FE	Yes	Yes	Yes	Yes
Observations	263,780	263,780	263,780	263,780
Adjusted R-squared	0.0501	0.0502	0.0502	0.0503

PIT Rate Differences along Borders affect capital investment

- Because of the Schengen Agreement and the right to free labor mobility in the EU, employees frequently seek employment in other countries.
- Importantly, according to Article 15 of the 2017 OECD Model Tax Convention and most EU countries' tax laws, employment is generally taxed in the employer's country if the employment is exercised for more than six months.
- Put differently, even if firms employ an individual from a neighboring country, PIT are to be paid in the firm's host country.
- **RESULTS:** a 1% increase in domestic net-of-average PIT increases investment by up to 0.34%. Moreover, **for two of four income classes, higher neighbor net-of-PIT values reduce domestic investment**. In other words, **lower tax rates across the border reduce capital investment** because of **workers seeking employment on the other side of the border if PIT decrease in the foreign country**.
- In this test, we control for local economic conditions through the inclusion of current and lagged controls for domestic and neighboring countries' characteristics.

Personal Income Tax: Foundations

There are two main concepts of income taxation:

- **consumption concept** - based on taxation of income, which is used for consumption. Parts of income used for saving and investments, such as dividends and interests, are excluded from taxation.
- **income concept** includes all types of income in the process of taxation
- Personal income tax is used as the most important instrument of redistribution of income among households in economy (Egger et al., 2012).

- **Public finance theory considers that progressive taxation of income ensures rightful distribution of tax burden**.
- One of the most important roles of the government is to ensure social welfare, which is higher when resources are more equally distributed.
- On the other hand, redistributive taxes and transfers can cause a decrease in individuals' incentives to work, save, and earn income. Therefore, it is necessary for the government to find an optimal tax system to ensure social welfare and encourage individuals to work (Diamond & Saez, 2011).

Personal Income Tax: Foundations

- Personal income taxation is widely researched in economic literature due to great significance of tax revenues on government policies and overall economy.
- Castro and Ramirez (2014) concluded that determinants of tax revenues in OECD differ among high-income and middle-income countries.
- High-income countries with high GDP per capita, low share of FDI, and robust industrial sector have higher tax revenues. Also, lagged values of tax revenues are strong determinants of current tax revenues.
- On the contrary, tax revenues of middle-income countries depend less on their lagged values and the role of economic, institutional, social, and structural factors are more significant determinants of tax revenues.

The role of personal income taxes in corporate investment decisions

- PIT reduce consumption and increase cost of labour. Thus, investment decisions can be affected because of the inevitable link of production input factors.
- Jacob & Vossebürger (2022) show that **personal income taxes substantially reduce investment**. The magnitude is comparable to the effect of corporate taxes.
https://doi.org/10.1016/j.jcorpfin.2022.102275
- PIT increases labor costs because the incidence of PIT burden is shared between employers and employees (e.g., Gruber and Saez 2002; Blomquist and Selin 2010; Piketty et al. 2014). To the extent that firms bear part of the PIT burden (because labour supply is decreased and firms compete for the remaining labour supply via higher wages), higher PIT increases labor costs.
  Due to higher labor costs, PIT decreases investments if capital and labor are complements: higher labor costs reduce labor demand, which reduces capital demand. In contrast, firms may substitute labor with capital. In this case, firms invest more when PIT increase.
- Higher PIT can reduce investment because higher PIT reduce workers' disposable income and, thus, consumption. Reduced consumption then translates into lower profitability and, hence, firms cutting investment.
- Which effect dominates is an empirical question.

The role of personal income taxes in corporate investment decisions

Jacob & Vossebürger (2022) show that the PIT–investment relation can be explained by two channels.

- First, **higher PIT increase labor costs**, which results in stronger investment responses by firms facing more elastic workers, by financially constrained firms, and by firms in industries with a strong link between capital and labor input.
- Second, **PIT can affect investment through reduced consumption**, particularly PIT at lower income levels.

- The reduced magnitude of the effects at higher income levels suggests that **governments could balance their budgets while avoiding negative investment effects by lowering taxes at lower income levels** and **financing the shortfall by implementing modest tax increases at higher income levels**.
- However, they do not provide a full welfare analysis.
- Still, given that investment is a key driver of overall economic growth, the documented investment responses appear to be important for policymakers.
- Thus policymakers facing budget deficits may consider PIT increases to balance their budgets.

Model

$$\Delta K_{i,j,t} = \alpha_0 + \beta_1 \Delta Net of PIT_{j,t} + \beta_2 \Delta XF_{i,t} + \beta_3 \Delta X_{j,t} + \beta_4 \Delta X_{j,t-n} + \varepsilon_{i,j,t}$$

where, for firm *i* in country *j* in year *t*, ΔK is the dependent variable.

- ΔK is the change of the natural logarithm of fixed assets from $t-1$ to t, winsorized at the first and 99th percentile.
- Δ ***Net-of-PIT***$_{j,t}$ denotes the change in the natural logarithm of the net wages as a percent of gross wages after PIT.
- The advantage of this approach is that ***β1* can be interpreted as an elasticity** (see, e.g., Piketty et al. 2014).
- Authors expect *β1* to be positive (negative) if labor and capital are complements (substitutes) or consistent with the consumption-based explanation.
- Authors separately use average PIT rates based on different income classes (ranging from EUR 10,000 to EUR 100,000) because including all income classes at the same time results in multicollinearity.
- Since the model is a first-difference specification, it absorbs all time-invariant firm-, industry-, or country-specific characteristics.

Testing theoretical prediction that PIT change the labor supply

- higher PIT reduce employment - the number of employees is positively related to an increase in net-of-average PIT. Put differently, higher taxes (i.e., lower net-of-average PIT) reduce employment, consistent with our theoretical considerations. **Firms employ up to 0.25% more employees per 1% decrease in PIT**
- increases in net-of-PIT increase the labor force participation rate by up to 3.96 percentage points, which is comparable to Zidar (2019)
- Gruber & Saez (2002); Blomquist & Selin (2010); Piketty et al. (2014) show that **the burden of PIT is shared between the employer and the employees**.
- All the net of average PIT coefficients are significant at the 1% level. The elasticity of PIT with respect to capital investments is estimated at –0.12 to –0.24, depending on the income used to calculate average PIT. At an income of EUR 30,000, a decrease of PIT by 1% (i.e., an increase of net salary by 1%) results in an increase of firm investments of about 0.22%. That is, as labor supply increases following a PIT cut, increased labor input following a tax decrease increases investments as labor and capital appear to be complements.
- the effect of PIT on investment declines at higher income levels. At an income of EUR 100,000, a decrease in PIT by 1% increases investments by 0.12%, compared to 0.22% at an income of EUR 30,000.

capital investment is influenced by changes in Net-of-average PIT - when control variables are included, the results hold.

Table 5: PIT and Capital Investment

This table presents the main results. The dependent variable is *Capital Investment*, the change of the natural logarithm of fixed assets in comparison to the prior year's fixed assets. The primary independent variable is *Net-of-PIT*, one minus the average PIT value, as the natural logarithm. All variables are measured as first difference from the lagged values. All variables except for key country economic indicators are measured as of year *t*. Controls are included in Columns (5) to (8), with industry–year–GDP quartile FE in all the regressions. Columns (5) to (8) control for key country economic indicators (*ΔGDP per Capita, ΔGDP Growth, ΔOpenness, and ΔGov. Deficit to GDP*) in year t, t–1, t–2 and t–3. We report robust standard errors clustered at the country–industry level in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	**ΔCapital Investment**				**ΔCapital Investment**			
Income p.a. for PIT Calculation	10k EUR	30k EUR	70k EUR	100k EUR	10k EUR	30k EUR	70k EUR	100k EUR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔNet-of-avg.-PIT$_t$	0.2526***	0.2290***	0.1700***	0.1311***	0.1710***	0.2244***	0.1710***	0.1276***
	(0.0508)	(0.0652)	(0.0512)	(0.0403)	(0.0651)	(0.0518)	(0.0418)	(0.0306)
ΔNet-of-avg.-SSC$_t$	0.0036	-0.1481	-0.0573**	-0.0458	0.0268	-0.1633*	-0.0303	0.0086
	(0.0601)	(0.1060)	(0.0289)	(0.0313)	(0.0508)	(0.0907)	(0.0303)	(0.0310)
ΔLeverage$_t$					0.3318***	0.3318***	0.3318***	0.3318***
					(0.0278)	(0.0278)	(0.0278)	(0.0278)
ΔReturn on Assets$_t$					0.0232**	0.0232**	0.0233**	0.0233**
					(0.0102)	(0.0102)	(0.0102)	(0.0102)
ΔSales$_t$					0.0255***	0.0255***	0.0255***	0.0255***
					(0.0030)	(0.0030)	(0.0030)	(0.0030)
ΔWages$_t$					0.0373***	0.0373***	0.0373***	0.0373***
					(0.0037)	(0.0037)	(0.0037)	(0.0037)
ΔNet-of-CIT$_t$					0.1443***	0.1512***	0.1366***	0.1415***
					(0.0366)	(0.0369)	(0.0374)	(0.0377)
ΔNet-of-VAT$_t$					0.0543	0.0306	0.0599	0.0448
					(0.0622)	(0.0651)	(0.0689)	(0.0659)
ΔNet-of-Interest Tax$_t$					0.0099	0.0108	0.0078	0.0061
					(0.0119)	(0.0127)	(0.0119)	(0.0118)
ΔNet-of-Dividend Tax$_t$					-0.1100***	-0.1173***	-0.1197***	-0.1155***
					(0.0182)	(0.0180)	(0.0175)	(0.0178)
ΔGovernance$_t$					0.0167*	0.0157*	0.0148*	0.0136
					(0.0093)	(0.0091)	(0.0089)	(0.0089)
Lagged Economic Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year-GDP Quart FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,823,311	1,823,311	1,823,311	1,823,311	1,823,311	1,823,311	1,823,311	1,823,311
Adj.R-squared	0.0087	0.0088	0.0088	0.0087	0.0406	0.0407	0.0406	0.0406

All the net of average PIT coefficients are significant at the 1% level. The elasticity of PIT with respect to capital investments is estimated at –0.12 to –0.24, depending on the income used to calculate average PIT. At an income of EUR 30,000, a decrease of PIT by 1% (i.e., an increase of net salary by 1%) results in an increase of firm investments of ca 0.22%.

The role of personal income taxes in corporate investment decisions

- Jacob & Vossebürger (2022) find that firms increase capital investments by up to 0.22% if the employees receive a 1% higher salary net of PIT. This shows that PIT play an important role in corporate investment decisions.
- At an income level of EUR 30,000, this **elasticity of about −0.22 for personal taxes with respect to investment** is comparable to the investment effect of corporate taxes. The role of PIT, however, diminishes for higher incomes and is insignificant at incomes higher than EUR 280,000.
- Jacob & Vossebürger (2022) document two potential explanations for this declining association thereby expanding the results in Zidar (2019).
- First, firms are, on average, less exposed to workers at higher income levels.
- Second, the complementary link between labor and capital is weaker at lower income levels.
- Importantly, they also show that **higher PIT reduce the number of employees** (i.e., **labor input**) and **labor market participation rates**, indicating that **part of the burden of PIT is indeed borne by firms**.

Figure 1: Composition of Remuneration for an Income of EUR 70k in Germany

This figure shows the components of gross wages and the share of PIT and SSC that are subtracted to calculate net wages for Germany in 2018.

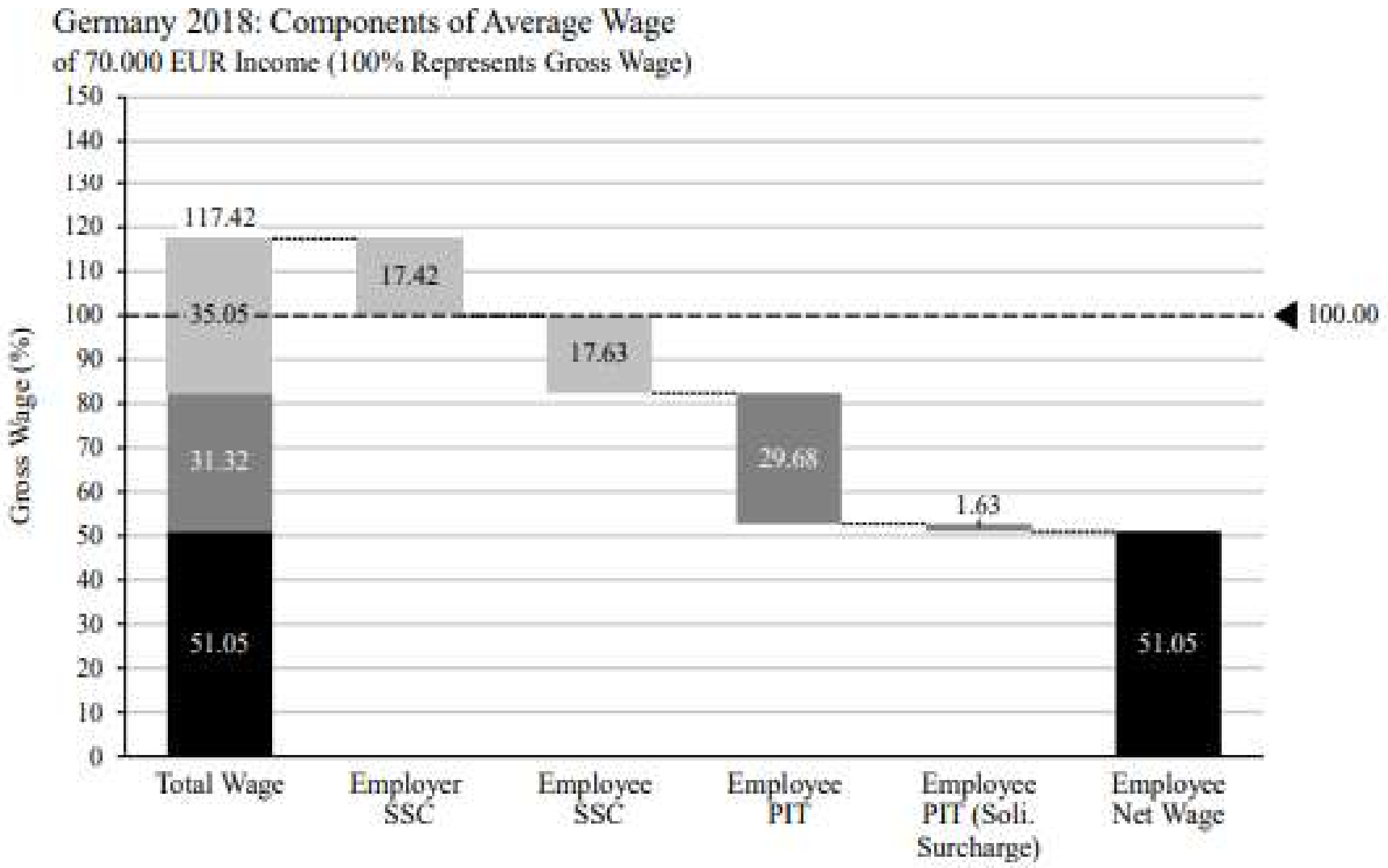

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Table 1: Overview of Average PIT Rates per Country

This table presents the average PIT rates for our sample countries. We estimate the respective taxes at incomes of EUR 10,000, EUR 30,000, EUR 70,000, and EUR 100,000. We estimate the mean values from 2006 to 2018. The numbers are the tax percent of the gross income earned. We estimate the average PIT for the displayed income classes by dividing taxes paid by gross income earned.

	Average Personal Income Tax Rate (2006–2018, in %)			
Income of:	**EUR 10k**	**EUR 30k**	**EUR 70k**	**EUR 100k**
Austria	0.00	23.73	35.85	40.00
Belgium	9.63	32.93	44.27	47.06
Bulgaria	11.64	11.98	12.08	12.10
Croatia	17.05	31.57	41.01	43.42
Cyprus	0.00	7.62	20.36	24.06
Czech Republic	11.24	18.31	20.46	20.86
Denmark	15.22	29.65	34.85	37.56
Estonia	16.59	19.48	20.30	20.49
Finland	0.00	14.96	29.56	35.61
France	1.52	11.48	22.13	27.57
Germany	2.92	19.73	31.96	35.67
Greece	1.69	17.93	31.56	35.46
Hungary	18.45	21.80	23.48	23.86
Ireland	3.02	14.34	28.27	32.02
Italy	5.76	20.70	31.90	35.41
Latvia	21.95	23.34	23.94	24.20
Lithuania	11.98	13.99	14.57	14.70
Luxembourg	0.00	11.12	26.90	30.99
Malta	2.35	18.51	26.32	28.92
Netherlands	4.72	7.26	27.45	34.82
Norway	2.37	18.86	25.30	28.83
Poland	16.63	23.38	29.36	30.70
Portugal	11.99	25.77	34.83	38.46
Romania	14.33	15.08	15.29	15.34
Serbia	11.38	14.54	25.11	28.49
Slovak Republic	12.25	16.75	19.42	20.12
Slovenia	13.91	28.38	35.47	38.54
Spain	11.05	21.67	31.97	35.81
Sweden	27.46	30.32	40.01	45.03
United Kingdom	2.33	13.38	25.26	29.68

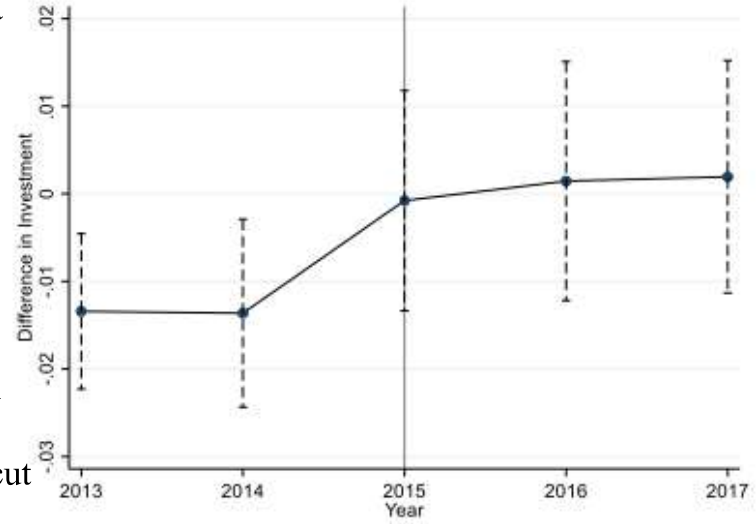
Changes in PIT are made to, among other reasons, **balance budget deficits** (justifying tax increases) or **foster employment and growth** (justifying tax decreases).

Figure 3: Parallel Trends Tests, Single-Country Event Studies

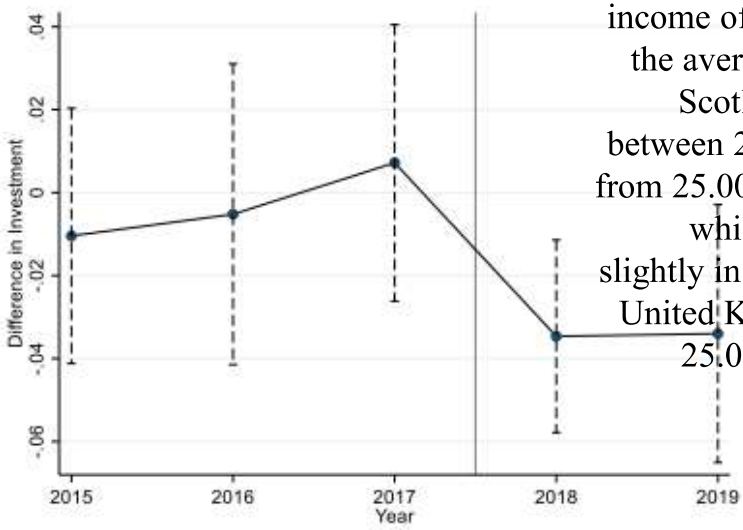
This figure plots the difference in investment between treated and control groups in two settings. Panel A uses the decline in regional PIT in Spain. The treatment group comprises firms located at the border of the region of Castilla La Mancha (with postcodes starting with *02*), and the control group comprises firms located in the region of Murcia (with postcodes starting with *30*). The rates of PIT were changed in 2015. Panel B uses the increase in PIT in Scotland as the event. We focus on two two-digit zip code regions in Scotland (those starting with *DG* and *TD*) bordering England and two two-digit zip code regions in England (those starting with *CA* and *NE*) bordering Scotland. The treatment group comprises Scottish firms after the change in PIT in April 2017. We also plot the 95% confidence bounds around the differences.

Castilla La Mancha decreased the tax rate on income to a larger extent (from 12.82% in 2013 to 11.94% in 2016 on EUR 30,000) than Murcia did (from 12.82% to 12.44% on EUR 30,000). Control groups are thus not unaffected since they also experienced a tax cut

Panel A: PIT Decrease in Spain, Castilla La Mancha versus Murcia



Panel B: PIT Increase in the United Kingdom, Scotland versus England



For example, for an income of EUR 70,000, the average tax rate in Scotland increased between 2016 and 2018 from 25.00% to 26.67%, while it decreased slightly in the rest of the United Kingdom, from 25.00% to 24.92%

A series of within country tests that exploit local shocks to PIT rates in Spain (along the border between Castilla La Mancha and Murcia), the UK (along the Scottish-English border) to corroborate cross-country findings. In these high internal validity settings, they confirm that **increases (decreases) in PIT lead to lower (higher) corporate investment**.

Table 7: Exploiting Within-Country Variation

This table presents the results from an event study focusing on within country variation in Spain and the United Kingdom. Panel A uses data from Amadeus for Spain over the period 2013–2017. We focus on the two-digit zip code regions of Castilla La Mancha (those starting with *02*) bordering Murcia and firms from Murcia (with postcodes starting with *30*). The treatment (control) group comprises the firms from Castilla La Mancha (Murcia). The dummy variable *Post* is equal to one for the years 2015 to 2017. In Panel B, we use data from Amadeus for the United Kingdom over the period 2014–2019. We focus on the two two-digit zip code regions in Scotland (those starting with *DG* and *TD*) bordering England and the two-digit zip code regions in England (those starting with *CA* and *NE*) bordering Scotland. The treatment (control) group comprises the Scottish (English) firms. The dummy variable *Post* is equal to one for the years 2017 to 2019. The dependent variable is the change in fixed assets scaled by lagged total assets. The control variables comprise leverage, sales growth, profitability, size, and wages. We include firm and industry–year fixed effects, where the industry is identified at the one-digit NACE (Standard Industrial Classification) code level in Panel A (Panel B). In Columns (3) and (4), we balance observations based on the mean and variance of firm-level characteristics, and use the weights from this entropy balancing as the weights in the regression. We require at least three observations per firm in each panel. In Panel C, we use the sample of Italy, with the same dependent variable as in Panels A and B. The independent variables are in first differences. The independent variable is the natural logarithm of *Net-of-Local-PIT*, one minus the average value of local PIT. We calculate the average value of PIT across municipalities in a zip code area. We include industry–year and province–year fixed effects. We report robust standard errors clustered at the firm level in parentheses in Panels A and B, and at the province level in Panel C. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: PIT Decrease in Spain, Castilla La Mancha versus Murcia

	Baseline		**Entropy Balancing**	
	(1)	(2)	(3)	(4)
Castilla La Mancha × *Post*	0.0107**	0.0111**	0.0110*	0.0097*
	(0.0054)	(0.0054)	(0.0056)	(0.0056)
Controls	No	Yes	No	Yes
Balancing	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Ind.–Year FE	Yes	Yes	Yes	Yes
Observations	8,198	8,198	8,198	8,198
Adj. R-squared	0.2053	0.2430	0.2108	0.2345

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The three sets of within-country tests support our main inferences of PIT having a negative effect on investments.

Panel B: PIT Increase in the United Kingdom, England versus Scotland				
	Baseline		Entropy Balancing	
	(1)	(2)	(3)	(4)
Scotland × Post	-0.0305*	-0.0355**	-0.0304*	-0.0317**
	(0.0158)	(0.0149)	(0.0163)	(0.0155)
Controls	No	Yes	No	Yes
Balancing	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Ind.–Year FE	Yes	Yes	Yes	Yes
Observations	1,915	1,915	1,915	1,915
Adj. R-squared	0.1320	0.1661	0.2131	0.2216
Panel C: Exploring Municipal-Level Taxes in Italy				
Income for PIT Calculation	EUR 10k	EUR 30k	EUR 70k	EUR 100k
	(1)	(2)	(3)	(4)
ΔNet-of-Local-PIT	0.0761	0.3255*	0.4009**	0.4164**
	(0.1293)	(0.1935)	(0.1963)	(0.1908)
Controls	Yes	Yes	Yes	Yes
Ind.–Year FE	Yes	Yes	Yes	Yes
Province–Year FE	Yes	Yes	Yes	Yes
Observations	499,812	499,812	499,812	499,812
Adj. R-squared	0.0627	0.0627	0.0627	0.0627

In Italy, except for incomes of EUR 10,000, lower local PIT are associated with greater investments. One potential reason for the lack of results in Column (1) is that the tax rates at that income level are the lowest of all income classes, averaging only 0.30%.

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taxes are borne by those who cannot easily adjust

(Kotlikoff and Summers 1987, p. 1047)

- the investment response should be stronger when firms are expected to bear more of the PIT burden because they are relatively inelastic vis-à-vis workers. Consistent with this, Jacob & Vossebürger (2022) find that the relatively inelastic firms' investment (proxied by low-margins, low unemployment environments, and border proximity) is more affected by PIT.
- Jacob & Vossebürger (2022) examine differences in financial constraints, because such constraints limit the flexibility of firms to respond to higher PIT-induced labor costs, making constrained firms less elastic.
- They find that the investment of firms with higher external financing costs (i.e., financially constrained firms) indeed responded more substantially to changes in PIT.
- If the link between capital and labor is strong (suggesting a complementary relation), a PIT-induced labor cost increase is expected to trigger a large capital investment response. There is a larger PIT–investment association in industries with a stronger capital–labor association.

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Table 8: Timing of Capital Investment around PIT Changes

This table presents the main regression results, including lead and lagged values for PIT. Controls and fixed effects from the main regression are included in all the regressions. We report robust standard errors clustered at the country–industry level in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable		**ΔCapital Investment**			
Income p.a. for PIT Calculation		EUR 10k	EUR 30k	EUR 70k	EUR 100k
		(1)	(2)	(3)	(4)
Response already before the tax change	year *t* + *2*	0.2013**	-0.0259	0.0432	0.0431
		(0.0842)	(0.0783)	(0.0713)	(0.0693)
	year *t* + *1*	0.1156	-0.0071	0.0397	0.0244
		(0.1012)	(0.0719)	(0.0592)	(0.0580)
Immediate Response	**year *t***	**0.3931*** **	**0.5133*** **	**0.4008*** **	**0.3464*** **
		(0.1011)	**(0.0900)**	**(0.0622)**	**(0.0544)**
Delayed Response	year *t* − *1*	-0.1897*	0.0180	0.0194	0.0663
		(0.1010)	(0.0690)	(0.0480)	(0.0419)
	year *t* − *2*	0.0865	-0.1336	-0.1119**	-0.0639
		(0.0850)	(0.0858)	(0.0559)	(0.0457)
Controls & FE		Yes	Yes	Yes	Yes
Observations		979,609	979,609	979,609	979,609
Adjusted R-squared		0.0428	0.0429	0.0429	0.0429

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Table 9: PIT and Investment, Stacked DiD Regressions

This table presents regression results on investment from a stacked regression, where we center events around the respective tax reform. We use tax reforms that changed the PIT at EUR 30,000 by at least 1 percentage point, but who did not reverse this change in the two years before and after. As control countries, we use countries that did not change their PIT by more than 0.2 percentage point around in the five years around the reform of the treated country. We obtain six events: Finland 2010, Hungary 2010, Croatia 2011, Hungary 2011, Netherlands 2015, and the United Kingdom 2015. In Column (1), we interact *Post* with *Treatment*. *Treatment* equals one for the tax change country. *Post* equals for the years after the reform, and zero otherwise. To use increases and decreases in the same regression, we multiply the dependent variable with -1 in case of a tax increase in Column (1). In Column (2), we split the events in *Tax Decrease* and *Tax Increase* events using indicator variables and refrain from multiplying the dependent variable with -1 in case of tax increases. As there is only one increase-event, the ability to make statements using the stacked approach is limited. In Column (3), we interact *Post* with the change in the Net-of-PIT due to the reform (*Reform ΔNet-of-PIT*). We include control variables (in levels) and industry-year fixed effects for each event in all specifications. We report robust standard errors clustered at the country–event–industry level in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	**ΔCapital Investment**		
	(1)	(2)	(3)
Post × *Treatment (=Tax Cut)*	0.0119**	-	-
	(0.004		
Post × *Tax Decrease*		0.0097**	
		(0.0044)	
Post × *Tax Increase*		0.0116	
		(0.0180)	
Post × *Reform ΔNet-of-PIT*			0.3787**
			(0.1768)
Controls	Yes	Yes	Yes
Industry-Year-Event FE	Yes	Yes	Yes
Observations	1,311,251	1,311,251	1,311,251
Adjusted R-squared	0.0280	0.0301	0.0301

Progressivity of the personal tax matters for investments

- the progressivity of the personal tax matters for investments (Zidar, 2019)
- positive relationship between tax cuts and employment growth is largely driven by tax cuts for lower-income groups, whereas the effect of tax cuts for the top 10% on employment growth is small (Zidar, 2019)
- irrespective of who pays a tax, what matters for investment decisions is who bears the tax burden (e.g., Jacob et al. 2019)
- the stimulative effects of income tax cuts are largely driven by tax cuts for the bottom 90 percent and that the empirical link between employment growth and tax changes for the top 10 percent is weak to negligible over a business cycle frequency. These effects are not confounded by changes in progressive spending, state trends, or prior economic conditions. The effects seem to come from labor supply responses as well as increased consumption and investment (Zidar, 2019)

Progressivity of the personal tax matters for investments

Equity-efficiency trade-offs in tax policy:

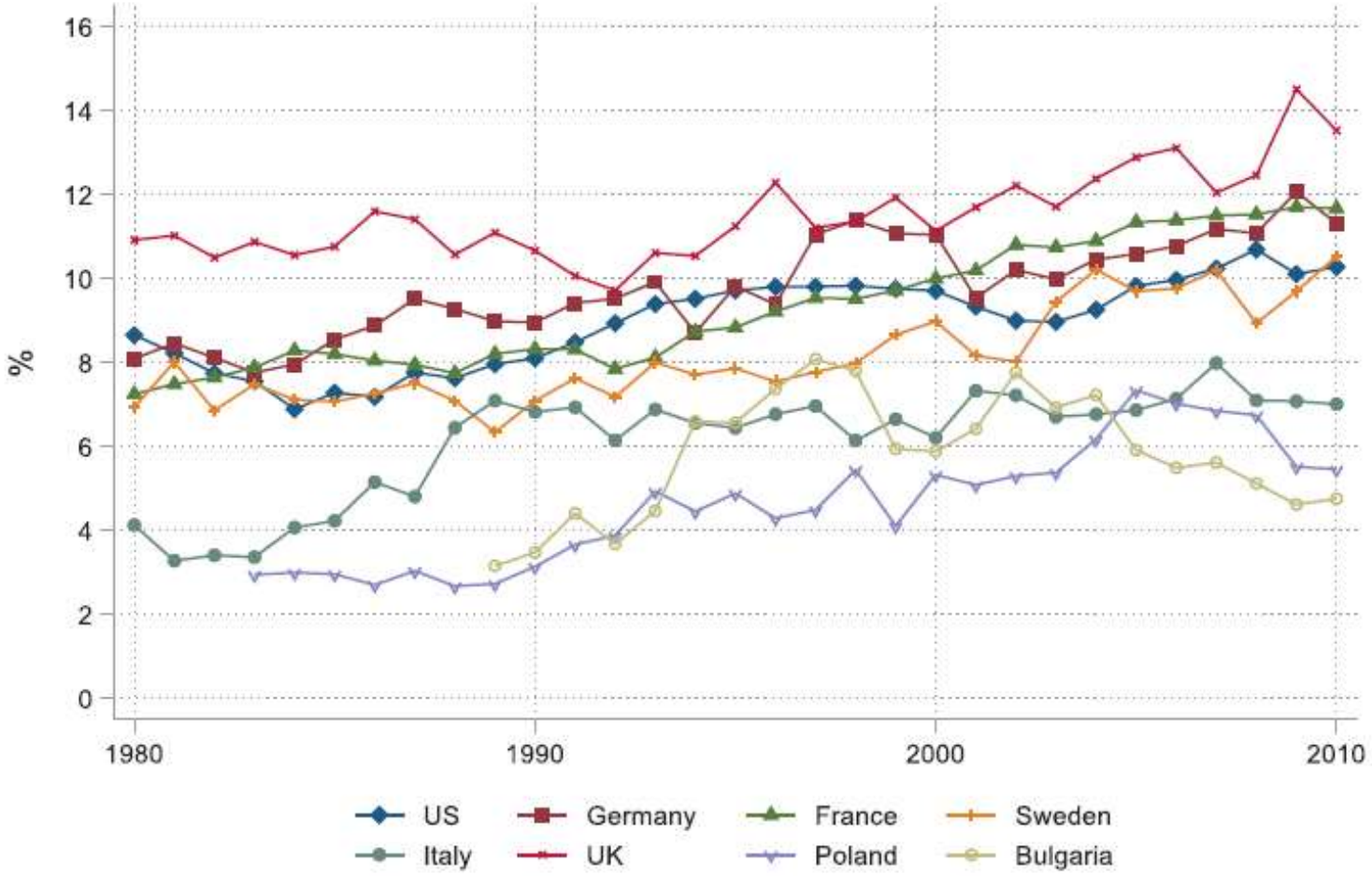
- If policy makers aim to increase economic activity in the short to medium run, tax cuts for top-income earners will be less effective than tax cuts for lower-income earners.
- While it is possible that **tax cuts for top-income earners have sizable long-run impacts through different channels** such as:
    - human capital investment,
    - firm creation,
    - innovation,
- much more compelling evidence on these channels is needed to support top-income tax cuts on efficiency grounds, especially given the magnitude of resources devoted to these tax policy changes. Future research is required.
- Overall, the results not only suggest some skepticism for "trickle-down" economics but also provide evidence that
supply side tax policies should do more to consider the relative efficacy of tax cuts targeted lower in the income distribution

Rising INEQUALITY – what determines income distribution?

- Evidence of rising inequality has drawn attention to the determinants of the income distribution. While the OECD (2011) focuses on common trends in technology, globalization, demographics and redistribution, there is in fact significant heterogeneity in inequality among industrialized countries (Atkinson et al., 2011).
- Economic and political institutions account for these differences as they determine the supply of skills, the degree of investment in technology, how markets are regulated, how bargaining power is distributed and also to what extent the market outcome is corrected by redistribution (Acemoglu and Robinson, 2015).
- Although the causal impact of inequality on social outcomes is hard to establish empirically, this could negatively impact economic growth (Berg et al., 2018) and health, family formation, crime, intergenerational mobility, trust, or populism (Nolan and Valenzuela, 2019).
- Responding to growing inequalities, many economists and policymakers have started to **call for increased income redistribution through higher taxes and transfers** (Piketty, 2014; Stiglitz, 2012; Ostry et al., 2016).

Redistributive policies effects on innovation

- While the link between inequality and innovation has been a subject of intense debate (Tselios, 2011; Antonelli and Gehringer, 2017; Aghion et al., 2019; Benos and Tsiachtsiras, 2019), the impact of income redistribution on innovation has so far received little attention.
- The theoretical effect of redistributive policies on innovation seems to be ambiguous.
- On one hand, one may expect that **financing redistributive transfers using higher** (and possibly more progressive) **income taxes lowers incentives to innovate** (especially among top-income earners) or motivates innovators to shift their activities to jurisdictions with lower tax rates.
- On the other hand, **higher redistribution can have a pro-innovation effect** if the social transfers are directed at increasing the supply of graduates in science, technology, engineering, and mathematics (STEM) fields or improving the chances of becoming inventors among talented persons with disadvantaged backgrounds.
- Therefore, the overall effect of redistribution on innovation is unknown a priori and should be verified empirically.



Note: Income redistribution is measured as a difference between pre-tax and post-tax Gini index.
Source: Own computation using data from the World Inequality Database project (WID.world).

Fig. 1. Trends in income redistribution based on the Gini index for selected countries.

FISCAL FEDERALISM - *redistribution* via taxation and transfers

- The constitutional assignment of fiscal responsibilities among different layers of government is an institutional characteristic that shapes the distribution of political power inducing political and economic constraints to the respective government level. A decentralized framework thus affects tax and spending policies.
- For whether tax and spending decisions are taken centrally or allocated to autonomous sub-national jurisdictions influences distributional outcomes. That is why the traditional theory of federalism assigns redistribution to the federal level (Oates, 1972; Musgrave, 1959). Mobile individuals and firms are thought to undermine the capacity of sub-federal jurisdictions to implement effective redistribution policies (Stigler, 1957; Oates, 1999).
- However, federalist structures are also likely to affect the distribution of pre-tax incomes. A decentralized organization of public expenditures involving sub-federal jurisdictions with genuine autonomy (e.g. in the areas of education, child and health care provision, infrastructure etc.) may lead to more efficient and targeted public goods provision and thus a more equal (pre-tax) distribution.

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Income inequality transmission channels on economic growth

In theory, income inequality can affect economic growth through the transmission channels of:

- human capital and capital services (investment, the input of capital into production) – income inequality may impede lower-income, liquidity-constrained households from undertaking profitable investments, exerting optimal effort or moving to productive neighborhoods & investment.
- fertility – income inequality could lead poorer households to have sub-optimally large families, limiting resources available for each child,
- total factor productivity (TFP) – income inequality could spur innovation and technological progress,
- political stability – income inequality may provoke political instability and social conflict.

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Income inequality's definitions:

- poverty,
- the income share of top incomes,
- ratios of incomes at different sections of the distribution (e.g. median to mean),
- measures of absolute income differences.

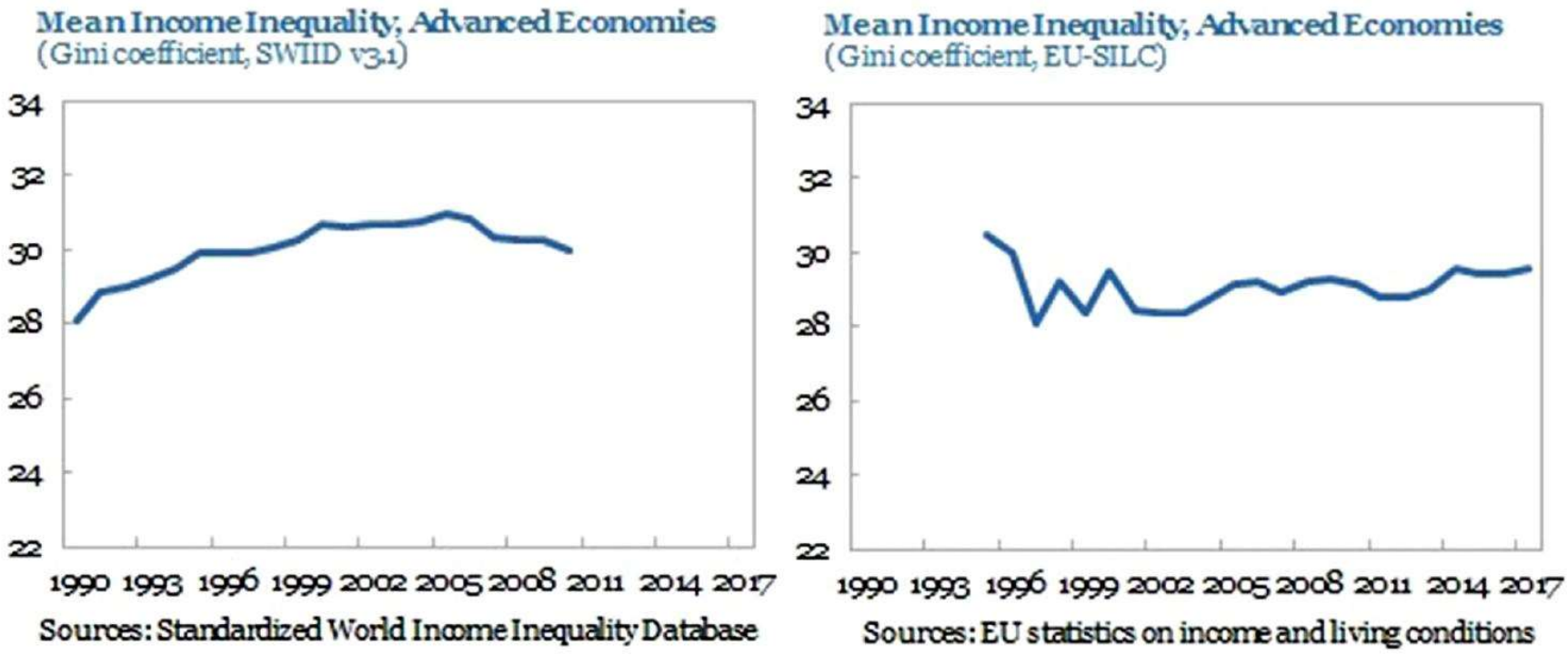

Fig. 1. Means of inequality measures.
Note: The Figure shows the evolution of the mean of the six inequality measures, calculated from a sub-sample of advanced economies that have at least one observation in either the EU-SILC or LIS data. For each measure, the mean is calculated yearly based on all available observations in each year over the period 1990-2017 in the sub-sample.

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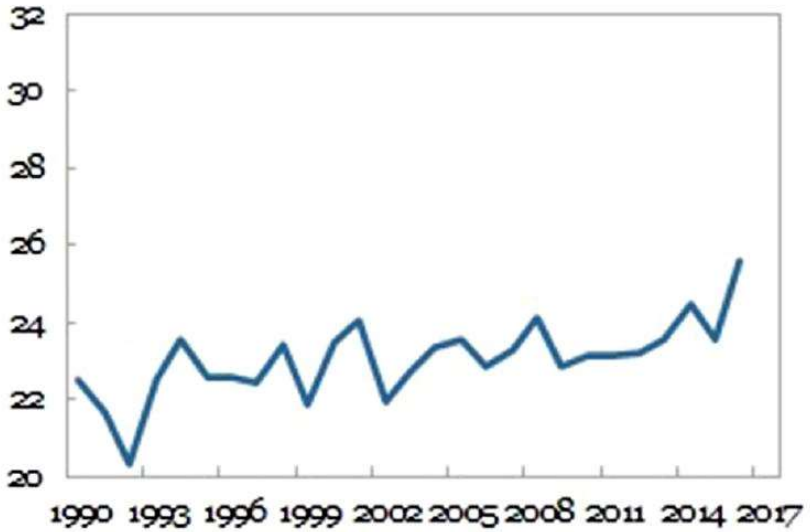
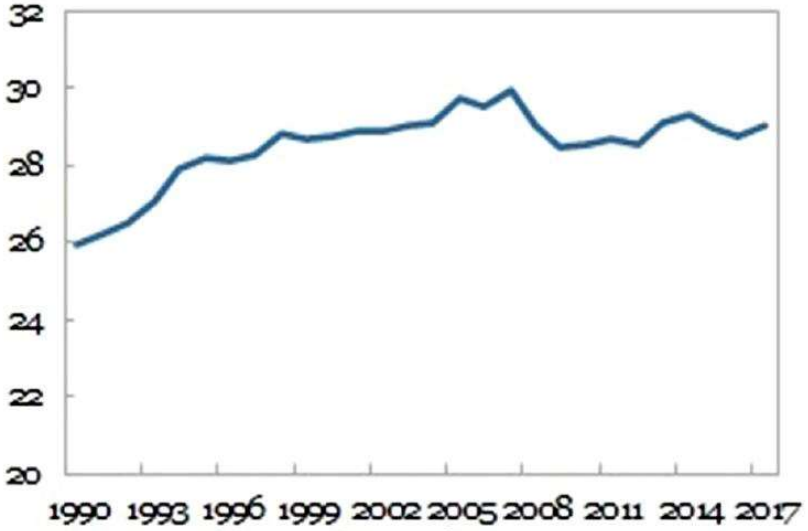
Mean Income Inequality, Advanced Economies
(Top10 Income Share, LIS)



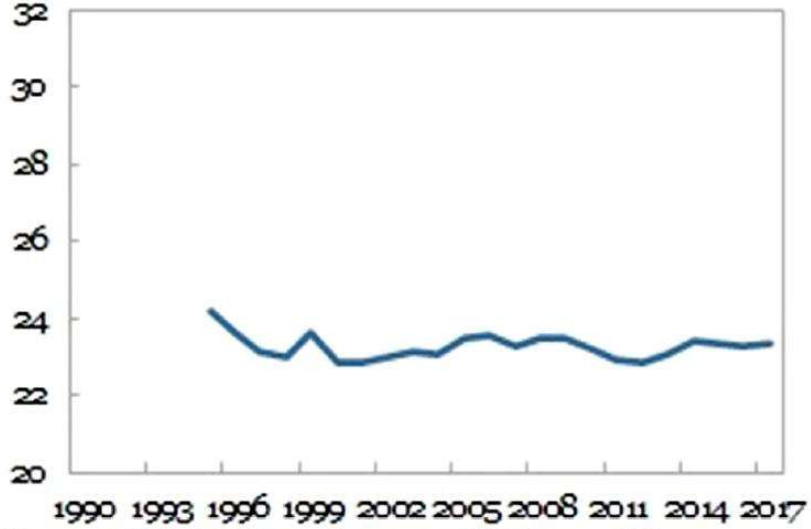
Sources: Luxembourg Income Study

Mean Income Inequality, Advanced Economies
(Top10 Income Share, WID)



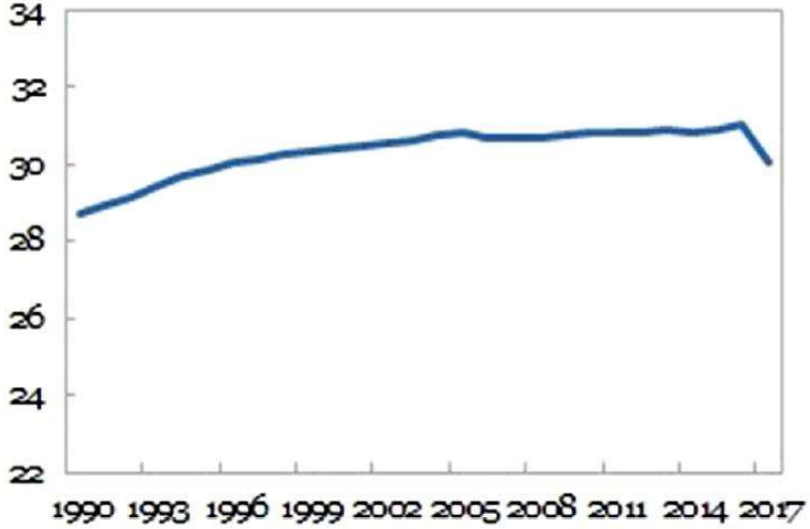
Sources: World Inequality Database

Mean Income Inequality, Advanced Economies
(Top10 Income Share, EU-SILC)



Sources: EU statistics on income and living conditions

Mean Income Inequality, Advanced Economies
(Gini coefficient, SWIID v8.3)



Sources: Standardized World Income Inequality Database

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Does income redistribution impede innovation?

- Economic inequalities have increased in many countries since the 1980s, provoking calls for more income redistribution. One **argument against increased redistribution is that it could hamper innovation and technological progress**.

- Brzezinski (2022) finds that redistribution has **no negative impact on innovation** in the cross-country setting. This result is robust to various measures of income redistribution and patent-based indicators of innovation, including patent counts, patent citations, and patent originality.

- Benos and Tsiachtsiras (2019) found a negative association between inequality and several measures of innovation in a panel of 29 countries. On the other hand, Brzezinski (2022) find no significant relationship between any measure of income inequality and innovation measured using patent counts. This suggests that **inequality may have a more pronounced effect on the quality of innovation and lesser or no effect on its quantity**.

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