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Dealing with Negative Observations While Calculating Inequalities – Examining Asset Declarations of Polish Parliamentary Deputies

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Abstract: Researchers and statisticians often face challenges when it comes to measuring inequalities of income, expenditure, and wealth. The aim of this paper was to draw attention to the problem of negative inputs, which are often ignored or treated as errors when measuring poverty and inequality. The paper presents the current state of proposals for normalising the Gini index in the presence of negative inputs, followed by a thorough data analysis of Polish parliamentary deputies' asset declarations for the year 2021. After a theoretical comparison of different Gini index normalisation methods, empirical results showed that even with a relatively small amount of negative values, differences between the normalisation methods are significant and need to be addressed. Two methods of decomposition of the Gini index are also shown to assess how inequality manifests itself between the political parties and how different inputs impact on the overall inequality. Hence, these decompositions show the influence of debts and liabilities on the Gini index.

Keywords: Gini index, inequalities, debt, negative values

1. Introduction

One of the main aims of measuring income, expenditure, wealth, etc. in some populations is to assess the inequalities in both standards of living and quality of life. The reduction of inequalities is one of the main policy goals policy of the European Union, however it is not certain which aspect is most suitable for this purpose. Income alone may not reflect the standard of living,

especially when a person has unique needs such as a disability or debts to be paid, yet individuals with savings may have a higher quality of life than could be simply a consequence of their incomes alone. Sometimes expenditures are taken into account, as allegedly better reflecting standard of living – which of course is true, but this level of standard of living may be very short-lived, driven by short-term loans. In recent decades, following the influential opus magnum by T. Picketty, the interest in wealth and capital is increasing.

Income is a representation of one's moment of financial situation that varies over time while wealth represents a history of inflows and outflows by accumulating outcomes of past decisions (Forrester, 1961, 1968). The high correlation between wealth and income inequality (Davies and Shorrocks, 2021; De Nardi and Fella, 2017) suggests that there might be a causal relationship between both of them. According to Osakwe and Solleder (2023), income inequality plays a significant role in driving extreme wealth inequality on a global scale, while in the developed countries it is the savings rate that matters. Based on data from 1995 to 2021, the pairwise correlation between the Gini indices for income and wealth inequalities is positive, with a value of 0.76 in the global sample, 0.86 in the developing countries sample and only 0.37 in the developed countries sample.

Nonetheless, wealth and incomes do not contribute in the same way to the level of social inequality – it seems that in an economic crisis one's well-being is based not on income, but rather on wealth (Skopek et al., 2014). This fact became much more relevant after the COVID-19 pandemic, when interest rates hiked in advanced economies, food and energy prices also increased, which in turn exacerbated the problem of inequality between the rich and the poor (World Bank, 2022).

Using consumption as a measurement of economic inequality could potentially be a better approach. Consumption can be expressed as an accumulation of assets (wealth) and access to credit (due to the level of income). The level of consumption is a choice depending on past, current and future income (Norris and Pendakur, 2015). Consumption also reflects the loss in wealth if asset values fall and it is more likely to be affected by government transfers – aspects that income approach could miss. Furthermore, consumption has been shown to be more correlated with other indicators of economic well-being than income (Meyer and Sullivan, 2003), which is usually underreported in surveys. At the same time, there are some concerns with data quality and categories in which consumption is commonly undisclosed such as alcohol, tobacco and jewellery (Bee et al., 2015). To avoid this, Meyer and Sullivan (2017) suggested focusing on the rental value of housing and vehicles or fuel and food expenses as categories that are well-measured and equally important across households.

The second problem to address, apart from the aspects to be taken into consideration – income, expenditures or wealth – is the status of the negative inputs; these are often ignored, as historically they were simply errors in data. Nowadays, however, both income and wealth can be negative, as shown in (Hlasny et al., 2021) that in a sample of 354 datasets of the Luxembourg Income Study for 2019, 65% contained negative disposable household incomes. In addition, the mean negative income was as large in absolute value as 754% of the national mean positive income. Such high numbers indicate that those observations should no longer be neglected.

Additionally, a study using data from 15 European countries (EU-15) estimated the positive impact of private sector credit growth on income inequality (Jianu, 2017). Similarly, Gulsah Topuz and Lore Obiero (2022), based on a study on internal and public debt on income inequality in Kenya from 1970-2018, suggested that the correlation between debt (both public and internal) and inequality is positive and significant in the long run. Moreover, Wood (2019), in measuring the effects of changes in household debt on income inequality in Great Britain between 1966 and 2016, found that household debt contributed to inequality by increasing the share of income at the top of the distribution, while reducing the concentration of income in the middle of the scale. These studies demonstrate the importance of taking into account personal and public debt when measuring inequalities and further show how important it is to treat negative values appropriately.

In the approach to measure inequality of wealth, the liabilities are usually simply subtracted from gross personal wealth to give net personal wealth (Picketty, 2016). Yet, this method may be questioned as it does not fully capture the complexity of a household's financial situation. In other words, is a person with a one-billion-dollar property and a one-billion-dollar mortgage to be paid in 20 years in the same situation and has the same standard of living as a person who has no property and no debts?

The other question regarding negative inputs to total wealth (and not only wealth) is more technical. It is known that most frequently used measure of inequality – the Gini index – is normalised in the interval [0,1] only in the absence of negative values. The lack of normalisation is a serious disadvantage, as it makes it impossible to compare values for different populations/ different periods. Thus, the question arises of how to overcome this problem.

The aim of the paper is not to fully answer the question, but rather to demonstrate these difficulties and examine some possibilities of solving them.

The next section presents the current state of proposals of normalising the Gini index in the presence of negative inputs. The following sections present the data for Polish parliamentary deputies' asset declarations to show the differences in approaches to normalisations, as well as some dependencies between wealth and debt.

2. Data

The authors concentrated on the income and wealth inequalities of Polish parliamentary deputies of the 9th term. Asset declarations are obligatory for deputies and publicly available on the Polish Sejm (Parliament) website (Sejm…, 2022). The study used data on asset declarations from the third year of the 9th term of office (2019-2023) of all (460) deputies.

The following items can be found the in the asset declaration:

a) monetary assets (PLN),
b) monetary assets (other currencies),
c) value of securities,
d) value of owned properties,
e) contributions to companies,
f) money borrowed,
g) income from investments in companies (before tax),
h) income from business activity (before tax),
i) income from a role in a commercial company/foundation and associations (before tax),
j) parliamentary emolument (before tax),
k) parliamentary allowance + other income (before tax),
l) total monetary liabilities.

Not all the declarations were fully consistent and sometimes information was missing about the degree of division of an asset, and this led to the problem of how to approach such statements. It was decided as follows: if the value for a given variable (category) contains information about the degree of division 1/n or information about the community property state (marriage), this value is divided by n or 2; otherwise this value is unchanged. Thus, there may be an underestimation regarding non-declaration of spouses' assets and divided assets.

Many of asset declarations were handwritten, making it more vulnerable to possible errors while collecting the data. Moreover, some interpretation issues occurred with "monetary liabilities", where many deputies had written the initial loan amount to be repaid and some only what they had left to pay.

It is also worth mentioning:

a) the values of the "foreign currencies" and "monetary liabilities" in foreign exchange categories were converted into PLN based on the appropriate exchange rate of the National Bank of Poland on April 29, 2023;
b) members' party affiliation was consisted with the data collection period (March/April 2023);
c) each deputy's age was calculated based on the date of declaration;
d) N/A was treated as zero.

Finally, the authors took into account the following categories:

a) Wealth = "monetary assets (PLN)" + "monetary assets (other currencies)" + "value of securities" + "value of owned properties" + "contributions to companies" + "money borrowed";
b) Income = "income from investments in companies (before tax)" + "income from business activity (before tax)" + "income from a role in a commercial company/foundation and associations (before tax)" + "parliamentary emolument (before tax)" + "parliamentary allowance + other income (before tax)";
c) Total debt = "total monetary liabilities".

3. Normalisation of the Gini index in the presence of negative observations

Some measures of inequality – e.g. the Theil index and the Atkinson index – are inapplicable in the presence of negative observations (as there do not exist logarithm or fractional powers of negative values, within real numbers). However, there are no problems with inserting negative values into the formula of the Gini index, either in the original form:

$$G = \frac{1}{2n^2\bar{x}} \sum i,j \left| x_i - x_j \right|, \tag{1}$$

where n is the number of people for whom inequality is counted, $\bar{x}$ is the average wealth and x_i and x_j are the values of the assets of the two people currently being compared, or in the more frequently used form, which requires non-decreasingly ordered observations:

$$G = \frac{1}{n^2\bar{x}} \sum_{i=1}^{n} (2i - n - 1) x_{(i)}, \tag{2}$$

where *x(i)* denotes observations ordered in non-decreasing order.

For all values being non-negative, the Gini index is normalised between 0 and 1. Zero means that the goods are perfectly evenly divided, and maximum inequality is achieved by transferring all goods to one person. Maximum value is equal to 1 – (1/n) for a finite population, and this upper bound tends to 1 with infinite population.

However, in the presence of negative observations, this property (normalisation) does not hold any more. As the value of the Gini Index is equal to the doubled area between the Lorenz curve and the line of equal distribution having observations with different signs, the Gini index can reach arbitrarily high values (see illustration for positive total sum in Figure 1).

As the lack of normalisation made it difficult to compare inequalities both in space and time, there was a need to adopt some normalisation procedure.

The first standardisation proposal was by Chen, Tsau and Rhai (Chen et al., 1982), further corrected by Berrebi and Silber (Berrebi and Silber, 1985) (abbreviated by CTR-BS in what follows). This idea was based on comparing the area defined by the Lorenz curve and the line of equal distribution to the area of the Lorenz curve segment under the OX axis, and then to the remaining part of the triangle used in classical normalisation (see Figure 2).

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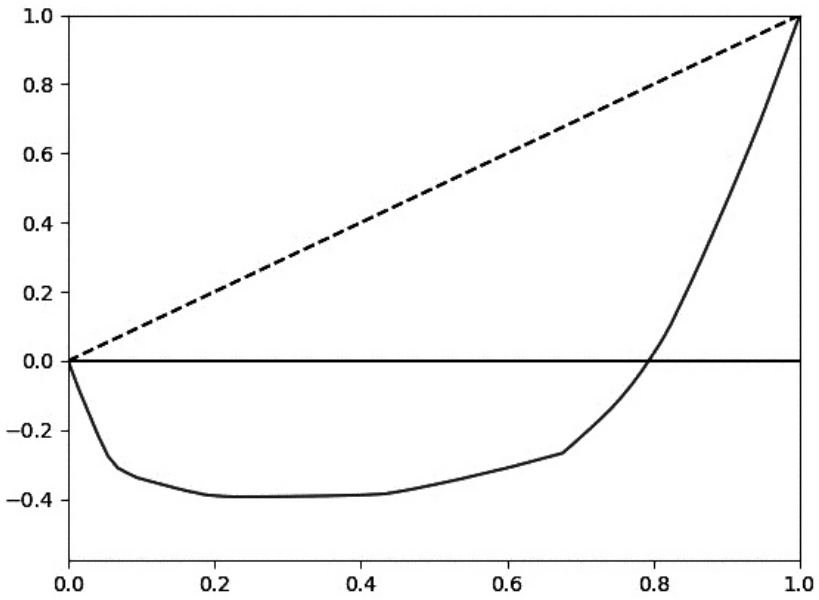

Fig. 1. Lorenz curve with negative values

Source: own work based on artificial values.

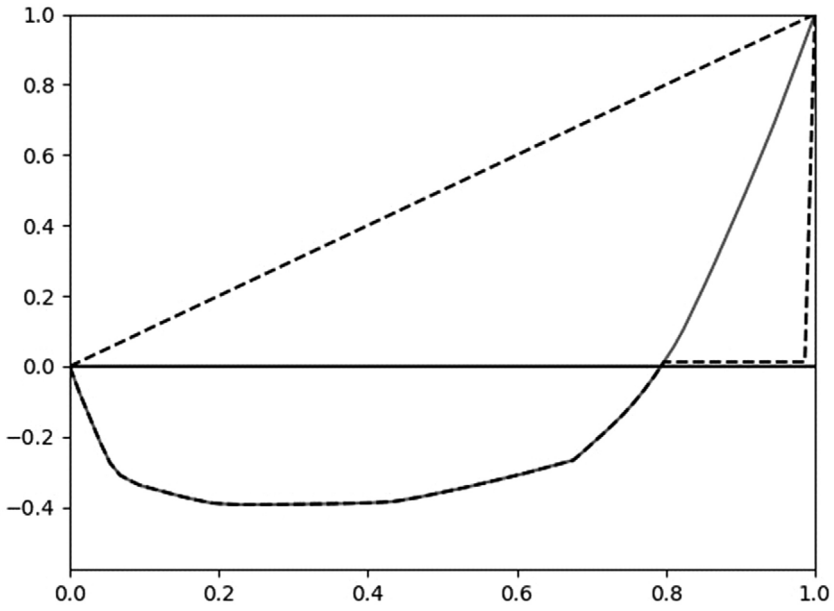

Fig. 2. CTR-BS normalisation

Source: own work based on artificial values.

However, the curve of the reference (dashed line in Figure 2) does not have a Lorenz character as there is a non-increasing segment following the increasing segment.

Instead of using the formula for normalising, one may proceed as follows: simply calculate the maximum possible inequality (represented by the dashed line in Figure 2), and divide the actual inequality by this maximum possible value (maximum, in the given situation, and defined by CTR-BS). This maximum is obtained by transferring all the wealth which remains after "compensation for the negative values" to the one person (if necessary, one person that stays at

the border of "compensation" may be divided into two fictional persons) and after that transfer by calculating the Gini index in the standard way.

In order to regain the Lorenz character of the reference line, RSV modification was proposed (Rafinetti et al., 2015). The idea is based on changing the order of the increasing and nonincreasing parts of the reference line, see Figure 3.

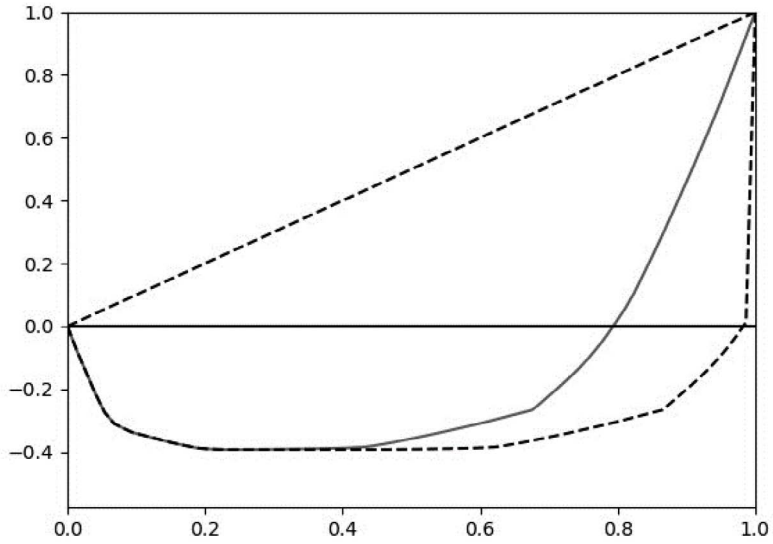

Fig. 3. CRT-RSV normalisation

Source: own work based on artificial values.

Yet again, instead of using the formula, one may obtain the normalised value by dividing the actual value by the maximum, as defined by the RSV procedure. To this aim, one again transfers – as above – all the wealth that remains after "the compensation for the negative values", but after that reordering the zero observations and positive observations.

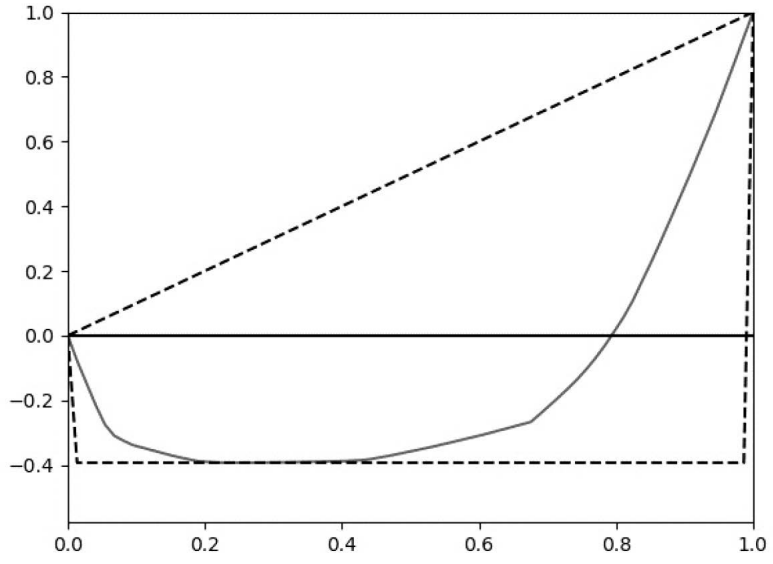

Fig. 4. RSV normalisation

Source: own work based on artificial values.

It could argued that such transfers do not necessarily represent the greatest possible inequality, as why should one increase inequality only by transfers from those above a fixed point to the richest one, leaving those below that point in an unchanged condition? The principle of transfers states that inequality would be greater if wealth was also taken away from other people with a positive value of wealth. Similarly, in the case of deepening debt in favour of the most indebted, this should also lead to greater inequality.

Probably a more intuitive concept of maximum inequality is to transfer all positive values to one person (as in the case of only positive observations), and all the negative values to another person. The proposal that all transfers that increase inequality are allowed – on condition that the total sums of negative and positive values are fixed – was described by Rafinetti, Siletti and Vernizzi (Ostasiewicz and Vernizzi, 2017). The reference curve that defines the area being the normalisation factor, is pictured in Figure 4.

Once again, instead of using the formula, one may just calculate the Gini index after transferring all the negative values to one person and all the positive values to another person, all the remainder stay with nothing. However, in this case the normalising factor can be obtained in a very simple form:

$$\frac{(n-1)(S_a + S_n)}{n(S_a - S_n)}, \tag{3}$$

where S_n is total debt and S_a is total wealth,

and in the case of transition to the infinite population, this maximum value is equal to:

$$G_{max} = \frac{S_a + S_n}{S_a - S_n}. \tag{4}$$

4. Results

As a reminder, in the following section, Wealth, Income and Total debt are defined as follows:

Wealth = Monetary Assets (PLN) + Monetary Assets (Other currencies) + Value of securities + Value of owned properties + Contributions to companies + Money borrowed.

Income = income from investments in companies (before tax) + income from business activity (before tax) + income from a role in a commercial company/foundation and associations (before tax) + parliamentary emolument (before tax) + parliamentary allowance + other income (before tax).

Total debt = Total monetary liabilities.

The basic statistics for Wealth, Income and Total debt are presented in Table 1.

Table 1. Basic descriptive statistics for deputies' Wealth, Income and Total debt

	Mean	Standard deviation	Coeffcient of variation [%]
Wealth	1133371.93	2491874.12	219.86
Income	230240.07	203165.84	88.24
Total debt	189905.90	517213.14	272.35

Source: own work based on data from deputies' asset declarations for 2021.

Obviously, the coefficient of variation of income is the lowest one, as the allowance is regulated by law and a high number of the parliamentary deputies declared incomes derived only from their work in the Sejm.

The linear correlation between Wealth and Total debt was 0.637. It seems that – as mentioned previously – great wealth 'goes together' with great debts. The correlation between Income and Total debt was 0.258, which is significantly lower than that between Wealth and Total debt.

Figures 5 to 7 present Lorenz curves for Wealth, Income and Total debt. The corresponding Gini indexes for them were as follows: GI(Wealth) = 0.562, GI(Income) = 0.240 and GI(Total debt) = 0.758. The GI for Income was lower than the Gini index for the whole of Poland in 2021 at 0.319 (GUS, 2022). This is not surprising, since most of the deputies declared only income from their work as government officials and their salaries are regulated. The Gini index for Total debt was very high. It is worth noting that 172 deputies, i.e. over a third of the total number, declared no liabilities.

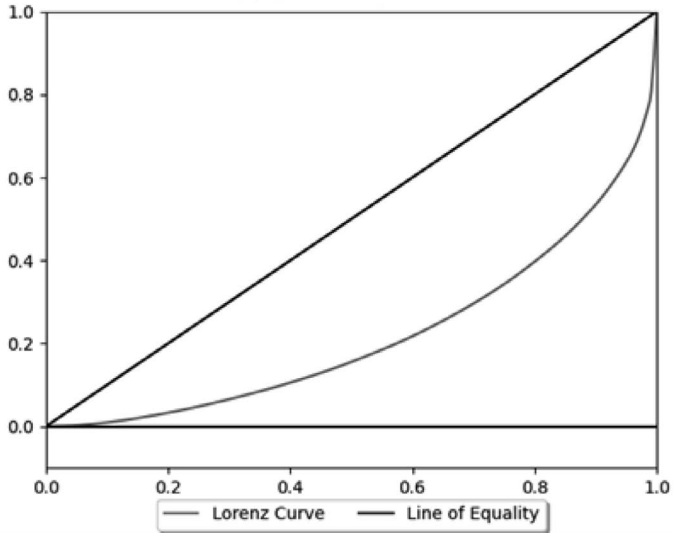

Fig. 5. Lorenz Curve for deputies' Wealth

Source: own work based on data from deputies' asset declarations for 2021.

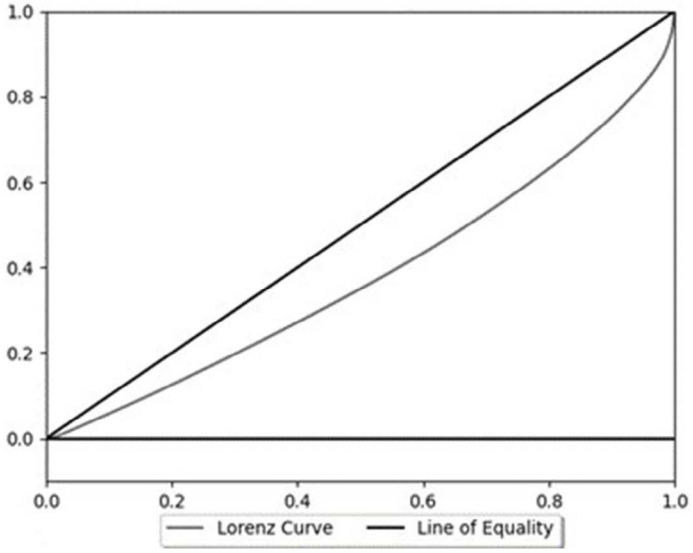

Fig. 6. Lorenz Curve for deputies' Income

Source: own work based on data from deputies' asset declarations for 2021.

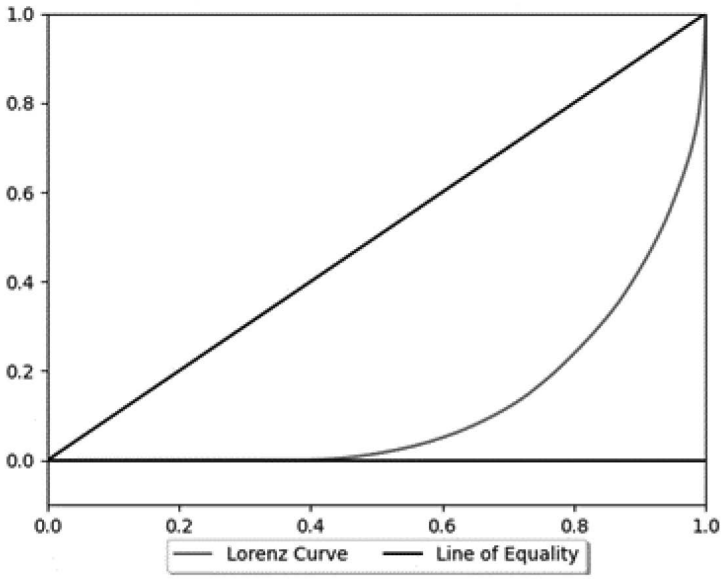

Fig. 7. Lorenz Curve for deputies' Debts

Source: own work based on data from deputies' asset declarations for 2021.

It was interesting to investigate the impact of incomes on the inequality of the total quantity being the sum of wealth and yearly incomes. As the Gini index for incomes was lower than for wealth it can be suspected that this source lowered the total inequality. However, it is important how incomes are arranged with respect to the order of wealth (and the total quantity). Even the source with a lower Gini index can increase the total inequality if this source is arranged the same as the other source of inequality. The Gini correlation is the measure that quantifies the rank correspondence of different sources and the total value.

$$R_u \equiv \frac{\mathrm{cov}(x_u, r)}{\mathrm{cov}(x_u, r_u)}, \tag{5}$$

where: R_u represents Gini correlation, normalised within <–1;1> range, r is the rank vector of the total quantity, x_u is the vector of values of source u, r_u is the rank vector of source u.

Concentration index:

$$C(x_u|r) = \frac{1}{\overline{x_u}} \cdot \mathrm{cov}(x_u, r) = G_u \cdot R_u, \tag{6}$$

is the quantity to be compared with the total Gini index in order to judge if the given source is increasing or decreasing the total inequality.

$$\sum_{u=1}^{w} \frac{\overline{x_u}}{\bar{z}} (C(x_u|r) - G) = 0, \tag{7}$$

where: $C(x_u \mid r)$ is the concentration index for the u source, G is the Gini index for the sum of all sources, G_u is the Gini index for source u, $\bar{z}$ is the average of the total quantity, $\overline{x_u}$ is the average of source u.

It is obvious that each source that has the same value for all the individuals decreases inequality. That is the conclusion from (7) above (concentration equal to zero, thus, the input to the sum is

negative) but also it is known that after shifting the whole distribution to the higher values the Gini index decreases. However, although parliamentary deputies' pensions are fixed, not all their incomes are strictly the same (the Gini index at 0.240), it is not obvious what is the impact of this source.

Figure 8 presents the Lorenz curve for the sum of Wealth and Income and the concentration curves (the counterpart of the Lorenz curve but for component quantity ordered according to the ranks of the total quantity). The picture suggests that Income to some degree compensates for Wealth, and as a consequence lowers the inequality of the sum of these two sources.

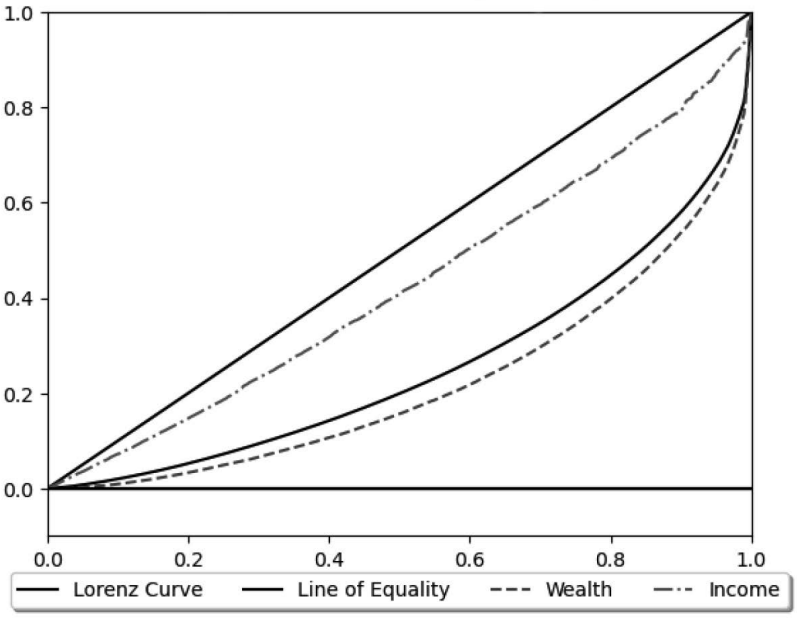

Fig. 8. Inequalities of deputies' Wealth and Income

Source: own work based on data from deputies' asset declarations for 2021.

To calculate the inequality of Wealth including debt, i.e. after subtracting Total debt, one faces the problem of negative values. Only 35 out of 460 total observations were negative, however they should not be neglected. Putting zeros instead of negative values provided the Gini index at 0.616. By including those negative values (without applying any kind of normalization) one obtains 0.640. Using different ways of normalisation, one still arrives at different values (differences up to the third decimal point). The CRT Correction produced a GI equal to 0.639, modified CRT – 0.624, and RSV – 0.622 (see Table 2). This shows how much negative values can influence the Gini index and also how the normalisation method matters. As discussed in the previous section, CRT always gives the highest value, while RSV is the lowest as observed in the results for Polish parliamentary deputies.

Next, taking into account only "Value of owned properties" as deputies' wealth and lowering it by their Total debt, the number of negative values was 50, hence slightly less than 11%, but the differences became much bigger. Turning negatives into zeros resulted in GI = 0.669, CRT with GI at 0.714, modified CRT – 0.684, and RSV – 0.679, with non-normalised GI equal to 0.726 (see Table 2). Now the difference between the normalisation methods is clearly visible. The plots for second example, as then they are more apparent, are shown below in Figure 9.

Both examples show clearly that the way of normalisation in the case of negative observations plays a significant role and it would be of purpose to adopt the common way of normalising to avoid misinterpretations.

Table 2. Comparison between values of GI for different normalisation methods

Normalisation method	GI for Wealth reduced by Total debts	Value of owned properties reduced by Total debt
None	0.640	0.726
Turning negatives into zeros	0.616	0.669
CRT	0.639	0.714
Modified CRT	0.624	0.684
RSV	0.622	0.679

Source: own work based on data from deputies' asset declarations for 2021.

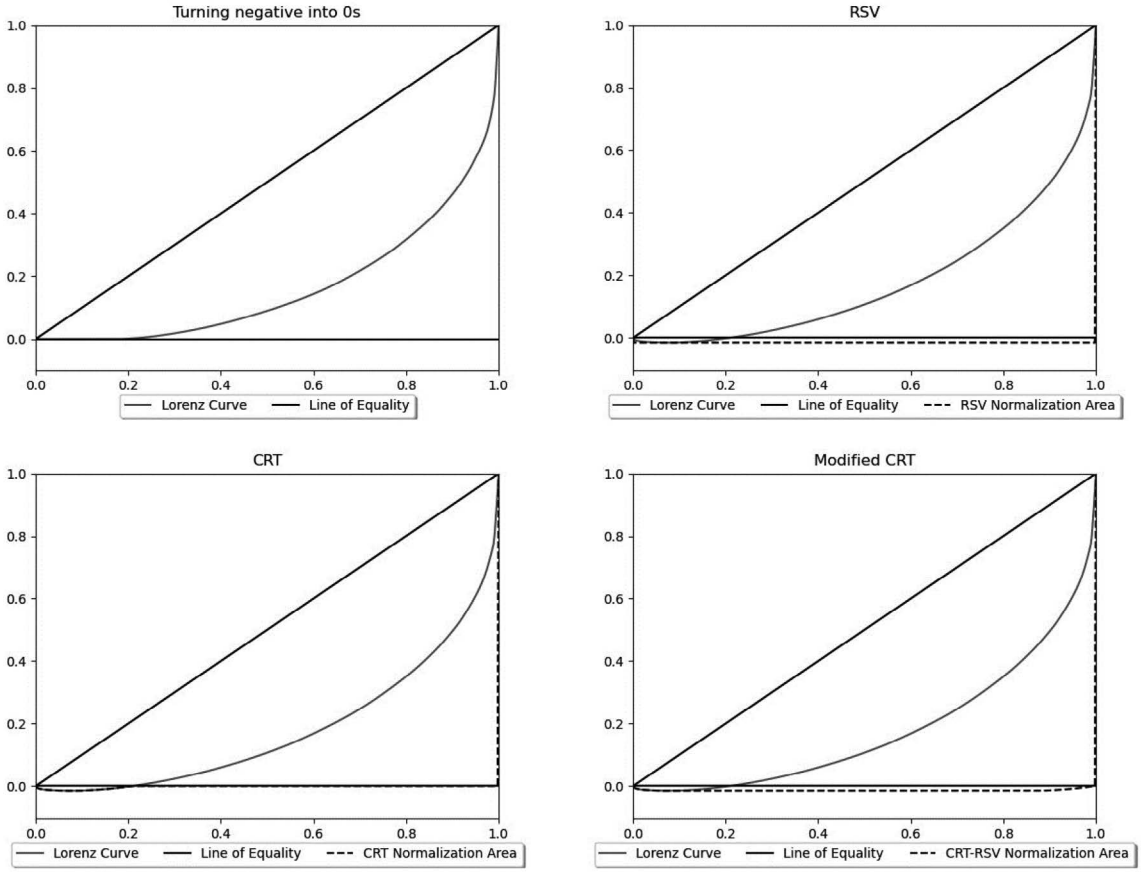

Fig. 9. Combined plot to compare different GI normalisations methods

Source: own work based on data from deputies' asset declarations for 2021.

Let us decompose the total inequality (of Wealth – Total Debts) with respect to political parties (parliamentary clubs). There are 11 political parties, the biggest one – PiS – with 228 members, and the second biggest one – KO – with 126 members. The mean values, number of deputies and the Gini index for each of those are given in Table 3.

The Gini index for each party was again calculated based on Wealth and Total debt with the RSV normalisation method to combat adjusting for negative values. The inequalities differed noticeably from one party to another, with Kukiz '15 having the lowest at above 0.152, and Konfederacja the highest, over 0.810. There seems to be no correlation between the number of parliamentary deputies and inequality.

Table 3. Comparison of means, Gini indexes and number of deputies between parties in the Sejm

Party	Mean	Gini index	Number of deputies
KO	1252133.02	0.612	126
PiS	726652.43	0.595	228
LD	3386986.51	0.262	3
Koalicja Polska	762491.61	0.548	24
Konfederacja	707765.10	0.810	12
Kukiz ,15	1131656.96	0.152	3
Lewica	843918.51	0.508	44
Niezrzeszeni	3521040.12	0.786	7
Polska 2050	839500.96	0.447	6
Polskie Sprawy	287123.55	0.616	3
Porozumienie Gowina	630469.24	0.194	4

Source: own work based on data from deputies' asset declarations for 2021.

The study decomposed the total inequality for between groups terms, within group, and overlapping terms. The Gini index was normalised with the RSV method in this decomposition. The total Gini index was 0.622, the inequality within groups contributing 0.180 to it, and that between groups – I 0.176, while the overlapping term was 0266. Thus, the overlapping term had the highest impact, which suggests that there was not much difference in wealth between the parties, and that belonging to any particular party does not have to imply being richer or poorer.

Now, let us proceed to decompose the inequality of the material status of the deputies with respect to sources, based on the concentration curves of particular inputs. The inputs taken into account were: Monetary Assets in PLN and Other currencies, Value of securities, Value of owned properties, Contributions to companies, Total monetary liabilities and Money borrowed, thus they were decomposed based on the individual inputs that made up the Wealth and Total debt above. The inputs of all the sources are given in Table 4 below.

As can be seen, the increasing influence on inequality came from Total monetary liabilities, however the lowered influence on inequality was due to Monetary Assets (PLN) and Value of owned properties.

Table 4. Decomposition of GI for Wealth lowered by Total debt with respect to inputs

	Monetary Assets (PLN)	Monetary Assets (Other currencies)	Value of securities	Value of owned properties	Contributions to companies	Total monetary liabilities	Money borrowed
Influence	P	P	p	P	p	n	P
Weight (W)	0.147878	0.032089	0.079668	0.918508	0.020282	0.201285	0.002862
Concentration (C)	0.337031	0.707439	0.652506	0.541401	0.927573	0.014767	0.852265
C-GI	-0.303054	0.067355	0.012421	-0.098683	0.287489	-0.625317	0.212181
W*(C-GI)	-0.044815	0.002161	0.000990	-0.090641	0.005831	-0.125867	0.000607
Adjusted	-0.044815	0.002161	0.000990	-0.090641	0.005831	0.125867	0.000607

Source: own work based on data from deputies' asset declarations for 2021.

Figure 10 below presents all the concentration curves compared to the Lorenz curve of the total quantity.

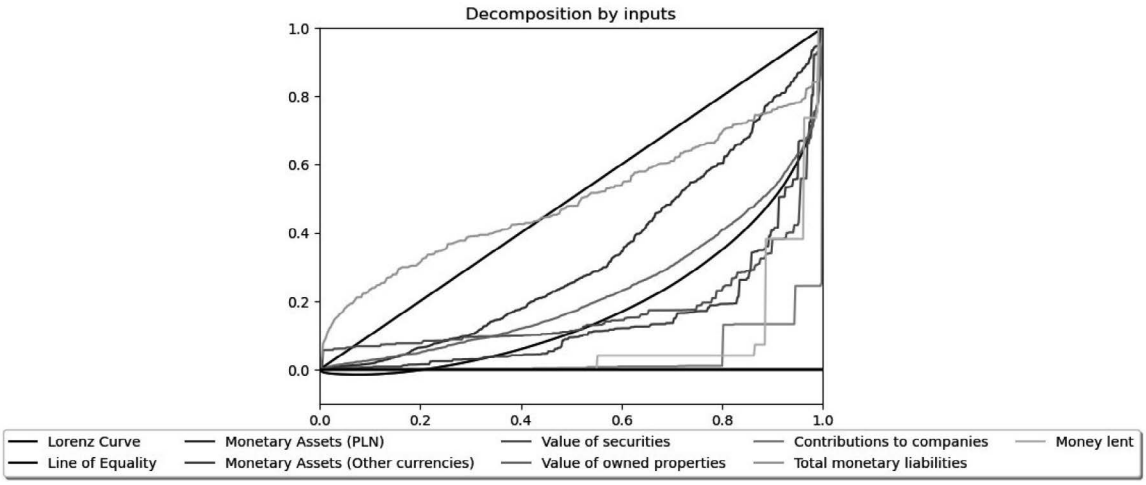

Fig. 10. Decomposition by inputs of deputies' Wealth lowered by their Total debts

Source: own work based on data from deputies' asset declarations for 2021.

For clarity, some important sources were selected and presented separately.

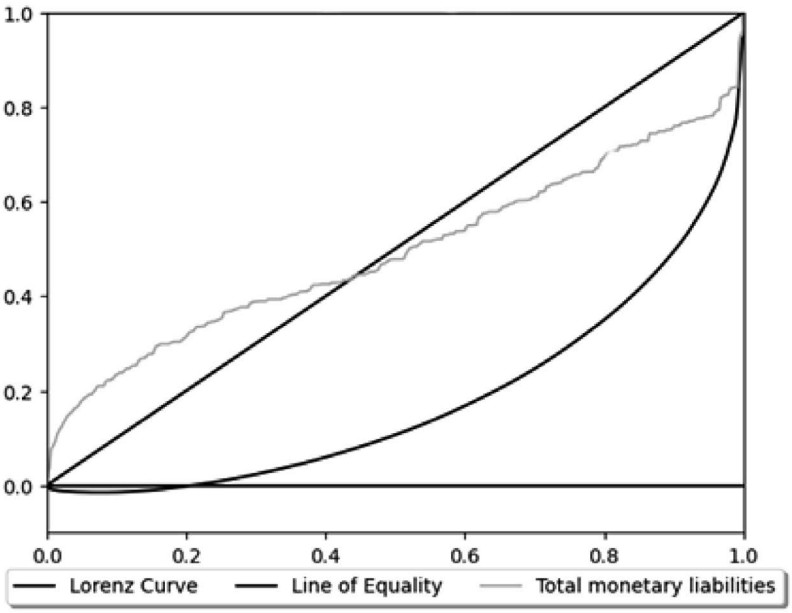

Fig. 11. Impact of Total monetary liabilities on overall inequality between deputies

Source: own work based on data from deputies' asset declarations for 2021.

Figure 11 presents the concentration curve for Total monetary liabilities as compared to the Lorenz curve. The impact of the liabilities on the total inequality can be traced in detail. As already shown (Table 4), the summary impact of the liabilities on the total inequality was positive. However, a detailed examination showed that up to 40% of the population (ordered according to the total quantity) liabilities were in the reverse order (a concentration curve above the line of equal distribution). This means that the richer the person overall, the lower his/her liabilities, and that debts increase the total inequality. However, for the 60% of the richest, the liabilities were ordered in the same way as the total wealth, i.e. the richer persons are richer at the cost of their higher debts, and in that range the impact of liabilities decreased the total inequality. Those two

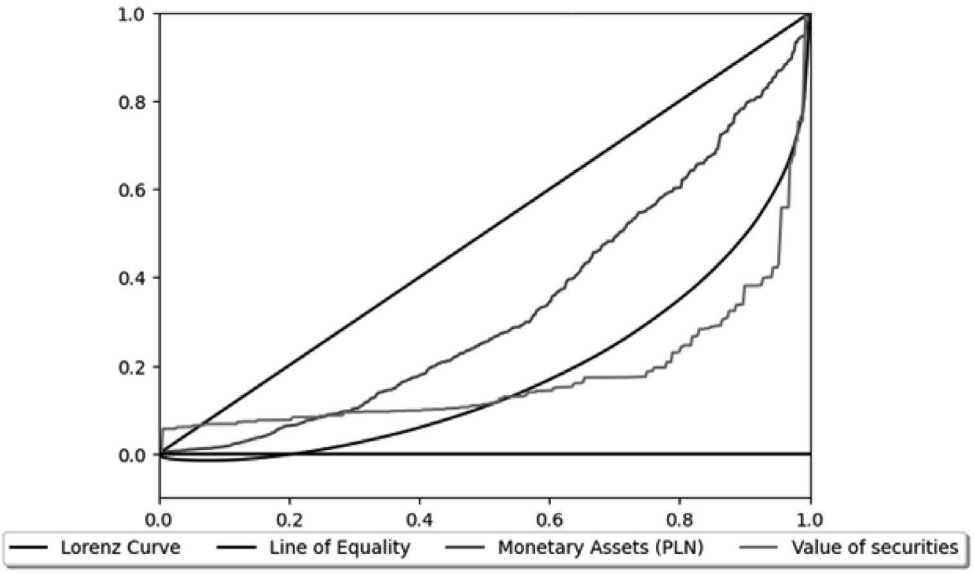

Fig. 12. Impact of Monetary Assets and Value of securities on overall inequality between deputies

Source: own work based on data from deputies' asset declarations for 2021.

opposing effects resulted in a positive impact on total inequality. It is worth mentioning that the 40th centile of the whole group corresponded to 400 000. Figure 12 also shows concentration curves for Monetary Assets (PLN) and Value of securities. The former for the whole range is situated above the Lorenz Curve thus, in the whole range it reduced the total inequality. The latter, however, has a two-way effect: in the lower range (up to the 50th centile) it lowered inequality, however, above 50%, it started to increase the inequality. Both effects nearly cancelled out each other as the total impact was almost zero (see Table 4).

5. Summary and Conclusions

As debt in the contemporary world is no longer an exception but rather a standard way of planning financial life strategy, liabilities cannot be ignored anymore – or turned into zero – I in calculations of inequalities. However, there are two main issues regarding those aspects.

The first one, more technical, is how to normalise the Gini index in the presence of negative observations. The authors showed that the choice of the normalizing method may play a significant role in having a considerable impact on the result and its interpretation.

The other question was how to treat debt. Should one subtract liabilities from the assets? It is clearly understood that having high-valued property and paying loan instalments means quite a different quality of life than having nothing and living in a shack. Therefore, perhaps some more advanced methods of assessing inequalities in standard of living with the presence of loans – e.g. multidimensional approaches – should be applied. For the groups of Polish parliamentary deputies it was shown that the total inequality in the state of their possessions was decreased by debts in the lower part of the distribution, and increased in the upper part. Certainly, the loans may be used not only for buying a property – which in itself refers to a higher standard of living – but also to make more money, for instance in the case of investment loans. Most probably, small debts in the very lowest parts of population distribution (referring to the total population of the country) reflect consumer credits and are used for daily needs. On the other hand, one may presume that large loans of well-to-do persons reflect their high abilities to repay them, thus the high incomes, and are used either for buying luxurious goods and/or for investments. Therefore, it

seems that the treatment of loans and debts is not straightforward either from a conceptual (just subtracting it from the possessions?), or the technical (normalisation) point of view.

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ŚLĄSKI PRZEGLĄD STATYSTYCZNY

Nr 20-21(26-27)

Radzenie sobie z obserwacjami ujemnymi przy obliczaniu nierówności – badanie oświadczeń majątkowych polskich posłów

Streszczenie: Badacze i statystycy często stają przed wyzwaniami, jeśli chodzi o pomiar nierówności dochodów, wydatków i bogactwa. Celem artykułu jest zwrócenie uwagi na problem negatywnych nakładów, które często są ignorowane lub traktowane jako błędy w pomiarze ubóstwa i nierówności. W tekście przedstawiono aktualny stan propozycji normalizacji współczynnika Giniego w obecności negatywnych danych wejściowych, a następnie wnikliwą analizę danych dotyczących oświadczeń majątkowych polskich posłów za rok 2021. Po teoretycznym porównaniu różnych metod normalizacji współczynnika Giniego wyniki empiryczne pokazują, że nawet przy stosunkowo niewielkiej liczbie wartości ujemnych różnice między metodami normalizacji są znaczące i należy się nimi zająć. Zaprezentowano również dwie metody dekompozycji współczynnika Giniego, aby ocenić, jak wyglądają nierówności między partiami i jak różne źródła majątku wpływają na ogólną nierówność. Dekompozycje te wskazują, jak duży wpływ na współczynnik Giniego mają długi i zobowiązania.

Słowa kluczowe: indeks Giniego, nierówności, dług, wartości ujemne