

# Mind the wage gap: an empirical analysis of the impact of labour income inequality on economic growth\*

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*This work aims to contribute to recent literature that empirically analyses the relationship between inequality in the labour market and economic growth. To do so, we measured wage inequality by using the ratio between the wages of the 10% of workers with the highest earnings and the wages of the bottom 40% of workers with the lowest earnings (10/40 ratio), capturing the wage gap between the two extreme classes of wage earners. We also used a panel data modelling approach, assuming that the main relationship studied is endogenous, and a sample with 189 countries in the period between 2004 and 2017. Our findings indicate a negative effect of wage inequality on economic growth.*

**Keywords:** *wage inequality, growth, demand-led models, dynamic panel data, system GMM*

**JEL codes:** *J31, O40, O11, E12, C33*

## 1 INTRODUCTION

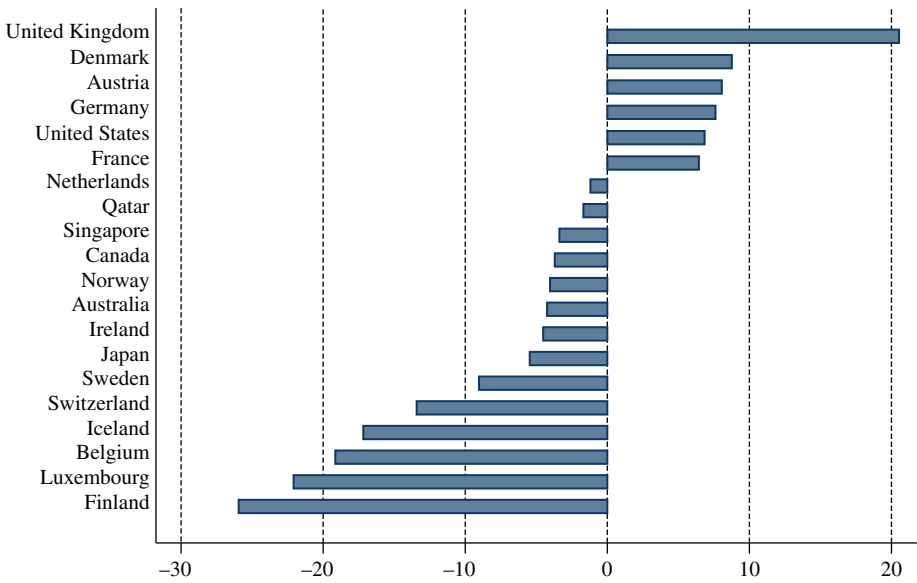
Wage inequality has been, by and large, declining in many countries in recent decades. Here, wage inequality is defined as the 10/40 wage ratio, which is the wage or salary income of the individuals at the 90<sup>th</sup> percentile, the ones that earn more than 90 percent of the total labour force, compared to the earnings of workers at the 40<sup>th</sup> percentile. The International Labour Organization database (ILO, 2019) shows, for a sample of 189 countries over the 2004–2017 period, that the 10/40 ratio decreased in 150 countries (79 percent of the sample), while it increased for the remaining 39 countries (21 percent of the sample). Figures 1 and 2 show the proportionate change in wage inequality between 2004 and 2017 in countries with the 20 highest and lowest GDP

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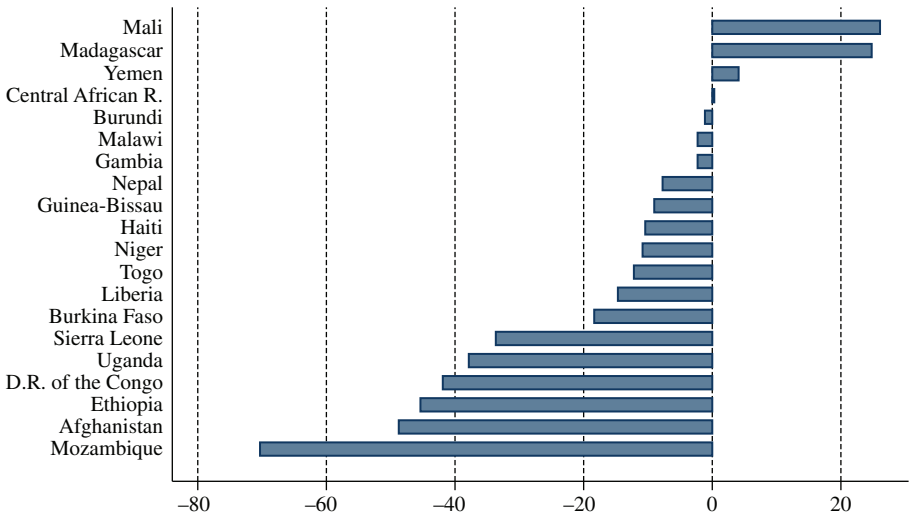
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Source: Author's elaboration with data from ILO (2019).

Figure 1 10/40 decile ratio (percentage change between 2004–2017) in the top 20 countries by GDP per capita in 2017



Source: Author's elaboration with data from ILO (2019).

Figure 2 10/40 decile ratio (percentage change between 2004–2017) in the bottom 20 countries by GDP per capita in 2017

per capita in 2017, respectively. Positive values imply an increase in wage inequality over this period, while negative values account for a reduction in wage differentials. Overall, the figures show that important changes in the wage distribution have occurred in this period worldwide: mainly, the wage gap has been reducing in both groups of countries, with poorer economies experiencing a more significant decrease in wage inequality.

The literature presents several possible mechanisms behind this reduction. In general, a smaller wage gap might be a consequence of social policies, especially those that promoted education and, consequently, labour qualification; and those that established or increased minimum wages. Other important factors are individual qualifications, which would explain the difference in wages for similar jobs, and the entry of immigrants and women into the labour market (ILO, 2016; OECD, 2012). The greater reduction of wage inequality in poorer economies might be a secondary effect of the commodity boom, as emphasised by Firpo and Portella (2019), as this boom led to higher employment, demand expansion, exchange rate appreciation and improved terms of trade. However, this latest tendency tends to be reversed in the current scenario of global recession, a consequence of the end of the previous commodity boom and the COVID-19 pandemic.

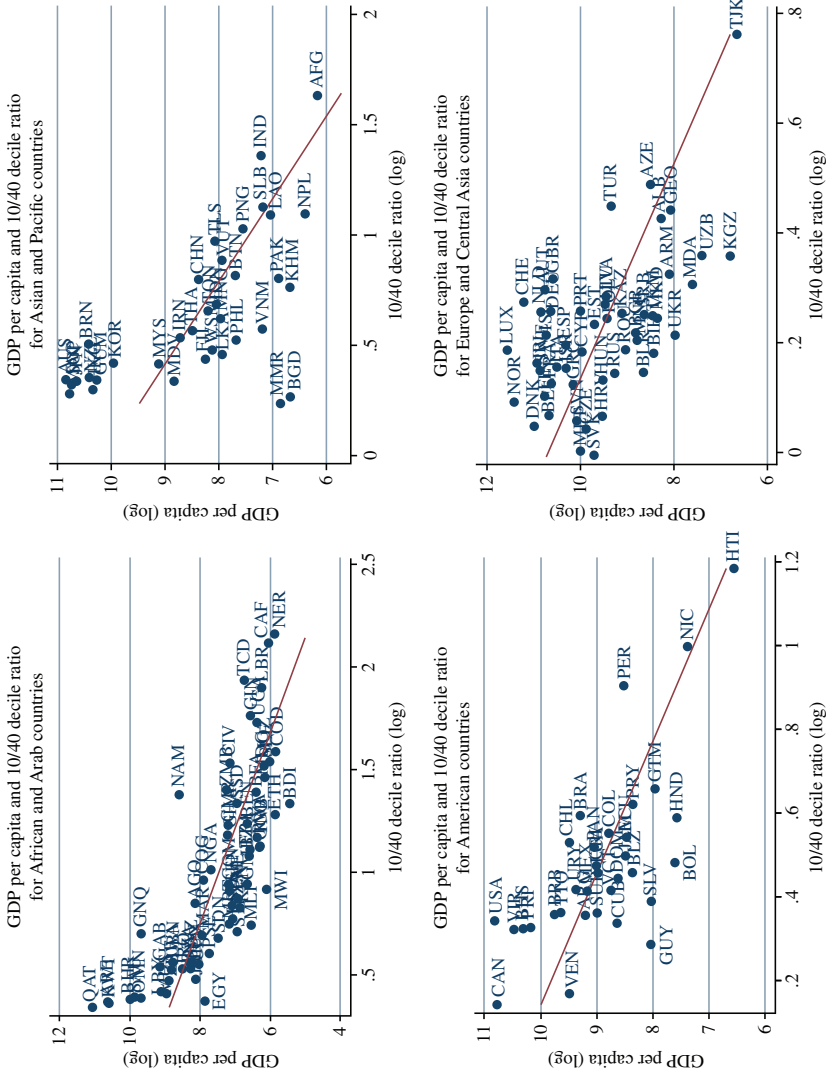
Even though wage inequality has been decreasing over the last years, high wage inequality remains a feature strongly associated with the poorest countries. Figure 3 displays the relationship between GDP per capita and the average 10/40 ratio from 2004 to 2017, by region. We observe that in advanced economies, characterised by higher income per capita, wage inequality tends to be smaller.

This inverse relationship between wage inequality and the level of per capita income raises some important questions. Can we see wage inequality not only as a consequence but also as a determinant of economic growth? In other words, can countries marked by strong heterogeneities in the labour market climb up the development ladder by promoting policies that aim to reduce the wage gap between workers?

Unlike the association between growth and income inequality that is frequently studied in the literature, investigations that disaggregate the labour market are less common, especially in the empirical literature. Some of the exceptions that relate wage inequality and demand are Carvalho and Rezai (2016) and Tavani and Vasudevan (2014), who look at the effects of this inequality over the saving rate and capacity utilisation, respectively. The former paper points out that higher wage gaps could be associated with lower growth, while the latter indicates the inverse relation. However, further econometric analyses are still needed, as this paper intends to add to the literature.

Thus, this study seeks to contribute to this debate over the economic consequences of labour market heterogeneities by empirically investigating one of the key aspects of this issue which is the relationship between wage inequality and economic growth. To do so, we conduct an empirical exercise for a sample of 189 countries over the 2004–2017 period. A unique feature of the paper is the variable used to measure wage inequality, which is the 10/40 ratio, a variable close in spirit to the Palma Index. We used a dynamic panel data approach to empirically assess the impact of wage differentials on growth both in the short and long run. To account for endogeneity issues, we employed a Generalized Method of Moments (GMM) estimator which is robust to reverse causality.

The remainder of the paper is structured as follows. Section 2 presents a theoretical and empirical revision of the studies on the relationship addressed. Section 3 outlines the data and economic model applied. Section 4 reports and discusses the results. Lastly, Section 5 concludes.



Source: Author's elaboration with data from ILO (2019).

Figure 3 GDP per capita (log) and 10/40 decile ratio (log)

## 2 THEORETICAL AND EMPIRICAL FRAMEWORK

### 2.1 Growth and inequality

The Classical-Marxian approach argues that capital accumulation, hence investment, drives economic growth. As earners of profits, capitalists have a bigger income (compared with workers), and thus a higher propensity to save. In this sense, the redistribution of income from wages to profits would increase total savings, which finances capital accumulation and leads to economic growth. This approach has evolved through two different models (Kurz and Salvadori, 2004; Hein, 2014): Neoclassical Models (or Old Neoclassical Models) developed in the 1950 and 1960s, which consider the production function as exogenous (and hence, technological progress as an exogenous variable in the growth model); and the New Growth Theory, which started in the 1980s based on endogenisation of technological progress. The main author of the Old Neoclassical Model is Robert Solow (1956), and for the New Growth Theories, we have Romer (1986) as a pioneer. Both neoclassical currents, though, defend that only with investment and thus better technological progress and higher productivity there will be economic growth. They also defend that investment comes from capital accumulation and might be made on technologies, Research and Development (R&D), innovations, learning-by-doing processes and improvements in human capital. Despite their specificities, a common feature shared by these models is that higher profit shares (hence, a more uneven income distribution) are usually associated with higher economic growth through increased savings and capital accumulation. Following Bhaduri and Marglin (1990), we classify their growth regime as profit led.

More recent neoclassical works, however, have found that an increase in inequality causes a decrease in economic growth based on empirical analyses of time series and panel data (Alesina and Perotti, 1994; Barro, 2000; Ostry *et al.*, 2014). In this sense, numerous authors argue in favour of some transmission channels that could explain such results. Aghion *et al.* (1999) discuss that, in an economy with an imperfect capital market and with heterogeneous human capital endowments or heterogeneous wealth across individuals, inequality reduces investment opportunities and loan incentives for borrowers, due to the limited liability and low effort of the population. Regarding this transmission channel, investment in human capital is highlighted in the literature. For its long-term return and fixed costs in the present, along with the lower number of agents capable of investing, Aghion *et al.* (1999) and Galor and Zeira (1993) argue that, again, higher inequality discourages investments in education and human capital, leading to lower economic growth. Aghion *et al.* (1999) and Alesina and Perotti (1996) also argue that a country with higher inequality tends to have higher tensions between classes, inducing more political instability, hence reducing incentives for investment and harming growth in the country.

Another transmission channel, following Bertola (1993), is progressive fiscal policy, a measure taken by governments to revert higher inequality. According to the author, by taxing the richer disproportionately to finance distributive policies, governments tend to discourage investments which leads to slow economic growth. Perotti (1996), using regression with data from 1960 to 1985, on Sub-Saharan, Southeast Asian, Latin American and rich countries (GDP per capita greater than \$1,500), finds a different causality direction: lower inequality leads to a reduction in tax distortions, which leads to income growth. Moreover, decreasing inequality leads to a decrease in sociopolitical instability, and thus to an increase in investment and growth. Alesina and Perotti (1994) had already arrived at similar results with a

regression for the period 1960–1982 for Asian, African, Latin American and advanced economies.

Castelló-Climent (2010) suggests that the level of development or income of a country is a relevant transmission channel as well: emerging countries have different initial conditions (credit market, available human capital, political stability, etc.) in relation to advanced countries. Consequently, the above-mentioned effects of inequality on economic performance vary in agreement to the initial conditions: according to Castelló-Climent, the majority of the theoretical channels between inequality and growth, like credit market imperfection, fertility, life expectancy and political instability, which anticipate a negative relationship, tend to have more support in developing economies. Ostry *et al.* (2014) reinforce this idea by investigating a sample of 153 developing and advanced countries for the period between 1980 and 2010 using system GMM. The authors conclude that the contractionary impact of higher inequality is stronger in more unequal economies than in more egalitarian economies. Barro (2000), through a panel regression, estimated by a three-stage least square estimator with a sample of 100 countries between 1960 and 1990, analysed the relationship between inequality and growth, concluding that in richer countries there is a positive relationship between the two variables, while the opposite is true for poorer countries.

Besides the neoclassical growth literature, there is a theoretical framework focused on demand-driven economic growth drawing upon the works of Keynes, Kalecki and Steindl. To better understand this literature, it is valid to formalise its main hypotheses: the aggregate demand is central (Keynes, 1936); the marginal propensity to save increases with the level of income so that the propensity to save out of profits is bigger than the propensity to save out of wages (Kaldor, 1955); and the economy usually operates with excess capacity utilisation (Kalecki, 1971). Kalecki also incorporates the functional income distribution: income is divided into wages and profits – workers receive the former and capitalists the latter. Thus, income distribution determines not only consumption but also investment.

More recently, Hein (2014) classifies these models as neo-Kaleckian and post-Kaleckian. The neo-Kaleckian models were advanced by the seminal works of Rowthorn (1981), Taylor (1985) and Dutt (1984, 1990) and assume that a redistribution of income from profits to wages would increase consumption (once wage earners tend to have a higher marginal propensity to consume compared to capitalists), thus increasing capacity utilisation and capital accumulation. Bhaduri and Marglin (1990), in turn, are part of the post-Kaleckian group as they introduce a more general theoretical framework, in which there is the possibility that capacity utilisation and capital accumulation are also inversely related to the wage share. Consequently, both the demand regime and the growth regime may be either wage led or profit led, depending on the parametric conditions regarding the responsiveness of capacity utilisation and accumulation to distributional changes. In this model, there is also the weakly wage-led regime (or ‘conflictual stagnation’), when the aggregate demand is wage led, while the growth regime is profit led.

Following the modelling proposed by Bhaduri and Marglin (1990), a series of empirical studies have been conducted to investigate if the growth and/or demand regimes of different economies are either wage or profit led, and the evidence so far is quite mixed. This empirical literature has employed, by and large, two different strategies: (i) the structural approach, which uses partial equations to analyse the effects of redistribution on each demand component; and (ii) the aggregative approach, which uses an aggregate equation, including mutual interactions and endogenous effects between the variables (Blecker, 2016). As an example of the first group, Bowles and Boyer (1995) found

that eight OECD countries between 1960 and 1987 had a wage-led demand regime; Hein and Vogel (2008), for six OECD countries (1960–2005) and Stockhammer and Stehrer (2011), for 12 OECD countries (1960–2007), achieved the same result. These authors used an OLS regression and regress each demand component against income distribution.

As an example of the aggregative approach, Stockhammer et al. (2009), using a VAR (Vector Autoregression) for each demand component, conclude that 12 European Union countries were wage led between the 1960s and 2005. Using SVAR (structural VAR) and combining endogenous and exogenous effects, Stockhammer and Onaran (2004) conclude, with weak evidence, that the US, the UK and France, between the 1960s and 1990s, had wage-led growth regimes. Using a similar method, Onaran and Stockhammer (2005) found for Turkey (1965–1997) and South Korea (1970–2000) that a fall in the wage share did not lead to economic growth, according to the Impulse-Response Function. Barbosa-Filho and Taylor (2006), again using a VAR model, found that the US economy was profit led between 1948 and 2002.

Blecker (2016) also argues that an aspect shared by these results is the time horizon considered in each study. He shows that, in the short term, the positive effect of a higher profit share on investments and net exports is greater than the negative effect of a lower wage share on consumption, while the opposite tends to occur in the long term. That is, due to slower responsiveness of demand, in the short run, growth regimes tend to be more profit led (and the demand regime may vary between wage and profit share) and in the long run both the demand and growth regimes tend to be more wage led. Using VAR modelling and following the aggregative approach, Vargas Sánchez and Luna (2014) arrive at the same conclusion for the Mexican economy, in the period between 1970 and 2010.<sup>1</sup>

There are several transmission channels highlighted by different works throughout the literature that explain the propensity of the growth of an economy to being wage or profit led. A variable already presented in Bhaduri and Marglin (1990) and extensively studied in other works, such as Blecker (1989) and Rezai (2011), is the level of globalisation or international trade. The greater the openness degree of the economy, the more profit led it tends to be. When there is a high domestic demand for imported goods and a great dependence on both international demand and prices, as a higher wage share leads to lower domestic investment, hence, to lower domestic production and international competitiveness, there is a retraction on the domestic supply side. Alternatively, a bigger wage share leads to a higher demand for imports, expanding aggregate demand (and hence, the world's economic growth through the demand side). Onaran and Galanis (2012) validate the trade hypothesis by analysing the relationship between inequality and growth in 16 countries, in the period of 1960–2007 for the developed countries, and 1970–2007 for the developing countries, using VAR. They confirm that even if small economies may be profit led, due to the dominance of net export effect, large and medium-sized open countries tend to be wage led. They also add that the global economy appears to be wage led, even if there are profit-led economies.

In addition to trade, other studies also point to different transmission channels to account for differences in the growth regime. Some studies suggest that financial and monetary factors may be key explanatory variables at play. Kapeller and Schutz (2015) advocate debt as a transmission channel due to the recent rise in indebtedness in poor and rich countries and its effect on consumption, allowing it to rise even when there is no increase in wages. Hein (2007) and Hein and Ochsén (2003) defend interest

1. For an extension of Blecker's (2016) analysis, see Rolim (2021).

rates and other monetary mechanisms as transmission channels, as a result of their current relevance and their ability to change investments, productivity and consumption. Finally, Rowthorn (1999) argues that higher wages stimulate savings out of wages, generating technological progress, capital deepening, higher labour productivity and finally economic growth. Hence, the level of technology seems to be a relevant transmission channel. Storm and Naastepad (2011) confirm it through OLS analyses, with 11 OECD countries (1990–2008): both labour productivity (labour-saving technological progress) and output growth rise with an increase in wage share.

Furthermore, recent empirical studies have analysed the relationship between functional income distribution and the demand regime using panel data for both the structural and aggregative approaches. Hartwig (2014), for 31 OECD economies in the period between 1970 and 2011, confirms the bigger propensity of saving out of profits than out of wages. The author affirms that redistribution does not affect real investment growth and found, by Fixed Effects, that GDP growth is weakly positively related to redistribution so that the demand regimes are weakly wage led. Ribeiro *et al* (2020) also estimate a dynamic panel model for a sample of 54 developing countries over the 1990–2010 period using a system GMM estimator and find a positive impact of an increase in the wage share on output growth.

As for transmission channels, Scheuermeyer (2017) argues for fertility and public education: once poor families struggle to improve their qualifications, hence their salaries, they choose to increase the number of family members to raise the family income (if there is no quality public education, which would generate more qualifications). The author also defends the degree of credit market imperfection as a transmission channel, given that easy access to credit generates wealth distribution and facilitates investment; and the level of development, which determines aggregate demand conditions and is generally related to the level of internal inequality. Scheuermeyer (2017) also adds human capital, investment, political stability, inflation, government consumption and openness as control variables in his investigation of the issue in 154 countries (from 1960 to 2010) using system GMM. The author also used the Gini index for inequality instead of functional income inequality measures. He observes a constant negative and significant relationship between inequality and growth, that is, the sample as a whole was wage led. Also, using a system GMM estimator, Stockhammer and Wildauer (2015) incorporate the debt effect as Kapeller and Schutz (2015) suggested and provided evidence that 18 OECD countries (1980–2013) had a wage-led growth regime. As control variables, the authors also include exports and imports, the interest rate, credit to households and the business sector, real property prices, exchange rate as a weight measure to trade and both the wage share and the Gini index as inequality measures. Blecker's (2016) argument that the time horizon changes the relationship between inequality and growth is confirmed in Kiefer and Rada (2014). These authors, using a panel of 13 OECD countries in the period ranging from 1976 to 2012 and a GMM estimator, conclude that these economies seem to have profit-led growth in the short-run, converting to wage-led growth in the long run.

## 2.2 Inequality in the labour market

Another key aspect regarding the growth–inequality nexus relates to the class conflict centred on the labour market. This conflict is currently highlighted due to the increasing gap between high-end salaried workers and other employees in many countries (Atkinson *et al.*, 2011). According to the Global Wage Report of 2016 (ILO, 2016),

the inequality between the extremes ends of the wage distribution has increased in many countries, which is confirmed by the database used in this work.

The introduction of the wage-differential in growth models has been developed since Pasinetti (1961), who expanded the distribution of wages and profits, arguing that both capitalists and workers receive wages and profits, though the latter tend to receive fewer profits than the former. Dutt (1990) introduced this expansion in a Kaleckian model, concluding that growth tends to be wage led since although workers receive profits and wages, they have a higher propensity to consume than to save. Palley (2005) emphasises that the distribution of profits depends on market competition, while the distribution of wages depends on labour market bargaining power.

Palley (2005) and Hein (2014) formalise the post-Keynesian model including three classes: capitalists, capitalist-managers and workers. Here, a better wage and ownership (what generates profits) distribution always leads to an expansion of utilised capacity and economic growth through the expansion of consumption. The effect of changes in the profit share, though, remains ambiguous and has to be analysed with the other variables that affect the growth rate. Some expansions of the wage-differential growth model are the inclusion of more than two classes for wage earners: subdividing managers (Tavani and Vasudevan, 2014), including a middle-management middle class (Palley, 2015) or subdividing workers in multidimensional aspects such as skills, regions, ethnicity and gender (Dutt and Veneziani, 2011, Dutt *et al.*, 2015, Seguino, 2012; Lima *et al.*, 2021). Neto and Ribeiro (2019) propose a macrodynamic model including intra-working-class income distribution and knowledge-intensive technological change, arguing about the ambiguous effect of the last variable on growth: technological innovation, on one hand, increases productivity, thus boosting exports and output growth; on the other hand, a skill-biased technological innovation may worsen the condition of unskilled workers, deepening wage inequality between working-class, thereby slowing aggregate consumption and economic growth.

Nevertheless, only a few papers have investigated the consequences of wage differentials on economic growth. To the best of our knowledge, only demand-led growth models have explicitly taken into account the effect of intra-working-class conflicts on income and, in this sense, how the wage differential affects economic performance. Carvalho and Rezaei (2016) analysed the US economy between 1967 and 2010 using a two-dimensional Threshold Vector Autoregression (TVAR). To measure the wage inequality, they used different percentiles of wage earners. They conclude that more unequal wages between classes lead the economy to grow when the profit share, rather than the wage share, increases. Also, an increase in income inequality is shown to lead to an increase in the propensity to save out of wages. Therefore, one can conclude that an economy can turn from wage-led to profit-led growth if the aggregate saving rate out of wages follows the movement of income inequality. Additionally, the endogenous relationship between demand and distribution is confirmed. It is worth remarking that the Gini index was used to measure inequality in this study.

Other authors that studied the relationship between wage inequalities and growth are Tavani and Vasudevan (2014). They consider the existence of workers, capitalists and managers, who are the agents that supervise workers so that they have maximum productivity. Hence, this class plays an important role in profit maximisation. It is also considered that the relationship between distribution and agent behaviour is endogenous. To measure the wage-differential, the difference between the wages of the mentioned classes is used. Analysing the demand response for inequality increases in the US (1960–2010), they provide evidence that both high and low investment-responsiveness regimes are inequality led. That is, a redistribution

from capitalists and managers towards workers always leads to less capacity utilisation and slower growth.

As shown, the empirical literature on the relationship between wage inequality and growth is ambiguous and scarce, putting in evidence the need for additional research on this matter. This paper aims to contribute to this empirical framework by investigating the impact of wage inequality on economic growth for a sample of 189 countries during the 2004–2017 period. To do so, we use the 10/40 ratio as our measure of wage differential which accounts for the wage or salary income of the individuals at the 90<sup>th</sup> percentile, that is, workers that earn more than 90 percent of the total labour force, to the earnings of the individuals below the 40<sup>th</sup> percentile. This is also the first work using a panel data approach to empirically assess the impact of wage differential on growth. To account for endogeneity issues, we employ a GMM estimator which is robust to reverse causality, as explained in Section 3.

### 3 DATA AND METHODOLOGY

#### 3.1 Data

An important issue in studying the relationship between economic growth and wage inequality is the measurement of these variables. Aiming to encompass the heterogeneities of both variables and to add the maximum number of countries as possible, three databases were used: World Development Indicators (WDI), elaborated by the World Bank; Penn World Table of 2015 (PWT 9.1), elaborated by the Economics Department of the University of Groningen; and ‘The Global Labour Income Share and Distribution,’ elaborated by International Labour Office (ILO, 2019). The constructed panel has 189 countries for the years 2004 to 2017.

To measure wage inequality, some works compare different deciles of the national income. Among these, a popular choice is the Palma Index (Palma, 2011), which is defined as the ratio between the richest 10 percent of the population’s share of gross national income and the poorest 40 percent’s share. Palma argues that it is a better representation of the distribution dynamic since there is a ‘centripetal’ force leading to a homogeneity between the deciles five to nine of the income distribution, representing a ‘stability in the middle.’ The relationship between the bottom 40 and the top 10 percent, in turn, represents the unstable divergence of classes. In this paper, a variable close in spirit to the Palma Index was created: the ratio between the wages of the 10 percent of workers with the highest earnings and the wages of the bottom 40 percent of workers with the lowest earnings (10/40 ratio). To create the 10/40 ratio, we use detailed distributional data of labour income share (LIS) by percentile, taken from ‘The Global Labour Income Share and Distribution’ database from ILO. This database succeeds in estimating the LIS between 2004 and 2017, including both employee compensations and self-employment,<sup>2</sup> enabling the analysis of the wage distribution dynamics. Moreover, economic growth is measured as the growth of GDP per capita using GDP and population data from the WDI from which the growth is computed for the time units used (two-year windows).

2. To successfully measure the LIS, the database used the self-employment approach, which adjusts the data ‘on the basis of the “compensation of employees” item of national accounts and on the self-employment rate in a given economy.’ To do the latter, they made an estimation rule using previous microdata from ILO (ILO, 2019).

Standard variables are used as controls. The first is the initial GDP per capita, which are the lagged observations of the GDP per capita in level and accounts for the conditional convergence hypothesis according to which economies that are lagging behind should grow faster than the rich countries. We also considered the country's level of trade openness, created by sum of the exports and imports of goods and services as a share of GDP. More open countries depend more on international markets and prices, which interferes with national supply, demand and prices. Thus, the trade openness of an economy interferes with economic growth, national wages and its distribution. We also add investment, measured as gross capital formation, and government spending to account for aggregate demand effects on the growth of GDP per capita – mainstream growth models also use government spending (percentage GDP) as a proxy for government burden. We also add domestic credit to the private sector as a share of GDP since it is a key determinant of consumption and production decisions. Other control variables include inflation, since price expectations may interfere with consumption and production decisions, along with the determination of salaries. Moreover, total population is taken as a measure of labour supply and human capital accounts for improvements in labour productivity through education. This variable presents a limitation in its difficulty in being collected in a harmonic and comparable form in a database with dozens of countries, as we try to do in the present work. Hence, by including human capital using data from the PWT 9.1, the number of countries in this investigation was reduced from 189 to 151.

Table 1 shows a more detailed description of the dataset used in our empirical model.

*Table 1 Source and description of the database*

Variables	Description	Source
GDP per capita	GDP (in constant 2010 US dollars) divided by total population (all residents regardless of legal status or citizenship)	WDI
Growth GDP per capita	GDP per capita growth rate $100 \left[ \left( \frac{GDP\ per\ capita_t}{GDP\ per\ capita_{t-1}} \right) \right]$	WDI
10/40 ratio	Log of the income proportion between the top 10 decile and the lowest first to fourth decile of share of labour income.	ILO (2019)
Trade openness	Log of the sum of imports and exports of goods and services (% of GDP)	WDI
Government consumption	Log of general government final consumption expenditure (% of GDP)	WDI
Gross capital formation variation	$\frac{Gross\ Fixed\ Capital\ Formation\ (\%ofGDP)_t}{Gross\ Fixed\ Capital\ Formation\ (\%ofGDP)_{t-1}}$	WDI
Credit	Log of the domestic credit to the private sector (% of GDP)	WDI
Population	Log of the total population (all residents regardless of legal status or citizenship)	WDI
Inflation	Log of inflation/consumer prices (annual %)	WDI
Human capital	Log of the human capital index, based on years of schooling and returns to education	PWT 9.1

*Source:* The adjusted variables were of author's own elaboration based on the respective database.

## 3.2 Methodology

### 3.2.1 The growth equation

The empirical literature that studies the relationship between growth and inequality often uses panel data due to several advantages over cross-section and time-series approaches: it takes into account individual heterogeneity, increases information by combining cross-section and time-series data and enables more reliable parameter estimators (Pesaran, 2015). In this context, the models more often adopted are Pooled OLS, Fixed and Random Effects and GMM. Except for the last alternative, all these models do not consider endogeneity between the variables. According to Skott (2017) and Taylor (2004), the relationship between growth and inequality, in its turn, has a two-way causality that needs to be taken into account: the state of the economy (stagnation, growth or recession) affects distribution as much as the former affects the latter. As discussed in the literature review, there are multiple channels through which income distribution and wage distribution affect growth. However, we must also take into account the reverse causality, according to which growth affects income and wage distribution. Hence, this double-sided relationship between the two variables invalidates the hypothesis of exogeneity required in the Pooled OLS, Fixed and Random Effects models.

In this context, the GMM estimator is a more appropriate method to empirically assess the growth–inequality nexus, once it is robust to reverse causality. Arellano and Bond (1991) developed the GMM-Difference, which takes the first difference of the variables of the model to eliminate non-observed specific effects. To account for endogeneity issues, the GMM-Difference uses lagged observations of the endogenous variables as instruments. In Arellano and Bover (1995) and Blundell and Bond (1998), however, this identification strategy is a potential problem: variables with a high degree of persistence might not be suitable instruments for variables in first difference. To overcome this issue, Blundell and Bond (1998) developed the GMM-System by adding the lagged differentials of endogenous variables to the matrix of instruments as a weak instrument for the regressors in level in the baseline model. Therefore, the GMM-System generates more robust estimates when compared to the GMM-Difference.

The panel we built to analyse the relationship between wage inequality and economic growth has 189 countries, spanning the years 2004 to 2017. We averaged the data over two-year window periods to satisfy the consistency properties of ‘large N, short T’ panel models. This procedure also minimises short-term fluctuations and helps to deal with unbalanced panels. The model specification goes as follows:

$$Y_{i,t} = \alpha + \theta Y_{i,t-1} + \beta(WI)_{i,t} + \delta x_{i,t} + v_i + \kappa_t + e_{i,t} \quad (1)$$

where  $i$  and  $t$  represent the cross-sectional and time units, respectively;  $\alpha$  is the intercept of the equation;  $\theta$ ,  $\beta$  and  $\delta$  are parameters to be estimated;  $Y$  is GDP per capita growth and its lagged value, which were included as endogenous explanatory variables;  $WI$  is wage-inequality;  $x$  is the vector of control variables;  $v$  captures the unobserved effects associated to heterogeneity across countries;  $\kappa$  capture the unobserved effects due to heterogeneity over the years; and  $e$  represents the residues.

According to Roodman (2009), the validation of the instruments chosen is evaluated through the Hansen test and the Arellano and Bond test for AR (2). The first uses a J statistic for the joint validity of the moment conditions. Its null hypothesis indicates the joint validity of the instruments; if rejected, it indicates that the instruments are overidentified and, ultimately, that the instruments are not exogenous and the GMM estimator is not consistent. To avoid overidentification, it is recommended

to impose constraints on the number of lags used as instruments for the endogenous variables. The Arellano and Bond test for AR (2), in turn, aims to test if there is autocorrelation in the idiosyncratic disturbance term. It is applied to the residuals in differences, so it is possible to check for first-order serial correlation in levels. The null hypothesis examines if the residual of the regression in difference is second-order serially correlated: although it is expected a first-order serial correlation due to the fixed effects, autocorrelation of second order in the residual term implies that the error term is serially correlated, following a moving average process of, at least, order one. If the null hypothesis is rejected, we concluded that the error term is serially correlated.

To encompass the multiple channels between income distribution and growth, the control variables are inserted endogenously when there is a simultaneous effect; otherwise, they are inserted exogenously. Here, the endogenous variables are trade openness, since the size of an economy interferes with its international competitiveness, thus potentially increasing its openness degree; therefore, the level of GDP growth also affects the level of openness. Capital formation variation (investment) increases when the GDP increases, through the multiplier effect. Consequently, this variable is endogenously inserted, as is private credit, given that it is also influenced by GDP growth (more revenue possibilities, more availability of credit). On the other hand, government consumption, population, human capital and inflation were considered exogenous. Different sets of control variables were tested to assess the robustness of our results. The exogeneity of the variables and the number of lags and instruments used are reported with the estimation results in the next section.

### 3.2.2 *The long-run impact of wage inequality on growth*

Another key issue that the dynamic panel data model allows us to investigate is the existence of possible effects of changes in wage inequality on long-run output growth. By drawing upon the standard Permanent Income Hypothesis (PIH), we should expect that short-run fluctuations in disposable income may not lead to instantaneous changes in the consumption pattern unless consumers are able to perceive such income variations as permanent.<sup>3</sup>

Workers may respond very differently to changes in wages depending on the direction of the change and on their initial level of income. When wages increase, both high- and low-wage earners may sustain their level of consumption unchanged for a while until they become confident that the additional income can be permanently incorporated into their earnings and start gradually increasing their expenditure on consumption goods and services. Following Carvalho and Rezai (2016), we may expect that the proportionate increase in income will not be fully translated into a proportionate increase in consumption since it is expected that their propensity to save may also increase. Conversely, when wages decrease, high-wage and low-wage earners may react in very different ways. A decline in high wages may not result in an immediate reduction in the consumption of high-wage earners since they tend to accommodate such fluctuation by spending their personal savings; assuming the validity of the PIH, the high-wage earners will only change their consumption pattern when such a reduction

3. The Permanent Income Hypothesis was developed by Milton Friedman in his book published in 1957 titled *A Theory of Consumption Function*. In a nutshell, this hypothesis states that individuals tend to change their consumption pattern based on changes in their permanent income, rather than changes in their transitory income.

in their disposable income is perceived as permanent. On the other hand, when low-wage earners undergo a drop in their disposable income, they may not have the option to sustain their current level of consumption due to insufficient levels of personal savings, thus resulting in significant and rapid deterioration in their consumption pattern. According to Carvalho and Rezai (2016), in this case we should also observe a drop in the propensity to save for both high- and low-wage earners.

Lastly, we also must consider the case in which we observe an increase (decrease) in high wages and a decrease (increase) in low wages simultaneously. An increase in high wages accompanied by an equivalent decrease in low wages tends to reflect an increase in the propensity to save of high-wage earners and a decrease in the propensity to save of low-wage earners and hence the net change in the average propensity to save becomes an empirical question. However, if we draw upon the standard Kaleckian hypothesis that workers consume all their income and plausibly assume that only low-wage earners consume all their income (that is, the propensity to save of low-wage workers is always negligible), then increases (decreases) in the wage gap will only result in increases (decreases) in the average propensity to save when they are caused by increases (decreases) in high wages.

A rise in the wage gap may be a result of either a faster growth in high wages or a faster decline in low wages or an increase in high wages accompanied by a decrease in low wages. When a permanent increase in the wage gap is led exclusively by an increase in higher wages (or when higher wages grow faster than lower wages), then we expect that a rise in consumption and output growth will only be observed in the future since, according to the PIH, workers tend to slowly change their consumption pattern in these cases. However, when a permanent rise in wage inequality is caused by a drop in low wages (or when higher wages fall slower than lower wages), we may see an immediate drop in consumption and growth following the expected rapid changes in the consumption pattern of low-wage earners. Lastly, when a rise in the wage gap is caused by a combination of an increase in high wages and a decrease in low wages, then we may see an impact on consumption and growth both in the short and long run.

In that vein, we propose an empirical exercise to test the heterogeneous effect of changes in the wage inequality on output growth between the short and long run. To do so, we need to obtain the long-run equilibrium growth rate. From equation (1), the long-run growth rate,  $Y^*$ , is given by the stationarity condition below:

$$Y^* = Y_{i,t} = Y_{i,t-1}. \quad (2)$$

By substituting equation (2) into equation (1) and rearranging the terms, we have:

$$Y^* = \frac{1}{1-\theta} [\alpha + \beta(WI)_{i,t} + \delta x_{i,t} + v_i + \kappa_t + e_{i,t}]. \quad (3)$$

Therefore, the short-run impact of wage inequality on growth is given by:

$$\frac{\partial Y_{i,t}}{\partial WI_{i,t}} = \beta. \quad (4)$$

And the long-run impact of wage inequality on growth is given by:

$$\frac{\partial Y^*}{\partial WI_{i,t}} = \frac{\beta}{1-\theta}. \quad (5)$$

## 4 RESULTS

Now we present our estimates in Table 2 and discuss the results. We estimated a total of seven models where the control variables are included one by one. Here we will focus on the estimates of model 7, which is the most complete. The models from 1 to 6 can then be seen as robustness checks.

Our results suggest that an increase in the wage differential, here proxied by the 10/40 ratio, has a negative and statically significant impact on GDP per capita growth across all the regressions. It is also noteworthy that the magnitude of such an impact does not change much across the seven models. Looking at model 7 more specifically, we see that a 10 percent increase in the wage differential leads to a reduction of 0.33 percentage points in the growth rate of GDP per capita on average. This suggests that an increase in wage inequality may lead to slower economic growth.

Regarding the coefficients of the control variables in model 7, initial GDP per capita and annual inflation are always significant and negative. For the first variable, this relationship results from the convergence effect: it is expected that countries with higher GDP per capita have lower growth rates than developing countries. This effect was anticipated as our database has countries with multiple levels of development, enabling the inclusion of the convergence effect. Annual inflation, in turn, is a proxy of economic and political stability. Hence, with more instability (and a higher inflation rate), the economy is expected to have worse performance.

The signs of the coefficients of the other control variables, when significant, go as follows: investment (capital formation variation) is always positive, following the classical principle that bigger capital accumulation leads to bigger economic growth. The coefficient of economic openness is also positive, as is the coefficient for credit. This last relationship can be explained by the increase in demand, and hence economic performance, generated by the availability of credit. Our estimates also show a positive impact of increases in the degree of openness to trade on economic growth, which seems to be consistent with the idea that trade and scale economies may boost the productivity of domestic firms and hence lead to faster output growth. The coefficient for government expenditure as a share of GDP, in turn, is negative; it is out of the scope of this work to discuss the relationship between the size of the government and output growth, and suffice to say that our result is consistent with the existing empirical literature.<sup>4</sup> Finally, the coefficients of human capital are not statistically significant in any regressions; that can be explained by the large reduction in the number of observations following the inclusion of this variable in the model.

Concerning the fit of the models, the reported tests show their adequacy. The Hansen test indicates that the set of instruments used in all models is valid and that the model is statistically suitable, while the Arellano–Bond test indicates that the residuals are not correlated in order superior of 2 lags. The consistently low autoregressive term is also an indicator of the stationarity of the model.

We also estimate the long-run impact of changes in the wage inequality on growth. Our findings are presented in Table 3:

Our results show that the adverse effects of increases in wage inequality on output growth are even stronger in the long run. This result seems to suggest that increases in

4. See Rodrik (2008) as an example. However, it is worth mentioning that a negatively signed coefficient associated with government expenditure (% GDP) may only be capturing a direct relationship between the denominator of the regressor and the dependent variable. Even though this variable may be problematic, we decided to include it as a control in order to enhance comparability with the existing empirical literature on growth models.

Table 2 Economic growth versus wage inequality GMM models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP per capita growth, lagged	0.3446*** (0.06)	0.3444*** (0.06)	0.3413*** (0.06)	0.3108*** (0.06)	0.2879*** (0.06)	0.3080*** (0.06)	0.3966*** (0.06)
10/40 index ratio	-3.8726*** (1.42)	-3.7946*** (1.45)	-3.4092*** (1.32)	-2.8076*** (1.05)	-3.2158*** (0.95)	-3.2799*** (1.00)	-3.3303*** (0.87)
Initial GDP per capita	-3.2098*** (1.01)	-2.9802*** (1.06)	-3.0087*** (0.92)	-3.3481*** (0.89)	-3.5765*** (0.84)	-3.5820*** (0.90)	-3.0763*** (0.85)
Capital formation variation (%GDP)	0.0294 (0.02)	0.0298* (0.02)	0.0295* (0.02)	0.0190 (0.02)	0.0198 (0.01)	0.0248 (0.02)	0.0323 (0.02)
Government expenditure (%GDP)		-1.3349 (1.00)	-1.1284 (0.93)	-1.8681* (1.03)	-1.3964 (1.11)	-3.0244*** (0.99)	-2.3258*** (0.86)
Trade openness (%GDP)			2.0990 (1.49)	2.5938 (1.66)	3.7643** (1.88)	1.8306 (1.53)	1.2532 (1.02)
Credit (%GDP)				1.6419 (1.36)	1.3753 (1.31)	1.6656* (1.01)	0.2776 (0.93)
Population					0.7534** (0.30)	0.4646* (0.28)	0.3637 (0.30)
Inflation						-1.6376*** (0.39)	-1.7478*** (0.39)
Human capital							1.1146 (3.07)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0000 (.)	36.8610*** (10.81)	0.0000 (.)	23.1736** (9.76)	0.0000 (.)	25.6458** (10.23)	27.0397** (10.84)
Observations	824	820	820	786	786	736	628
Instruments	75	76	96	116	117	137	138
Arellano-Bond test for AR(2) in first difference (p-value)	0.1674	0.1735	0.1822	0.1855	0.1773	0.6720	0.8715
Hansen test of joint validity of instruments (p-value)	0.0890	0.0848	0.1394	0.2349	0.2637	0.2173	0.4929

## Notes:

- Standard errors reported within brackets below the coefficients.
  - Endogenous variables are capital formation variation, economy openness, credit. Exogenous variables are population, inflation and human capital.
  - We used lags from 1 to 4 in the instruments' matrix.
  - The Hansen test: the null hypothesis is that the instruments are not correlated with the residuals.
  - The Arellano-Bond test for AR (2) in first difference: the null hypothesis is that the errors in the first difference regression has no second-order serial correlation.
  - \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .
- Source: Authors' elaboration.

Table 3 Long-term coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
10/40 index ratio in the long run	-5.9090*** (1.8728)	-5.7880*** (1.8994)	-5.1760*** (1.7606)	-4.0739*** (1.5044)	-4.5156*** (1.3046)	-4.7399*** (1.3376)	-5.5195*** (1.4427)

*Notes:*

1. Standard errors reported within brackets below the coefficients.
  2. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .
- Source: Authors' elaboration.

wage inequality may be disproportionately affecting the consumption pattern of low-wage workers, thus causing a cumulative process of lower aggregate consumption followed by slow capital accumulation and income stagnation.

In short, after controlling for several determinants of output growth, our results strongly suggest that increases in wage inequality may result in slower economic growth. These findings seem to be in line with a possible scenario laid out by the Kaleckian models in which a higher wage inequality may be closely linked to a lower average propensity to consume, thus leading to a decrease in capacity utilisation, capital accumulation and growth (Carvalho and Rezai, 2016; Dutt and Veneziani, 2011; Dutt *et al.* 2015; Neto and Ribeiro, 2019; Palley, 2015; Tavani and Vasudevan, 2014). Nevertheless, it is worth remarking that, even though the propositions of the Kaleckian models may be used to justify our results, we do not seek to propose a test for the validity of these models. In fact, more specific tests would be required for the parameters of the consumption function by classes of workers, which is out of the scope of this work. In terms of policy, however, we believe that these results may help to subsidise the discussions on the causes of slow economic growth by shedding some light on the economic consequences of growing disparities within the labour market.

## 5 CONCLUDING REMARKS

This work aimed to provide further evidence of the relevance of wage differential in the current economic dynamic for a sample of 189 countries during the period between 2004 and 2017. Aiming to expand the existing empirical framework, relevant features were inserted in this study: the dynamic panel data approach, aiming to encompass endogenous relationships among the explanatory and the explained variables; and the use of the 10/40 ratio as a measure of wage inequality, collaborating to the analyses of the different aspects of inequality, specifically by focusing in the two extremes classes of wage earners – the top 10 against the lowest 40<sup>th</sup> percentiles.

Our results indicate that the impact of an increase in the 10/40 ratio on the GDP per capita is negatively signed and statistically relevant. That is to say that, on average, a rising wage inequality may be directly associated with poorer economic performance. There is then empirical evidence favourable to the use of endogenous models in the analysis of the economic performance and inequality relationship. Moreover, the inequality index based on the Palma Index has also proven to be a successful measure of wage inequality. Finally, the study of the relationship between economic performance and intra-wage distribution has confirmed the importance of analysing inequalities in the disaggregated labour market.

Based on our result that wage gaps may harm economic growth, this study sheds some light on the importance of government actions toward a more even income distribution. In the current context of global economic recession due to the SARS-CoV-2 pandemic, this might be of practical use. In order to determine a sustainable path of economic growth, policies aimed at reducing wage inequality have become particularly relevant, such as promoting equal access to primary education and higher education; labour market policies seeking to improve workers' conditions, such as minimum wage settlement, unionisation and job protection to promote higher and stable levels of employment; a more adequate social safety net programs; and a transfer system, mainly through the elimination of significant tax cuts for the upper classes.

Furthermore, the focus on wage inequality encompasses other relevant discussions, such as gender and racial inequality, also present in the labour market. Besides the moral aspect of such inequalities, it also leads to the loss of the potential of part of the labour

force, thus lowering the overall labour productivity of the economy. In addition, due to the absence of fairer salaries, there is also a loss of potential demand, thus potentially leading to economic stagnation. In this sense, the inclusion of gender or racial variables in the model might be relevant for robustness checks in future research. Other possible improvements and expansions of the present study may include estimates for specific countries both at the national and sub-national levels. Since the convergence effect between countries was significant in our model, we suggest studying the wage inequality–economic growth relationship in different groups of countries, by the level of development. Different econometric techniques and control variables may also be explored in future studies as additional robustness checks. We invite readers to stay tuned for future research.

## REFERENCES

- Aghion, P., E. Caroli and C. Garcia-Penalosa (1999), 'Inequality and economic growth: The perspective of the new growth theories', *Journal of Economic Literature*, 37(4), 1615–1660.
- Alesina, A. and R. Perotti (1994), 'The political economy of growth: A critical survey of the recent literature', *World Bank Economic Review*, 8(3), 351–371.
- Alesina, A. and R. Perotti (1996), 'Income distribution, political instability, and investment', *European Economic Review*, 40(6), 1203–1228.
- Arellano, M. and S. Bond (1991), 'Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations', *The Review of Economic Studies*, 58(2), 277–297.
- Arellano, M. and O. Bover (1995), 'Another look at the instrumental variable estimation of error-components models', *Journal of Econometrics*, 68(1), 29–51.
- Atkinson, A., T. Piketty and E. Saez (2011), 'Top incomes in the long run of history', *Journal of Economic Literature*, 49(1), 3–71.
- Barbosa-Filho, N., and L. Taylor (2006), 'Distributive and demand cycles in the US economy: a structuralist Goodwin model', *Metroeconomica*, 57(3), 389–411.
- Barro, R.J. (2000), 'Inequality and growth in a panel of countries', *Journal of Economic Growth*, 5(1), 5–32.
- Bertola, G. (1993), 'Factor shares and savings in endogenous growth', *American Economic Review*, 83(5), 1184–1198.
- Bhaduri, A. and S.A. Marglin (1990), 'Unemployment and the real wage: the economic basis for contesting political ideologies', *Cambridge Journal of Economics*, 14(4), 375–393.
- Blecker, R.A. (1989), 'International competition, income distribution and economic growth', *Cambridge Journal of Economics*, 13(3), 395–412.
- Blecker, R.A. (2016), 'Wage-led versus profit-led demand regimes: The long and the short of it', *Review of Keynesian Economics*, 4(4), 373–390.
- Blundell, R. and S. Bond (1998), 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of Econometrics*, 87, 115–143.
- Bowles, S. and R. Boyer (1995), 'Wages, aggregate demand, and employment in an open economy: an empirical investigation', in G. Epstein and H. Gintis (eds.), *Macroeconomic Policy After the Conservative Era: Studies in Investment, Saving and Finance*, Cambridge, UK: Cambridge, University Press, pp. 143–73.
- Carvalho, L. and A. Rezai (2016), 'Personal income inequality and aggregate demand', *Cambridge Journal of Economics*, 40(2), 491–505.
- Castelló-Climent, A. (2010), 'Inequality and growth in advanced economies: An empirical investigation', *Journal of Economic Inequality*, 8(3), 293–321.
- Dutt, A.K. (1984), 'Stagnation, income distribution, and monopoly power', *Cambridge Journal of Economics*, 8 (1), 25–40.
- Dutt, A.K. (1990), 'Growth, distribution and capital ownership: Kalecki and Pasinetti Revisited', in D. Ray, B. Dutta, S. Gangopadhyay and D. Mookherjee (eds.), *Economic Theory and Policy: Essays in Honour of Dipak Banerji*, Oxford: Oxford University Press, pp. 130–45.

- Dutt, A.K. and R. Veneziani (2011), 'Education, growth and distribution: Classical-Marxian economic thought and a simple model', *Cahiers d'Economie Politique*, 61, 157–185.
- Dutt, A.K., S. Charles and D. Lang (2015), 'Employment flexibility, dual labor markets, growth and distribution', *Metroeconomica*, 66(4), 771–807.
- Firpo, S. and A. Portella (2019), 'Decline in wage inequality in Brazil: a survey', Policy Research Working Paper No. 9096. World Bank, Washington, DC.
- Galor, O. and J. Zeira (1993), 'Income distribution and macroeconomics', *Review of Economic Studies*, 60(1), 35–52.
- Hartwig, J. (2014), 'Testing the Bhaduri–Marglin model with OECD panel data', *International Review of Applied Economics*, 28(4), 419–435.
- Hein, E. (2007), *Money, Distribution Conflict and Capital Accumulation: Contributions to 'Monetary Analysis'*, London: Palgrave Macmillan.
- Hein, E. (2014), *Distribution and Growth after Keynes: A Post-Keynesian Guide*, Cheltenham, UK: Edward Elgar.
- Hein, E. and C. Ochsens (2003), 'Regimes of interest rates, incomes shares, savings, and investment: a Kaleckian model and empirical estimations for some advanced OCDE-economies', *Matroeconomica*, 54 (4), 404–433
- Hein, E. and L. Vogel (2008), 'Distribution and growth reconsidered: empirical results for six OECD countries', *Cambridge Journal of Economics*, 32(3), 479–511.
- ILO (2016), *Global Wage Report 2016/2017*, ISBN 978-92-2-130929-1.
- ILO (2019), *The Global Labour Income Share and Distribution*, Data Production and Analysis Unit, ILO Department of Statistics.
- Kaldor, N. (1955), 'Alternative theories of distribution', *Review of Economics Studies*, 23(2), 83–100.
- Kalecki, M. (1971), 'Class struggle and income distribution', *Kyklos*, 24(1), 1–9.
- Kapeller, J. and B. Schutz (2015), 'Conspicuous consumption, inequality and debt: the nature of consumption-driven profit-led regimes', *Metroeconomica*, 66(1), 51–70.
- Keynes, J.M. (1936), *The General Theory of Employment, Interest, and Money*, New York: Harcourt, Brace.
- Kiefer, D. and C. Rada (2014), 'Profit maximising goes global: the race to the bottom', *Cambridge Journal of Economics*, 39(5), 1333–1350.
- Kurz, H. D. and N. Salvadori (2003), 'Theories of economic growth: old and new', in N. Salvadori (ed.), *The Theory of Economic Growth: A 'Classical' Perspective*, Cheltenham: Edward Elgar.
- Lima, G.T., L. Carvalho and G.P. Serra (2021), 'Human capital accumulation, income distribution, and economic growth: a demand-led analytical framework', *Review of Keynesian Economics*, 9(3), 319–336.
- Neto, A. and R. Ribeiro (2019), 'A Neo-Kaleckian model of skill-biased technological change and income distribution', *Review of Keynesian Economics*, 7(3), 292–307.
- OECD (2012), *Economic Policy Reforms 2012: Going for Growth*, OECD Publishing. DOI: 10.1787/growth-2012-en.
- Onaran, O. and G. Galanis (2012), 'Is aggregate demand wage-led or profit-led? A global model', in M. Lavoie and E. Stockhammer (eds.), *Wage-led Growth: Advances in Labour Studies*, London: Palgrave Macmillan, pp. 71–99.
- Onaran, O. and E. Stockhammer (2005), 'Two different export-oriented growth strategies: accumulation and distribution in Turkey and South Korea', *Emerging Markets Finance and Trade*, 41(1), 65–89.
- Ostry, J.D., A. Berg and C.G. Tsangarides (2014), 'Redistribution, inequality, and growth', IMF Staff Discussion Note, February.
- Palley, T. (2005), 'Class conflict and the Cambridge theory of distribution', in B. Gibson (ed.), *The Economics of Joan Robinson: A Centennial Celebration*, Cheltenham, UK: Edward Elgar.
- Palley, T. (2015), 'Rethinking wage vs. profit-led growth theory with implications for policy analysis', IMK Working Paper, IMK at the Hans Boeckler Foundation, Macroeconomic Policy Institute.
- Palma, J. (2011), 'Homogeneous middles vs. heterogeneous tails, and the end of the inverted-U: it's all about the share of the rich', *Development and Change*, 42(1), 97–153.

- Pasinetti, L. (1961), 'Rate of profit and income distribution in relation to the rate of economic growth', *The Review of Economic Studies*, 29 (4), 267–279.
- Perotti, R. (1996), 'Income distribution, and democracy: what the data say', *Journal of Economic Growth*, 1(2), 149–187.
- Pesaran, M.H. (2015), *Time Series and Panel Data Econometrics*, Oxford: Oxford University Press.
- Rezai, A. (2011), 'The political economy implications of general equilibrium analysis in open economy macro models', Working Papers 1111, New School for Social Research, Department of Economics.
- Ribeiro, R.S.M., J.S.L. McCombie and G.T. Lima (2020), 'Does real exchange rate undervaluation really promote economic growth?', *Structural Change and Economic Dynamic*, 52 (March), 408–417.
- Rodrik, D. (2008), 'The real exchange rate and economic growth', *Brooking's Papers on Economic Activity*, 2, 365–412.
- Rolim, L.N. (2021), 'A note on "Wage-led versus profit-led demand regimes: the long and the short of it"', *Review of Keynesian Economics*, 9(3), 413–424.
- Romer, P.M. (1986), 'Increasing returns and long-run growth', *Journal of Political Economy*, 94(5), 1002–1037.
- Roodman, D. (2009), 'How to do xtabond2: an introduction to difference and system GMM in Stata', *Stata Journal*, 9(1), 86–136.
- Rowthorn, R. (1981), 'Demand, real wages and economic growth', *Thames Papers in Political Economy*, Autumn, 1–39.
- Rowthorn, R. (1999), 'Unemployment, wage bargaining and capital-labour substitution', *Cambridge Journal of Economics*, 23(4), 413–425.
- Scheuermeyer, P. (2017), 'Macroeconomic consequences of income inequality: evidence from panel data econometrics', Inaugural-Dissertation, Julius-Maximilians-Universität Würzburg.
- Skott, P. (2017), 'Weakness of "wage-led growth"', *Review of Keynesian Economics*, 5(3), 336–359.
- Seguino, S. (2012), 'Macroeconomics, human development, and distribution', *Journal of Human Development and Capabilities: A Multi-Disciplinary Journal for People-Centered Development*, 13(1), 59–81.
- Solow, R.M. (1956), 'A contribution to the theory of economic growth', *The Quarterly Journal of Economics*, 70(1), 65–94.
- Stockhammer, E. and O. Onaran (2004), 'Accumulation, distribution and employment: a structural VAR approach to a Kaleckian macro model', *Structural Change and Economic Dynamics*, 15(4), 421–447.
- Stockhammer, E. and R. Stehrer (2011), 'Goodwin or Kalecki in demand? Functional income distribution and aggregate demand in the short run', *Review of Radical Political Economics*, 43(4), 506–522.
- Stockhammer, E. and R. Wildauer (2015), 'Debt-driven growth? Wealth, distribution and demand in OECD countries', *Cambridge Journal of Economics*, 40(6), 1609–1634.
- Stockhammer, E., O. Onaran and S. Ederer (2009), 'Functional income distribution and aggregate demand in the Euro area', *Cambridge Journal of Economics*, 33(1), 139–159.
- Storm, S. and C.W.M. Naastepad (2011), 'The productivity and investment effects of wage-led growth', *International Journal of Labour Research*, 3(2), 197–218.
- Tavani, D. and R. Vasudevan (2014), 'Capitalists, workers and managers: wage inequality and effective demand', *Structural Change and Economic Dynamics*, 30(C), 120–131.
- Taylor, L. (1985), 'A stagnationist model of economic growth', *Cambridge Journal of Economics*, 9(4), 383–403.
- Taylor, L. (2004), *Reconstructing Macroeconomics. Structuralist Proposals and Critiques of the Mainstream*, Cambridge, Massachusetts: Harvard University Press.
- Vargas Sánchez, G. and A. Luna (2014), 'Slow growth in the Mexican economy', *Journal of Post Keynesian Economic*, 37(1), 115–133.