
Income distribution in Poland

A glance at recent EU-SILC data

a seminar paper by

Andreas Chmielowski and Patrick Zommer

January 2019



for the specialization seminar

2063 Ökonomie der Verteilung

Wirtschaftsuniversität Wien

Contents

1	Introduction	3
2	Literature Review	3
3	Empirical Analysis	4
3.1	Income and population concepts	4
3.2	Mean Income	6
3.3	Median Income	6
3.4	Gini Coefficient	9
3.5	S80/S20 measure	12
3.6	Share of the Top 10 Percent	13
3.7	Determining Factors	14
4	Conclusions	18
5	Appendix	19
6	References	23

1 Introduction

The rise of income and wealth inequality in the last decades, especially in developed countries, has increasingly caught the attention of both policy makers and academics. Numerous economists have considered a too high level of inequality as harmful to economic growth and point out the consequences for social mobility, happiness and social trust (Brzeziński 2017; Muszyńska, Oczki, and Wędrowska 2018). There is also an ongoing discussion on the association of wealth and income concentration with the concentration of political power, and connected to this, the effect of inequality within a society on democracy (Houle 2009).

The study at hand investigates the inequality of yearly income in Poland. In section 2 we take a look at the current literature on the topic and gain an initial understanding of distinctive features characterizing income inequality in Poland. In section 3 we pursue with our own analysis of the newest available (2017) data of the *EU Survey of Income and Living Conditions* (EU-SILC), where we take a look on established inequality measures (such as the Gini coefficient or S80/S20, which are going to be explained in the respective section) and their history since 2005. In order to observe also the differences before and after taxation and social transfers, we investigate these measures for three distinct, predefined income concepts. Also, we take a more detailed look at some of the determining factors for income inequality via regression analysis. In particular, we investigate the impact of gender and education on three income concepts in two different points in time. Finally, in section 4 we summarize our results and discuss their impact for potential policy measures aiming to mitigate income inequality.

2 Literature Review

The history of income distribution in Poland is characterized by a substantial increase in inequality since 1989, followed by a moderating period since 2007 in which inequality has stabilized. As Brzeziński 2017 points out, the observed rise in wage dispersion in Poland between 1989 and 2015 was higher than in comparable transition countries such as Hungary or the Czech Republic, and according to Jędrzejczak 2008, the main source of differences in income are wages and salaries (which indicates a lack of inequality-minimizing social transfers). In recent years, however, no significant rising trend has been observed (Brzeziński 2017) and some studies have even measured a decline in divergence on a household level (Gęstwicki and Wędrowska 2016). Moreover, Muszyńska, Oczki, and Wędrowska 2018 have reported a decrease in inequality between 2005 and 2014.

Income inequality is nowadays still high, with a 2014 high-to-low ratio (S10/S90) in wages of 4.7, which is the highest among EU member states. The reason for this is a relatively high university wage premium (compared to the EU average), which denotes the difference in average income between earners holding a university degree and earners with only lower education. The former have been subject to a fast increase in wages after the end of socialism, while the wages for professions requiring lower education developed in a slower pace. However, this university wage premium is currently decreasing. Other contributing factors are a low collective contract density, a relatively large low-wage sector and the fact that the Polish income tax system, which has only two progression steps, has only a negligible effect on reducing income inequality (Brzeziński 2017). Furthermore, Ruzik and Rokicka 2010 argued that a substantial gender pay gap in Poland exists. Specifically they compared formal and informal work and showed that in informal work at the bottom of the distribution the inequality widens, whilst in formal work it is among the higher incomes the case.

Several papers point out the consequences of the financial crisis of 2008 and the subsequent Great Recession for the Polish economy. An early assessment by Mitrus 2010 of the 2009 labor law changes as an answer to the crisis highlights how the regulations for increased labor market flexibility were able to help employers to overcome temporarily decreased demand in consequence to the crisis. This is debated by Mrozowicki, Roosalu, and Senčar 2013, who argue that leading multinational retail companies in CEE were not strongly affected by the crisis to begin with and might have used the crisis as a justification to expand precarious employment. A survey conducted among 1500 firms by Strzelecki and Wyszyński 2016 finds that the only mild increase in unemployment and the overall absence of a recession in Poland can mainly be attributed to the high nominal and real wage flexibility, while other labor market reforms only had a constrained impact. Most of the firms, which have participated in the survey, reported no change in their capacity to adjust labor costs due to these reforms. In spite of the absence of a recession and

sustained economic growth due to both structural funds from the EU and high domestic consumption, Kośny 2013 finds in increased polarization of income on the household level in this time.

One very important topic constitutes the impact of inequality on the Polish society. Brzeziński 2017 argues that there is a correlation between income inequality and a growing disappointment in the economic and social system as such. High incomes are broadly perceived as undeserved and associated with corruption. Letki, Brzeziński, and Jancewicz 2014 point out that in spite of the decline of material deprivation in Poland since 1989, the perceived inaction of the Polish government regarding inequality (due to the focus on combating absolute levels of poverty rather than relative) also undermines the legitimacy of the political system and has resulted in lower confidence in political institutions and declining voting turn-out and levels of unionization. On the other hand, there have also been observed rising levels of social trust and stable social capital, as many Poles have tried to compensate for this on an individual level via the support of charity organizations.

Two policy changes might have affected the distribution of income in Poland very recently: On the one hand, the raise of minimum wage in 2015 might have potentially resulted in a decrease in income inequality due to the relatively large low-wage sector. On the other hand, the launch of the fertility promotion benefit program "500+", which yields means-tested financial benefits for the first child and universal benefits from the second child onward, is currently said to have ambiguous effects: While the consequent radical reduction of child poverty is widely recognized, some studies point out the resulting negative effect on labor force participation, especially for eligible mothers (Bargu and Morgandi 2018; Magda, Kielczewska, and Brandt 2018). As the paper at hand will later proceed to investigate the newest EU-SILC data (2017), we might also assess these recent policy measures regarding its impact on income inequality.

In summary, the literature conveys a very coherent picture of income inequality in Poland and already implies possible policy measures for its reduction:

- As the main source of income inequality is wage dispersion, it is clear that the factors causing this dispersion need to be addressed by the policy maker. One such factor is the relatively high (but already decreasing) university wage premium, which potentially could be lowered further by adequate educational policies.
- Other possible measures would address the relatively large low-wage sector. The recent rise in minimum wages is possibly a step into this direction.
- Furthermore, capability of the tax system to redistribute income should be increased by raising the tax burden of high-wage individuals and simultaneously lowering it for low-wage earners (Brzeziński 2017).
- Also, the targeting of social protection programs should be improved (Muszyńska, Oczki, and Wędrowska 2018). Whether the new program "500+" denotes such an improvement, or might be another factor actually contributing to inequality due to the suspected effect of reducing labor-force participation in women, still remains to be answered.

3 Empirical Analysis

3.1 Income and population concepts

For our analysis of income inequality in Poland we use EU-SILC data from 2005 until 2017. From the large stock of income components this dataset provides, we have decided for three income concepts as a basis for our analysis. Observed differences in the development of our inequality measures between these concepts will help us understand the roots of income inequality: For example, a Gini coefficient that is high before but low after taxation and the receipt of social transfers might serve as an indication for the redistributive power of a country's fiscal policy. The three income concepts are:

1. **Pre-tax factor income:** This concept incorporates only earnings from active participation in the labor market and is equivalent to the "primary income" according to the Canberra Group standard (OECD 2013). Inequality measurements applied to this income concept tell us how large inequality is, if the observed country had no tax or social transfer system at all. It is composed of the following EU-SILC variables:

- gross employee cash or near cash income (PY010G)
 - company car (PY021G)
 - gross cash benefits or losses from self-employment (including royalties) (PY050G)
 - income received by people aged under 16 (HY110G)
 - income from rental of a property or land (HY040G)
 - interests, dividends, profit from capital investments in unincorporated business (HY090G)
 - pensions received from individual private plans (PY080G)
2. **Pre-tax national income:** This concept builds on the pre-tax factor income, but adds unemployment and old-age benefits. Differences between pre-tax national and pre-tax factor income thus indicate reforms regarding these two transfers:
- everything from concept 1: pre-tax factor income
 - unemployment benefits (PY090G)
 - old-age benefits (PY100G)
3. **Post-tax disposable income:** As the name indicates, this is what individuals can spend effectively after the subtraction of taxes and social contributions and the receipt of any other transfers. It consists of the sum of the following variables:
- survivor's benefits (PY110G)
 - sickness benefits (PY120G)
 - disability benefits (PY130G)
 - education-related allowances (PY140G)
 - family/children related allowances (HY050G)
 - social exclusion not elsewhere classified (HY060G)
 - housing allowances (HY070G)
 - regular inter-household cash transfers received (HY080G)

These variables are being subtracted:

- regular taxes on wealth (HY120G)
- regular inter-household cash transfer paid (HY130G)
- tax on income and social insurance contributions (HY140G)

Shown within parentheses are the specific variable codings from the EU-SILC data set. Note that all these variables denote yearly income components in Polish Złoty (PLN). Also, only some of these variables are distinctly attributable to the interviewed individuals, while others (those with codings starting with an "H") have only been determined on a household basis. It is therefore additionally necessary to define the populations our analysis should be based on. We decided for the following two concepts:

- **P1:** Here we include the whole population in our analysis and assume that all resources (i.e. individual earnings and income on a household basis alike) are being shared equally among all household members. We take into account economies of scale with a household via equivalence scaling (that is, we divide the sum of household income by equivalence factor HX050 before appointing it individually to the household members). This is equivalent to the Eurostat concept of "equivalised disposable income" (Eurostat 2018b).
- **P2:** Here, we only include persons of age 20 or higher into our analysis and assume that everyone keeps their individually earned/received money to themselves. Forms of income that are only documented on a household level are summed up and then distributed equally among all household members of 20 years or more. This corresponds to the population concept of the Wealth and Income Database (Chancel and Gethin 2017).

In what follows, we are going to calculate every measurement of income inequality for every possible combination of income and population concept, respectively. In order to control for inflation, all income concepts have been divided by the Eurostat CPI with base year 2015 (Lahti et al. 2017). It is important to note that the income reference period is lagged, meaning that for e.g. 2017, the reported income was actually earned in 2016 (Eurostat 2018a). We took this into account for our analysis and applied every CPI value for the year the income has actually been earned (i.e. the CPI for 2015 was attributed to the income reported in 2016, but earned in 2015.) However, we did not shift the incomes themselves, the calculated indices are therefore referring to the time of *reporting* of having the money earned rather than having the money earned.

As the outcomes for most of these inequality measures look pretty much the same for both population concepts P1 and P2, we have decided to focus on mostly on the description of the results for P1 and have put the tables and figures for P2 into the appendix.

3.2 Mean Income

In Table 1 we can see the average yearly income for all three income concepts for P1, and Figure 1 shows us the translation of these numbers into graphs. Since 2005 the mean in our income measures increased steeply until 2009. Following the financial crisis, a huge fall in our income measures occurred and post-tax disposable income reached pre-crisis levels again in 2017. An interesting fact is, that in 2017 pre-tax factor and pre-tax national income decreased but post-tax disposable income increased, which seems to lead to the conclusion that income was falling from 2016 to 2017 but redistributive measures still ensured an increase in post-tax disposable income. Looking at the growth rate of income we can see that the increase in the pre-crisis period was much higher. This seems to be due to the fact that real wage growth between 2004 and 2007 was exceptionally high and unemployment was reaching record lows creating wage pressure. Following the financial crisis wage growth started to fall and began to recover again in 2013 (Lewandowski 2018; Gajewski 2015). These differences in income growth along time correspond to differences in Polish GDP growth in the same time (very high before the crisis, less high afterwards), providing a possible explanation for the former (see Figure 2).

	Pre-tax factor	Pre-Tax National	Post-Tax Disposable
2005	3432.31	4458.39	3617.56
2006	4478.94	5713.31	4619.20
2007	5062.10	6395.30	5110.33
2008	5968.71	7374.67	5929.80
2009	6897.48	8460.68	6894.44
2010	5598.75	6938.91	5666.06
2011	6160.75	7566.86	6270.84
2012	6071.95	7442.54	6128.98
2013	5865.50	7267.23	5987.89
2014	6040.70	7467.56	6126.66
2015	6167.22	7662.28	6331.74
2016	6477.48	8015.33	6659.41
2017	6493.47	8014.74	6823.70

Table 1: Mean yearly income in 2015 PLN for all three income concepts for P1 (EU-SILC 2018, Eurostat 2019).

3.3 Median Income

The median income (Table 2 and Figure 3) shows a similar pattern compared to the mean income, which should not be a huge surprise. A big difference is that the median is constantly smaller than the mean income, which is a standard pattern in income and wealth distributions leading to the conclusion that very high incomes skew the income distribution to the right (see also Figure 4 as an exemplary income distribution). Regarding the growth rates the same conclusion as mentioned already before at the

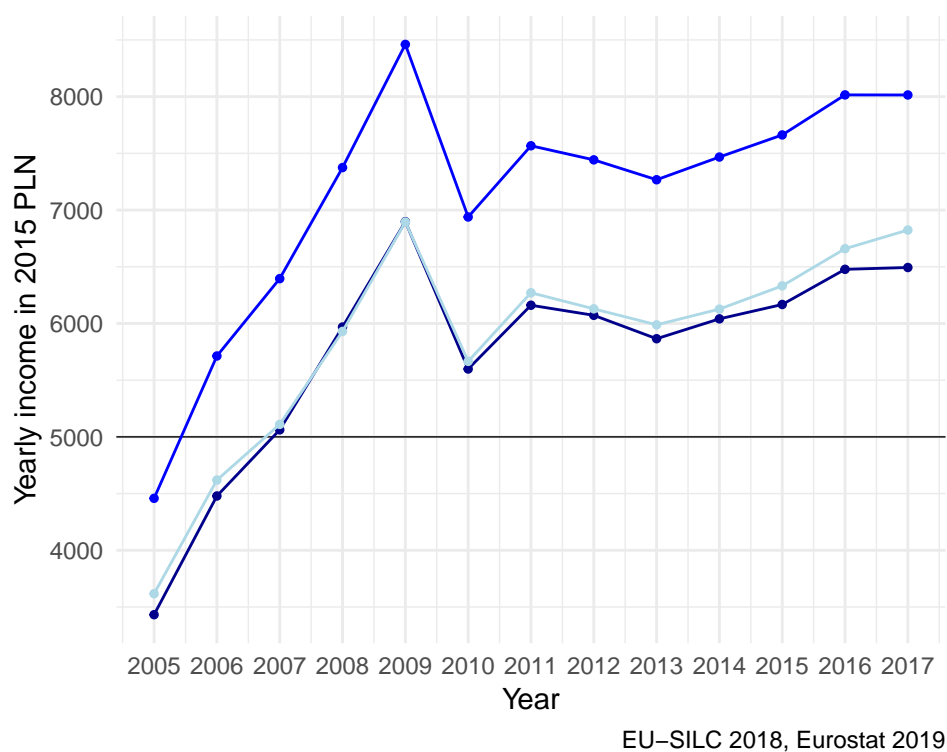


Figure 1: Mean income for all three income concepts over time for P1. Pre-tax factor income is dark blue, pre-tax national income is blue and post-tax disposable income is light blue. The black horizontal line facilitates comparison of this mean with other measures.

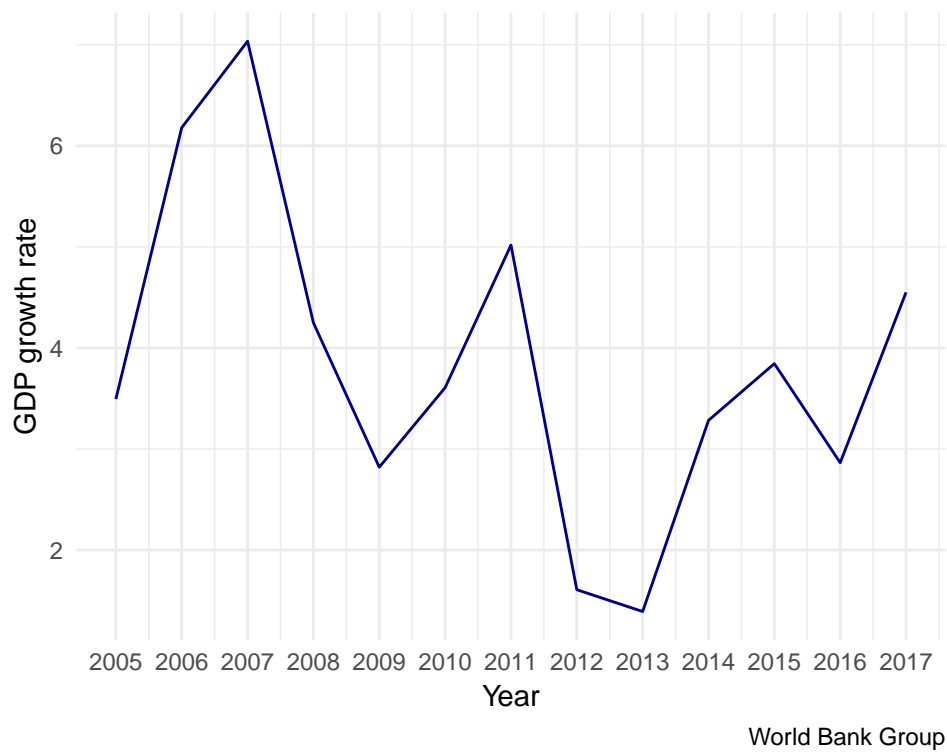


Figure 2: GDP growth in Poland in the observed time period of this study. Mean and median income growth seems to correlate with GDP growth, as it was much higher before the crisis. (Recall that the EU-SILC data is lagged by one year when it comes to income data.

mean applies. An interesting fact is that the median post-tax disposable income decreased like our other income measures in 2017 but the mean showed an increase. This implies that redistributive measures favoured high incomes in this year more.

	Pre-tax factor	Pre-Tax National	Post-Tax Disposable
2005	2339.38	3533.09	3025.15
2006	3262.46	4648.04	3879.54
2007	3853.85	5290.07	4313.25
2008	4643.12	6115.87	4987.60
2009	5487.80	7032.77	5872.59
2010	4529.12	5866.49	4878.59
2011	4963.94	6466.17	5421.10
2012	4893.44	6315.53	5253.94
2013	4780.78	6233.28	5174.28
2014	4897.38	6387.94	5304.40
2015	5056.14	6575.39	5517.07
2016	5436.02	7017.61	5883.27
2017	5433.10	6935.93	5957.09

Table 2: Median yearly income in 2015 PLN for all three income concepts for P1 (EU-SILC 2018, Eurostat 2019).

3.4 Gini Coefficient

The Gini coefficient measures the area between the actual Lorenz-curve and one which would be realized if there was absolute equality among all individuals in the observed society. It ranges between 0, which means that all individuals have exactly the same income, and 1, which means that one individual has all the income earned in the society, and all others have nothing. That is, the higher the value of the Gini coefficient, the higher the income inequality in the observed society.

In Table 3 we have listed the Gini coefficients for all three income concepts over all observed years. We can see a decrease over time for all three concepts, being in line with the findings of Brzeziński 2017 and Muszyńska, Oczki, and Wędrowska 2018. Table 3 also tells us about the redistributive power of the Polish tax and social transfer system: If there was no such redistributive system at all, the income inequality actually experienced by the Polish society would have a Gini of 0.48 instead of 0.29 for 2017.

	Pre-tax factor	Pre-tax national	Post-tax disposable
2005	0.58	0.44	0.39
2006	0.54	0.40	0.33
2007	0.52	0.39	0.32
2008	0.50	0.38	0.32
2009	0.49	0.37	0.31
2010	0.49	0.36	0.31
2011	0.48	0.37	0.31
2012	0.48	0.37	0.31
2013	0.48	0.36	0.31
2014	0.48	0.36	0.31
2015	0.48	0.36	0.31
2016	0.47	0.35	0.30
2017	0.48	0.36	0.29

Table 3: Gini coefficients over time for all three concepts for P1 (EU-SILC 2018, Eurostat 2019).

The values of Table 3 are depicted in Figure 5. Most striking is here the synchronous movement of the three lines over time, which indicates that changes over time in the Gini coefficient did not stem

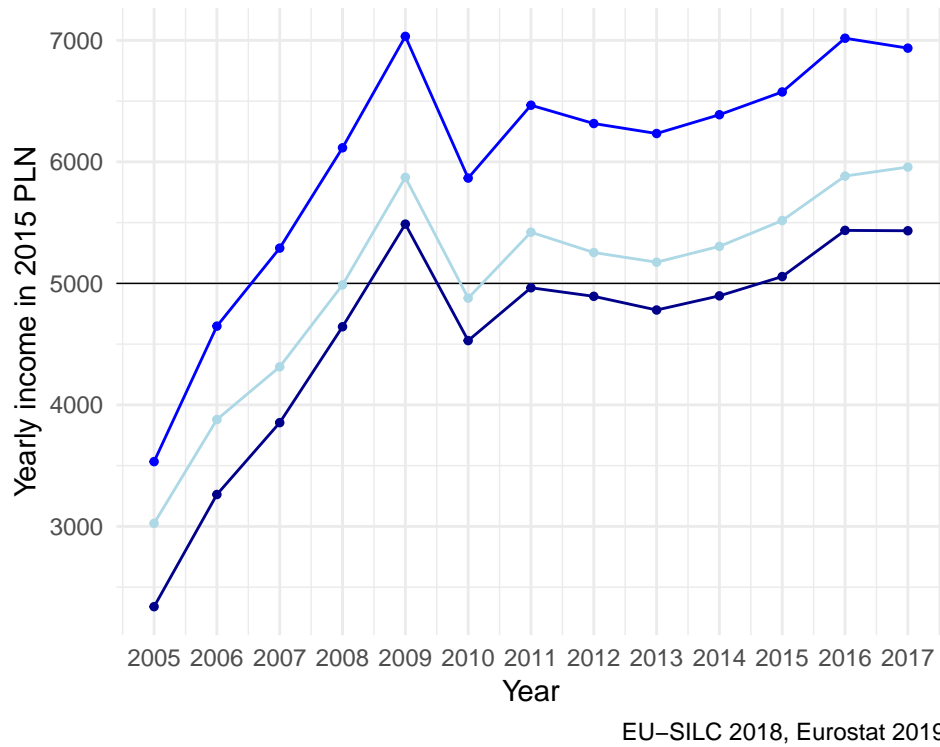


Figure 3: Median income in 2015 PLN for the three income concepts over time for P1. The graphs for pre-tax factor income, pre-tax national income and post-tax disposable income are again dark blue, blue and light blue, respectively.

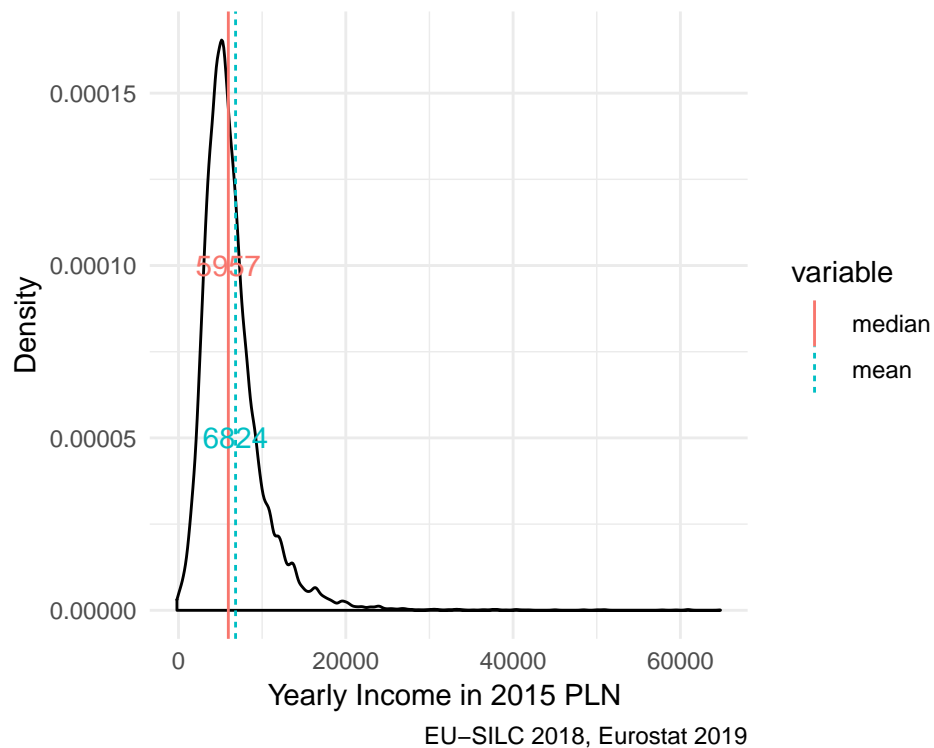


Figure 4: A depiction of of the distribution post-tax disposable income in 2017. As visible, mean and median are very close to each other.

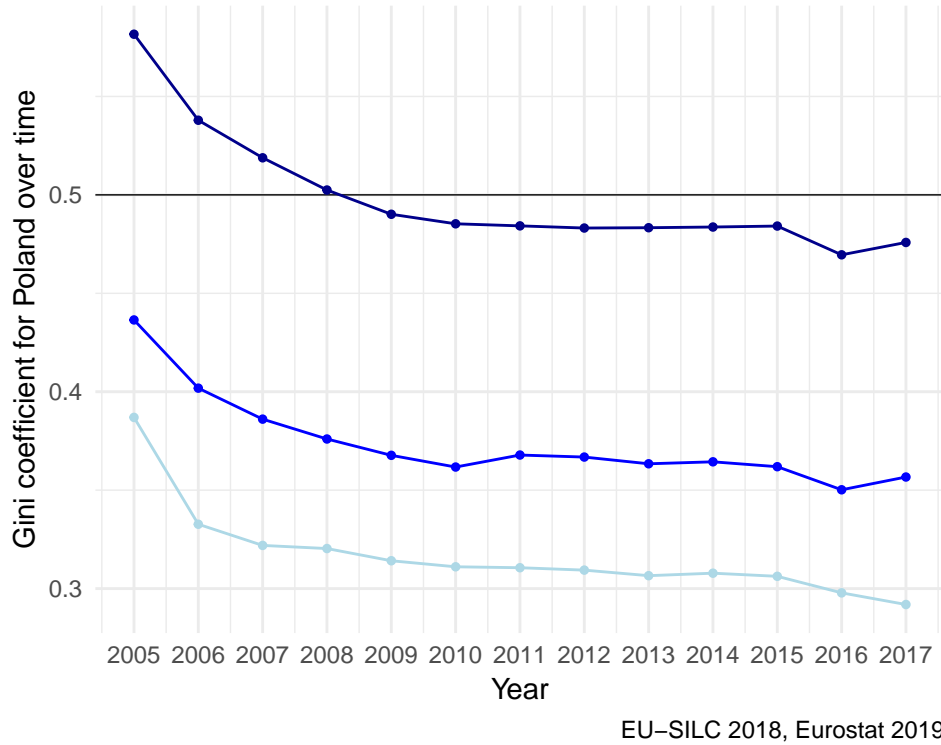


Figure 5: The development of the Gini coefficient for all three income concepts over time for P1. As everywhere, pre-tax factor income is again dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

from changes in the redistributive system, but in changes from pre-tax factor income: When inequality in pre-tax factor income was high in 2005, post-tax disposable income was also high, but with a certain distance below pre-tax factor income. When inequality began to shrink in pre-tax factor income, it shrank proportionally in post-tax disposable income. Apparently, the Polish tax and social transfer system is designed in a way that allows for a certain reduction of income inequality, but for most of the time there were no policies in place which would have fortified redistribution in times of higher pre-tax factor inequality. An exception are the years 2016 and 2017, where the Gini fell for pre-tax factor and pre-tax national income but rose for post-tax disposable income. This might depict the combined effect of the 2015 introduced new minimum wage and the 2016 introduced fertility benefit "500+", although these data alone does not allow for a thorough investigation of this suspicion.

Table 10 and Figure 10 draw a much different picture of the Gini index in Poland. Although the trend here is equally decreasing, the levels for each year and each income concept are much higher, and also, in Figure 10, the graph referring to post-tax disposable income is *above* the graph referring to pre-tax national income. According to this depiction, unemployment and old-age benefits manage to reduce initial inequality in pre-tax factor income, but then the combination of all other benefits and the deduction of taxes increases inequality again. We attribute these two properties (the overall higher Gini levels and the increase in inequality between pre-tax national and post tax income) to the fact that P2 is a much more individualistic population concept. In opposite to P1, the household members keep their individually earned money and do not share it with the others, while the tax burden is distributed among all household members. Therefore, individuals with a higher income only get to pay the average of the household taxes (which is less than what they had to pay on an individual tax basis), while those with low individual income must pay the same average (which is higher than what they would have to pay individually).

We can thus conclude that inequality is decreasing over time in Poland, but mostly not because of the Polish redistributive system, but because of the decrease in inequality in pre-tax factor income. The impact of the redistributive system, although existent, is ambiguous and seems to depend on the

underlying population concept. The newly introduced benefit "500+" and the new minimum wage might accelerate this decreasing trend, but at this point, it remains open to which extend.

3.5 S80/S20 measure

The S80/S20 ratio is another method for measuring inequality. It calculates the ratio of the total income of the highest income quintile (top 20%) to the total income to lowest quintile (bottom 20%). This ratio tells us how many times higher the income of the top 20% compared to the bottom 20% is.

This measure is not entirely unproblematic. During our calculation, we found that the sum of pre-tax factor income of the bottom 20% for P1 was 0; likewise the pre-tax factor and pre-tax national income for the bottom 20% in P2. This forced us to exclude all individuals with an income zero, which denotes a distortion of our data to some extent. Also, all values of the S80/S20 measure for post-tax income are negative (see Table 11 and Figure 11 in the appendix). This can be explained by the fact that the sum of the bottom 20% is negative in P2, presumably because in this population concept, taxes are being shared among household members but individual individual incomes are not. Of course, this means that the S80/S20 measurements for this income concept are not valid, and the results regarding this measure must generally be handled with care.

	Pre-tax factor	Pre-tax national	Post-tax disposable
2005	15.93	14.90	9.26
2006	12.89	10.30	5.64
2007	11.66	8.94	5.26
2008	10.33	7.91	5.12
2009	9.70	7.49	4.96
2010	9.46	7.37	4.95
2011	9.35	7.97	4.95
2012	9.04	7.92	4.92
2013	9.19	7.89	4.87
2014	9.19	7.88	4.90
2015	8.98	7.91	4.92
2016	8.12	7.39	4.75
2017	8.99	7.65	4.55

Table 4: S80/S20 ratios over time for all three income concepts for P1 (EU-SILC 2018, Eurostat 2019).

In Table 4, we see the values for all income concepts for P1, and in Figure 6, we see their plotted translation. We see a general accordance with our findings regarding the Gini coefficient: Inequality is decreasing over time, but mainly due to a decrease in pre-tax factor income. The other two income concepts seem to just "move along" with this development in a constant distance (again indicating the lack of policies strengthening redistribution independently of movements in the pre-tax factor income measures). Additionally, we see the same hint for a reinforced distributional effect since the introduction of the new minimum wage and "500+" as in Figure 5, which might indicate a inequality-reducing effect of these policy measures.

For P2 (Table 11 and Figure 11) we see a much weaker (especially in the earlier years) but still decreasing trend for pre-tax factor income and a almost steady level for pre-tax national income. This behavior of the graphs can again be explained by P2 being a more individualistic concept of population.

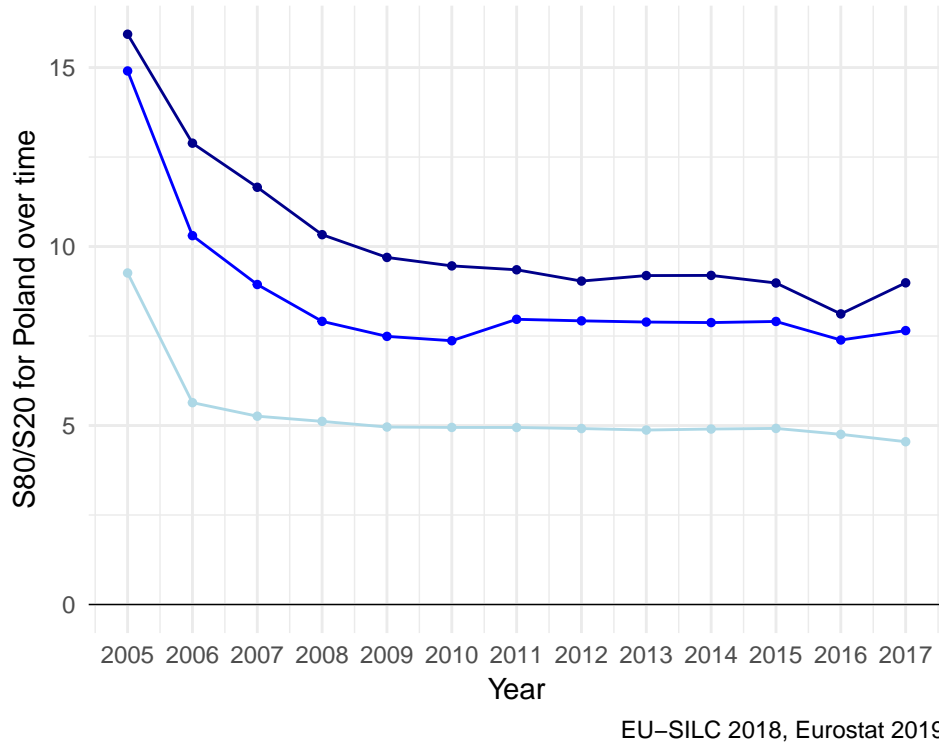


Figure 6: The development of the S80/S20 ratio for all three income concepts over time for P1. Pre-tax factor income is dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

3.6 Share of the Top 10 Percent

Now we take a look at the total income share of the top 10%, as shown in Table 5 and depicted in Figure 7. For P1, we see a development similar to the ones of mean and median income: A steep increase before the crisis, then a drop at the crisis and then a slower increase until 2016, where we witness a small drop again. An important difference, however, is that pre-tax factor income has the highest values in every year and post-tax disposable income the lowest, which means that the redistributive system in Poland reduces the income disparity between the top 10% and the bottom 90%.

For P2 we see a similar development for the three income concepts, but higher (because individual income is not being shared with other household members) and the post-tax income share is slightly higher than the pre-tax national income share (probably because of the shared tax burden in all households, which means also those without an individual income pay taxes and are therefore reducing the bottom 90% share.)

	Pre-tax factor	Pre-tax national	Post-tax disposable
2005	0.20	0.15	0.13
2006	0.25	0.20	0.16
2007	0.28	0.23	0.19
2008	0.34	0.28	0.25
2009	0.40	0.35	0.32
2010	0.27	0.24	0.21
2011	0.33	0.28	0.26
2012	0.33	0.27	0.25
2013	0.31	0.26	0.24
2014	0.33	0.28	0.26
2015	0.34	0.29	0.27
2016	0.36	0.30	0.29
2017	0.36	0.31	0.30

Table 5: The total-income share of the top 10 percent over time for all three income concepts for P1 (EU-SILC 2018, Eurostat 2019).

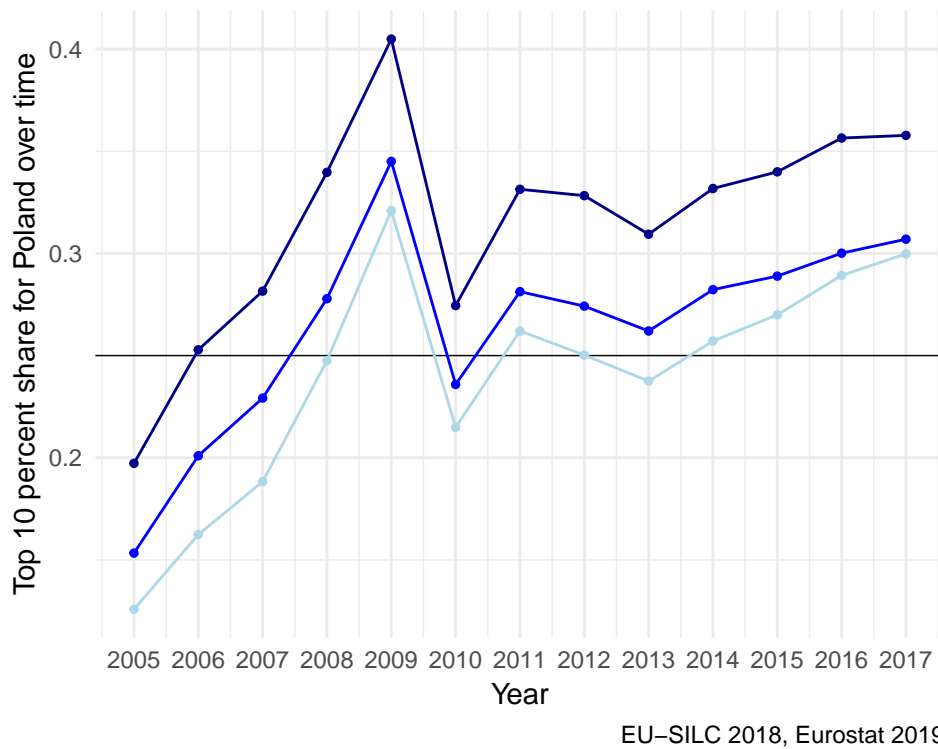


Figure 7: Depiction of the development of the total income share of the top 10 percent for all three income concepts over time for P1. Pre-tax factor income is dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

3.7 Determining Factors

As Brzeziński 2017 has pointed out, one main reason for wage dispersion is the relatively high university premium, which shows a decreasing trend over time. In order to test this proposition, we have estimated the mean effect of age, the highest educational attainment and gender on our three income concepts via OLS. We did this twice, for 2005 and 2013, in order to check for changes between these two points

in time. (Unfortunately, 2017 was not feasible due to a change in coding of the "highest education attained"-variable in 2014, PE040). We have run this regression only for P2, as this population concept only includes individuals of age 20 or older, and EU-SILC only provides values for variable P040 for persons of age 16 or higher.

The results of our analysis are shown in Table 6 and Table 7. As gender and the education variable are interacted, we have to keep in mind that the intercept stands for the base category *male * pre – primary*, and the values for all other categories build up on this base category. For example, a man with upper secondary education adds the coefficient of *uppersecondary* to the sum of the intercept and his age multiplied with *age* and *age*². A woman with pre-primary education adds *female* to the sum of intercept and the age-multiplied age coefficients, and a woman with tertiary education additionally adds the *tertiary*-dummy and *female * tertiary*.

Table 6: Determining factors for all three income aggregates in 2005

	<i>Dependent variable:</i>		
	Pre-tax factor (1)	Pre-tax national (2)	Post-tax disposable (3)
<i>age</i>	387.573*** (8.884)	268.232*** (8.839)	253.166*** (7.867)
<i>age</i> ²	−4.293*** (0.087)	−2.246*** (0.087)	−2.089*** (0.077)
<i>female</i>	431.439*** (158.434)	−137.487 (154.756)	−258.360** (128.174)
<i>primary</i>	−783.690*** (161.200)	−19.256 (159.087)	80.866 (131.132)
<i>lowersecondary</i>	−463.495** (211.211)	295.765 (211.117)	120.413 (270.595)
<i>uppersecondary</i>	903.169*** (164.178)	1,909.551*** (161.337)	1,596.083*** (135.121)
<i>postsecondary</i>	2,165.975*** (347.639)	3,093.466*** (343.926)	2,202.532*** (285.981)
<i>tertiary</i>	6,585.590*** (387.428)	7,828.283*** (380.794)	6,106.577*** (330.218)
<i>female</i> × <i>primary</i>	−708.317*** (169.216)	−552.042*** (166.955)	−545.919*** (139.154)
<i>female</i> × <i>lowersecondary</i>	81.698 (277.232)	410.061 (379.418)	562.585 (390.025)
<i>female</i> × <i>uppersecondary</i>	−1,883.600*** (169.327)	−1,375.949*** (165.899)	−1,278.790*** (138.382)
<i>female</i> × <i>postsecondary</i>	−1,416.692*** (396.729)	−641.037 (390.374)	−465.932 (330.945)
<i>female</i> × <i>tertriary</i>	−3,198.260*** (423.878)	−2,750.651*** (417.352)	−2,448.442*** (360.582)
<i>intercept</i>	−5,194.344*** (249.185)	−4,534.480*** (245.334)	−4,484.626*** (214.607)
Observations	35,098	35,098	35,098
Log Likelihood	−349,529.500	−349,261.000	−344,502.500
Akaike Inf. Crit.	699,087.000	698,550.000	689,033.100

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 7: Determining factors for all three income aggregates in 2013

	<i>Dependent variable:</i>		
	Pre-tax factor (1)	Pre-tax national (2)	Post-tax disposable (3)
<i>age</i>	546.463*** (12.994)	396.613*** (12.909)	334.482*** (11.581)
<i>age</i> ²	−6.060*** (0.123)	−3.539*** (0.122)	−2.852*** (0.109)
<i>female</i>	696.976* (399.235)	−969.672** (395.690)	−398.259 (317.382)
<i>primary</i>	−1,403.940*** (391.835)	−568.978 (381.854)	−269.310 (310.329)
<i>lowersecondary</i>	−1,446.771*** (425.703)	−229.453 (414.691)	−186.516 (352.380)
<i>uppersecondary</i>	724.137* (391.064)	1,969.069*** (378.925)	1,852.164*** (307.293)
<i>postsecondary</i>	1,943.506*** (531.345)	3,223.290*** (526.096)	2,785.555*** (428.832)
<i>tertiary</i>	6,456.593*** (477.537)	8,137.335*** (464.223)	6,715.549*** (385.781)
<i>female</i> × <i>primary</i>	−1,178.116*** (415.916)	−559.948 (412.795)	−781.947** (333.275)
<i>female</i> × <i>lowersecondary</i>	−861.490 (555.026)	536.954 (551.536)	240.191 (493.577)
<i>female</i> × <i>uppersecondary</i>	−3,430.541*** (409.966)	−2,008.930*** (406.652)	−2,339.025*** (327.649)
<i>female</i> × <i>postsecondary</i>	−2,918.570*** (580.843)	−1,218.899** (578.234)	−1,737.282*** (478.011)
<i>female</i> × <i>tertiary</i>	−3,976.897*** (519.291)	−2,578.248*** (513.369)	−2,848.267*** (425.529)
<i>intercept</i>	−6,191.714*** (479.654)	−5,346.796*** (470.332)	−4,916.882*** (397.790)
Observations	26,512	26,512	26,512
Log Likelihood	−269,563.500	−269,303.900	−265,776.200
Akaike Inf. Crit.	539,155.100	538,635.900	531,580.400

Note:

*p<0.1; **p<0.05; ***p<0.01

Our analysis shows indeed a very large university wage premium, especially for men: A man with

tertiary education had in 2005 a pre-tax factor income 6,586 PLN higher than a man of the same age with no education at all, and still 4,420 PLN more than a man of same age with a post-secondary education. For women, the respective values are 3,819 PLN and 2,638 PLN. The redistributive system is able to temper these extreme differences among educational groups (the respective values regarding the post-tax disposable income for men are 6,107 PLN and 3,904 PLN, and for women 3,400 PLN and 1,922 PLN), but they remain high. Also, there is a very high difference between men and women both before and after redistribution by the tax and social transfer system.

In 2013, the university wage premium relative to the intercept regarding the pre-tax factor income for men has slightly (6457 PLN) decreased, but regarding post-tax disposable income, it has even increased (6716 PLN). Same applies to women: The university wage premium relative to the intercept has decreased for pre-tax factor income (3177 PLN), but increased for post-tax disposable income (3469 PLN). One explanation for this phenomenon might be the poor redistributive performance of the Polish income tax system, which only has one progression step (PwC 2018). Of course, we also have to keep in mind that for P2 there is no individual taxation of incomes, presenting these premia in a very drastical light. Nonetheless, it has become clear that income inequality in Poland is indeed driven by gender and educational premia. Regarding the latter, this is in line with Gomułka 2016, who states:

It seems that the single most important factor is the rise in earnings inequality caused by increasing educational premia for highly-qualified workers employed in highly-skilled occupations coupled with the worsening of a relative position of workers employed in low-paying occupations. However, the improvement in the relative economic level indicator is so large that it justifies to call the period of the last 25 years a golden quarter century of the last three centuries of the Polish history based on GDP per capita, but it may be additionally supported by data on a substantial improvement in ecological indicators, much improved access of households and companies to the latest technologies for processing information, mass scale of travelling of Poles all over the world and a rise of life expectancy by about 10% (Gomułka 2016).

Smart policies aiming to decrease income inequality must also aim on these specific circumstances. Whether "500+" and the new minimum wage contribute to a more equal income distribution is unclear from this regression analysis.

4 Conclusions

Our results regarding the inequality are on par with Gęstwicki and Wędrowska 2016 which show declining divergence on the household level and Muszyńska, Oczki, and Wędrowska 2018 who reported a decrease in inequality between 2005 and 2014, considering the Gini and S80/S20 income share ratio. The median and mean income measures show a substantial increase since 2005, even considering the financial crisis and the following fall of income and slower growth rates in the aftermath, Poland has still managed to avoid stagnation.

From our estimation we can conclude that education is one of the main drivers for income dispersion. The differences between the lower educational levels are not that striking compared to the yield an individual will get with tertiary education, which matches with our key implication from the beginning, that the relative high university wage premium exists and leaves space for policy measures. The results regarding gender are also strong evidence for a gender pay gap in our estimation and is also conform with in the literature mentioned disparities between men and women and leaves potential for further investigation.

However, the findings presented in this study have to be treated with caution. As Brzeziński 2017 points out, survey data as the EU-SILC likely underlies a selection bias, because "*high-income earners are difficult to capture in surveys, a tendency that may be more pronounced in Poland than in wealthier EU countries*" and are therefore underrepresented. According to this, the author follows, the observed significant reduction in income equality between 2004 and 2007 is not credible, and matching tax-authority data for the same period - which includes high-income households in a representative quantity - shows no such reduction. However, as this period marked only the beginning of the EU-SILC surveys, chances are that later sets were controlled for this possibility by crosschecking other sources such as tax data (Brzeziński 2017).

5 Appendix

	Pre-tax factor	Pre-Tax National	Post-Tax Disposable
2005	2961.71	3976.82	3271.73
2006	3612.31	4786.54	3917.26
2007	4091.21	5358.35	4343.14
2008	4779.90	6117.61	4982.75
2009	5487.49	7021.10	5790.23
2010	4420.53	5714.26	4723.63
2011	4852.40	6134.69	5183.75
2012	4785.42	6037.02	5050.79
2013	4621.32	5892.13	4928.72
2014	4749.53	6035.03	5034.96
2015	4829.14	6175.72	5169.82
2016	5063.39	6441.61	5415.61
2017	5086.43	6441.96	5515.74

Table 8: Mean yearly income in 2015 PLN for all three income concepts for P2 (EU-SILC 2018, Eurostat 2019).

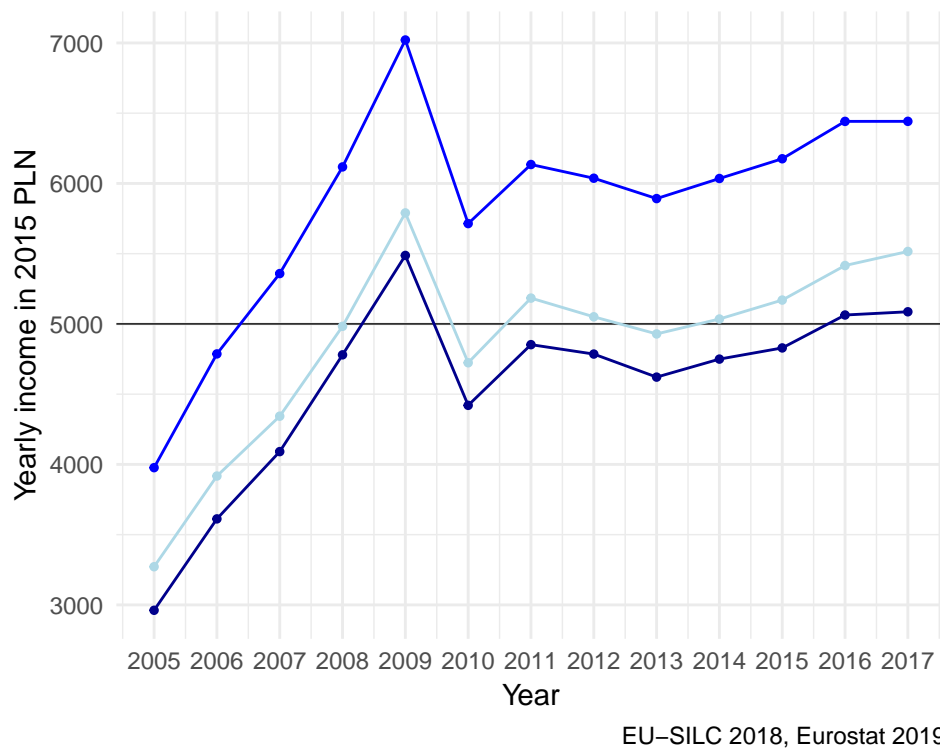


Figure 8: Mean income for all three income concepts over time for P2. As in Figure 1, pre-tax factor income is again dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

	Pre-tax factor	Pre-Tax National	Post-Tax Disposable
2005	2339.38	3533.09	3025.15
2006	3262.46	4648.04	3879.54
2007	3853.85	5290.07	4313.25
2008	4643.12	6115.87	4987.60
2009	5487.80	7032.77	5872.59
2010	4529.12	5866.49	4878.59
2011	4963.94	6466.17	5421.10
2012	4893.44	6315.53	5253.94
2013	4780.78	6233.28	5174.28
2014	4897.38	6387.94	5304.40
2015	5056.14	6575.39	5517.07
2016	5436.02	7017.61	5883.27
2017	5433.10	6935.93	5957.09

Table 9: Median yearly income in 2015 PLN for all three income concepts for P2 (EU-SILC 2018, Eurostat 2019).

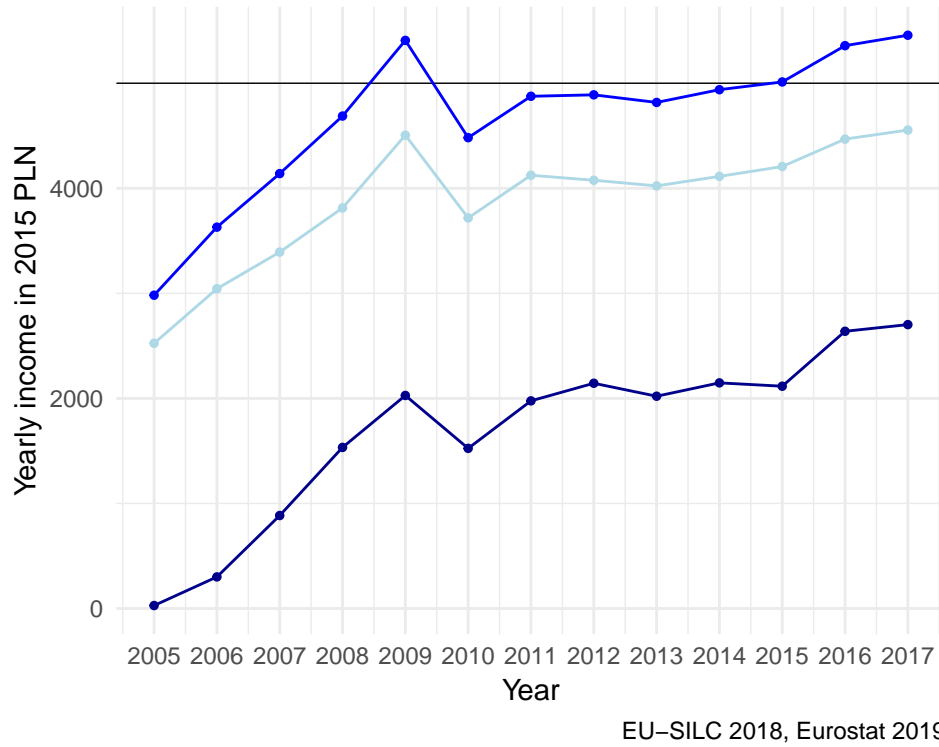


Figure 9: Median income in 2015 PLN for the three income concepts over time for P2. Pre-tax factor income is again dark blue, pre-tax national income is blue and post-tax disposable income is again light blue.

	Pre-tax factor	Pre-tax national	Post-tax disposable
2005	0.73	0.56	0.60
2006	0.71	0.55	0.57
2007	0.69	0.53	0.56
2008	0.68	0.53	0.56
2009	0.67	0.52	0.54
2010	0.67	0.51	0.54
2011	0.66	0.52	0.54
2012	0.66	0.51	0.53
2013	0.66	0.51	0.53
2014	0.66	0.51	0.53
2015	0.66	0.51	0.52
2016	0.65	0.50	0.51
2017	0.64	0.50	0.50

Table 10: Gini coefficients over time for all three concepts for P2 (EU-SILC 2018, Eurostat 2019).

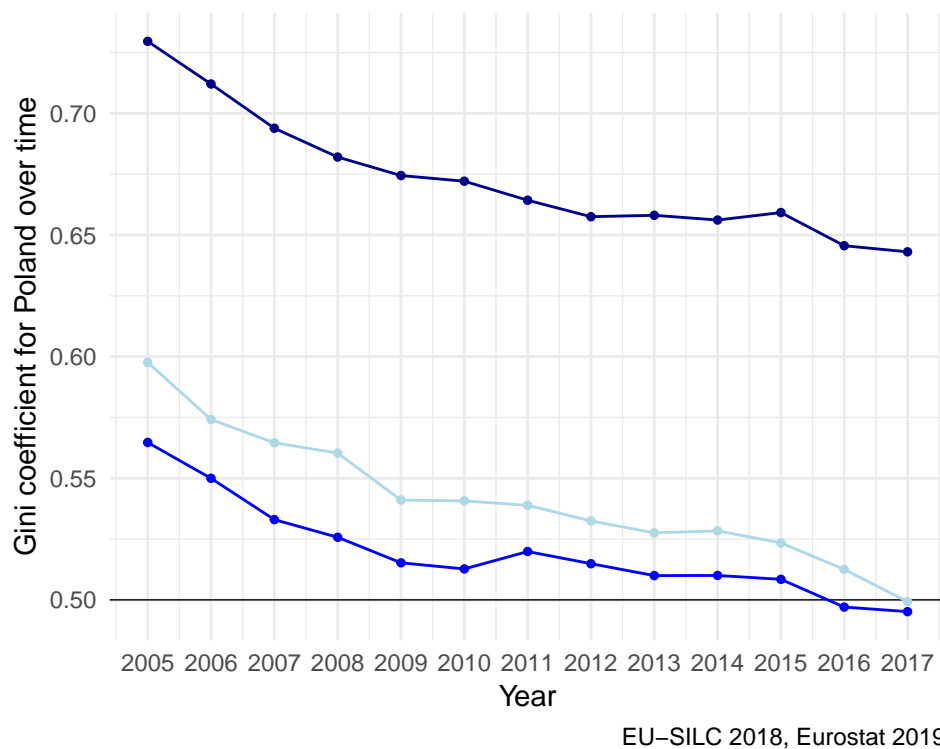
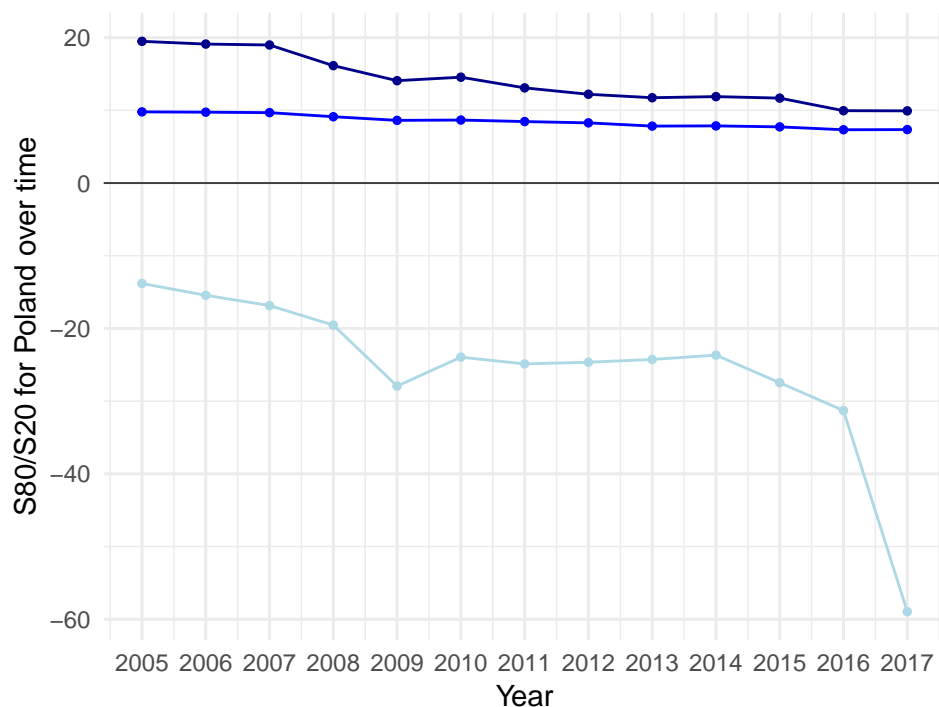


Figure 10: The development of the Gini coefficient for all three income concepts over time for P2. Pre-tax factor income is again dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

	Pre-tax factor	Pre-tax national	Post-tax disposable
2005	19.49	9.79	-13.81
2006	19.11	9.74	-15.44
2007	18.98	9.68	-16.85
2008	16.15	9.12	-19.55
2009	14.08	8.62	-27.93
2010	14.56	8.66	-23.95
2011	13.09	8.45	-24.87
2012	12.21	8.28	-24.65
2013	11.73	7.83	-24.27
2014	11.88	7.86	-23.67
2015	11.68	7.72	-27.47
2016	9.95	7.33	-31.29
2017	9.92	7.35	-58.95

Table 11: S80/S20 ratios over time for all three income concepts for P2 (EU-SILC 2018, Eurostat 2019).



EU-SILC 2018, Eurostat 2019

Figure 11: The development of the S80/S20 ratio for all three income concepts over time for P2. Pre-tax factor income is dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

	Pre-tax factor	Pre-tax national	Post-tax disposable
2005	0.31	0.23	0.23
2006	0.37	0.28	0.28
2007	0.40	0.31	0.31
2008	0.46	0.36	0.37
2009	0.53	0.43	0.43
2010	0.42	0.33	0.34
2011	0.44	0.36	0.37
2012	0.42	0.35	0.35
2013	0.41	0.33	0.34
2014	0.42	0.34	0.35
2015	0.44	0.35	0.36
2016	0.44	0.36	0.37
2017	0.44	0.36	0.37

Table 12: The total-income share of the top 10 percent over time for all three income concepts for P2 (EU-SILC 2018, Eurostat 2019).

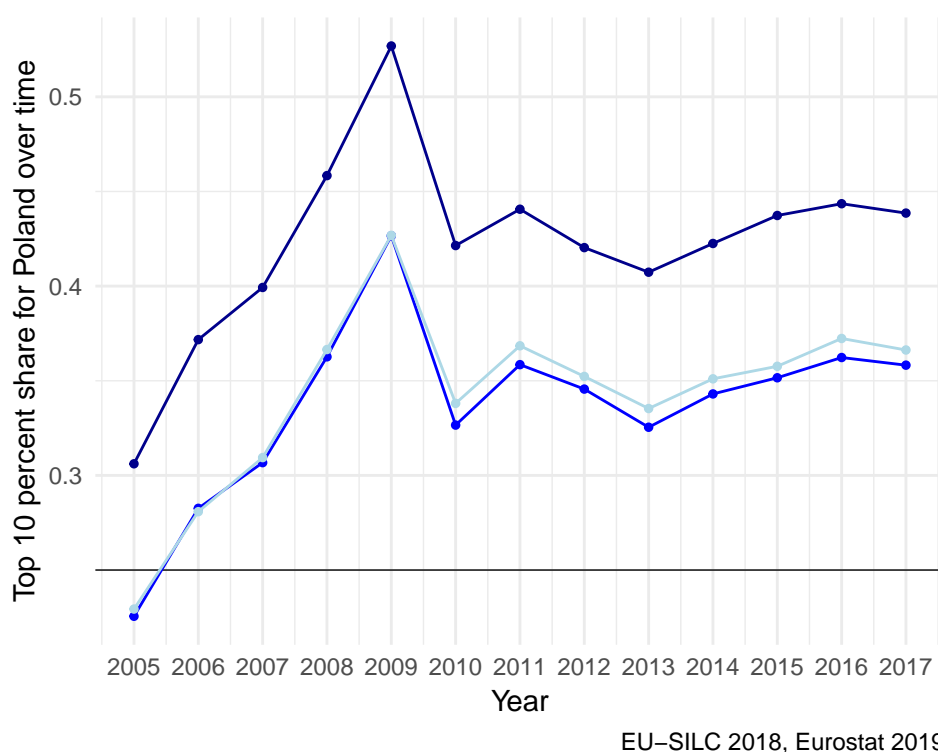


Figure 12: Depiction of the development of the total income share of the top 10 percent for all three income concepts over time for P2. Pre-tax factor income is dark blue, pre-tax national income is blue and post-tax disposable income is light blue.

6 References

- Bargu, A. and Morgandi, M. (2018). *Can Mothers Afford to Work in Poland: Labor Supply Incentives of Social Benefits and Childcare Costs*. The World Bank. DOI: 10.1596/1813-9450-8295.
- Brzeziński, M. (2017). *Is high inequality an issue in Poland?* Policy Paper 1/2017. Instytut Badań Strukturalnych.

- Chancel, L. and Gethin, A. (2017). *Building a global income distribution brick by brick*. Tech. rep. Wealth and Income Database.
- Eurostat (2018a). *EU statistics on income and living conditions (EU-SILC) methodology - private households*. URL: [https://ec.europa.eu/eurostat/statistics-explained/index.php/EU_statistics_on_income_and_living_conditions_\(EU-SILC\)_methodology_-_private_households#Reference_period](https://ec.europa.eu/eurostat/statistics-explained/index.php/EU_statistics_on_income_and_living_conditions_(EU-SILC)_methodology_-_private_households#Reference_period).
- (2018b). *Glossary:Equivalised disposable income*. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Equivalised_disposable_income.
- Gajewski, Pawel (2015). “Labour Market Measures in Poland 2008-13: The Crisis and Beyond”. In: *Geneva: ILO*.
- Gomulka, Stanisław (2016). “Poland’s economic and social transformation 1989–2014 and contemporary challenges”. In: *Central Bank Review* 16.1, pp. 19–23.
- Gęstwicki, F. and Wędrawska, E. (2016). “Assessment of the Degree of the Divergence and Inequality of Household Income Distribution in Poland in the Years 2005–2013”. eng. In: *Folia Oeconomica Stetinensia* 16.1, pp. 50–62. ISSN: 1898-0198.
- Houle, Christian (2009). “Inequality and Democracy: Why Inequality Harms Consolidation but Does Not Affect Democratization”. In: *World Politics* 61.4, pp. 589–622. DOI: 10.1017/S0043887109990074.
- Jędrzejczak, A. (2008). “Decomposition of the Gini Index by Sources of Income”. In: *International Advances in Economic Research* 14(4), pp. 441–447.
- Kośny, M. (2013). “Economic activity, saving, credit and income polarisation in Poland”. In: *Post-Communist Economies* 25(4), pp. 512–528.
- Lahti, Leo et al. (2017). *eurostat R package*. Version 3.3.1. URL: <https://journal.r-project.org/archive/2017/RJ-2017-019/index.html>.
- Letki, N., Brzeziński, M., and Jancewicz, B. (2014). “The rise of inequalities in Poland and their impacts: When politicians don’t care but citizens do”. In: *Changing Inequalities and Societal Impacts in Rich Countries: Thirty Countries’ Experiences*. Ed. by Brian Nolan et al. Oxford: Oxford University Press, pp. 488–513.
- Lewandowski, Piotr Magda et al. (2018). “The labor market in Poland, 2000- 2016”. In: *IZA World of Labor*.
- Magda, I., Kielczewska, A., and Brandt, N. (2018). *The “Family 500+” child allowance and female labour supply in Poland*. Policy Paper 1/2018. Instytut Badań Strukturalnych.
- Mitrus, L. (2010). “Anti-Crisis Regulations of Polish Labour Law”. In: *European Labour Law Journal* 1(2), 269 ff.
- Mrozowicki, Adam, Roosalu, Triin, and Senčar, Tatiana Bajuk (2013). “Precarious work in the retail sector in Estonia, Poland and Slovenia: trade union responses in a time of economic crisis”. In: *Transfer: European Review of Labour and Research* 19.2, pp. 267–278. DOI: 10.1177/1024258913480601. eprint: <https://doi.org/10.1177/1024258913480601>. URL: <https://doi.org/10.1177/1024258913480601>.
- Muszyńska, J., Oczki, J., and Wędrawska, E. (2018). “Income Inequality in Poland and the United Kingdom. Decomposition of the Theil Index”. eng. In: *Folia Oeconomica Stetinensia* 18.1, pp. 108–122. ISSN: 1898-0198. URL: <https://doaj.org/article/9c2b85461c8b48048307a05d2fad7959>.
- OECD (2013). *Glossary of Statistical Terms*. URL: <https://stats.oecd.org/glossary/detail.asp?ID=254>.
- PwC (2018). *Poland: Individual - Taxes on personal income*. URL: <http://taxsummaries.pwc.com/ID/Poland-Individual-Taxes-on-personal-income>.
- Ruzik, Anna and Rokicka, Magdalena (2010). *The gender pay gap in informal employment in Poland*. Center for Social and Economic Research.
- Strzelecki, P. and Wyszynski, R. (2016). *Poland’s labour market adjustment in times of economic slow-down - WDN3 survey results*. Working Paper 233. Narodowy Bank Polski.