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Correcting inequality of personal incomes before income taxes and transfers: theoretical underpinnings and competition policy options

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Aim: The purpose of this paper is to bring together theory and policy of (personal) income distribution on the one hand and competition policy on the other hand.
Design / research: The methods used in this paper cover a brief model set-up, followed by a numerical model-calibration. Thereafter, we present a model simulation and proceed to a Gini decomposition. Herewith, we are able to demonstrate how market imperfections translate into a higher concentration of personal incomes.
Conclusions / findings: Our major finding is that only a rigorous competition policy is qualified to not only correct for market imperfections, but also to fight a greater inequality of personal incomes ex-ante.
Originality / value of the article: This contribution provides – to our knowledge for the first time – a simultaneous explanation for stagnating, if not falling real wages and a deteriorating development of inequality of personal incomes, as measured by the Gini coefficient ex-ante. The US economy is a case study for this double observation, but many more developed economies may follow in the foreseeable future.
Limitations of the research: The implication of the research is that long before government intervenes income distribution via taxes and transfers, competition policy should correct for market imperfections and thereby reduce the inequality of personal incomes. Unfortunately, to this point, we observe a lack of meaningful macroeconomic indicators for market imperfections and hence the possibility to conduct broad econometric studies in this area of investigation.

Keywords: Market imperfections, superstar economy, Gini coefficient, competition policy.
JEL Codes: D31, D33, D42, D43, J31, L44.

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1. Introduction

The new world economy – disregarding for a moment Covid-19 – is and continues to be dominated by the forces of globalisation and digitalisation. Champions of the new digital technologies such as Amazon, Google, Apple, Facebook, Microsoft etc., make use and profit extensively of patent regulations. They help them to raise enormous revenues to the detriment of labor income and of a greater equality in the distribution of incomes between profit income on the one hand and labor income on the other hand. The argument has at least two different aspects: in the first place, it is said that monopolies which intensively reap the benefits of patent law, tend to raise the profit share vis-a-vis to the wage share (see Author et al. 2020) *within the firm*. This is supported by the finding that – as an indicator for a rising within-firm profit share – one observes an increasing ratio of profits per employee. Secondly, this effect will be extended over the whole economy if the portion of GDP which is generated in these monopolies rises over time. As a result, the profit (wage) share expands (shrinks) in the *whole economy*.

The boader context into which these observations fall, is the role of market imperferctions for the inequality of incomes. Besides the wage share and the profit share effects mentioned above, the increasing concentration of incomes, as measured by the Gini coefficient, is a further consequence of monopolies on goods markets, but also of monopsonies on factor markets. Why? Both market types tend to distort the remuneration of factors of production, such as labor income, capital income, etc. It is a distortion in the sense that monopolies should not reap the benefits of their market position beyond the (necessarily transitory) "Schumpeterian momentum".[1] A more than transitory deviation of factors of production remuneration from their respective productivities is in a way "illegitimate" and stands in contrast to the convictions of a functioning market economy .

Furthermore, one may claim as a working hypothesis that the more relevant and dominant these market types become for the whole economy, the higher will be the Gini coefficient *ex-ante* (that is before the government intervenes with transfers

[1] By the "Schumpeterian momentum" it is meant that pioneering entrepreneurs are sort of allowed to temporarily enjoy the position of a monopolist provided it can be soon contested by competing imitators.

and/or taxes) for the respective factor incomes. The decomposition "technique" of the Gini coefficient enables one to then aggregate the increasing concentration of labor, capital etc. compensation to the overall concentration of income(s). This opens an attractive alternative option for income (re)distribution policies: instead of waiting for the government(s) to traditionally correct the Gini coefficient ex-ante by tax and transfer instruments (which later results in a presumably lower Gini coefficient ex-post), the concentration of market incomes, as measured by the Gini coefficient ex-ante, can be directly affected by an effective and efficient competition policy.[2]

It is precisely here where our contribution can help to fil a gap in research, but also in economic policy: Traditionally, theory and policy of income distribution were not concerned with questions of competition theory and policy (see, for example, Campano, Salvatore 2006). At the same time, the latter strand of economics was seldom, if at all, interested in issues of inequality (see, for example, Motta 2009). Only recently, one finds attempts to investigate barriers to entry into markets and their distributional consequences (see Colciago, Mechelli 2020), the possible links between the struggle for market shares and inequality (Hefti, Teichgräber 2021) or the impact of import competition on income quantiles of households (Helble et al. 2018).

The rest of the paper is organized as follows: In the next, second, section, we will present some stylized facts on the development of Gini coefficients and of real wages in the US economy. This is followed by a brief review of the literature related to our subject. In the third section, we theoretically develop a simple model for the factor remuneration when monopolies/monopsonies are at work and demonstrate the impact of such market imperfections on the real wage rate and the partial/overall Gini coefficients with the help of model calibration and simulation. The fourth section puts our results into the framework of the Gini decomposition approach.The fifth chapter is then dedicated to the options for competition policy to correct market

[2] Traditional competition policy has not been concerned directly with distributional issues. It was led by the profound conviction that market outcomes are acceptable, as long as the market dominance of individual firms and/or attempts to hinder competition are either only transitory or can be avoided at all.

imperfections and thereby reduce the concentration of personal incomes. We conclude in the sixth section.

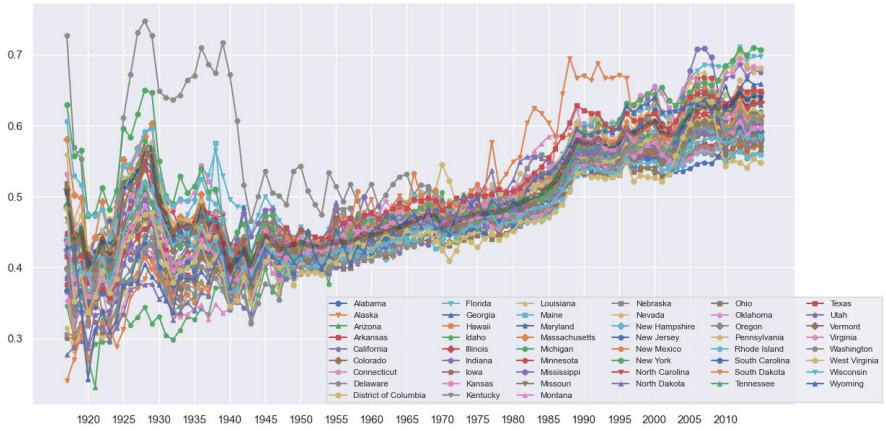
Notice that the intention of our paper is basically a conceptual, and hence not an empirical one: the insights won here are not dependent of a specific country (sample of countres) or period(s) of observation. When we cite literature relevant to our subject, many contributions comment market imperfections in the conetxt of the US economy. But this does not imply that observations from the US economy are too "country-specific": On the contrary, especially in the field of digital platform technologies, the US development anticipates what will and does later on occur in other parts of the world economy. We want to elaborate a theoretical foundation for a new focus of competition policy and establish the direct and complementary link between goals and instruments of competition policy and, at the same time, of income distribution policy. In a sense, we plead for a Neo-Adam-Smithsonian view which expects a well functioning market economy with highly contested markets to best fulfil the requirements of an acceptable inequality of incomes.

2. Stylized facts and a brief review of recent literature

Figure 1 plots the Gini coefficients[3] ex-ante (that is before transfers and taxes) against the calendar years, each of the 51 US states is on a separate line. Additionally, the aggregated Gini coefficient of the USA is plotted as a thick grey band. The impression one gets from **Figure 1** is clear: we can observe two things. Both an upward trend – and hence an increasing concentration of personal incomes – among all the single Gini coefficients ex-ante of the 51 US states. Also, these single Gini coefficients ex-ante are converging very much since the beginning of the new millennium, though considerable convergence is already to be seen in the data long before.

[3] The Gini coefficient is a widely used measure of statistical dispersion or likewise of concentration intended to indicate the income inequality within a region/nation or any other sub-sample of persons. It is defined for a range between 0 (no concentration) and 1 (full concentration). It was originally developed and brought into science by the Italian statistician and sociologist Corrado Gini. See, for more details, Schira (2003: 65-75).

Figure 1. Gini coefficients (0 < G < 1) for the states of the USA (1917-2015)



Sources: Frank (2021), own calculations and elaboration.

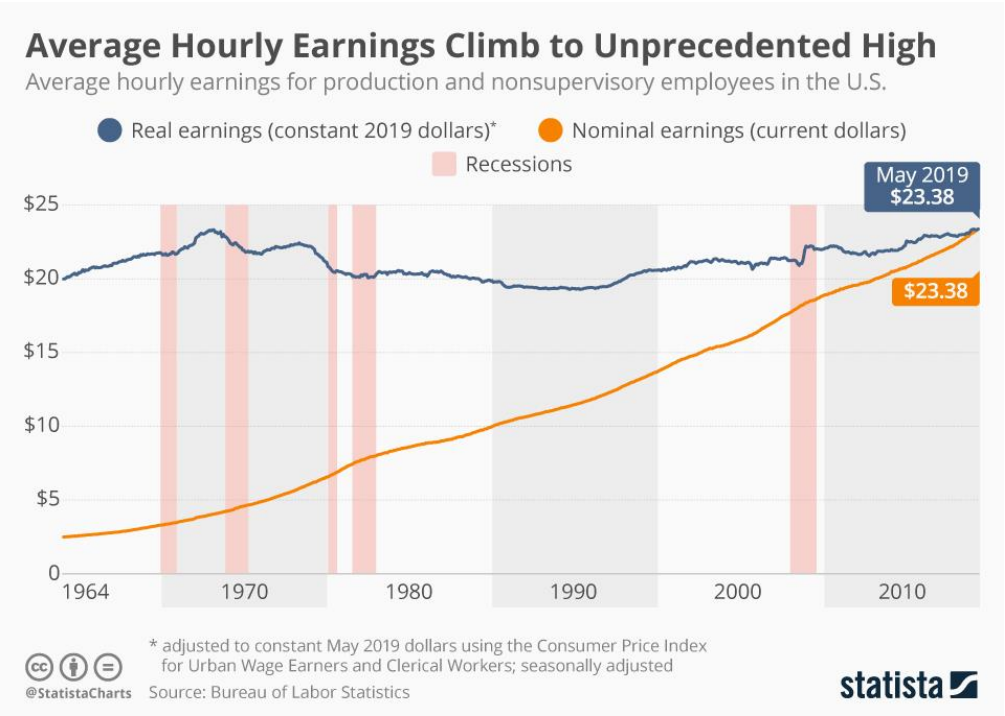
From **Figure 2**, we can also learn two things: first, that nominal average hourly wages (at current USD) rose steadily from the mid-1960s on. The five recessions (see the pink columns in **Figure 2**) which occurred since then could not change this picture. However, that development did not translate into real welfare gains for employees. This is the second significant observation. Real hourly wages (at constant 2019 USD) are hence almost constant in the USA since the mid-1960s. There were some moderate ups (in the 1970s) and downs (in the 1990s), but the overall impression one gets from the data is that US workers have not profited from economic growth in the US economy.

Now, the academic challenge consists in finding a theoretical framework which is capable to both explain stagnating/falling real (hourly) wages and an increasing (and possibly) converging concentration of personal incomes.[4] Before we do this by means of a simple numerical model based on neoclassical tools – which is then both

[4] Notice that for a full explanation of the falling labour share in the USA, one needs to have also a look at GDP, at employment figures, etc. and at additional aspects of the US economy which go beyond the market imperfections we emphasize below. The network society raised by Castells (1996), but also issues such as globalisation, capital deepening, substitution of labour by capital and automation processes, etc. come into play. See, for that matter, a recent McKinsey study (2019).

calibrated and simulated – let us have a short view on related literature: what do we know, what is/has been researched so far? In the few examples out of recent literature we give in the following (see below), one can find distinct and singular explanations of stagnating/falling *real wages*, of market imperfections (*monopolies*, *monopsonies*) and of the increase both in *income inequality* as in the *convergence of inequality*. Every single contribution brings up important aspects of our subject. But none of them, as it seems, puts them comprehensively together.

Figure 2



Source: Richter (2019).

Real wages in the USA

Hourly real wages, and their stagnation if not decline in the USA is a subject frequently addressed not only by academics – like Stricker (2020) and Graetz and Shapiro (2020) – but also by consulting agencies as McKinsey (2019), research units like the PEW research center (Desilver 2018) and institutional (parliamentarian)

services as the Congressional Research service (2020): "Reports of stagnant median wages have … therefore raised concerns among some that economic growth over the last several decades has not translated into gains for all worker groups" (Congressional Research 2020: 2).

Monopolies in the US economy

The recent "hype" (which is not too much saying) across the globe on the alleged monopoly power of US digital giants (or likewise "superstars"), such as Amazon, Google, Facebook, Apple, Microsoft etc. has raised also a new interest among economists and further scientists for market imperfections and their possible repercussions on the labor share (Author et al. 2020), on the concentration of (personal) incomes (Sell 2020) and/or the social and political consequences of their accumulated power (Moore, Tambini 2018) and control on personal data.

Monopsonies in the US economy

After a more or less short trip into the field of monopsonistic competition, labor economics seems to have steered back its focus towards monopsony itself. Many generalizing, but also country-oriented studies have been published recently. After the great recognition the investigation of Card and Krueger (1997) – whose main concern was to establish the positive employment effects that minimum wages can generate under the regime of a monopsony – received in the 1990s, nowadays, the interest centers on sectors of the US economy such as health care (Chown et al. 2019), education (Goolsbee, Syverson 2019) or even football (Makofske 2018).

Increasing inequality and inequality convergence, not only in the USA

This "double feature" needs a bit more of a paragraph: An outstanding contribution to this subject is, on a broad scale, due to Piketty and Saez (2003) and their many papers which came afterwards: on a theoretical level, the main interest of the authors is with the construction, validity and empirical relevance of the so-called Kuznets curve – an inverse-*U* shaped function with the real per-capita income as independent and the (ex-ante) Gini coefficient as the dependent variable – for the US economy. They find a sort of "double Kuznets curve" in their data (1913-1998):

"One could indeed argue that what has been happening since the 1970s is just a remake of the previous inverse-U curve: a new industrial revolution has taken place, thereby leading to increasing inequality, and inequality will decline again at some point, as more and more workers benefit from the innovations" (Piketty, Saez 2003: 2). At the end of the day, this finding can neither be taken as an argument in favor nor against convergence in inequality.

The paper of Lin and Huang (2011) – like an earlier study by Bao and Dhongde (2009) – is basically empirical. It makes explicitly theoretical reference, however, to the neoclassical (conditional) convergence of per-capita incomes approach in the vein of Barro and Sala-i-Martin (1999): countries or regions with similar political preferences[5] and/or economic fundamentals[6] tend to move towards the same time-invariant distribution of income (Lin, Huang 2012: 154).[7] The problem with this type of thinking is that "preferences" and/or "fundamentals" of an economy are often mirrored and directly affected by government consumption and/or investment. As the latter highly correlate with public taxes and transfers, Gini coefficients ex-ante, it seems, are an inadequate means to measure inequality here.

Sell (2015) does not conduct any country-specific empirical investigations in the field of inequality convergence. However, he finds out empirically that inequality converges between the group of developing and the group of industrialized countries: while income dispersion has decreased in the first group of countries, it increased in the second group of countries. As the USA belongs to the second group of countries, this finding confirms that the steady state in the inequality of personal incomes of the USA has tended to go up (Sell 2015: 15-19).

Doran and Jordan (2015), analyze changes in the levels and in the composition of income inequality among US counties in the period from 1969 to 2009. They also decompose inequality using the Theil coefficient into between-state and within-state inequality. Their article finds that income inequality has increased in the period studied with between-state inequality decreasing and within-state inequality

[5] Such as for democracy, independency of key public institutions, the rule of law etc.
[6] Such as the degree of industrialization, stock of human capital, etc.
[7] Notice that this formulation literally resembles in total a phrase in Bao, Dhongde (2009: 296). When it comes to neoclassical convergence theory, it seems, as if one is assuring (only) what the other says or has said before.

increasing. The authors subsequently decompose income inequality into the proportion arising from differences in productivity and employment–population ratios across counties. The results suggest that inequality arising from differentials in labor productivity has fallen over the period studied while those arising from employment-population ratio differences have increased.

Apergis et al. (2018) defend the idea of club convergence, which is the perception that specific states, sectors, regions, who share a number of important similarities (institutions, jurisdictional system, etc.), move from "disequilibrium positions to their club-specific steady state positions" (Apergis et al. 2018: 152). Studying a very long period of inequality (1929-2009), the authors come to the conclusion that a sort of mixed picture evolves, especially in the more recent past: while in the 1970s and in part of the 1980s, the hypothesis of convergence is supported, divergence dominates thereafter.

One of the most recent significant contributions to our subject stems from Sergio Rey (2018): his extensive investigation on US states, over a huge period of time (1929-2012), concludes that interpersonal inequality displayed – for the longest time – a (not inverse, but a "correct", the author) *U* pattern (Rey 2018: 174). "By contrast, interregional income inequality between the US states has displayed a general decline up until the end of this period where convergence has slowed or even reversed" (Rey 2018: 174).

Guo and Sell (2020, 2021) develop a political economy equilibrium framework for personal income distribution. In the beginning, they set up a theoretical model rooted in status theory. With this concept, one may explain a certain or optimal degree of inequality in society and define a steady-state to which inequality can converge. By taking the aggregated Gini coefficient due to a collective decision process, deviations from the steady-state due to shocks are allowed. A return to equilibrium is feasible with speed compatible with the collective decision-making process. The authors then conduct an empirical analysis of personal income distribution in 28 European nations for the period before, during, and after the great recession of 2009/2010 and the Euro crisis of 2010/2015 (1995–2019). Not surprisingly, they find inequality convergence in the data. However, the speed of convergence is not the same for all countries.

3. Profits, wages, prices, income and employment against the background of market imperfections: a calibration of monopoly cum monopsony (and of competition cum competition)

The aim of this section is to explain what the occurrence of a "double imperfection", that is both on the goods ("monopoly", one supplier only) and on the labour ("monopsony", one employer only) market implies for the remuneration of labour and capital, but also for profits, prices, employment and income achieved. To keep things simple, we concentrate on the factor of production "labour". The results achieved can be compared in theory with a "perfect world" of competition both on the goods and on the factor market. We then proceed to a numerical calibration of both models ("monopoly cum monopsony" vs. "competition cum competition") which enables us finally to conduct a simulation experiment of the distributional consequences for each scenario, as measured by the implied Gini coefficients ex ante. The idea behind this procedure is to demonstrate how dominant market positions – either on the goods ("monopoly") or on the labour market ("monopsony") – tend to deteriorate personal income distribution.

Monopsony in theory

The following equation defines the maximization problem of a monopsonist: π stands for the profit of the firm, p is the price of the output good, w is the nominal wage rate, y is output, which depends on labor L and capital K (here capital $\bar{K} \geq 0$ is a constant parameter). Hence, the monopsonist maximizes profit vis-à-vis labour input L when the marginal revenues and the marginal costs of labor equate:

$$(1)\max_{L}\pi(\mathrm{L}) = \max_{L}\left\{ py(\mathrm{L},\bar{\mathrm{K}}) - L\left[w\right] - \mathrm{r}\bar{\mathrm{K}}\right\}$$

$$(2)\frac{\partial\pi}{\partial L} = p\frac{\partial y}{\partial L} - (\frac{\partial w}{\partial L}L + w) = 0\,,\ \text{hence}$$

$$(3)p\left[1+\frac{1}{\frac{\partial L}{\partial w}:\frac{w}{L}}\right]\frac{\partial y}{\partial L} = w$$

Monopoly in theory

The following equation defines the maximization problem of a monopolist, with the standard definition of economic variables (see above). Hence, also the monopolist maximizes profit vis-à-vis labour input L when the marginal revenues and the marginal costs of labor equate:

$$(4)\max_{L}\pi(\mathrm{L}) = \max_{L}\left\{ p(\mathrm{y})\,\mathrm{y}(L,\bar{K}) - Lw - r\bar{K}\right\}$$

$$(5)\frac{\partial\pi}{\partial L} == \frac{\partial p}{\partial y}\frac{\partial y}{\partial L}y + \frac{\partial y}{\partial L}p - w = 0$$

Hence

$$(6)\,p\left[1+\frac{1}{\frac{\partial y}{\partial p}:\frac{y}{p}}\right]\frac{\partial y}{\partial L} = w$$

Monopoly cum monopsony in theory

Integrating both solutions yields[8]:

$$(7)\ p\left[\frac{1+\frac{1}{\frac{\partial y}{\partial p}:\frac{y}{p}}}{1+\frac{1}{\frac{\partial L}{\partial w}:\frac{w}{L}}}\right]\frac{\partial y}{\partial L}=w$$

In the following, we disregard from the factor Capital (*K*) and consider all income sources in the dimension "Euro per hour".

Numerical calibration of monopoly cum monopsony

Demand function: $p = 30 - 0.4y^2$
Marginal revenue: $MR = 30 - 1.2y^2$
Labour supply: $w = 5 + 0.9L$
Marginal costs: $MC = 5 + 1.8L$
Production function: $y(L) = 10\sqrt{L} = 10L^{0.5}$; $y^2 = 100L$

Marginal Revenue: $MR = 30 - 120L = 5 + 1.8L = MC$; $y^2 = 100L = 20.5$
Numerical Output: $y = 4.528$

Marginal productivity of labour: $\frac{\partial y(L)}{\partial L} = 11.038 = 0.5\ .\frac{1}{\sqrt{0.205}}$

Wage rate: $w = 5.185$
Labour input: $L = 0.205$
Price: $p = 30 - 0.4\ x\ 20.5 = 21.799$
Real wage rate: $\frac{w}{p} = \frac{5.185}{21.799} = 0.238$

[8] It is evident from the formula that the development of (marginal) labour productivity is a further decisive factor for the explanation of stagnating real wages (see above). This subject, however, goes well beyond the scope of this paper. The same applies to the important question whether monopolies/monopsonies are a hindering factor for the evolution of labour productivity, as long as they persist much longer than a Schumpeterian innovator would do. To test for the existence of the latter would at least require to detect significant imitators.

Wage formula: $w = 5 + 0.9L = 5.185 = 21.799 \cdot 11.038 \left[\frac{1+\frac{1}{\eta}}{1+\frac{1}{\sigma}}\right]$

$$5.185 = 240.617 \cdot \left[\frac{1+\frac{1}{\eta}}{1+\frac{1}{\sigma}}\right];\ 0.022 = \left[\frac{1+\frac{1}{\eta}}{1+\frac{1}{\sigma}}\right]$$

Profits: $\pi = 21.799 \cdot 4.528 - 5.185 \cdot 0.205 = 99.706 - 1.063 = 98.643$

Profits per hour: $\frac{\pi}{L} = 481.185$

Numerical calibration of competition cum competition

Marginal Revenue (price): $MR = 15 = p$

Marginal costs (wage rate): $MC = 6.50$ = w[9]

Real wage rate: $\frac{w}{p} = \frac{6.5}{15} = 0.433$

Production function: $(L) = 10\sqrt{L} = 10L^{0.5}$; $y^2 = 100L$

Marginal productivity of labour: $\frac{\partial y(L)}{\partial L} . 15 = 6.50$; $\frac{\partial y(L)}{\partial L} = 0.433 = 0.5\ \frac{1}{\sqrt{L}}$. ; $\frac{1}{\sqrt{L}} = 0.867$

Labour input: $\sqrt{L} = 1.153$; $L = 1.130$

Numerical Output: $y(L) = 11.53$

Profits: $\pi = 15 \cdot 11.53 - 6.50 \cdot 1.13 = 172.95 - 7.345 = 165.605$

Profits per hour: $\frac{\pi}{L} = 146.553$

The results of the model calibration are clear: wages per hour are higher under competition cum competition (6.50 vs. 5.185), while profits per hour are higher under monopoly cum monopsony (481.185 vs. 146.553). The same applies to real wages and real profits (0.433 vs. 0.238).

In the **Annex**, we have simulated the corresponding Gini coefficients of labour income per hour, of profit income per hour and of total income per hour, separately. In **Tables 1** and **2**, we have calculated Gini coefficient for wages (€ per hour); the wages corresponding to the different market forms are sort of stylized figures of the numbers we achieved in the model calibration (5 € vs. 6.5 €).

[9] Knowing the structural difference between the "monopoly cum monopsony" and the "competition cum competition" model enables us to choose sort of "freely" the nominal wage rate (higher) and the price level (lower) in the latter constellation.

In both **Tables**, we suppose the existence of 10 different markets with either "monopoly cum monopsony" or with "competition" prevailing as a market form. In **Table 1,** the assumption is that 10 percent of the markets are organized by "monopoly cum monopsony", and 90% by competition, in **Table 2** we assume an equal share (0.5/0.5) of both market forms. When calculating the respective Gini coefficients, one gets a clear result: the Gini coefficient is strictly lower in an economy with a comparatively high share of competitive markets: 0.021 < 0.062.

In **Tables 3** and **4**, we have calculated Gini coefficient for profits (€ per hour); the profits corresponding to the different market forms are sort of stylized figures of the numbers we achieved in the model calibration (300€ per hour vs. 100€ per hour). In **Table 3,** the assumption is that 10 percent of the markets are organized by "monopoly cum monopsony", and 90% by competition. In **Table 4**, we assume an equal share (0.5/0.5) of both market forms. When calculating the respective Gini coefficients, one gets a clear result: the Gini coefficient is strictly lower in an economy with a comparatively high share of competitive markets: 0.136 < 0.227.

In **Tables 5a/5b** and **6a/6b**, we finally have calculated Gini coefficient for the *sum* of profits (€ per hour) and wages (€ per hour). The Gini decomposition axioms (see below) allow for that. In **Tables 5a/5b,** the assumption is that 10 percent of the markets are organized by "monopoly cum monopsony", and 90% by competition, in **Tables 6a/6b,** we assume an equal share (0.5/0.5) of both market forms. When calculating the respective Gini coefficients, one gets a clear result: the Gini coefficient is strictly lower in an economy with a comparatively high share of competitive markets: 0.129 < 0.219.

Table 1. Calculation of the Gini coefficient for wages (€ per hour), monopoly cum monopsony and competition (0.1/0.9) with 10 different markets

Original Distribution	Accumulated distribution	Accumulated even distribution	Difference
5	5	6.35	1.35
6.5	11.5	12.7	1.2
6.5	18	19.05	1.05
6.5	24.5	25.4	0.9
6.5	31	31.75	0.75
6.5	37.5	38.10	0.6
6.5	44	44.45	0.45
6.5	50.5	50.8	0.3
6.5	57	57.15	0.15
6.5	63.5	63.5	0
63.5	342.5	322.25	6.75

63.5/10 = 6.35
Source: own compilation.
Gini = 6.75/322.25 = 0.021

Table 2. Calculation of the Gini coefficient for wages (€ per hour), monopoly cum monopsony and competition (0.5/0.5) with 10 different markets

Original Distribution	Accumulated distribution	Accumulated even distribution	Difference
5	5	5.75	0.75
5	10	11.5	1.5
5	15	17.25	2.75
5	20	23	3
5	25	28.75	3.75
6.5	31.5	34.5	3
6.5	38	40.25	2.75
6.5	44.5	46	1.5
6.5	51	51.75	0.75
6.5	57.5	57.50	0
57.5	297.5	316.25	19.75

57.5/10 = 5.75
Source: own compilation.
Gini = 19.75/316.25 = 0.062

Proposition 1: The Gini coefficient for wages is a positive (negative), monotone function of the degree of monopolisation/monopsonisation (competition) prevailing in the economy.

Table 3. Calculation of the Gini coefficient for profits (€ per hour), monopoly cum monopsony and competition (0.1/0.9) with 10 different markets

Original Distribution	Accumulated distribution	Accumulated even distribution	Difference
100	100	120	20
100	200	240	40
100	300	360	60
100	400	480	80
100	500	600	100
100	600	720	120
100	700	840	140
100	800	960	160
100	900	1080	180
300	1200	1200	0
1200	5700	6600	900

1200/10 = 120
Source: own compilation.
Gini = 900/6600 = 0.136

Table 4. Calculation of the Gini coefficient for profits (€ per hour), monopoly cum monopsony and competition (0.5/0.5) with 10 different markets

Original Distribution	Accumulated distribution	Accumulated even distribution	Difference
100	100	200	100
100	200	400	200
100	300	600	300
100	400	800	400
100	500	1000	500
300	800	1200	400
300	1100	1400	300
300	1400	1600	200
300	1700	1800	100
300	2000	2000	0
2000	1900	11000	2500

2000/10 = 200
Source: own compilation.
Gini = 2500/11000 = 0.227

Proposition 2: The Gini coefficient for profits per hour is – perfectly in line with the case of wages (see above) – a positive (negative), monotone function of the degree of monopolisation/monopsonisation (competition) prevailing in the economy.

Table 5a. Calculation of the Gini coefficient for profit income (€ per hour) and wage income (€ per hour) monopoly cum monopsony and competition (0.1/0.9) 10 different markets

Profit income	Wage income	Total income	Accumulated distribution
100	6.5	106.5	106.5
100	6.5	106.5	213
100	6.5	106.5	319.5
100	6.5	106.5	426
100	6.5	106.5	532.5
100	6.5	106.5	639
100	6.5	106.5	745.5
100	6.5	106.5	852
100	6.5	106.5	958.5
300	5	305	1263.50
1200	63.5	1263.50	6056

Source: own compilation.

Table 5b. Calculation of the Gini coefficient for profit income (€ per hour) plus wage income (€ per hour) monopoly cum monopsony and competition (0.1/0.9) 10 markets

Accumulated distribution	Accumulated even distribution	Difference
106.5	126.35	19.85
213	252.7	39.7
319.5	379.05	59.55
426	505.4	79.4
532.5	631.75	99.25
639	758.1	119.1
745.5	884.45	138.95
852	1010.8	158.8
958.5	1137.15	178.65
1263.50	1263.5	0
6056.0	6949.25	893.25

Source: own compilation.

Table 6a. Calculation of the Gini coefficient for profit income (€ per hour) and wage income (€ per hour) monopoly and competition (0.5/0.5) with 10 different markets

Profit income	Wage income	Total income	Accumulated distribution
100	6.5	106.5	106.5
100	6.5	106.5	213
100	6.5	106.5	319.5
100	6.5	106.5	426
100	6.5	106.5	532.5
300	5	305	837.5
300	5	305	1142.5
300	5	305	1447.5
300	5	305	1752.5
300	5	305	2057.5
2000	57.5	2057.5	8835.0

Source: own compilation.

Table 6b. Calculation of the Gini coefficient for profit income (€ per hour) and wage income (€ per hour) monopoly cum monopsony and competition (0.5/0.5) 10 markets

Accumulated distribution	Accumulated even distribution	Difference
106.5	205.75	99.25
213	411.5	198.5
319.5	617.25	297.75
426	823	397
532.5	1028,75	496.25
837.5	1234.5	397
1142.5	1440.25	297.75
1447.5	1646.0	198.5
1752.5	1851.75	99.25
2057.5	2057.5	0
8835.0	11316.25	2481.25

Source: own compilation.

Proposition 3: If total income (€ per hour) is the sum of wages (€ per hour) and profits (€ per hour), the impact of an increasing degree of monopolisation cum monopsonisation in the economy on the overall Gini coefficient is clear-cut: the higher (lower) the representation of monopolies/monopsonies in the economy is, the higher (lower) will be the associated Gini coefficient.

4. Gini decomposition

Equation (8) is the basic decomposition of the Gini coefficient (ex-ante) following Shorrocks (1982), Doran and Jordan (2016), Costa (2019) and many other contributions.

$$(8)\ G = G_W + G_B + G_T$$

G symbols the Gini coefficient of total income for the whole population. G_W is obtained quite easily as a weighted sum of the Gini indexes G_i of each (say two, 1 and 2, that makes i = 1, 2; in our case the group of wage earners and the group of profit earners) subgroup, where the weights are given by the population (in our case market) share p_i and the income share s_i of the two subgroups:

$$(9)\ G_W = G_1 p_1 s_1 + G_2 p_2 s_2.$$

"G_W allows to evaluate the contribution to total inequality related to the variability *within* the subgroups. Low values of G_W indicate homogenous subgroups … while a high G_W provides the opposite indications (Costa 2019: 7). Hence, by definition of (1) and (2), we achieve:

$$(10)\ G - (G_1 p_1 s_1 + G_2 p_2 s_2) = G_B + G_T,$$

where in the case of only two subgroups: $p_1 = (1 - p_2)$ and $s_1 = (1 - s_2)$. G_B measures the extent of inequality *between* subgroups and G_T is the *overlapping* component, which captures the "degree of overlap between the income distributions in the various areas" (Özmucur, Silber 2009: 324):

$$(11)\ G_B + G_T = G_{12} p_1 s_2 + G_{21} p_2 s_1,$$

where $G_{12} = G_{21}$ in the case of only two subgroups. So we get:

$$(12)\ G - (G_1 p_1 s_1 + G_2 p_2 s_2) = G_{12} p_1 s_2 + G_{21} p_2 s_1,$$

The term G_{12} or likewise G_{21}, when there are only two subgroups, equals the Gini coefficient between group 1 and group 2. According to Costa (2019, S. 9):

$$(13)\ G_T = (G - G_W - p_1 - s_1)/2$$

A look at **Tables 1** through **4** and the respective distribution of wages and profits shows that, in our case, there is **no overlapping** of the distributions of incomes ($G_T = 0$). Applying hence the above formulas with no over-lapping to our simulation exercise, reveals the following numbers/results:

$$(14)\ G = G_1p_1s_1 + G_2p_2s_2 + G_{12}p_1s_2 + G_{21}p_2s_1,$$

Table 5b: Income distribution in the mostly competitive economy
From the simulation in the annex, we have: $G = 0.129$.
1: wage income; $p_1 = 9/10$; $s_1 = 0.05$; $G_1 = 0.021$; $G_1p_1s_1 = 0.01$
2: profit income; $p_2 = 1/10$; $s_2 = 0.95$; $G_2 = 0.136$; $G_2p_2s_2 = 0.013$
(9a) $G_W = 0.01 + 0.013 = 0.023$
(10a) $G - G_W = 0.129 - 0.023 = 0.106 = G_B$

Table 6b: Income distribution in the economy with strong market imperfections
From the simulation in the annex, we have: $G = 0.219$.
1: wage income; $p_1 = 5/10$; $s_1 = 0.028$; $G_1 = 0.062$; $G_1p_1s_1 = 0.001$
2: profit income; $p_2 = 5/10$; $s_2 = 0.972$; $G_2 = 0.227$; $G_2p_2s_2 = 0.110$
(9a) $G_W = 0.001 + 0.110 = 0.111$
(10a) $G - G_W = 0.219 - 0.111 = 0.108 = G_B$
There is a significant difference in the variability *within* the subgroups: 0.023 vs. 0.111, where the variability is comparatively higher in the market imperfections scenario of **Table 6b**. With regard to the inequality *between* the subgroups, the variability is almost identical, though comparatively smaller in the competitive scenario of **Table 5b** (0.106 vs. 0.108).

5. Competition policy as a device for correcting personal (market) income distribution before income taxes and money transfers do

It is common knowledge among economists that in a world of ordinary scales, an equal distribution of incomes maximizes total utility, whenever individual marginal utilities of income are identical (Külp 1975: 83). This result changes if individual marginal utilities of income differ (Külp 1975: 85). Now, maximization of total utility requires to render more income to those equipped with the higher marginal utility of income (curve). As the magnitude of individual marginal utilities of income is, in principle, unknown to us, one may think of many types of (more or less) uneven distribution of incomes. As long as we talk about positive economics,

there is no criterion at hand which helps us to make the best choice. Therefore, we tend to accept the distribution of incomes, as it is delivered by the market process in the first place. If policy makers follow the axioms of a widely respected (normative) welfare function, it is feasible to design an *optimal* distribution of incomes. However, one may postulate that the market-oriented distribution of incomes itself should not already be biased, long before the government starts to correct it. Put it in these words: the Gini coefficient ex-ante is actually being calculated on the basis of existing significant monopolies and monopsonies, but it should not. An "un-biased" Gini coefficient ex-ante should be computed after correcting for market imperfections. Hence, competition policy has two reasons to fight market imperfections: one is to safeguard a functioning competition on markets and the second is to submit to the policy makers a "well-functioning" income distribution of incomes they may wish to correct afterwards.

Depart from the following thought: the Gini coefficient ex-ante is traditionally higher (see Sell, Öllinger 2019) than the Gini coefficient ex-post (after taxes and transfers installed by policy makers). If competition policy successfully reduces the Gini coefficient ex-ante, the policy effort to reduce the Gini coefficient ex-ante – given the envisaged Gini coefficient ex-post – can be lower (and cheaper in terms of the transfer size required), ceteris paribus. In addition, further economic policy chapters, such as minimum wage policy and/or a strategy of wage subsidies, become (more) redundant. Hence, competition policy enhances the *efficiency* of redistribution (fiscal) and/or of labour market policy.

Moreover, if it becomes less necessary for the government to make use of progressive taxation for the upper income groups, fiscal policy will presumably become more *effective* as well: because a lower need for redistribution (fiscal) policy reduces the pitfalls of the Laffer curve, too.

In the following, we will assess two options: one is that competition policy eases/enhances the possibilities for new firms to enter monopolized or monopsonized markets, the other is that competition policy makes it harder to monopolies and/or monopsonies to survive under the pressure of taxes, tariffs etc.

The *first option* has been the subject of a library filling amount of books and articles. Therefore, it seems unnecessary to evoke the key results of these many

studies. However, we will see below that one can relate specific instruments used by policy makers to directly fight the market power of monopolies and/or monopsonies to the overall goal to create more competition in markets.

Let us inspect the *second option*. See, for the following (Sell, Kermer 2017: 90-93): Fiscal policy has several possibilities to fight monopolies and/or monopsonies and their detrimental effects to consumers (low supply/high prices). The main alternatives consist in taxing profits, taxing revenues or to subsidize costs. Let us begin with the case of a *monopoly*:

(1) The taxation of profits results primarily in a status-quo: the optimal quantity and the optimal price to the monopolist will not change at all, only his level of profits will be dampened. The consumer rent remains constant. (2) The effects to be expected from a taxation of revenues is even worse for the consumers: The optimal quantity will shrink and the optimal price will rise, hence, the consumer rent is reduced. (3) Economic policy might want to incentivize the monopolist to increase the level of production by granting him a cost subsidy: here, the monopolist will in fact react with an increased supply and a concomitant lowering of the price. The consumer rent, hence, will rise. (4) A fourth option applies to the situation where the domestic (importing) economy faces a foreign (exporting) monopolist. As is the case of (domestic) taxation, one may expect (again only) a rise in the domestic price to consumers, a lowering of the consumer rent and a shrinking supply of goods. One thing, however, can make a difference: if the government deploys the collected tariff revenues in favour of domestic consumers, their loss of consumer rent may be (even more than) compensated. And there might as well exist another indirect effect: profits of the foreign monopolist are reduced. A possible consequence: the domestic market becomes less attractive to the monopolist and he might shift his interest towards other countries…. If so, domestic producers will possibly discover a new market.

What about *monopsonies*? As can be shown easily, a taxation of profits does, again, not alternate the profit maximum: neither the amount of labour hired nor the wage paid to the employees is affected. Results change quite a bit, when it is not the profit, but the revenue which becomes taxed: The monopsonist will choose for his optimum a lower input of labour, and, accordingly, a lower wage rate offered to the

employees (see Kermer, Sell 2021, forthcoming). The final option is interesting: paying a (constant) subsidy for any unit produced, will incentivize the monopsonistic firm to increase production and hence employment. Given the upward sloped labour supply function, the wage rate must rise, also. Minimum wages are an interesting case with respect to monopsonies. As we know already from early studies by Card and Krueger (1997), excluding special situations (see Sell, Ruf 2016), minimum wages tend to increase wages and employment offered by the monopsonist. But, there is another "side effect": minimum wages tend to dampen also profits of the monopsonist, what makes this market less attractive for access to further (competing) employers (Sell, Ruf 2016). Hence, the likelihood for a switch in the market from a monopsony to an oligopsony becomes less likely, ceteris paribus. The latter, in turn, would presumably increase the degree of competition. Here comes the link to our first option from above: the specific instruments used against monopolies and analysed earlier, such as the taxation of revenues or profits, the instalment of tariffs to weaken foreign monopolists or the granting of production subsidies, will also be accompanied by "side effects": the effectiveness of these instruments will hence be the higher (lower), the less (more) they are going along with a shrinking profitability of the respective monopoly/monopsony. Ultimately, a kind of trade-off appears: all those instruments designed to "hurt" the monopolist/monopsonist by reducing his net profits, have a countervailing effect on the attractiveness of the market to possible newcomers, as long as its profitability is lowered relatively to the median or the average market in the economy.

6. Summarizing conclusions

The aim of this paper was to close the gap between the subjects of personal income distribution on the one hand and of competition policy in markets with (non-transitory and hence non-Schumpeterian) monopolies and monopsonies on the other hand. What have we learnt? First, competition policy has at least two reasons to fight market imperfections: one is to safeguard a functioning competition on markets

and the second is to submit to the policy makers a "well-functioning" income distribution of incomes they may wish to correct afterwards. Second, competition policy enhances the *efficiency* of fiscal redistribution and/or of labour market policy. And third: fiscal policy is capable to *effectively* fight monopolies and monopsonies. The alternative instruments available have been presented above.

As a result, we may summarize that a correction of inequality in personal incomes is feasible ex-ante, that is, long before the government intervenes with taxes and transfers in order to dampen the original Gini coefficient which is the outcome of market processes. In order to put forward our thoughts, we have made use of simple model calibration, simulation and Gini decomposition techniques. A future extension of our approach may search for macro-economically valid indicators for market imperfections which will make an in-depth empirical analysis of this subject possible.

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