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ABSTRACT

How has globalization affected the relative taxation of labor and capital, and why? To address this question we build and analyze a new database of effective macroeconomic tax rates covering 150 countries since 1965, constructed by combining national accounts data with government revenue statistics. We obtain four main findings: (1) The effective tax rates on labor and capital converged globally since the 1960s, due to a 10 percentage-point increase in labor taxation and a 5 percentage-point decline in capital taxation. (2) The decline in capital taxation is concentrated in high-income countries. By contrast, capital taxation increased in developing countries since the 1990s, albeit from a low base.(3) Consistently across a variety of research designs, we find that the rise in capital taxation in developing countries can be explained by a tax-capacity effect of international trade: Trade openness leads to a concentration of economic activity in formal corporate structures, where capital taxes are easier to impose. (4) At the same time, international economic integration reduces statutory tax rates, due to increased tax competition. In high-income countries, this negative tax competition effect of trade has dominated, while in developing countries the positive tax-capacity effect of international trade appears to have prevailed.

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1 Introduction

How has globalization affected the relative taxation of labor and capital, and why? Has international economic integration eroded the amount of taxes effectively paid by capital owners, shifting tax burdens to workers? If so, which countries have been most affected by this process and through which mechanisms? Answering these questions is critical to better understand the macroeconomic effects and long-run social sustainability of globalization.

To address these questions, this paper builds and analyzes a database of effective tax rates on labor and capital covering more than 150 countries since 1965. Constructed following a common methodology that combines government revenue statistics with national accounts data, these series allow us to study trends in labor and capital taxation comprehensively, globally, and over a long period of time. Our database captures all taxes paid at all levels of government: corporate income taxes, individual income taxes, payroll taxes, property taxes, estate and inheritance taxes, consumption taxes, and other indirect taxes. This makes it possible to estimate total tax wedges, for instance the gap between what it costs to employ a worker and what the worker receives. Because our series are based on national accounts data that are harmonized across countries, they can be used to meaningfully compare effective tax rates internationally and over time. Last, since capital income is always more concentrated than labor income, the relative taxation of the two factors of production is closely linked to the progressivity of the overall tax system. Our database thus provides insights into changes in tax redistribution over the last half-century.

To maximize the time and geographical scope of this database, we conducted a large-scale digitization and harmonization of historical data published by national statistical offices, which we combine with existing (but limited in coverage) series published by the United Nations, the OECD, and the IMF. The construction of our effective tax rates proceeds in three steps. Using national accounts data we first compute total labor and capital income in each country. Using government revenue statistics we then classify all government revenue sources into either labor taxes, capital taxes, or indirect taxes. Combining these two inputs, we compute effective macroeconomic tax rates on labor and capital by dividing

labor or capital taxes paid by the corresponding income flow. The database—including detailed decompositions by type of tax—is available online at https://globaltaxation.world.

From this database, we are able to make two main contributions. The first is to establish a set of facts on the evolution of factor income taxation. Taking a global perspective, we find that average effective labor and capital tax rates have converged globally since the 1960s, due to a 10 percentage-point increase in labor taxation and 5 percentage-point decrease in capital taxation. This decline in capital taxation is driven by a collapse in the taxation of corporate profits, from close to 30% in the 1960s to less than 20% in the late 2010s. The rise in labor taxation owes primarily to the expansion of payroll taxes.

Our most striking findings involve the evolution of capital taxation. We uncover an asymmetric evolution of capital taxation across countries of different development levels. In high-income countries, effective capital tax rates collapsed, from close to 40% in the post-World War II decades to about 30% in 2018. For instance, in the United States, the average effective capital income tax rate fell from more than 40% in the 1960s to 25% in 2018. By contrast, in developing countries effective capital tax rates have been on a rising trend since the 1990s, albeit starting from a low level. Effective capital tax rates rose from about 10% in the 1990s to 20% in 2018, with the increase happening primarily in large economies. Between 1995 and 2018, for example, the effective capital tax rate rose from 10% to 30% in China, 18% to 28% in Brazil, 7% to 11% in India, and 5% to 10% in Mexico. This increase is one factor explaining the rise in the overall tax-to-GDP ratio of developing countries, along with the increase of indirect taxes and a slow but steady rise in labor taxation.

This rise of capital taxation in low- and middle-income countries had not been noted in the literature before, due to the lack of data on the evolution of tax structures in developing countries. The finding appears to be robust. It holds when we exclude China and oil-rich countries; when we restrict the analysis to a balanced sample of countries; and under different weighting schemes. It holds with alternative approaches to computing capital and labor income in non-corporate businesses, where factor shares are not directly observable. It is also robust to alternative ways of assigning certain taxes to capital versus labor.

Why did effective tax rates on capital rise in developing countries while they fell in high-income countries in the era of hyper-globalization? Our second main contribution

is to formulate and test a hypothesis that sheds light on this puzzle. Our hypothesis is motivated by the observation that the increase in capital taxation in developing countries coincides with their trade liberalization. Between the late 1980s and the early 2000s, many countries opened their markets and reduced tariffs. This policy revolution, combined with technological improvements (e.g., the rise of container shipping), led to a boom in international trade and reshaped the economy of countries such as Mexico, India, and China. We hypothesize that trade liberalization exerts a positive effect on developing countries' ability to raise tax revenue: by increasing the concentration of economic activity in formal corporate structures at the expense of smaller informal businesses, it facilitates the imposition of taxes, particularly of corporate taxes—a pro-tax-capacity effect.[1] Meanwhile globalization exacerbates tax competition and create new opportunities for tax avoidance, putting downward pressure on capital tax rates—a race-to-the-bottom effect. Our evidence suggests that in high-income countries the race-to-the-bottom effect has dominated, while in developing countries the tax-capacity effect appears to have prevailed since the mid-1990s.

To establish these results, we implement three research designs. First, we run non-parametric estimations of the five-year relation between changes in effective tax rates and changes in trade openness. Second, we analyze major trade liberalization events which occurred in seven large developing countries. These events are those that caused the largest and most sudden reduction in trade barriers, including for instance the often-discussed WTO accession of China in 2001 (Goldberg and Pavcnik, 2007; Goldberg and Pavcnik, 2016; Brandt et al., 2017). We use synthetic control methods to create counterfactuals for each country's event, and present event-study graphs. Last, we extend the two instruments for trade openness presented in Egger, Nigai, and Strecker (2019), to estimate the effect of trade on factor taxation.

In each case we find that trade openness leads to a large rise in effective capital taxation in developing countries, and a smaller increase in effective labor taxation. On the contrary, trade integration has a null or negative effect on capital taxation in high-income countries,

[1] Trade also encourages the adoption of modern accounting practices and leads to growth in firm size and the expansion of value chains. As large corporations are more visible and generate information trails (Kleven, Kreiner, and Saez, 2016; Basri et al., 2019), the literature is consistent with the hypothesis that trade-induced economic change could make the tax base more enforceable in low-tax-capacity states.

but a positive effect on labor taxation. Although the sources of variation and identification strategies involved are different in our three empirical specifications, our results are consistent across them and robust to a range of sensitivity checks.

To better understand these results, we study potential mechanisms using event studies and the instrumental variable research designs. Consistent with the tax-capacity hypothesis, we find that trade liberalization leads to a rise in the fraction of domestic product that originates from the corporate sector (at the expense of the non-corporate business sector) and to an increase in salaried employment (at the expense of self-employment). These changes lead to a growing fraction of output being produced and income being earned in sectors that are more visible and easier to tax. We also find that the positive impact of trade on capital taxation, in addition to being concentrated in developing countries, is stronger in populous countries and in countries with restrictions on capital flows. This finding is consistent with the notion that large countries and countries managing their capital accounts are less exposed to the race-to-the-bottom effect that has pushed capital taxation down in high-income countries. Last, trade liberalization is actually associated with a decline in statutory corporate tax rates across all countries, but more so in high-income countries. On net, the trade-induced increase in tax capacity dominates the statutory tax rate reduction in developing countries, and vice-versa in rich countries.

The rest of the paper proceeds as follows. In Section 2, we relate our work to the existing literature. Section 3 describes the methodology and data collection. Section 4 presents our findings on the evolution of effective tax rates over the long-run. In Section 5, we present graphical evidence on the association between trade openness and effective tax rates. Section 6 studies the impacts of major trade liberalization events. Section 7 presents instrumental variable estimates of the effect of trade liberalization and investigates heterogeneity and mechanisms. In Section 8 we analyse episodes of capital liberalization. Section 9 concludes. The paper is supplemented by an Online Appendix that provides step-by-step details of data construction and additional results.

2 Related literature

2.1 Globalization and taxation

Our paper first relates to the literature on globalization and taxation. Since Adam Smith (1776), economists have conjectured that increased openness pushes governments to reduce taxes on the most mobile factors of production (e.g., high-wage workers, capital) and recover the revenue shortfalls by increasing the taxation of less mobile factors (Bates, Da-Hsiang, and Lien, 1985; Rodrik, 1997). This effect is thought to be particularly strong for countries competing for capital (Wilson, 1999; Kanbur and Keen, 1993).

In an important contribution, Egger, Nigai, and Strecker (2019) show that globalization led to a decline in the progressivity of labor taxation in OECD countries since 1994 (namely, an increase in labor taxation for the middle class and a decline for the top 1 percent). Our approach, which focuses on the changing balance of labor vs. capital taxation in both OECD and non-OECD countries, is complementary. For OECD countries, our findings reinforce Egger, Nigai, and Strecker (2019): we show that in addition to reducing labor tax progressivity, globalization has been associated with a sharp decline in capital taxation. This decline reduces overall tax progressivity (above and beyond the decline due to falling labor tax progressivity) given the concentration of capital income at the top.

Our paper also adds to the macroeconomic literature on the link between trade and taxes. Due to the lack of systematic statistics on the evolution of tax structures in developing countries, this literature has focused on high-income countries or a single tax (e.g., the corporate income tax).[2] Our contribution to this literature is to build and analyse a new global dataset of effective tax rate, extending prior work which focused on developed countries (Mendoza, Razin, and Tesar, 1994; Carey and Rabesona, 2004; McDaniel, 2007). This allows us to uncover new trends (most importantly, the rise in capital taxation in

[2] Rodrik (1997) finds that trade openness is associated with a decline in effective capital tax rates and an increase in effective labor tax for 14 OECD countries with high levels of capital mobility, between 1965 and 1991. In a sample of 14 OECD countries between 1981 and 1995, Swank and Steinmo (2002) finds that trade is not associated with changes to effective tax rates, neither on capital nor on labor. Over the same period Slemrod (2004) finds that trade is not associated with changes to the statutory corporate income tax rate.

developing countries in the era of hyper-globalization) and to formulate an hypothesis that can explain this dynamic.

2.2 Tax capacity in developing countries

Our paper also relates to the growing literature on tax capacity in developing countries. This literature highlights a number of factors driving the rise of taxation over the path of development, including change in employment structure (Jensen, 2022), growing capacity to observe income (Pomeranz, 2015), the threat of whistle-blowing in large firms (Kleven, Kreiner, and Saez, 2016), and administrative investments in tax capacity (Besley and Persson, 2014). We complement these studies by investigating the role of a new channel, international trade. The increase in effective tax rates we document in response to trade liberalization is consistent with previous studies showing that trade has a positive effect on growth (e.g., Goldberg and Pavcnik, 2016) and growth is associated with higher tax rates (e.g., Besley and Persson, 2014). Our approach goes further by showing the direct role of trade openness. Moreover, we provide evidence on mechanisms through which trade liberalization affects effective tax rates – namely an increase in the corporate share of domestic product and a transition from self-employment to salaried employment. While the literature on tax capacity has emphasized theoretically and descriptively the importance of these mechanisms along the development path, we provide some of the first well-identified evidence.[3]

Last, we add to a body of work in economic history documenting the long-run evolution of tax revenue and tax capacity (Cogneau, Dupraz, and Mesple-Somps, 2021; Cogneau, Dupraz, Knebelmann, et al., 2021; Albers, Jerven, and Suesse, 2020).[4] A strand of that literature studies the tax revenue effects of trade liberalization and the extent to which lost tariff revenues were compensated by other taxes, in particular the value-added tax (Baunsgaard and Keen, 2009; Cage and Gadenne, 2018; Buettner and Madzharova, 2018).

[3]We also find that trade liberalization increases the effective tax rate on labor, suggesting that it raises labor formality. Recent work shows this is the case for the tradable sector (e.g., Dix-Carneiro, Goldberg, et al., 2021), but the evidence of the impact of trade on overall labor formality in developing countries is mixed (e.g., McCaig and Pavcnik, 2018; Dix-Carneiro and Kovak, 2017; Attanasio, Goldberg, and Pavcnik, 2004).

[4]These studies cover a century of tax revenue, dating from pre-independence, respectively for French colonial Africa, and all of Africa.

Our paper complements this work by focusing on effective labor vs. capital tax rates in addition to total tax revenues, and by implementing several identification strategies to capture the causal effect of trade.[5]

3 Construction of factor shares and effective tax rates

This section describes the construction of our database of effective tax rates on labor and capital. The data covers the 150 most populous countries from 1965 to 2018, with exceptions only for pre-independence, civil war, and command economy eras. The database is available online at http://globaltaxation.world along with country-specific visualizations and notes. Here we focus on the general methodological principles.

3.1 Conceptual framework and methodology

3.1.1 Factor shares

We begin by decomposing each each country's output into a labor and capital component. Following standard national accounts definitions, net domestic output Y at factor prices (i.e., before indirect taxes) can be expressed as:

$$Y = CE + OS_{CORP} + OS_{HH} + OS_{PUE} \tag{1}$$

where CE is compensation of employees (wages, salaries, plus supplements to wages and salaries such as contributions to pensions); OS_{CORP} is the operating surplus of corporations (profits, net of depreciation); OS_{HH} is the operating surplus of households (actual and imputed rental income); and OS_{PUE} is the operating surplus of private unincorporated enterprises, or mixed income.

[5] Cage and Gadenne (2018) find that trade liberalization led to a decrease in overall tax revenue pre-1995. Our paper highlights positive revenue effects of trade liberalization but looking at different outcomes (effective capital and labor tax rates, as opposed to indirect tax revenues) and sample periods (the positive effects we obtain are concentrated after 1995). We also complement Buettner and Madzharova (2018) who shows that lost tariff revenue from WTO accession events in the 1990s were fully compensated.

The capital share of net domestic output, denoted α is computed as:

$$\alpha = \frac{Y_K}{Y} = \frac{OS_{CORP} + OS_{HH} + (1-\phi) \cdot OS_{PUE}}{CE + OS_{CORP} + OS_{HH} + OS_{PUE}} \tag{2}$$

where ϕ is the labor share of mixed income. The labor share of net domestic output, $1-\alpha$ equals compensation of employees plus a share ϕ of mixed income:

$$1 - \alpha = \frac{Y_L}{Y} = \frac{CE + \phi \cdot OS_{PUE}}{CE + OS_{CORP} + OS_{HH} + OS_{PUE}} \tag{3}$$

Four points are worth noting. First, our output measure is net domestic product, that is, operating surplus is measured net of capital depreciation. Throughout this paper we focus on net-of-depreciation output concepts, as in, e.g., Karabarbounis and Neiman (2014) and Guerriero (2019). Second, as is standard in the literature (see Browning, 1978; Saez and Zucman, 2019b), we do not allocate indirect taxes to labor or capital; we instead compute factor shares of domestic product net of indirect taxes. Third, public-sector enterprises are usually included in the corporate sector (see Lequiller and Blades, 2014). Last, we compute factor shares of domestic output (as opposed to national income). For example, residents in Lesotho may earn labor income in South Africa, and corporations resident in France may book profits in Luxembourg. Wages earned in South Africa are included in Y_L for South Africa (not Lesotho); profits booked in Luxembourg are included in Y_K for Luxembourg (not France). This is the most logical thing to do for our purposes, since countries typically try to tax domestic output.

The labor share of mixed income. In the data we collected (discussed in Section 3.2), we observe all components of equations (3) and (2), except for the labor share of mixed income, ϕ. Measuring the labor component of self-employment and unincorporated enterprises' income is challenging, as discussed in Gollin (2002) and Karabarbounis and Neiman (2014). For our benchmark series we follow the literature in assuming that $\phi = 70\%$ (see Blanchet, Chancel, et al., 2021). To test for robustness, we also implement the method discussed in Young (1995), Gollin (2002), and Guerriero (2019) and developed further in Cette, Koehl, and Philippon (2020) and ILO (2019). This method imputes to the self-employed a labor

income similar to the wage they would have earned in an employer-employee relation, based on observable characteristics. We extend the estimates in ILO (2019), using ILOSTAT (2021) data on self-employment shares of the workforce, to all countries since 1991, and impute the series backwards to complete it. Details are in the data Appendix B.

3.1.2 Effective tax rates on capital and labor

We allocate each tax revenue source to labor, capital, or a mix of the two. Specifically, (1) Corporate income taxes, wealth taxes, and property taxes are allocated to capital. (2) Payroll taxes and social security payments are allocated to labor. (3) Personal income taxes are allocated partly to labor and partly to capital (see below), reflecting the fact that personal income is composed of salaries, capital income, and mixed income. (4) Indirect taxes are treated as a separate category (i.e., are assigned neither to labor nor to capital). Table A1 summarizes our allocation.

Allocation of the personal income tax to factors of production. The main empirical difficulty in assigning taxes to labor or capital concerns the allocation of the personal income tax (PIT). In most countries, both labor income and capital income are subject to the PIT. As labor income accounts for about 70% of national income and capital income for about 30%, a naive procedure would allocate 70% of the PIT to labor and 30% to capital. In practice, however, not all labor and capital income is subject to personal income taxation, due both to the fact that some individuals are not required to file an income tax return and to legal exemptions for some forms of income. Exemptions for capital (e.g., imputed housing rents, undistributed corporate profits, investment income earned on retirement accounts) are typically larger than for labor (e.g., pension contributions, health insurance contributions); see, e.g., Saez and Zucman (2019b). In the United States, Piketty, Saez, and Zucman (2018) find that 75% of labor income is subject to the individual income tax in 2015, as opposed to only a third of capital income. This would call for allocating about 15% of the personal income tax to capital and about 85% to labor.[6] A last difficulty is that

[6] If 75% of labor income is taxable and labor income is 70% of national income (resp. 33% and 30% for capital income), then $75\% \times 70\%/(75\% \times 70\% + 33\% \times 30\%) = 84\%$ of the PIT base is labor income and 16% is capital income.

labor and capital income are not necessarily subject to the same tax rate. Starting in the 1990s, a number of economies have adopted dual-income tax systems, whereby labor and capital incomes are subject to different schedules, with labor income typically subject to a progressive tax schedules and (some) capital income subject to flat tax rates.

To account for these facts, we proceed as follows. We start with the baseline assumption, consistent with US data, that 15% of PIT revenues derive from capital and 85% from labor. We then use data from Jensen (2022), which documents the location of the PIT threshold across countries, to adjust for the share of capital income in the PIT at the country-year level. Since richer taxpayers derive a larger share of their income from capital, countries with a high PIT exemption threshold—and thus more exempted taxpayers—have a larger capital share of PIT revenue. Finally, we use data from the OECD to account for dual income tax systems. Specifically, when dividends face a lower tax rate than ordinary income, we compute the ratio of the statutory rate on dividends to that of the top rate on labor income, and adjust the capital share of PIT revenue down when this ratio is below one. Appendix B.2 discusses these adjustments in further detail.

The resulting share of PIT revenue allocated to capital varies between 7% and 35%, depending on countries and years. Over time, this share falls from a global average of 19% in 1965 to 14% in 2018, due to both a reduction in PIT exemption thresholds and to the adoption of lower tax rates on dividends in some countries.

Effective tax rates. The total tax revenue assigned to labor and capital is:

$$T_L = \sum [\lambda_{ic} \cdot \tau_i] \quad \text{and} \quad T_K = \sum [(1 - \lambda_{ic}) \cdot \tau_i] \tag{4}$$

where λ_{ic} is the allocation to labor of each type of tax τ_i in country c (see Table A1).

The effective tax rates (ETR) on labor and on capital, ETR_L and ETR_K, are computed by dividing tax revenue collected by the size of the respective labor and capital income flows:

$$ETR_L = \frac{T_L}{Y_L} \qquad \text{and} \qquad ETR_K = \frac{T_K}{Y_K} \tag{5}$$

These measures of macroeconomic effective taxation capture the overall tax burden on labor and capital, building on the work of Mendoza, Razin, and Tesar (1994) and Carey and Rabesona (2004).[7] These ETRs have a number of advantages. First, they capture the economically relevant tax wedges on each factor of production (i.e., the wedges that matter for production decisions), such as the difference between the costs to employ a worker and what the worker receives.[8] Second, because national account statistics are compiled following harmonized concepts and methods, they are conceptually comparable over time and across countries. Third, since they rely on the amount of tax effectively collected by governments, they incorporate the net effects of all tax rules— such as base reductions, exemptions, and tax credits—and of tax avoidance and evasion.[9]

3.2 Data sources

3.2.1 National income components

To estimate factor shares for 156 countries since the 1960s, we create a harmonized panel of national accounts which combines data from the UN System of National Accounts, the World Inequality Database, and other sources.

From the World Inequality Database (WID, 2020), we retrieve United Nations (UN) System of National Accounts (SNA) data that covers 4,000 country-years. These data come from the production and income accounts of the online UN SNA (2008), "Main Aggregates and Detailed Tables." In addition, the UN Statistics Division provided us access to their archival data on the components of GDP, with over 2,000 country-year observations from the 1960s and 1970s, presented following the 1968 System of National Accounts (UN

[7]Compared to pre-existing work, our ETRs are global, cover over a half-century, systematically integrate mixed income, and account for heterogeneity in the capital component of PIT revenue using new data on the location of the PIT exemption threshold and on the relative taxation of dividends vs. labor income.

[8]The computation of these economically relevant wedges does not require one to make assumptions about behavioral responses (and hence about the incidence of taxes). See Mendoza, Razin, and Tesar (1994) and Saez and Zucman (2019a) for a conceptual discussion.

[9]The ETRs computed in (5) are called backward-looking ETRs in the literature. A separate literature tries to model all statutory features of the tax system at a point in time in order to measure forward-looking ETRs (see, e.g., King and Fullerton, 1984; Devereux, 2004).

SNA, 1968).[10] When these accounts are incomplete (e.g., a component of GDP is missing, or there is no data on depreciation), we recover missing values using accounting identities or by following the imputation procedures used in the World Inequality Database (WID, 2020). To ensure comparability with the more recent data, we recast the historical series into the 2008 System of National Accounts framework.[11] To our knowledge, this is the first factor income shares dataset that harmonizes data from the 2008 and 1968 System of National Accounts. In countries and years when the two systems overlap (typically in the 1970s, when countries transitioned from the old to the new framework), the series match well.

Our work expands the dataset in Karabarbounis and Neiman (2014) along two dimensions. First, the integration of the 1968 System of National Accounts data extends coverage in time and space.[12] Second, while Karabarbounis and Neiman (2014) focuses on factor shares in the corporate sector, we compute factor shares of total domestic output.

3.2.2 Tax revenue data

We construct a new tax revenue dataset that includes disaggregated tax revenue data by type of tax. Our database includes all taxes—personal income taxes, corporate income taxes, Social Security payroll taxes, property taxes, wealth taxes, estate and inheritance taxes, consumption and other indirect taxes —at all levels of government. We integrate previously unused historical data from developing countries to obtain a global coverage.

We first gathered existing high-quality data from OECD (2020) and ICTD/UNU-WIDER (2020) for recent years, and from the IMF GFS (2005) for older years. Second, we retrieved thousands of country-year observations of historical revenue data from the Harvard University Library archives,[13] as well as online data from national statistical offices and

[10]The variables include value added; compensation of employees; operating surplus of corporations; operating surplus of unincorporated enterprises; consumption of fixed capital; and indirect taxes net of subsidies.

[11]Specifically, 1968 SNA data always include compensation of employees and operating surplus of corporations, but do not disaggregate mixed income and operating surplus of the household sector (which are lumped into a single aggregate). We impute the split of mixed income vs. household operating surplus according to the split seen in the 2008 SNA at the time of switching (typically in the 1970s). We also follow the United Nations guidelines to stitch these series together (UN, 2018).

[12]Karabarbounis and Neiman (2014) restrict their sample to online UN SNA 2008 data, and to countries with at least 15 consecutive years of complete-case data.

[13]Lamont Library, Government Documents section.

finance ministries. Third, we classify each revenue source following the OECD's tax classification (see OECD, 2020). Table B1 details the data sources used.

When available, OECD tax revenue data is our preferred source, because it covers and classifies all types of tax revenues, usually back to 1965 for OECD countries. OECD data accounts for 41% of the country-year observations in our dataset. Its drawback is its limited coverage of non-OECD countries: in total it covers 93 countries, and only over the past two decades.

To increase coverage, we augment the OECD data with the tax revenue data from the ICTD/UNU-WIDER (2020) (17% of observations). This dataset achieves near worldwide coverage but, for our purposes, faces limitations: it only starts in the 1980s; it does not follow the tax classification of the OECD; it sometimes mixes personal and corporate income taxes; and it often lacks payroll taxes and decentralized taxes. To address these shortcomings, we use historical public finance data from government reports, primarily from the Harvard Library archives (30% of country-year observations) and from the IMF GFS (2005) offline historical database (10% of observations).[14]

To stitch together country-by-country time series of tax revenues, we follow three principles. First, we aim to only rely on a maximum of two data sources by country: the OECD when it exists, and the alternative source with the best coverage over time and by tax type. Archival data is our second in priority since it often dis-aggregates revenue by source, and goes back to the 1960s. Our data hierarchy choice also depends on which source best matches the OECD data over their shared time frame. Second, we interpolate series with gaps, but only up to four years between two data points. Finally, we check country-specific policy reports and scholarly studies to triangulate across data sources and to identify events which may explain discordance across sources.

Tax revenues are disaggregated as finely as possible by source, according to the OECD tax classification (OECD, 2020). To allocate taxes to capital and labor, we pay attention to three dimensions. First, we systematically separate income taxes into personal and

[14]The ICTD/UNU-WIDER data draws principally from the IMF Government Finance Statistics online data, which covers the past few decades well. Our use of the IMF data is restricted to the offline historical dataset, which covers 1972-89 and fills gaps from the OECD and historical archives data. The ICTD does not report pre-1980 data.

corporate income.[15] Second, we always include payroll taxes, which requires at times to add new data sources (e.g., we digitized payroll tax revenues from the UN System of National Accounts and from Fisunoglu et al. (2011)). Third, we always include taxes on property, often the main source of local government tax revenues.

3.2.3 Data coverage

Figure A1 shows that our dataset covers 86% of World GDP in 1965 and 98% in 2015, as the number of countries grows from 78 to 156.[16] The main change in the sample of countries covered corresponds to the entry of ex-communist countries in the early 1990s. We also include China from 1994 on, the date of the creation of the modern Chinese tax system (World Bank, 2008).[17] Late decolonization and end of civil wars are other reasons to enter the panel later than 1965.

The dataset is thus composed of two (quasi) balanced panels: the first covers the years 1965-1993 and excludes communist regimes. It accounts for 85-90% of World GDP during those years. The second covers 1994-2018 and includes former communist countries and China; it accounts for 98% of World GDP. At their time of entry into the dataset, ex-communist countries account for 8% of World GDP (4.5% for China and 3.3% for Russia).

4 Global trends in tax revenues, factor shares and effective tax rates

With this new dataset, we document the global evolution of tax revenues, factor shares, and effective taxation on capital and labor from 1965 to 2018. Our objective is to show time series for each outcome which can be interpreted as the global value worldwide, in each year. For example, the global effective tax rate on capital equals worldwide capital tax

[15] In some cases, this split is not available in the headline, official income tax revenue aggregates, so we look to expert studies elsewhere.

[16] In the most recent years we do not cover 100% of world GDP, as we did not try to collect data from countries with under 1 million inhabitants when these were not available through online sources.

[17] See Appendix B.3 for a case study of China.

revenue divided by worldwide capital income in the same year.[18] For each outcome we first show the global trends, and then show separately high vs. low and middle-income countries.

Tax revenues. Figure 1 shows the time series of tax revenue as a share of net domestic product (NDP), separated into its main components: corporate income taxes, property and asset taxes, personal income taxes, payroll taxes, and indirect taxes (VAT and tariffs). Globally, tax revenue as a share of NDP increased from 26% to 32% between 1965 and 2015. This is driven by an increase in payroll and personal income taxes, which went from 11% to 16%. Indirect taxes slightly rose over the past 50 years from 8% to 9%, while revenues from taxes on capital (corporate and property) stagnated at around 6%.

We observe two differences in tax revenue patterns between high-income versus low- and middle-income countries. First, tax revenue as a share of NDP is much higher in rich countries than in developing countries (37% vs. 23% in 2018). Second, in developing countries, all types of taxes increase their revenue collection over time (particularly from 1990 onward), including those on capital. By contrast, corporate income tax revenue decreased over time in high-income countries, and revenues from property taxes stagnated. Rising tax revenue in rich countries came primarily from the expansion of payroll taxes between 1965 and 1985.

Factor shares. Figure 2 shows the capital share of net domestic product over time (solid line) and the capital share within the corporate sector (dotted line). The capital share of world income increased from 20% to 26%. This global trend is due to rises in the capital share within both rich countries (from 25% to 28%) and developing countries (from 36% to 38%) and to the increasingly large weight of developing countries in world income. The capital share within the corporate sector followed the same evolution as the aggregate capital share: it increased from around 19% in 1965 to 28% in 2015.

[18] Global figures depend on countries' changing shares of world GDP: Figure A2 shows how the weight of different countries evolved over time, highlighting the growth of China's weight in the past 20 years, and to a lesser extent that of other developing countries. The weight of China in world GDP was far less in the pre-1994 era during which it is excluded. Appendix B provides further discussion.

Effective tax rates. Figure 3 shows our key time series: the evolution of the effective tax rates on labor (red) and capital (blue); and, within capital income, the evolution of the effective tax rate on corporate profits (dashed blue).[19] Globally, the ETRs on labor and capital converged between 1965 and 2018. This is due to a large increase in labor taxation and a mild decrease in capital taxation. The global ETR_L increased from 16% to approximately 25%, while over that same period, the ETR_K decreased from an average of 32% in the mid-1960s to 27% in the late 2010s. Within the corporate sector, the global ETR on corporate profits saw a more pronounced decline, from 27% in 1965 to 18% in 2018.[20] The decline in global effective capital taxation captures both changes within countries (most importantly the reduction in corporate tax rates in most high-income countries) and changes in the allocation of profits across countries, such as the rise of profit shifting to tax havens (Tørsløv, Wier, and Zucman, 2020).

The patterns are robust to the two main sources of uncertainty in the computation of effective tax rates. Figure A5 shows the evolution of ETRs over time when we allocate mixed income to labor and capital following the ILO country-specific method, instead of the benchmark 70/30 split. Figure A6 varies the allocation of the personal income tax (PIT) revenue to labor versus capital taxes, comparing the benchmark to two extreme scenarios which allocate 100% to labor (0% to capital), or 70% to labor (30% to capital).

These global trends mask heterogeneity by development level. First, the ETR_L increased by more in developed than in developing countries, even though the starting point was already higher in rich countries (18% in 1965) than in poorer countries (6%). Second, and most importantly, the decline in the effective tax rate on capital is concentrated in high-income countries, where it went from close to 40% in 1965 to about 30% by 2018. In contrast,

[19] The ETR on corporate profits is computed as the ratio of the revenue from the corporate income tax over the operating surplus of the corporate sector.

[20] Figure A4 shows the ETR series in a fully balanced panel of all countries since 1965, where missing values are imputed to control for the changing sample composition over time (most importantly China and Russia missing pre-1994). Imputing missing values has limited impact on the global ETRs series, since the countries entering in 1994 only represent 8% of global net product at that time, and Russia's ETRs are close to the global average upon entry. China's ETR are lower, which explains the slight drop in adjusted ETR_K and ETR_L series pre-1994. Focusing on developing countries only (1994 entrants now represent a third of total net product), the imputation of missing country-years raises the pre-1994 ETR on labor and on capital by 2 percentage points, due to Russia's higher levels, while China's ETRs match developing countries' average in 1994.

the ETR_K increased in developing countries, albeit from a low base: it rose from 10% to 20%, with most of the increase happening after 1995. Despite this rise, effective capital tax rates in emerging countries remain significantly lower than in rich countries in 2018. The increase in effective capital taxation within low- and middle-income countries starting around 1990 appears to be a broad-based phenomenon. Figure 4 shows the evolution of ETRs in several sub-samples of developing countries. First, the rise remains—but is more muted—when excluding China: in that case ETR_K rises from 10% in 1995 to 13% in 2018. The lower increase highlights the importance of China's rising capital taxation and its extraordinary growth (and thus rising global weight) over the past 25 years. Second the rise in ETR_K remains when excluding oil-rich countries (defined as deriving 7% or more of their GDP from oil); in that case the rise in ETR_K (from 10% in 1990 to to 24% in 2018), is in fact larger than in our benchmark series. Removing oil-rich countries also leads to more stable series and a flat trend in effective capital taxation pre-1990. If we exclude both ex-communist countries and oil-rich countries (mid-right panel), we again observe a large rise in ETR_K.

The rise in capital taxation in developing countries thus reflects more than China's rise or changes in tax collection in oil-rich countries. Figure A7 shows the evolution of effective tax rates in the most populated developing countries. In a majority of large countries, ETR_K increased between 1990 and 2018: for example, India's rose from 6 to 11%, Indonesia's from 10 to 16%, and Brazil's from 10 to 28%. The bottom panels of Figure 4 divide the sample between the 18 largest (non-oil rich) developing countries whose population exceeds 40 million, and the 55 countries with population under 40 million. The rise in ETR_K is much more pronounced in large countries, where it increases from approximately 10% to 25%, while the rise is modest in smaller countries (from 8% to 12%).

5 Correlation in trade and factor income taxation

5.1 Motivation

How can we explain the evolution of effective tax rates on labor and capital since the 1960s? A natural starting point is the large literature which focuses on the role of globalization. Cross-border trade in goods and services has grown (relative to GDP) in both developed and developing countries since the 1960s; this increase was driven in part by the rise of global value chains (Feenstra and Hanson, 2001), where the production process is fragmented across borders and firms rely on foreign subsidiaries and contractors. The literature argues that firms' ability to shift production processes across borders limits governments' capacity to tax mobile production factors. The long-run decline in ETR_K in rich countries is consistent with this hypothesis.[21] However, we saw that since the 1990s—the onset of the hyper-globalization period—developing countries experienced a rise in ETR_K.

Focusing on developing countries, we observe that the positive association between trade and capital taxation runs deeper: when we separate countries based on their initial level of trade in the pre-1995 period, early globalized countries saw trade and the ETR on capital rise in tandem prior to the 1990s, and stagnate thereafter (Figure A9). Developing countries which participated in the second wave of globalization (after the early-1990s proliferation of trade agreements) saw an increase in their trade and capital taxation in 1995-2018 period. These heterogeneous trends motivate our systematic analysis of the impact of globalization in the remainder of the paper.

Trade and capital flows are both important dimensions of globalization and correlate with each other. Because internationally comparable data are more widely available for trade than for capital flows, and the literature focuses primarily on causal determinants of trade openness, we focus on trade as the main measure of globalization. We return to capital openness in Section 8.

[21] The long-run decline in statutory corporate tax rates is also consistent with this hypothesis (Figure A8).

5.2 Correlation over time

Our first empirical strategy exploits the within-country association between trade and our outcomes of interest: factor shares and effective tax rates on labor and capital. We measure trade as the share of imports and exports relative to GDP.[22] We create 5-year growth rates within countries in both the trade measure and our outcomes of interest. To visualize these associations, we plot binned scatters of each outcome against trade, after residualizing all variables against year fixed effects. Each dot in the figure corresponds to a ventile (20 equal-sized bins) of the residualized trade openness distribution; we add back the mean of each variable to ease interpretation.

Figure 5 non-parametrically shows the medium-run within-country association, conditional on global time trends, but without any other controls or weights. We observe a positive association between the within-country growth in trade openness and ETR_K. Trade openness is also positively correlated with ETR_L, although the slope is smaller than for capital. We also observe a positive association between trade openness and the capital share of income; this association is almost twice as large for the corporate capital share. Trade may thus positively affect capital taxation, both through increasing capital's share of aggregate income and by raising ETR_K.[23]

Previous studies on ETRs and globalization mainly focus on rich countries. In Figure 6, we find that the association between trade and ETR_K differs between high- and low- and middle-income countries. The relationship between trade openness and ETR_K has a mild

[22] An interesting extension would be to study imports and exports separately, noting that import competition may impact factor taxation differently than export opportunities (see Goldberg and Pavcnik, 2016; McCaig and Pavcnik, 2018). In the event-study and instrumental variables designs, our estimating variation affects both imports and exports. More generally, imports and exports are strongly correlated in the data, making it hard to estimate separate effects with precision. This extension may be better suited to using micro-data which could leverage the fact that different firms within the same economy are exposed either to import or export shocks.

[23] The positive association between trade and the capital share is not consistent with classical trade models such as Heckscher-Ohlin (Ohlin, 1933), which predict that trade favors a country's abundant factor (labor in poor countries). Rather, it is consistent with bargaining models, in which opportunities to produce abroad improve capital owners' bargaining position (Rodrik, 1998a; Harrison, 20050; Rodriguez and Ortega, 20060). It is also consistent with the global value chains theory (Feenstra and Hanson, 2001): high-income countries focus on capital-intensive portions of the global value chain and outsource labor-intensive processes to developing countries. Outsourced processes are still relatively capital-intensive for developing countries. Thus, trade integration benefits capital in both groups of countries, despite capital being the scarce resource in poorer ones.

negative slope in high-income countries, but a steeply positive slope in developing countries. While the negative slope in high-income countries is consistent with the cross-border mobility hypothesis (see Section 2), the positive slope in developing countries suggests that other channels—such as a pro-tax capacity effect of globalization—could be at play.

6 Event-studies around large trade liberalization events

6.1 Empirical design

In this section, we analyse trade liberalization events in key developing countries. To discern sharp breaks from trends in our outcomes, we search for events which caused large trade barriers reductions. We focus on the six events studied in the review papers by Goldberg and Pavcnik (2007) and Goldberg and Pavcnik (2016) (Colombia in 1985, Mexico in 1985, Brazil in 1988, Argentina in 1989, India in 1991, Vietnam in 2001), and add the often discussed World Trade Organization accession of China in 2001 (Brandt et al., 2017). These events share two key features. First, they are characterized by large reductions in tariffs, the easiest trade barrier to measure. For instance, Brazil reduced average tariffs from 59% to 15% percent, India from 80% to 39%, and China from 48% to 20%. Second, these events have been studied exhaustively before. Since trade liberalization events do not occur in a vacuum and are often accompanied by other reforms, we can rely on the existing in-depth narrative of the conditions surrounding trade reforms to gauge threats to identification and to our results' interpretation.[24] Appendix C.1 details all seven trade liberalization events.

For each event and outcome, we construct a synthetic control country following the methodology in Abadie, Diamond, and Hainmueller (2010). The synthetic control is created as a weighted average over the donor pool of countries. To construct the weights, we match on the level of each outcome in the 10 years prior to the event, to minimize the mean squared prediction error between the event-country and the synthetic control countries in pre-event years. We then create event-study graphs showing the average of the outcome variable for treated countries vs. synthetic controls by relative time to the event.

[24]The reductions in trade barriers are sometimes implemented over several years. To be conservative, we focus on the earliest start year for each event as defined in published studies.

We also implement the event-study in a regression setting, where we include country and calendar year fixed effects, using the seven treated countries and their synthetic controls in the 10 years before and after the events:

$$Y_{it} = \sum_{j=-10, j\neq -1}^{10} \beta_j * \mathbb{1}(j = t)_t * D_i + \theta_t + \kappa_i + \pi_{Year(it)} + \epsilon_{it} \tag{6}$$

where θ_t are event-time fixed effects, κ_i are country fixed effects, and $\pi_{Year(it)}$ are year fixed effects. The year fixed effects control for common shocks to factor shares and taxation which may be correlated with clusters of reforms. D_i is a dummy equal to one if country i is treated. β_j captures the difference between treated and synthetic control countries in event time j, relative to the pre-reform year $j = -1$ (omitted period). Since statistical inference based on small samples should be approached with caution (Abadie, Diamond, and Hainmueller, 2010), we plot 95% confidence bounds based on the wild bootstrap method (Cameron, Gelbach, and Miller, 2008), clustered at the country-event level.

We run two more specifications to attenuate potential issues with synthetic control event studies. First, in addition to the dynamic effects model, we estimate the simpler difference-in-differences model, where the coefficient measures the average treatment effect over the first 10 years post-liberalization. We compute coefficients based on the imputation method of Borusyak, Jaravel, and Spiess (2021), which addresses estimation issues from two-way fixed effects and heterogeneous event-times (Chaisemartin and D'Haultfœuille, 2020). Second, we are interested in the impact of trade liberalization on several outcomes (trade, factor share, factor taxation). Our baseline approach creates a separate synthetic control for each event and each outcome, which increases the likelihood of obtaining similar pre-trends (Akcigit et al., 2021), but implies that for a given country-event, the synthetic control countries might differ across outcomes. Therefore we also implement a design where we simultaneously match on all outcomes of interest for each country-event (similar to Jaeger, Noy, and Schoefer, 2021). All methodological details are in Appendix C.2.

6.2 Results

Figure 7 shows the results for the main outcomes. The left-hand panels display the event-studies in levels, while the right-hand panels display the regression-based event-studies. The top panels show that for trade openness the synthetic control matches the average treated country closely during the 10 years prior to the event.[25] Trade openness increases in the year of the event and its trend changes in post-reform years, compared to the stable pre-trends. The absence of a dip in the immediate pre-reform years limits concerns about intertemporal substitution, although some liberalization events were predictable (especially in China and Mexico where the event is World Trade Organization accession). Overall, as expected, trade increases substantially when countries slash their import tariffs.

Turning to our outcomes, we see that trade liberalization events coincide with a positive break from trend in the capital share of domestic product. The synthetic control continues on its slight upward trend.[26] The impacts on factor taxation are displayed in the bottom set of panels of Figure 7. We observe that ETR_K sharply increases following the liberalization event. Both ETR_K and ETR_L break from the stable pre-trend at the time of liberalization, but the effect on capital taxation is about double that on labor. Despite the small sample size, the dynamic post-treatment effect coefficients are typically significant at the 5% level. The p-value for the joint significance of all post-reform dummies are well below 0.05. Based on the difference-in-differences model, the liberalization events led to a 10 percentage point rise in trade openness over 10 years and a 4.8 (2.0) percentage point increase in the effective tax rate on capital (labor) (Table A2).

6.3 Robustness, interpretation and limitations

To test for robustness of the event-study results, we conduct several checks. First, we jointly match on all four outcomes for each event to create synthetic controls, instead of creating outcome specific synthetic controls. Figure A10 shows that this leads to a small deterioration of the pre-trends, but to very similar point-estimates. Second, to check that

[25] Table C1 details the synthetic control matches for each event and outcome.

[26] The stability of these patterns helps alleviate concerns that the true counterfactual level would be overstated if trade flows and returns to capital were diverted away from countries in the synthetic control.

one specific event does not drive the results, we remove one treated country at a time; Figure A11 shows robust dynamic treatment effects for all subsets of treated countries. Finally, the last row of Table A2 shows that the results are similar when we re-estimate the difference-in-differences coefficient following the imputation method of Borusyak, Jaravel, and Spiess (2021) to attenuate issues with the two-way fixed effects estimation.

We recognize that our set of treated countries is small and that liberalization events do not occur in a vacuum. The timing of the events could coincide with unobserved changes in determinants of factor shares and factor taxation. Yet the relatively stable trends in treated countries pre-liberalization imply that these confounding changes would have to sharply coincide with the events. The narrative analyses of the reforms, reproduced from past studies in Appendix C, do not reveal obvious confounding shocks.

Even if the events are primarily trade related, our interpretation of the dynamic coefficients depends on whether other reforms or confounding economic shocks occurred in post-reform years (Rodriguez and Rodrik, 2001). As discussed in Appendix C, some countries implemented further trade reforms following the initial liberalization event: Mexico joined NAFTA in 1994; Argentina and Brazil joined MERCOSUR in 1991. Some countries also liberalized cross-border capital flows (Mexico removed capital inflow restrictions in 1989; India liberalized foreign direct investment rules in 1993). These reforms often occurred several years after trade liberalization, but we observe sharp effects in the first few years. The short-run results showing a swift break from stable pre-trends are thus more likely to be directly attributable to trade liberalization. We caution, however, against attaching too much importance to the specific medium-run coefficients as those incorporate further cross-border liberalization reforms, general equilibrium impacts, and other systemic reforms (Goldberg and Pavcnik, 2007). [27]

Finally, we note that our results are based on a selected set of trade liberalization events characterized by sharp tariff cuts, in large developing countries with constraints on capital

[27] Wacziarg and Wallack (2004) study if trade liberalization events in developing countries coincide with domestic reforms. Out of our seven events, only Mexico has a confounding domestic privatization reform within the first five years of our event-year; Brazil (privatization) and Colombia (broad market-oriented reforms) had confounding reforms between 5 and 10 years after liberalization; and, the remaining four countries had no confounding reforms. The results are robust to excluding Mexico (Figure A11).

mobility (Chinn and Ito, 2006). The impacts of trade liberalization are more likely to carry over to countries with similar characteristics (see also Section 7.3).

7 Regressions with instrumental variables for trade

7.1 Empirical design

In this section, we study the impact of trade in a regression setting, which permits the study of mechanisms and of heterogeneity by income levels. We use instruments to alleviate endogeneity concerns. We estimate how trade impacts factor shares and factor taxation:

$$y_{ct} = \mu * trade_{ct} + \Theta * X_{ct} + \beta_c + \pi_t + \epsilon_{ct} \tag{7}$$

where y_{ct} is the outcome of interest in country c in year t, $trade_{ct}$ is the share of import and exports in net domestic product and μ_c and π_t are country and year fixed effects. We cluster the error term, ϵ_{ct}, at the country level. We also estimate models which include, in X_{ct}, proxies for confounding determinants of factor shares and factor taxation: the exchange rate, gross capital formation, log of population, log of GDP per capita, and capital openness (Rodrik, 1997; Harrison, 2005).

OLS estimation may be biased due to reverse causality and unobservable confounding factors which correlate with changes in trade. Since we are interested in uncovering causal effects, the challenge is to find exogenous trade variation. This leads us to focus on the two instruments in Egger, Nigai, and Strecker (2019). The first instrument relies on the general structure of quantitative general equilibrium models of trade (Eaton and Kortum, 2002; Arkolakis, Costinot, and Rodriguez-Clare, 2012). Under the standard gravity model assumptions, this instrument uses the average bilateral trade frictions between exporting and importing countries as the source of variation (aggregated to the country-year level).[28] In our context, this instrument is valid if the distribution (not the level) of trade costs

[28]Other studies which leverage the structure of the gravity model to create instruments for trade include Frankel and D. Romer (1999), Wacziarg (2001), and Anderson and Wincoop (2003).

among individual country-trading pairs is not influenced by the level of factor shares or factor taxation in the import or export country.

The second instrument exploits the time-series variation in global oil prices interacted with a country-specific measure of access to international markets. Specifically, access at the country-level is captured by the variance of distance from the three most populated cities to the closest maritime port. Intuitively, this time-invariant measure captures the internal geography of a country which is an important component of transportation costs. Following a global shock to oil prices, the transportation costs will be larger in countries with less concentrated access to maritime ports, leading to a larger drop in imports and exports.[29] Conceptually, both instruments aim to capture variation in trade costs driven by exogenous economic forces. They are detailed in Appendix D.

We extend the data coverage of these instruments to our full set of countries and time periods. Since the IV estimate of equation (7) recovers a local average treatment effect (LATE), it is important to understand the relevance of each instrument across our full sample. Figure A12 shows that each instrument is relevant in different subsamples: the oil-distance instrument has a strong first stage in recent decades and in high-income countries, while the gravity instrument has a stronger first-stage in earlier time periods and in lower-income countries.[30] This reveals that an IV estimate based on either of the individual instruments will be driven by first-stage compliers with characteristics that differ from the average country in the full sample. But, restricting the analysis to subsamples where an individual instrument has a strong first stage biases the IV estimates upwards (Abadie, Gu, and Shen, 2019). To guard against this, we combine the two instruments, which also raises statistical power (Mogstad, Torgovitsky, and Walter, 2020), and estimate a LATE that is representative across income levels and time periods. The LATE identified

[29] In the transport logistics literature, oil prices are a key determinant of transportation costs (Gross, Hayden, and Butz, 2012; Storeygard, 2016).

[30] Conceptually, the oil-distance instrument may be stronger in high-income countries if economic development is associated with improvements in domestic road networks (holding the physical distances from cities to maritime ports constant). We measure transportation networks in the latest year available; this introduces possible measurement error which weakens the instrument's relevance in earlier periods.

with multiple instruments retains an intuitive interpretation: it is a weighted combination of the instrument-specific LATEs using the instruments one at a time.[31]

Finally, an attractive feature of these instruments is that they impact cross-border trade in different ways: Table A3 shows that the gravity instrument causes on average an increase in trade, while the oil-distance instrument reduces trade. Moreover, both instruments have significant impacts on imports as well as exports. As such, our IV-estimate reflects the broad impacts of cross-border trade through its increases and decreases of goods and services in and out of the country.

7.2 Main results

Table 1 presents the OLS and IV estimation of equation (7) for our core outcomes. Panel A shows the OLS results, while Panels B through D show different IV specifications. The OLS and IV coefficients display the same sign, but the IV coefficients are always larger. In Panels B-D we estimate the IV model. Panel B shows the IV weighted by countries' yearly national domestic product (NDP), our benchmark to mirror the global trends shown in section 4. The 1st stage shows a strong F-statistic of 26.07. The IV estimation yields a positive impact of trade on the capital share, both in national income and in the corporate sector.[32]

Turning to the effective tax on factor shares, the IV-results indicate that trade leads to statistically significant increases in the effective tax rate of both capital and labor, but the effect on capital (0.375) is twice as large as the effect on labor (0.163). The IV-coefficient on ETR_L is more precise (p-value = 0.003) than that on ETR_K (p-value=0.081), which, as we will see later, masks large heterogeneity across income levels.

The IV estimates in Panel B are globally representative, since they include country weights, but Panel C shows that the results are robust to removing these weights: the 1st stage strength is reduced (F-statistic=8.415), but the results are broadly similar. In

[31]The weights are a function of the strength of each instrument in the first-stage regression in the full sample (Angrist and Imbens, 1995). In our setting, a stronger weight is placed on the oil-distance instrument (see first-stage regressions in Table A7).

[32]The re-allocation towards capital inside the corporate sector implies that our results are not confounded by a positive impact of trade on the corporate share of national income. Moreover, we relate to the previous literature on global trends in factor incomes which focuses on shares within the corporate sector.

particular, trade's impact on the effective tax on capital (0.250, p-value=0.018) remains positive, and larger than that on labor taxation (0.133, p-value=0.013).

In Panel D, we include the set of country-year varying controls contained in X_{ct} in addition to the NDP weights. The inclusion of controls can help improve the precision of the estimates and could increase the likelihood that the exclusion restriction holds. Indeed, the controls lower the p-values and trade continues to have a positive impact on the capital factor share, and a larger positive impact on capital factor taxation than on labor taxation. Throughout the panels, we see in column 5 that the coefficients on the ETR on corporate profits mirror that of ETR_K, and are more precise.

The IV-results are robust to a battery of checks. First, we show that they hold with different measures of trade intensity (Table A4). Second, since one of the instruments relies on oil price variation, we allow oil-rich countries to be on a separate non-parametric time path; this addresses the concern that our estimating variation is correlated with trends in factor shares and effective taxation specific to oil-producing countries, and re-enforces the results (Table A5). Third, the results are broadly similar when we change our measurement assumptions to construct factor shares and ETRs (Table A6). The results are robust to the alternative assignment of taxes to capital versus labor proposed by Mendoza, Razin, and Tesar (1994); to changing the share of the PIT assigned to capital vs labor; and to using the ILO (2019) method to attribute mixed-income to labor vs capital, although the coefficients on ETR_K and ETR_L are now closer. Fourth, the results based on each individual instrument are comparable to the joint IV results (Table A7).

Finally, Table A3 directly reports the reduced-form impact of trade on our outcomes, leveraging the fact that the two instruments have opposite effects on trade. We find that the effects of globalization are symmetric: expanded openness increases both ETR_L and ETR_K, while reduced cross-border trade decreases the effective taxation of both factors.

7.3 Mechanisms and heterogeneity by income levels

These results re-enforce the findings of the previous sections, that trade raises effective tax rates, especially on capital. One conjecture to explain these results is that trade exerts

a pro-tax capacity effect: trade openness changes the structure of labor markets and corporations by concentrating economic activity in large capital intensive firms; in turn this relaxes tax enforceability constraints.[33] Although the tax capacity channel has not been studied in-depth before, a wide literature argues that trade exacerbates tax competition and increases tax avoidance opportunities, thus exerting a downward pressure on capital tax rates in rich countries (a race-to-the-bottom effect).

To shed light on each of these mechanisms we look at how trade impacts outcomes which more directly relate to each hypothesis (self-employment shares for tax-capacity, statutory corporate tax rates for the race-to-the-bottom). We then revisit previous results to check for heterogeneous impacts across income levels, since we expect the tax capacity effect to mainly operate in low and middle-income countries.

Outcomes linked to mechanisms Table 2 repeats the benchmark IV specification but looks at additional outcomes. Panel A shows that trade leads to a reduction in the statutory corporate income tax rate, thus supporting a race-to-the-bottom effect.[34] At the same time, Panels B and C show that trade causes a reduction in the share of workers in self-employment, and an increase in the corporate share of GDP.[35] Thus, two countervailing forces appear to be at play: the growth in employee-employment and of the corporate sector raises tax enforceability, while active government policies in the form of reductions of the statutory corporate tax rate lower the tax burden on capital.

Heterogeneity by development level Motivated by the contrasting long-run trends of ETR_K in high versus low and middle-income countries, we investigate if trade impacts

[33]The literature convincingly shows that third-party information trails are key for tax enforcement (Pomeranz, 2015; Naritomi, 2019). Activities with limited third-party data, such as self-employment, lead to high tax evasion rates (Kleven, Knudsen, et al., 2011), and the movement from self-employment to formal wage employment is associated with growth in tax enforcement capacity (Jensen, 2022).

[34]In Appendix Table A8, we verify that corporate income tax rate changes are significantly associated with changes in corporate income tax revenue (% of GDP) and with ETR_K. Consistent with past studies on the determinants of tax policies (C. Romer and D. Romer, 2010), the outcome variable is the first-difference of the CIT rate: $\Delta CIT_{t,t-1}$. Results are robust to alternative outcomes, including: the level of the CIT rate while controlling for the lagged CIT rate; and a reform-tracker which changes value when the CIT rate changes. Results available upon request.

[35]Table A9 also shows that trade primarily causes a transition from agriculture to industry, with a small positive impact on services. Thus, in this empirical setting, trade induces a transition from a commonly identified 'hard-to-tax' sector (agriculture) to an 'easy-to-tax' sector (industry).

taxation differentially across development levels. We estimate heterogeneous IV effects by interacting the trade variable with a high-income country dummy:[36]

$$y_{ct} = \mu * trade_{ct} + \kappa * trade_{ct} * \mathbb{1}(HighIncome) + \Theta * X_{ct} + \beta_c + \pi_t + \epsilon_{ct} \tag{8}$$

The results are presented in Table 3. In Column (1), we find that trade has a strong positive effect on ETR_K in developing countries, but a null effect in rich countries. Column (2) shows that trade increases ETR_L in both samples, but that this effect is stronger in high-income countries. Column (3) finds that trade decreases the statutory corporate tax rate in both samples, although by more so in rich countries. In contrast, Columns (4)-(6) show that the positive effect of trade on the employee-share and the corporate share is entirely concentrated in developing countries, with null effects in high income countries. These results point to heterogeneous mechanisms depending on countries' income levels: globalization might have limited capital taxation in rich countries by putting downward pressure on statutory corporate tax rates; while in developing countries although statutory rates also fell, they were more than counteracted by the expansion of the capital tax base which became more enforceable. On net this led to a rise in effective capital taxation in developing countries.

The trade liberalization events (Section 6) took place exclusively in developing countries. In Appendix Figure A13, we find that the trade-events led to growth in the corporate share but had no important impacts on corporate tax policy. These mechanism results are strongly consistent with the IV analysis, and reinforce the plausible role of enforceability in mediating trade's impact on capital taxation in developing countries.

Heterogeneity by country size and mobility of capital Beyond the split by development level, we estimate additional sources of heterogeneity which mediate the impact of trade on taxation. Concerns related to capital flight are more pronounced in small-market economies (Wilson, 1999) and in countries with few restrictions on capital mobility (Rodrik, 1997;

[36]The two instruments leverage distinct variation; as such, interpreting heterogeneous IV-coefficients is challenged by the possibility that each instrument captures different LATEs (Mogstad, Torgovitsky, and Walter, 2020). However, as previously discussed, the IV-estimates based on using each instrument separately are in the range of the estimates based on using both instruments simultaneously (Table A7).

Chinn and Ito, 2006). We test for these mechanisms, by looking at heterogeneous treatment effects for statutory tax rates and effective tax rates using equation (8).

Table 4 shows the results. In Panel A, we find that increased trade openness leads to a reduction in the statutory CIT rate which is stronger in smaller countries and in countries with limited restrictions on capital mobility. Mirroring this result, panel B, shows that the positive effect of trade on ETR_K only occurs in large countries (population over 40 Million) and in countries with capital restrictions. These results support the conjecture that the pro-tax capacity effects of trade happen simultaneously with the race-to-the-bottom effects: only countries that can limit capital mobility and tax avoidance are able to increase ETR_K when they open to trade. A further hypothesis is that countries which collect less revenue from capital due to trade liberalization, compensate by taxing more the immobile factor, labor, to balance their budget (Rodrik, 1998b). In Panel C, we indeed find that the rise in ETR_L is qualitatively larger in small countries and in countries without capital restrictions.

7.4 Impacts on tax revenue

To further substantiate the tax capacity hypothesis, we look at the impact of trade on overall tax collection as a share of GDP, including capital, labor and indirect taxes.[37] Table 5 shows the impacts of trade on different taxes by development level. Column (1) shows that in developing countries, trade openness leads to a significant increase in overall tax to GDP as opposed to a null effect in rich countries. The positive result for developing countries re-enforces the hypothesis that trade produces an increase in overall tax capacity, while the null result for rich countries is expected given their already high tax capacity.

Further, Table 5 breaks down the impact of trade on different tax revenue sources. In developing countries, the increase in total tax revenue with trade is primarily due to the significant rise in corporate income tax. All other tax sources slightly rise with trade, but no coefficient is significantly different from zero. In high income countries the effect of trade on CIT collection is slightly negative (but insignificant). Among taxes mainly assigned to labor, the PIT collection does not change with trade, as opposed to payroll taxes which

[37] Looking directly at tax revenue also alleviates potential concerns of weak statistical capacity in developing countries, which could bias our measures of national income components and thus ETR_L and ETR_K.

increases significantly in high-income countries. These results on labor taxes echo the literature: Egger, Nigai, and Strecker (2019) shows that trade shifts the tax burden of the personal income tax away from the top earners and towards the median worker without changing overall collection. The rise in payroll tax revenues re-enforces Rodrik (1997)'s insurance argument: to protect themselves against the economic fluctuations brought by trade openness, workers demand further social protection, financed by payroll taxes.

7.5 Quantitative importance of trade openness

How should we think of the quantitative importance of trade in accounting for the rise in capital taxation in developing countries? First, we note that although the IV and event-study estimations (Section 6) rely on entirely different identifying assumptions and methodologies, they yield comparable results in magnitude. Under the strong assumption that the trade liberalization events only impact factor taxation via trade, the event-study results imply an impact on ETR_K of 0.489, compared to the IV-coefficient of trade on ETR_K in developing countries of 0.44 (Table 3). Taken at face value, this means that increasing trade by 10 percentage points raises ETR_K by 4 to 5 percentage points. Second, we can combines our ETR_K coefficient with the change in trade openness in developing countries between 1965 and 2018: this back of the envelope calculation implies that trade accounts for a rise in ETR_K of 3 percentage points. This number should be taken with caution, but suggests that a third of the long-run rise in ETR_K is explained by trade globalization.[38]

8 Capital liberalization events

Until now, we have studied one key dimension of globalization, in the form of trade openness, and its impact on factor income taxation. Given our interest in the taxation of capital, another relevant dimension of globalization is capital openness. However, due to differences in countries' reporting requirements for capital flows, data on capital openness

[38]Concretely, the long-run increase in trade openness is 7.01 percentage points (Figure A9) and the trade-coefficient for ETR_K is 0.44 (Table 3), hence $7.01 * 0.44 = 3.08ppt$. The long-run increase in ETR_K is 10.1ppt (Figure 3), thus yielding $3.08/10.1 = 0.305$

is not as internationally comparable and available than data on trade (Egger, Nigai, and Strecker, 2019). Further, to our knowledge, the literature has not identified a credible instrumental variable for capital openness (Magud, Reinhart, and Rogoff, 2011; Alfaro, Kalemli-Ozcan, and Volosovych, 2005).[39] Notwithstanding, we provide here some evidence on the impact of capital liberalization based on an event-study design.

We rely on Chari, Henry, and Sasson (2012) who identified capital liberalization events in 25 developing countries corresponding to the date when foreign investment in the domestic stock market was first allowed.[40] The paper shows that these seemingly narrow events actually greatly expand foreign capital flows into the country, including foreign direct investment (FDI), and raise the import of capital goods.[41] Compared to other reforms aimed at lifting restrictions on FDI, opening the domestic stock market internationally occurs at a precise point in time (other policies are often less precise and staggered); is not marked by policy-reversal or by net capital outflow; and is unambiguously related to capital liberalization (Henry, 2007; Eichengreen, 2001).

We employ the same empirical design as in in Section 6, and create a synthetic control for each treated country and outcome of interest (see Appendix C.3 for details). We measure capital openness as the sum of foreign assets and liabilities, as a share of GDP (Lane and Milesi-Ferretti, 2017). Figure 8 reports the results.[42] Starting from a stable pre-trend, we observe a rise in capital openness, precisely at the time of the event, which keeps on building over the post-event decade. The ETR_K also increases, but with a few years lag relative to the event: in the medium-run, the effect is precisely estimated and significant

[39] Trade and capital flows may also exhibit strong co-movement. Per example, as the cost of importing intermediate goods decreases, a firm can decide to outsource the production of intermediate goods abroad – which may result in an outflow of capital if the firm decides to purchase the production process abroad. This co-movement makes it challenging to estimate separate effects of capital and trade flows with precision.

[40] Removing restrictions on the stock market constitute a liberalization of the capital account in relation to domestic financial markets. Lane and Milesi-Ferretti (2009) find that capital account liberalization and domestic financial development are strongly correlated with financial integration across countries

[41] FDI includes both green field investments (building of plants from scratch) and cross-border mergers and acquisitions; the latter is directly impacted by stock market liberalization and makes up 40-60% of FDI in recent times in developing countries. It is likely that the increased foreign ownership on the stock market subsequently triggers an increase in green field investments.

[42] In Appendix Figure A14, we show that the results are robust to creating synthetic controls that are based on simultaneously matching all outcomes for each treated country.

at the 5% level.[43] There is no discernible effect on ETR_L. The absence of an increase in the capital share is intriguing; we note that Chari, Henry, and Sasson (2012) find large wage effects, suggesting a proportionate (and high) growth of both factor incomes. Foreign inflow of capital, as well as any subsequent increase in capital goods import and aggregate investment, may positively impact ETR_K by contributing to the growth of large, complex firms with employees and thereby raising the tax-enforceable share of capital income (Section 7.3). Consistent with a role for tax capacity, we find that the capital liberalization events led to a decrease in the non-corporate sectors (Appendix Figure A15).

Qualitatively, these results are consistent with those from the previous sections, suggesting that the positive impact of globalization on effective capital taxation in low and middle income countries is robust to using capital instead of trade openness. However, given the inherent limitations with the measurement of capital flows, we consider that our results based on trade openness provide more meaningful and robust insights into globalization's impacts on factor taxation.

9 Concluding remarks and perspectives

In this paper, we combine a new global database with several empirical strategies to provide novel evidence on trends and causal effects of globalization on tax structures worldwide. Our starting point is the systematic harmonization of novel historical national accounts data and dis-aggregated government revenue statistics. This data collection permitted the construction of a new measures of effective tax rates on capital and labor in 156 countries between 1965 and 2018.

Using this database, we make two contributions. First, we establish new facts. Taking a global perspective, the average effective tax rates on labor and capital have converged, due to a increase in labor taxation and a fall in capital taxation. We find differences between developed and developing countries: while the effective tax rate on capital fell in OECD

[43] Consistent with our result, Quinn (1997) finds a positive correlation between de-jure capital account openness and corporate taxation as a share of GDP. Note that the events considered here remove restrictions on capital *inflows*; it is possible that increased capital *outflows* may, conversely, reduce ETR_K.

countries, it increased in the rest of the world (albeit starting from a very low level) in the post-1995 period of hyper-globalization.

Our second contribution is to formulate and test a new hypothesis that sheds light on these diverging global trends: that trade liberalization exerts a pro-tax-capacity effect, by increasing the concentration of economic activity in large, formal corporate structures. Using a verity of research designs, we show that trade leads to a higher effective taxation of capital, but only in developing countries. For these countries, the base expansion channel has been quantitatively large enough to offset the negative tax-competition effect of globalization. In high income countries, by contrast, the tax-competition effects has dominated, leading to a decline in capital taxation.

In this paper we have taken a global and macroeconomic perspective on tax systems and inequality, focusing on factor income shares and effective tax rates on labor and capital. In future research, our database (available online) could be used to study the effects of globalization on tax progressivity and inequality between groups of individuals. By combining our macroeconomic tax rates on labor and capital with estimates of the progressivity of labor and capital taxes (for instance using tax simulators, as in Egger, Nigai, and Strecker (2019), one could estimate changes in the progressivity of the entire tax system. Moreoever, these changes in tax progressivity could be compared to the effects of globalization on the distribution of pre-tax income. This would make it possible to quantify the extent to which changes in taxation caused by globalization have curbed or exacerbated the unequalizing effects of international economic integration.

References

Abadie, Alberto, Alexis Diamond, and Jens Hainmueller (2010). "Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program". In: *Journal of the American Statistical Association* 105(490), pp. 493–505.

Abadie, Alberto, Jiaying Gu, and Shu Shen (2019). *Instrumental Variable Estimation with First-Stage Heterogeneity*. Tech. rep.

Akcigit, Ufuk et al. (2021). "Taxation and Innovation in the 20th Century." In: *NBER Working Paper Series*(24982).

Albers, Thilo, Morten Jerven, and Marvin Suesse (2020). "The Fiscal State in Africa: Evidence from a century of growth". In: *African Economic History Working Paper Series*.

Alfaro, Laura, Sebnem Kalemli-Ozcan, and Vadym Volosovych (2005). "Capital Flows in a Globalized World: The Role of Policies and Institutions". In: *NBER Working Paper Series*(11696).

Anderson, James and Eric van Wincoop (2003). "Gravity with Gravitas: A Solution to the Border Puzzle". In: *American Economic Review* 93(1), pp. 170–92.

Angrist, Joshua and Guido Imbens (1995). "Two-Stage Least Squares Estimation of Average Causal Effects in Models With Variable Treatment Intensity". In: *Journal of the American Statistical Association* 90(430), pp. 431–45.

Arkolakis, Costas, Arnaud Costinot, and Andres Rodriguez-Clare (2012). "New Trade Models, Same Old Gains?" In: *American Economic Review* 102(1), pp. 94–130.

Attanasio, Orazio, Pinelopi Goldberg, and Nina Pavcnik (2004). "Trade reforms and wage inequality in Colombia". In: *Journal of Development Economics* 74(2), pp. 331–366. ISSN: 0304-3878. DOI: https://doi.org/10.1016/j.jdeveco.2003.07.001. URL: https://www.sciencedirect.com/science/article/pii/S0304387804000185.

Basri, Chatib et al. (2019). "Tax Administration vs. Tax Rates: Evidence from Corporate Taxation in Indonesia". In: *NBER Working Paper*(26150).

Bates, Robert, Da-Hsiang, and Donald Lien (1985). "A Note on Taxation, Development and Representative Government". In: *Politics and Society* 14(1), pp. 53–70.

Baunsgaard, Thomas and Mick Keen (2009). "Tax revenue and (or?) trade liberalization". In: *Journal of Public Economics* 94(9), pp. 563–577.

Besley, Timothy and Torsten Persson (2014). "Why Do Developing Countries Tax So Little?" In: *Journal of Economic Perspectives* 28(4), pp. 99–120.

Blanchet, Thomas and Lucas Chancel (2016). "National Accounts Series Methodology." URL: https://wid.world/document/1676/.

Blanchet, Thomas, Lucas Chancel, et al. (June 2021). *Distributional National Accounts Guideliens: Methods and Concepts Used in the World Inequality Database*. Tech. rep. World Inequality Lab. URL: https://wid.world/document/distributional-national-accounts-guidelines-2020-concepts-and-methods-used-in-the-world-inequality-database/.

Borusyak, K, X Jaravel, and J Spiess (2021). *Revisiting Event Study Designs: Robust and Efficient Estimation*. Tech. rep. Working Paper.

Brandt, Loren et al. (2017). "WTO Accession and Performance of Chinese Manufacturing Firms". In: *American Economic Review* 107(9), pp. 2784–2820.

Browning, Edgar K. (1978). "The Burden of Taxation." In: *Journal of Political Economy* 86(4), pp. 649–671. DOI: 10.1086/260703.

Buettner, Thiess and Boryana Madzharova (2018). "WTO membership and the shift to consumption taxes". In: *World Development* 108(1), pp. 197–218.
Cage, Julia and Lucie Gadenne (2018). "Tax revenues and the fiscal cost of trade liberalization, 1792-2006". In: *Explorations in Economic History* 70, pp. 1–24.
Cameron, Colin, Jonah Gelbach, and Douglas Miller (2008). "Bootstrap-Based Improvements for Inference with Clustered Standard Errors". In: *Review of Economics and Statistics* 90(3), pp. 414–27.
Carey, David and Josette Rabesona (2004). "Tax Ratios on Labor and Capital Income and on Consumption." In: *Measuring the Tax Burden on Capital and Labor.* Ed. by Peter B. Sørensen. MIT Press. DOI: 10.7551/mitpress/4522.001.0001.
Cette, Gilbert, Lorraine Koehl, and Thomas Philippon (2020). "Labor share". In: *Economics Letters* 188, p. 108979. ISSN: 0165-1765. DOI: https://doi.org/10.1016/j.econlet.2020.108979. URL: https://www.sciencedirect.com/science/article/pii/S0165176520300239.
Chaisemartin, Clément de and Xavier D'Haultfœuille (Sept. 2020). "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects". In: *American Economic Review* 110(9), pp. 2964–96. DOI: 10.1257/aer.20181169. URL: https://www.aeaweb.org/articles?id=10.1257/aer.20181169.
Chari, Anusha, Peter Henry, and Diego Sasson (2012). "Capital Market Integration and Wages". In: *American Economic Journal: Macroeconomics* 4(2), pp. 102–132.
China Daily (2018). *Taxation: Historical development*. URL: https://govt.chinadaily.com.cn/s/201809/20/WS5c08d6fe498eefb3fe46e52c/historical-development.html.
Chinn, Menzie and Hiro Ito (2006). "What Matters for Financial Development? Capital Controls, Institutions, and Interactions". In: *Journal of Development Economics* 81(1), pp. 163–192.
CIAT and IDB (2019). *IDB-CIAT Revenue Collection Database*. URL: https://www.ciat.org/idb-ciat-revenue-collection-database/?lang=en.
Cogneau, Denis, Yannick Dupraz, Justine Knebelmann, et al. (2021). "Taxation in Africa from Colonial Times to Present Evidence from former French colonies 1900-2018". In: *Mimeo*.
Cogneau, Denis, Yannick Dupraz, and Sandrine Mesple-Somps (2021). "Fiscal Capacity and Dualism in Colonial States: The French Empire 1830–1962". In: *The Journal of Economic History* 81(2), pp. 441–480. DOI: 10.1017/S0022050721000140.
Devereux, Michael P. (2004). "Measuring Taxes on Income from Capital." In: *Measuring the Tax Burden on Capital and Labor.* Ed. by Peter B. Sørensen. MIT Press. DOI: 10.7551/mitpress/4522.001.0001.
Dix-Carneiro, Rafael, Pinelopi Goldberg, et al. (Jan. 2021). *Trade and Informality in the Presence of Labor Market Frictions and Regulations*. Working Paper 28391. National Bureau of Economic Research. DOI: 10.3386/w28391. URL: http://www.nber.org/papers/w28391.
Dix-Carneiro, Rafael and Brian Kovak (2017). "Trade Liberalization and Regional Dynamics". In: *American Economic Review* 107(10), pp. 2908–46.
Eaton, Jonathan and Samuel Kortum (2002). "Technology, Geography, and Trade." In: *Econometrica* 70(5), pp. 1741–79.
Egger, Peter H., Sergey Nigai, and Nora M. Strecker (2019). "The Taxing Deed of Globalization." In: *American Economic Review* 109(2), pp. 353–90. DOI: 10.1257/aer.20160600.

Eichengreen, Barry (2001). "Capital Account Liberalization: What do Cross-Country Studies Tell Us?" In: *World Bank Economic Review* 15(3), pp. 341–365.
Feenstra, Robert and Gordon Hanson (2001). "Global Production Sharing and Rising Inequality: A Survey of Trade and Wages". In: *NBER Working Paper Series*(8372).
Fisunoglu, Ali et al. (2011). *Relative Political Capacity Dataset*. Version 2.4 (August 2020). DOI: 10.7910/DVN/NRR7MB.
Frankel, Jeffrey and David Romer (1999). "Does Trade Cause Growth?" In: *American Economic Review* 89(13), pp. 379–399.
Goldberg, Pinelopi and Nina Pavcnik (2007). "Distributional Effects of Globalization in Developing Countries." In: *Journal of Economic Literature* 45(1), pp. 39–82.
Goldberg, Pinelopi and Nina Pavcnik (2016). "The Effects of Trade Policy". In: *NBER Working Paper Series*(21957).
Gollin, Douglas (2002). "Getting Income Shares Right". In: *Journal of Political Economy* 110(2). DOI: 10.1086/338747.
Gross, Wendelin, Cristina Hayden, and Christian Butz (2012). "About the impact of rising oil price on logistics networks and transportation greenhouse gas emission". In: *Logistics Research* 4, pp. 147–56.
Guerriero, Marta (2019). "The Labor Share of Income around the World: Evidence from a Panel Dataset." URL: https://www.adb.org/publications/labor-share-income-around-world-evidence-panel-dataset.
Gygli, Savina et al. (2019). "The KOF GLobalization Index – revisited". In: *The Review of International Organizations* 14, pp. 543–574.
Harrison, Ann (2005). *Has Globalization Eroded Labor's Share? Some Cross-Country Evidence*. Working Paper.
Henry, Peter (2007). "Capital Account Liberalization: Theory, Evidene and Speculation". In: *Journal of Economic Literature* 45(4), pp. 887–935.
ICTD/UNU-WIDER (2020). *Government Revenue Dataset*. URL: https://www.wider.unu.edu/project/government-revenue-dataset.
ILO (2019). "The Global Labour Income Share and Distribution." URL: https://www.ilo.org/ilostat-files/Documents/Labour%5C%20income%5C%20share%5C%20and%5C%20distribution.pdf.
ILOSTAT (2021). *Statistics on labour income and inequality.* URL: https://ilostat.ilo.org/topics/labour-income/.
IMF GFS (2005). *Historical Government Finance Statistics (1972-1989 in GFSM 1986 format)*. CD-ROM. URL: https://www.imf.org/external/pubs/cat/longres.aspx?sk=18674.0.
Jaeger, Simon, Shakked Noy, and Benjamin Schoefer (2021). "What Does Co-Determination Do?" In: *NBER Working Paper Series*(28291).
Jefferson, Gary (2016). "State-Owned Enterprise in China: Reform, Performance, and Prospects". In: *Working Paper*.
Jensen, Anders (2022). "Employment Structure and the Rise of the Modern Tax System". In: *American Economic Review* 112(1), pp. 213–34.
Kanbur, Ravi and Michael Keen (1993). "Jeux Sans Frontier: Tax Competition and Tax Coordination when Countries Differ in Size". In: *American Economic Review* 83(1), pp. 877–92.

Karabarbounis, Loukas and Brent Neiman (2014). "The Global Decline of the Labor Share." In: *Quarterly Journal of Economics* 129(1), pp. 61–103. DOI: 10.1093/qje/qjt032.

King, Mervyn A. and Don Fullerton (1984). "The Theoretical Framework." In: *The Taxation of Income from Capital: A Comparative Study of the United States, the United Kingdom, Sweden, and Germany*. National Bureau of Economic Research, pp. 7–30. ISBN: 9780226436319. DOI: 10.7208/chicago/9780226436319.001.0001.

Kleven, Henrik, Martin Knudsen, et al. (2011). "Unable or Unwilling to Cheat? Evidence from a Tax Audit Experiment in Denmark". In: *Econometrica* 79(3), pp. 651–692.

Kleven, Henrik, Claus Kreiner, and Emmanuel Saez (2016). "Why Can Modern Governments Tax so Much? An Agency Model of Firms as Fiscal Intermediaries". In: *Economica* 83(330), pp. 219–246.

Kornai, János, Eric Maskin, and Géard Roland (Dec. 2003). "Understanding the Soft Budget Constraint". In: *Journal of Economic Literature* 41(4), pp. 1095–1136. DOI: 10.1257/002205103771799999. URL: https://www.aeaweb.org/articles?id=10.1257/002205103771799999.

Lane, Philip and Gian Maria Milesi-Ferreti (2017). "International Financial Integration in the Aftermath of the Global Financial Crisis". In: *IMF Working Paper* 17(115).

Lane, Philip and Gian Maria Milesi-Ferretti (2009). "The Drivers of Financial Globalization". In: *American Economic Review P P* 98(2), pp. 327–32.

Lequiller, François and Derek Blades (2014). *Understanding National Accounts*. 2nd ed. OECD. DOI: 10.1787/9789264214637-en.

Lotz, Joergen R and Elliott R Morss (1970). "A theory of tax level determinants for developing countries". In: *Economic Development and cultural change* 18(3), pp. 328–341.

Magud, Nicolas, Carmen Reinhart, and Kenneth Rogoff (2011). "Capital controls: Myth and reality". In: *NBER Working Paper Series*(16805).

Mahdavi, Paasha (2020). *Power Grab: Political Survival through Extractive Resource Nationalization*. Cambridge University Press. DOI: 10.1017/9781108781350.

McCaig, Brian and Nina Pavcnik (2018). "Export Markets and Labor Allocation in a Low-Income Country". In: *American Economic Review* 108(7), pp. 1899–1941.

McDaniel, Cara (2007). "Average tax rates on consumption, investment, labor and capital in the OECD 1950-2003". In:

Mendoza, Enrique G., Assaf Razin, and Linda L. Tesar (1994). "Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption." In: *Journal of Monetary Economics* 34(3), pp. 297–323. DOI: 10.1016/0304-3932(94)90021-3.

Mogstad, Magne, Alexander Torgovitsky, and Christopher Walter (2020). "The Causal Interpretation of Two-Stage Least Squares with Multiple Instrumental Variables". In: *NBER Working Papers*(25691).

Naritomi, Joana (2019). "Consumers as Tax Auditors". In: *American Economic Review* 109(9), pp. 3031–72.

OECD (2020). *Revenue Statistics*. URL: https://www.oecd.org/tax/revenue-statistics-2522770x.htm.

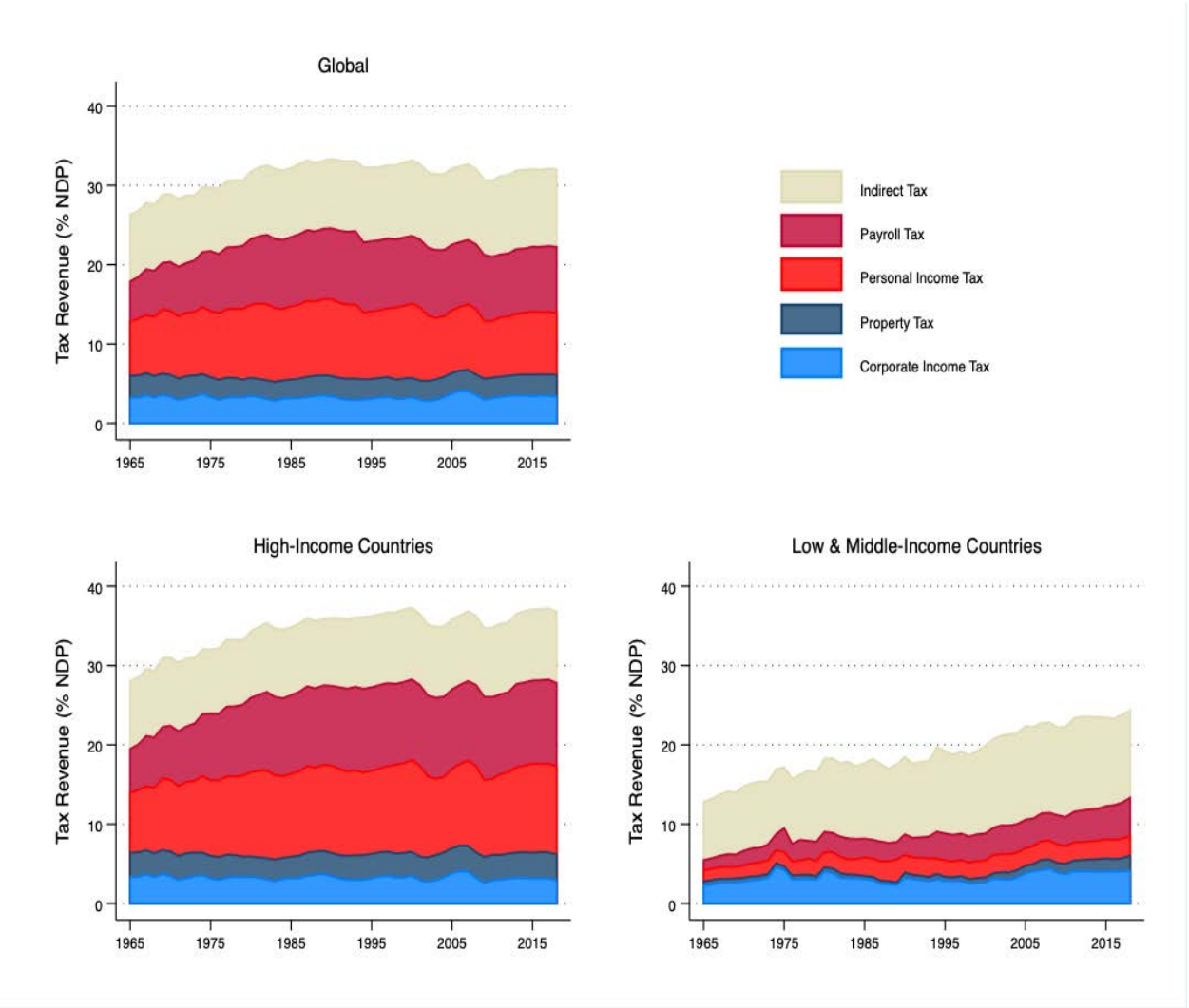
OECD-UCLG (2019). *World Observatory on Subnational Government Finance and Investment*. URL: http://www.sng-wofi.org/data/.

Ohlin, Bertil (1933). "Interregional and International Trade". In:

OPEC (2021). *Average annual OPEC crude oil price from 1960 to 2021*. URL: https://www.statista.com/topics/1830/opec/.
Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman (2018). "Distributional National Accounts: Methods and Estimates for the United States". In: *The Quarterly Journal of Economics* 133(2), pp. 553–609.
Pomeranz, Dina (2015). "No Taxation without Information: Deterrence and Self-Enforcement in the Value-Added Tax". In: *American Economic Review* 105(8), pp. 2539–69.
Quinn, Dennis (1997). "The Correlates of Change in International Financial Regulation". In: *American Political Science Review* 91(3), pp. 531–551.
Rodriguez, Francisco and Daniel Ortega (2006). "Are Capital Shares Higher in Poor Countries? Evidence from Industrial Surveys". In: *Working Paper*.
Rodriguez, Francisco and Dani Rodrik (2001). "Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence". In: *NBER Macroeconomic Annual* 15, pp. 261–338.
Rodrik, Dani (1997). "Trade, Social Insurance, and the Limits to Globalization". In: *NBER Working Paper Series*(5905).
Rodrik, Dani (1998a). "Why do More Open Economies Have Bigger Governments?" In: *Journal of Political Economy* 106(5), pp. 997–1032. DOI: 10.1086/250038.
Rodrik, Dani (1998b). "Why do More Open Governments Have Bigger Governments?" In: *Journal of Political Economy* 106(15), pp. 997–1032.
Romer, Christina and David Romer (2010). "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks". In: *American Economic Review* 100(1), pp. 763–801.
Ross, Michael and Paasha Mahdavi (2015). "Oil and gas data, 1932–2014". In: *Harvard Dataverse* 2.
Saez, Emmanuel and Gabriel Zucman (2019a). *Clarifying Distributional Tax Incidence: Who Pays Current Taxes vs. Tax Reform Analysis*. Tech. rep. UC Berkeley.
Saez, Emmanuel and Gabriel Zucman (2019b). *The Triumph of Injustice: How the Rich Dodge Taxes and How to Make Them Pay*. W.W.Norton. ISBN: 9780393531732. URL: https://taxjusticenow.org/#/.
SeaRates (2021). *Online Freight Shipping and Transit Time Calculator.* URL: https://www.searates.com/services/distances-time/.
Slemrod, Joel (2004). "Are Corporate Tax Rates, Or Countries, Converging?" In: *Journal of Public Economics* 88(6), pp. 1169–1186.
Storeygard, Adam (2016). "Farther on down the Road: Transport Costs, Trade and Urban Growth in Sub-Saharan Africa". In: *Review of Economic Studies* 83(1), pp. 1263–95.
Swank, Duane and Sven Steinmo (2002). "The New Political Economy of Taxation in Advanced Capitalist Democracries". In: *American Journal of Political Science* 46(3), pp. 642–655.
Topalova, Petia and Amit Khandelwal (2011). "Trade Liberalization and Firm Productivity: The Case of India". In: *Review of Economics and Statistics* 93(3), pp. 995–1009.
Tørsløv, Thomas, Ludvig Wier, and Gabriel Zucman (Apr. 2020). *The Missing Profits of Nations*. Working Paper 24701. National Bureau of Economic Research. DOI: 10.3386/w24701. URL: http://www.nber.org/papers/w24701.

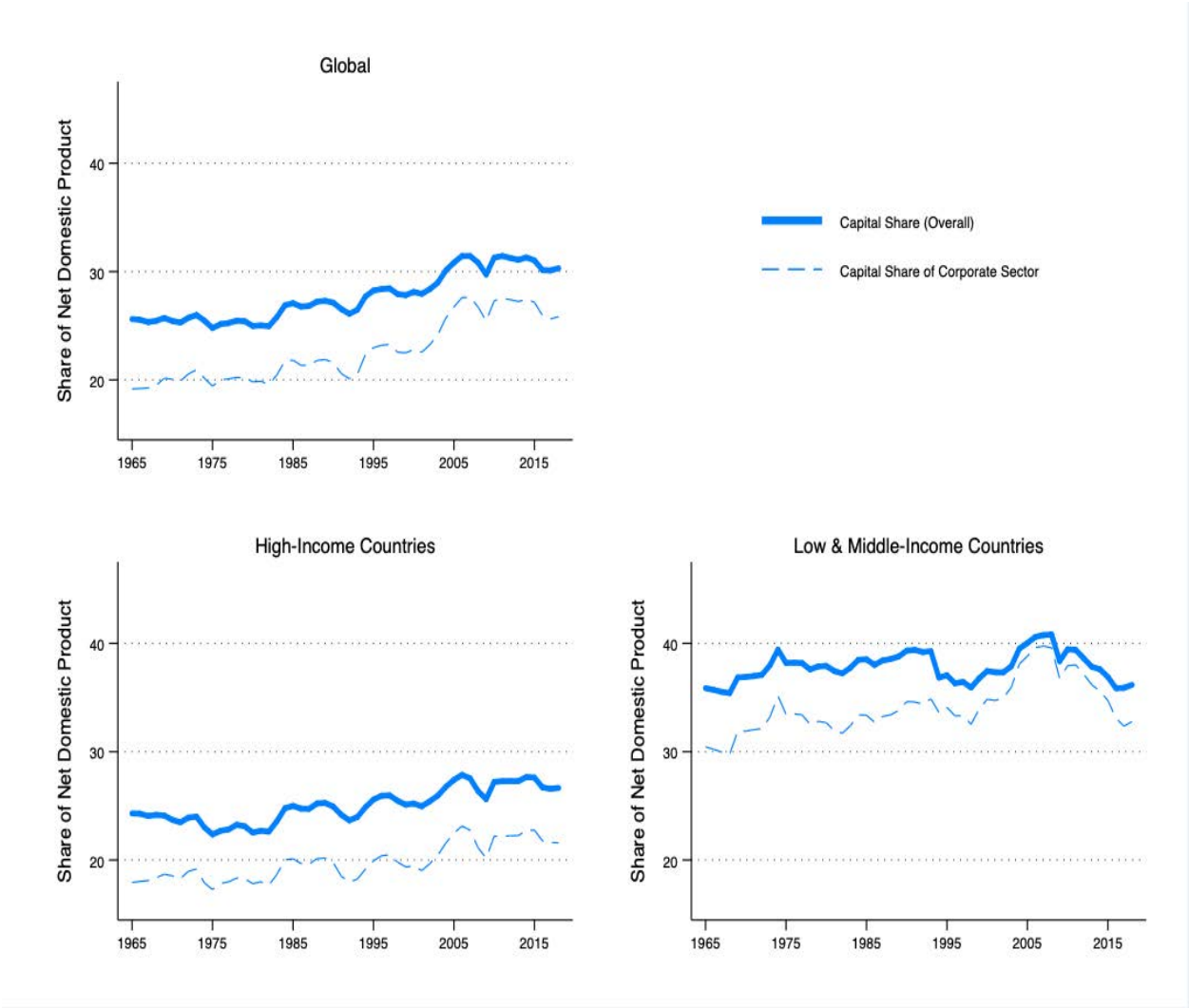
UN (2018). *Handbook on Backcasting*. URL: https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12_8iiib_Backcasting.pdf.
UN DESA (2019). *World Urbanization Prospects: The 2018 Revision*. United Nations, Department of Economic and Social Affairs, Population Division.
UN SNA (1968). *A System of National Accounts*. URL: https://unstats.un.org/unsd/nationalaccount/docs/1968SNA.pdf.
UN SNA (2008). *A System of National Accounts*. URL: https://unstats.un.org/unsd/nationalaccount/docs/sna2008.pdf.
UNSD (2018). *Handbook on Backcasting*. URL: https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12_8iiib_Backcasting.pdf.
Wacziarg, Romain (2001). "Measuring the Dynamic Gains from Trade". In: *World Bank Economic Review* 15(3), pp. 393–429.
Wacziarg, Romain and Jessica Wallack (2004). "Trade Liberalization and Intersectoral Labor Movements". In: *Journal of International Economics* 64, pp. 411–439.
WID (2020). *World Inequality Database*. URL: http://wid.world.
Wilson, John (1999). "Theories of Tax Competition". In: *National Tax Journal* 52(2), pp. 269–304.
Wong, Christine P. W. and Richard M. Bird (2008). "China's Fiscal System: A Work in Progress". In: *China's Great Economic Transformation*. Ed. by Loren Brandt and Thomas G. Rawski. Cambridge University Press, pp. 429–466. DOI: 10.1017/CBO9780511754234.013.
World Bank (2008). *Public Finance in China: Reform and Growth for a Harmonious Society*. Ed. by Jiwei Lou and Shuilin Wang. The World Bank.
Young, Alwyn (1995). "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience". In: *The Quarterly Journal of Economics* 110(3), pp. 641–680.

Figure 1: Tax Revenue as a Share of Domestic Product



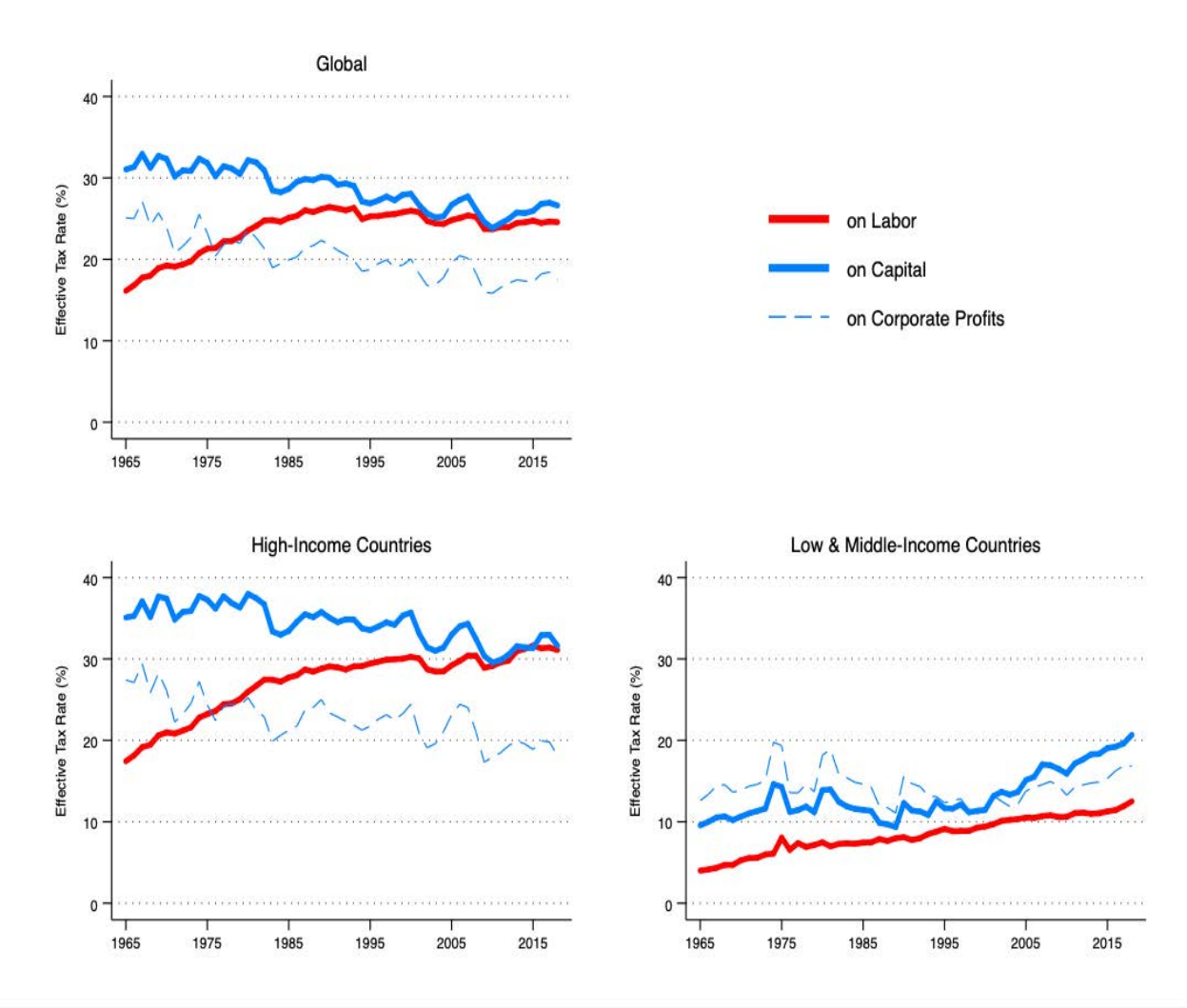
Notes: This figure plots the time series of tax revenue as a share of net domestic product (NDP), separated into five revenue sources. The top left panel corresponds to the global average, weighting country-year observations by their share in that year's total NDP, in constant 2019 USD (N=156). The bottom-left panel shows the results for high-income OECD countries (N=37), and the bottom right for low- and middle-income countries (N=119). We consider as high-income, all OECD countries that meet the World Bank's classification of high-income. Tax revenues are separated into five main categories: indirect taxes (including domestic consumption taxes, excises, and tariffs), payroll taxes, taxes on personal income, taxes on property and wealth, and taxes on corporate income. The dataset is composed of two (quasi) balanced panels: the first covers the years 1965-1993 and excludes communist regimes. It accounts for 85-90% of World GDP during those years. The second, covers 1994-2018 and integrates former communist countries, and in particular China and Russia, and accounts for 98% of World GDP.

Figure 2: Capital Share of Domestic Product



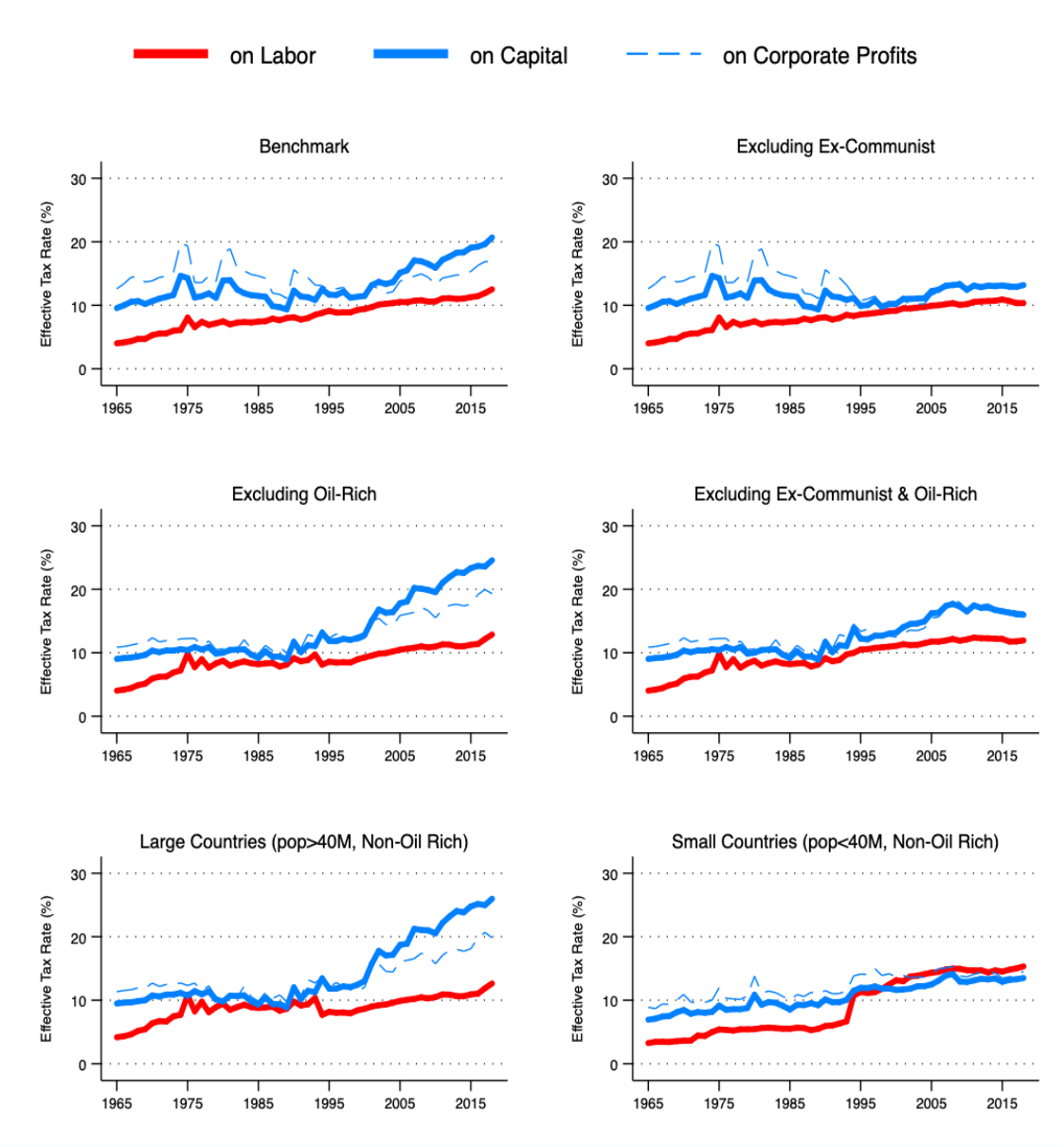
Notes: This figure plots the time series of the capital share as a percentage of net domestic product (NDP). The solid line corresponds to the overall capital share, and the dotted line to the capital share within the corporate sector. The top left panel corresponds to the global average, weighting country-year observations by their share in that year's total NDP, in constant 2019 USD (N=156). The bottom-left panel shows the results for high-income OECD countries (N=37), and the bottom right for low- and middle-income countries (N=119). We consider as high-income, all OECD countries that meet the World Bank's classification of high-income. The dataset is composed of two (quasi) balanced panels: the first covers the years 1965-1993 and excludes communist regimes. It accounts for 85-90% of World GDP during those years. The second, covers 1994-2018 and integrates former communist countries, and in particular China and Russia, and accounts for 98% of World GDP.

Figure 3: Effective Taxation of Capital and Labor



Notes: This figure plots the time series of average effective tax rates on labor (blue) and capital (red), as well as the effective tax rate on corporate profits (red dashed line). The top-left panel corresponds to the global average, weighting country-year observations by their share in that year's total NDP, in constant 2019 USD (N=156). The bottom-left panel shows the results for high-income OECD countries (N=37), and the bottom-right panel for low- and middle-income countries (N=119). High-income countries are OECD countries that meet the World Bank's income threshold of high-income. The dataset is composed of two (quasi) balanced panels: the first covers the years 1965-1993 and excludes communist regimes. It accounts for 85-90% of World GDP during those years. The second, covers 1994-2018 and integrates former communist countries, and in particular China and Russia, and accounts for 98% of World GDP. Figure shows how the entry into our panel in 1994 of these countries impact the results, by imputing their pre-1994 data with a regression procedure.

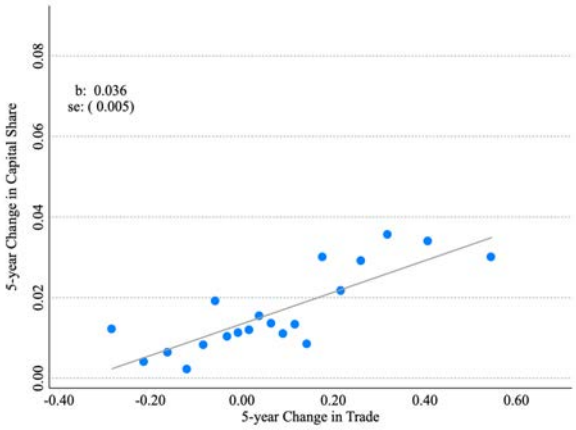
Figure 4: Effective Taxation of Capital and Labor in Low- and Middle-Income Countries



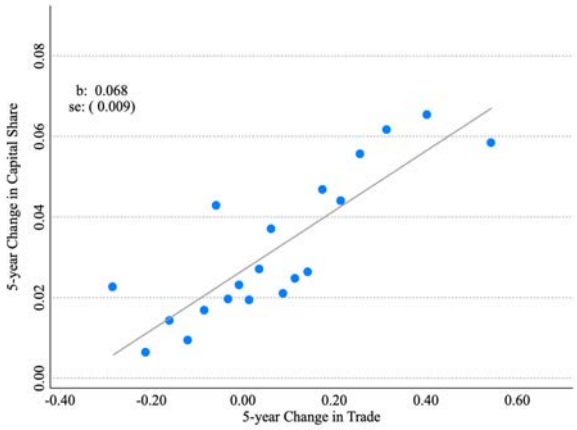
Notes: This figure plots the time series of average effective tax rates on labor, capital, and corporate profits, in the 118 low- and middle-income countries. Compared to the full sample of 156 countries, it excludes OECD countries classified as high-income by the World Bank. The top-left panel is our benchmark result, taken from 3. The top-right panel excludes former communist countries, most notably China and Russia. The mid-left panel excludes oil-rich countries (the 33 countries where average oil production since 1990 has exceeded 6.5% of GDP, per Ross and Mahdavi (2015)). The mid-right panel excludes both ex-communist and oil-rich nations. Finally the bottom panels show the results separately for the 18 large (non-oil rich) countries to the left, and the 68 small (non-oil rich) countries to the right. Large (small) countries are defined as having a population above (below) 40 Million in 2018.

Figure 5: Change in Capital Shares and Factor Taxation vs. Change in Trade

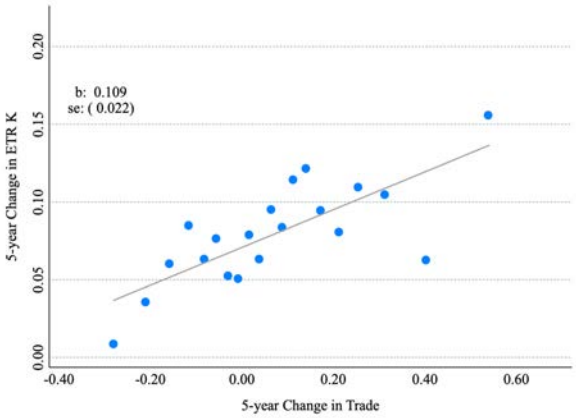
(a) Capital Share



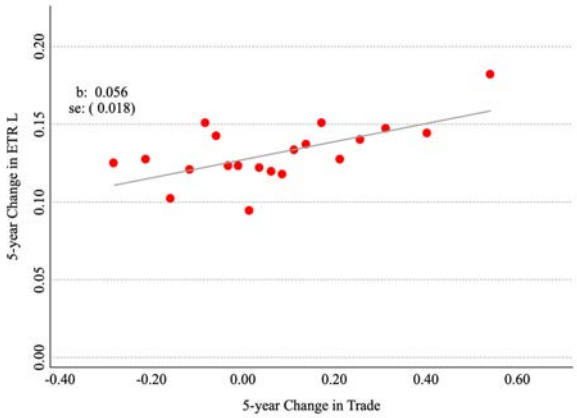
(b) Capital Share of Corporate Sector



(c) ETR on Capital



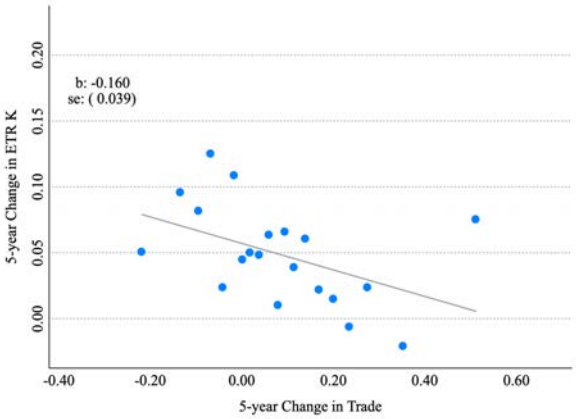
(d) ETR on Labor



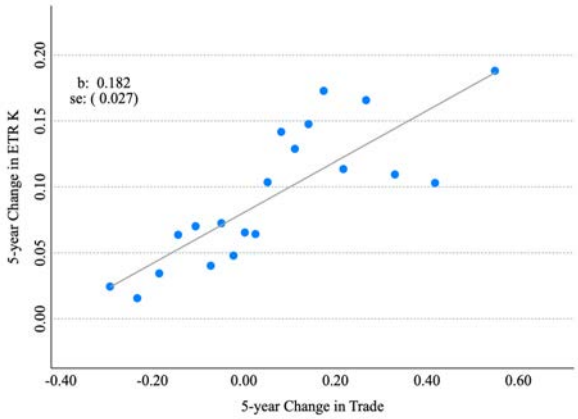
Notes: These figures show the relationship between trade and the capital share of domestic product (a); the capital share of the corporate sector (b); the effective tax rate on capital income (c); and the effective tax rate on labor income (d). Trade is measured as the sum of import and exports as a share of NDP. Both the x-axis and y-axis are measured as within-country percent changes over 5 years. Each graph shows binned scatter plots of each outcome against trade, after residualizing all variables against year fixed effects. Each dot corresponds to a ventile (20 equal-sized bins) of the residualized trade variable. For ease of interpretation, we add back the (non-residualized) mean of the given variable. Linear trend lines are unweighted, with year fixed effects, and are estimated based on the underlying country-year panel data. The corresponding slope and standard error are shown top-left in each panel.

Figure 6: Change in Factor Taxation vs. Change in Trade, by Income Level

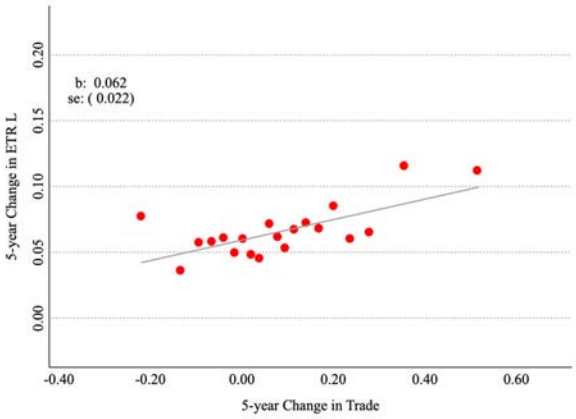
(a) ETR K: High-Income



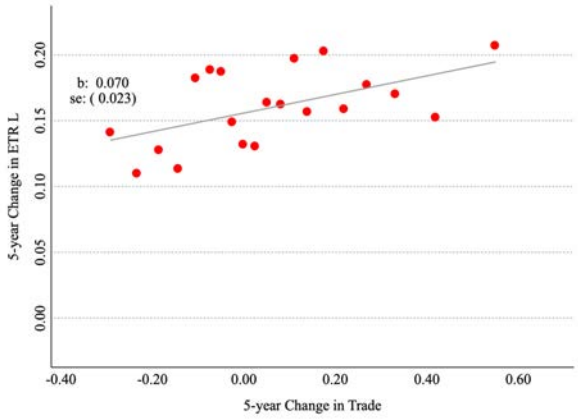
(b) ETR K: Low & Middle-Income



(c) ETR L: High-Income

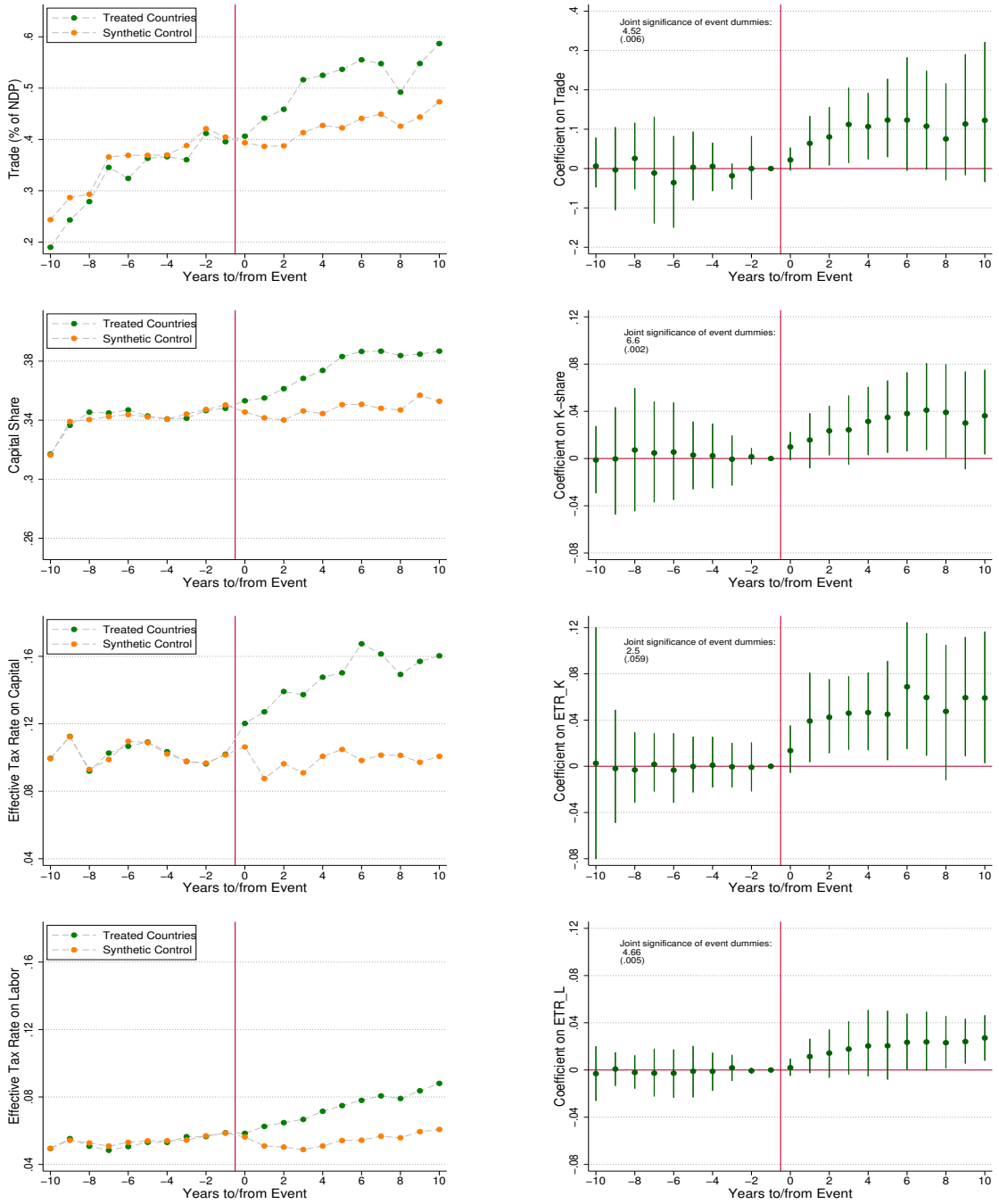


(d) ETR L: Low & Middle-Income



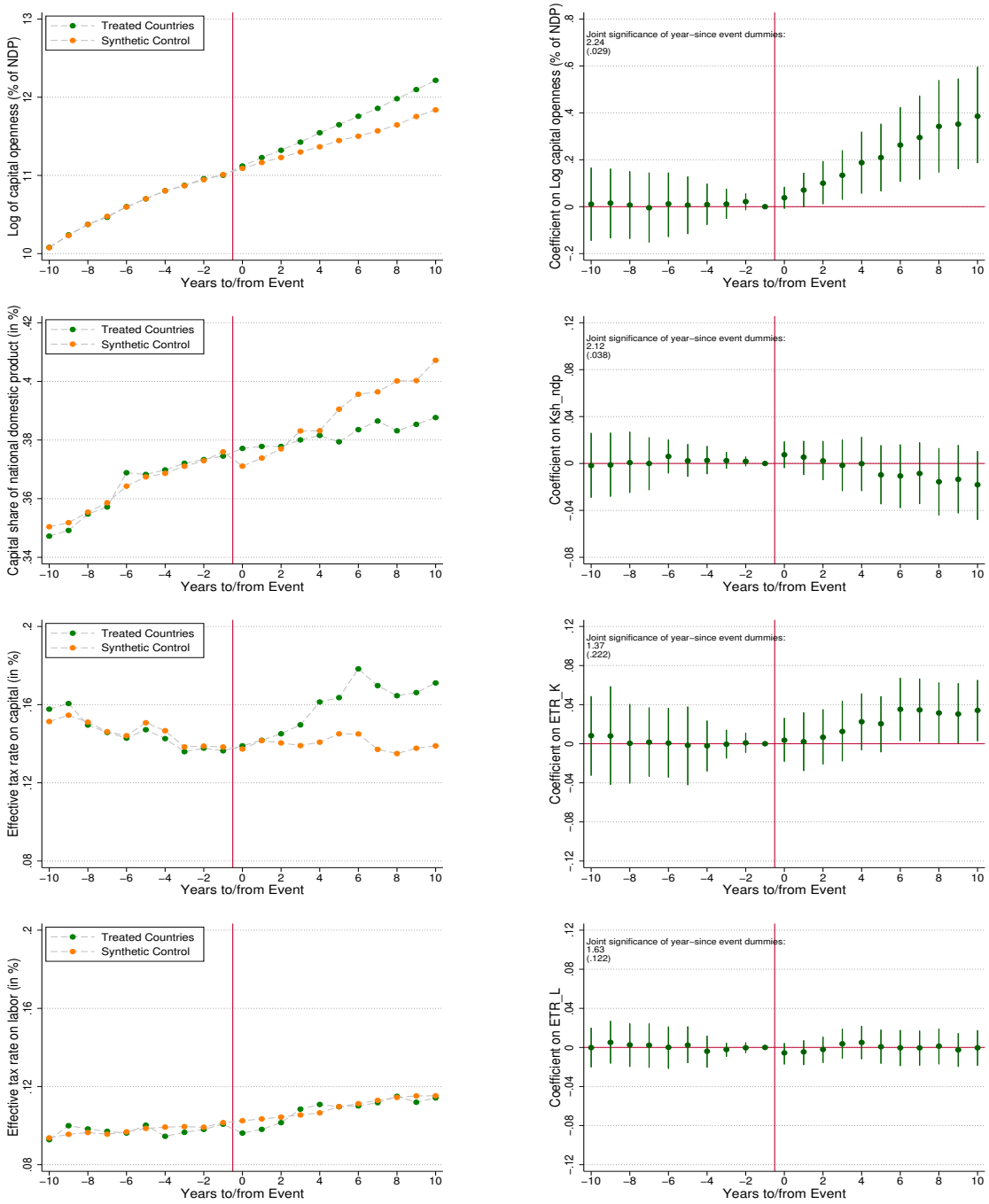
Notes: These figures show the association between changes in trade and changes in effective tax rates of capital (panels a and b) and labor (panels c and d), respectively for high income OECD countries and for low and middle income countries. Trade is measured as the sum of import and exports as a share of NDP. Both the x-axis and y-axis are measured as within-country percent changes over 5 years. Each graph plots binned scatter plots of the outcome against trade, after residualizing all variables against year fixed effects. Each dot corresponds to a ventile (20 equal-sized bins) of the residualized trade variable. For ease of interpretation, we add back the (non-residualized) mean of the given variable. Linear trend lines are unweighted, with year fixed effects, and are estimated based on the underlying country-year panel data. The corresponding slope and standard error are shown top-left in each panel.

Figure 7: Event Study of Trade Liberalization Reforms



Notes: These figures show event-studies for trade liberalization in seven large developing countries: Argentina, Brazil, China, Colombia, India, Mexico and Vietnam. The panels correspond to different outcomes: trade; capital share; effective tax rate on capital, and on labor. The left-hand graphs show the average level of the outcome in every year to (since) the event for the treated group and for the group of synthetic control countries. The right-hand graphs show the coefficients on the 'to' ('since') dummies, in a regression with country fixed effects, year 'to' ('since') fixed effects, and calendar year fixed effects. The bars represent the 95% confidence intervals. Standard errors are clustered at the country-reform level and estimated with the wild bootstrap method. The top-left corners report the F-statistic on joint significance of the post-reform dummies, with the p-value in parentheses below. Details on methodology in Section 6.1 and Appendix C.2.

Figure 8: Event Study of Capital liberalization Reforms



Notes: These figures show event-studies for trade capital reforms in the 25 developing countries of Chari, Henry, and Sasson (2012). The panels correspond to different outcomes: capital openness; capital share; effective tax rate on capital, and on labor. Capital openness is the log of total foreign assets and liabilities as a % of GDP. The left-hand graphs show the average level of the outcome in every year to (since) the event for the treated group and for the group of synthetic control countries. The right-hand graphs show the coefficients on the 'to' ('since') dummies, in a regression with country fixed effects, year 'to' ('since') fixed effects, and calendar year fixed effects. The bars represent the 95% confidence intervals. Standard errors are clustered at the country-reform level and estimated with the wild bootstrap method. The top-left corners report the F-statistic on joint significance of the post-reform dummies, with the p-value in parentheses below. More details are in Section 8 and Appendix C.3.

Table 1: Trade Impacts on Factor Shares and Factor Taxation

	Capital Share		Effective Tax Rate		
	overall	corp. sector	labor	capital	corp. profits
Panel A: OLS					
Trade	0.0195*	0.0217	0.0246**	0.0168	0.0120
	(0.0109)	(0.0148)	(0.0101)	(0.0302)	(0.0220)
Panel B: IV estimate (NDP-weighted)					
Trade	0.151**	0.184**	0.163***	0.375*	0.342***
	(0.0698)	(0.0800)	(0.0538)	(0.213)	(0.121)
First-stage F-statistic	26.07	26.07	26.07	26.07	26.07
Panel C: IV estimate (unweighted)					
Trade	0.118*	0.122	0.133**	0.250**	0.359***
	(0.0681)	(0.0826)	(0.0526)	(0.105)	(0.0870)
First-stage F-statistic	8.42	8.42	8.42	8.42	8.42
Panel D: IV estimate (NDP-weighted, with controls)					
Trade	0.115**	0.142**	0.226***	0.400***	0.205*
	(0.0475)	(0.0546)	(0.0551)	(0.112)	(0.129)
First-stage F-statistic	19.02	19.02	19.02	19.02	19.02
N	*4518*	*4518*	*4518*	*4518*	*4518*

Notes: This table presents results from estimating the effect of trade on factor shares and factor taxation. In Panel A, we present results from estimating equation (7) using OLS, while Panels B and C and D present IV estimates—weighted by National Domestic Product (NDP); unweighted; and weighted with controls, respectively. Across columns, the outcome is the capital share of national domestic product and within the corporate sector, and the effective tax rate on labor, capital and corporate profits. Trade is measured as the sum of export and imports divided by NDP. IV estimates in panels B,C,D instrument for trade using the oil-price and the gravity-instruments from Egger, Nigai, and Strecker (2019). All estimates include country and year fixed effects and observations are weighted by net domestic product in constant 2019 USD at PPP (except in Panel C). The controls included in Panel C are: USD exchange rate; gross fixed capital formation (as a percentage of NDP); (log) population; (log) GDP per capita; and *de jure* capital accounts mobility. For more details, see Section 7. * p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses are clustered at the country level.

Table 2: Trade Impacts on Additional Outcomes

	OLS	IV		
		Weighted	Unweighted	Controls
	(1)	(2)	(3)	(4)
Panel A: Statutory Corporate Income Tax Rate				
CIT rate	-0.002	-0.064***	-0.051*	-0.061***
	(0.003)	(0.017)	(0.028)	(0.017)
Panel B: Self-Employment as a Share of the Workforce				
Self-employment	-0.0117	-0.220*	-0.185***	-0.174***
	(0.0145)	(0.126)	(0.0460)	(0.0560)
Panel C: National Income Components				
Corporate profits	0.0339***	0.175**	0.124***	0.206***
	(0.0128)	(0.0767)	(0.0321)	(0.0726)
Employee compensation	0.00848	-0.0749	-0.0964	0.0485
	(0.0175)	(0.0904)	(0.0669)	(0.0785)
Mixed income	-0.0231	-0.0685	-0.0391	-0.202**
	(0.0182)	(0.105)	(0.0301)	(0.0816)
Household operating surplus	0.0002	0.0145	0.0072	0.0171
	(0.0039)	(0.0146)	(0.0159)	(0.0137)
Corporate-sector value-added	0.0396*	0.164	0.0917***	0.274***
	(0.0210)	(0.109)	(0.0342)	(0.0943)
First-stage F-statistic		26.07	19.02	8.415
N	*4518*	*4518*	*4518*	*4518*

Notes: This table reports estimates of the impact of trade on additional outcomes. Each cell corresponds to a coefficient on trade from a regression model which varies in the outcome (across rows) and estimation model (across columns). Across columns, the coefficients are based on estimating equation 7 using, respectively: OLS; IV; IV without weights, IV with weights and controls. The controls included in column (4) are: USD exchange rate; gross fixed capital formation (as a percentage of NDP); (log) population; (log) gross domestic product per capita; and *de jure* capital accounts mobility. Weighted regressions are weighted by annual net domestic product in constant 2019 USD at PPP. Across panels, the outcome is: the statutory corporate income tax rate (Panel A); the self-employed share of the active workforce (Panel B); the share in national income of corporate profits, employee compensation, mixed income, household operating surplus, and the share of the corporate sector in the economy (Panel C). Trade is measured as the sum of export and imports divided by net domestic product. We instrument for trade using the oil-price and the gravity-instruments from Egger, Nigai, and Strecker (2019). All estimates include country and year fixed effects. For more details, see Section 7. * p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses are clustered at the country level.

Table 3: Heterogeneous Impacts of Trade by Development Level

	ETR_K	ETR_L	CIT rate	Capital share of income	Self employment	Mixed income	Corporate profits	Corporate value-added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Trade	0.444**	0.145	-0.043*	0.182**	-0.252**	-0.124	0.219***	0.220***
	(0.181)	(0.093)	(0.024)	(0.077)	(0.107)	(0.097)	(0.063)	(0.083)
Trade∗𝟙(High-inc.)	-0.441	0.120	-0.032	-0.219	0.232	0.374*	-0.299**	-0.381**
	(0.347)	(0.194)	(0.047)	(0.137)	(0.209)	(0.205)	(0.146)	(0.176)
Implied coef. for	0.003	0.265**	-0.075***	-0.036	-0.021	0.250*	-0.080	-0.160
Trade∗𝟙(High-inc.)	(0.231)	(0.122)	(0.457)	(0.083)	(0.151)	(0.144)	(0.102)	(0.129)
N	*4518*	*4518*	*3810*	*4518*	*4518*	*4518*	*4518*	*4518*

Notes: This table presents results from the heterogeneous IV analysis based on estimating equation (8). The top row denotes the outcome variable: effective tax rate on capital; effective tax rate on labor; statutory corporate income tax rate; capital share of domestic product; self-employed share of workforce; mixed income as a share of domestic product; corporate profits; and share of the corporate sector in the economy. The regression coefficients for $Trade$ as well as the interaction with a dummy for high-income countries, $Trade * \mathbb{1}(High - income)$ are presented. The bottom row reports the coefficient for the linear combination of $Trade$ and the interaction term. Trade is measured as the sum of export and imports divided by net domestic product. We instrument for trade using the oil-price and the gravity-instruments from Egger, Nigai, and Strecker (2019). All estimates include country and year fixed effects and observations are weighted by net domestic product in constant 2019 USD at PPP. For more details, see Section 7. * p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses are clustered at the country level.

Table 4: Additional Heterogeneity Impacts of Trade

Heterogeneity H_c :	Small population	Capital openness
Panel A: CIT rate		
Trade	-0.053***	-0.063***
	(0.014)	(0.018)
Trade$*H_c$	-0.034	-0.034
	(0.054)	(0.079)
Coefficient on Trade in H_c	-0.088*	-0.094
	(0.049)	(0.072)
Panel B: ETR_K		
Trade	0.357**	0.617**
	(0.177)	(0.274)
Trade$*H_c$	-0.491	-0.483
	(0.544)	(0.456)
Coefficient on Trade in H_c	-0.134	0.133
	(0.456)	(0.224)
Panel C: ETR_L		
Trade	0.169***	0.144
	(0.061)	(0.158)
Trade$*H_c$	0.145	0.159
	(0.282)	(0.275)
Coefficient on Trade in H_c	0.314	0.304**
	(0.242)	(0.139)

Notes: This table presents results from the heterogeneous IV analysis based on estimating equation (8). The top row denotes the source of heterogeneity H_c, respectively across columns: a dummy for small population size (below 40 million); the Chinn-Ito index of capital account openness (Chinn and Ito, 2006), which is a continuous variable between 0 and 1; and, a dummy indicator for the post-1995 period. Across Panels, we estimate the effects of trade on the statutory corporate income tax rate (Panel A), the effective tax rate on capital (Panel B), and the effective tax rate of labor (Panel C). At the bottom of each panel, we report the coefficient on trade (and standard error) in the heterogeneity sub-sample as the linear combination of the coefficients on $Trade$ and $Trade * H_c$. Trade is measured as the sum of export and imports divided by net domestic product. We instrument for trade using the oil-price and the gravity-instruments from Egger, Nigai, and Strecker (2019). All estimates include country and year fixed effects and observations are weighted by net domestic product in constant 2019 USD at PPP. For more details, see Section 7. * p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses are clustered at the country level.

Table 5: Trade Impacts by Tax Source (% of GDP) and Development Levels

	total taxes (1)	indirect (2)	CIT (3)	property (4)	PIT (5)	payroll (6)
Trade	0.218*	0.002	0.102***	0.025	0.010	0.055
	(0.112)	(0.047)	(0.028)	(0.025)	(0.025)	(0.045)
Trade$*\mathbb{1}$(High-Inc)	-0.270	-0.146	-0.128**	-0.012	-0.061	0.090
	(0.251)	(0.132)	(0.061)	(0.042)	(0.062)	(0.093)
Implied coef. for Trade in High-Inc	-0.052	-0.144	-0.026	0.013	-0.0506	0.145**
	(0.188)	(0.105)	(0.036)	(0.026)	(0.042)	(0.056)
N	*4518*	*4518*	*4518*	*4518*	*4518*	*4518*

Notes: This table presents results for the impact of trade on different sources of taxation, estimated using the IV. Across columns, the outcome is the revenue collected by each tax as a percentage of NDP: total taxes, then indirect taxes, corporate income tax, property and wealth taxes, personal income tax, and social security taxes. The regression coefficients for $Trade$ as well as the interaction with a dummy for high-income countries, $Trade * \mathbb{1}$(High-income) are presented. The bottom row reports the coefficient for the linear combination of $Trade$ and the interaction term. Trade is measured as the sum of export and imports divided by GDP. We instrument for trade using the oil-price and the gravity-equation instruments from Egger, Nigai, and Strecker (2019). All estimates include country and year fixed effects and observations are weighted by net domestic product in constant 2019 USD at PPP. We use dummy variable controls for significantly interpolated revenue data (rare) or imputed factor share data (frequent) in all columns. * p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses are clustered at the country level.