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Measuring The Redistributive Effect of Personal Income Tax in Poland: A Study of Changes Induced by the „Polish Deal" Program*

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Abstract

The subject of this study is the examination of changes in fiscal policy following the implementation of the „Polish Deal" program. Specifically, the analysis focuses on the impact of the modifications introduced in the methodology of calculating the Personal Income Tax (PIT) on the extent to which this tax contributes to a more equitable distribution of household income. The aim of the study is to demonstrate, by means of simple and comprehensible calculations suitable for didactic purposes, a quantitative assessment of the redistributive function of PIT before and after the implementation of the „Polish Deal" program. The motivation for this work stems from the observation that, to date, scientific and didactic literature has provided only limited comparative analyses of the redistributive role of PIT within the Polish tax system.

Our research relies on the well-established measure of income inequality, the Gini coefficient. Two statistical approaches to its calculation, most frequently cited in the literature, are applied. To reinforce the conclusions and as an independent tool of rapid assessment, regression analysis using the ordinary least squares (OLS) method is also conducted. The findings indicate that the PIT system has fulfilled its redistributive function both prior to and after the „Polish Deal" program. Nevertheless, certain differences favoring the new calculation method are identified. These are reflected in the trajectory of improvements in the Gini coefficient and in the diagnostic indicators of the regression models.

Keywords: fiscal policy, personal income tax (PIT), redistributive function, „Polish Deal" program, Gini coefficient.

Introduction

Within the framework of changes introduced by the "New Polish Deal" program since 2022, the system of personal income taxation in Poland underwent significant modifications, including the implementation of a new methodology for calculating PIT. The declared aim of the reform was to "create a fair tax system in Poland" (Deresz & Podstawka, 2024). The measures included, among others, an increase in the tax-free allowance and a higher threshold for the second tax bracket (Act, 2021; Act, 2022). These changes were partly a response to the rising level of household income.

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The rapid growth of incomes, particularly pronounced in the Polish economy over the past decade (Laska, 2023), has been accompanied by an undesirable trend: the widening gap between the rich and the poor (Atkinson, 1970; Cowell, 2011). From this perspective, the redistributive role of taxation becomes no less important than its fiscal function. It serves to mitigate income inequality, strengthen social stability, and channel resources from wealthier to less protected segments of society.

Given the growing importance of achieving a more balanced distribution of income — both as a matter of social policy and as a prerequisite for sustainable economic growth — this article presents comparative assessments of the redistributive function of PIT under the methodology in place prior to the reform and under the rules introduced by the "Polish Deal" program as of January 1, 2022 (Act, 2022).

A review of the existing scientific and didactic literature leads to two conclusions. First, most academic contributions concerning the 2022 tax reform in Poland have concentrated primarily on the fiscal consequences of the reform, thereby assigning only secondary importance to the redistributive role of PIT (Hajdys, 2021; Janiszewska & Janiszewski, 2025; Król, 2023; Sawulski et al., 2023; Wyszkowska, Wyszkowski, & Dziekański, 2022). Second, in the didactic literature, examples of relatively straightforward quantitative methods that allow for a comparison of the redistributive function of PIT before and after the 2022 reform are absent. Yet, such methodological examples would be highly valuable in teaching practice, as they would provide a relatively simple and transparent way to obtain a quantitative criterion for evaluating changes in fiscal policy from the perspective of the improvement or deterioration of the redistributive function of PIT.

Theoretical and methodological framework

In this study, the Gini coefficient (Gini, 1912, 1936; Ceriani & Verme, 2012) is employed as the primary analytical tool. This indicator represents one of the most widely used and internationally recognized measures of income inequality in the distribution of household incomes.

In both scientific and didactic literature, several interpretations of the Gini coefficient calculation are encountered. These formulations represent various discrete approximations of the integral definition of the index based on the Lorenz curve (Lorenz, 1905; Kakwani, 1977). In its general form, the Gini coefficient is defined as:

$$G = 1 - 2\int_0^1 L(p)dp, \qquad (1)$$

where *L(p)* is the Lorenz curve function representing the cumulative share of income accruing to the bottom *p* fraction of the population, with $[0 \leq p \leq 1]$ (Sen, 1973; Cowell, 2011).

For discrete data, when incomes are ordered in ascending order ($x_1 \leq x_2 \leq \cdots \leq x_n$), the Gini coefficient can be computed using the following expression:

$$G = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}|x_i - x_j|}{2n^2\bar{x}}, \qquad (2)$$

where $\bar{x}$ denotes the mean income and *n* the number of observations (Dagum, 1998).
An alternative, simplified expression frequently applied in empirical research is given by:

$$G = \frac{2\sum_{i=1}^{n} i x_i}{n\sum_{i=1}^{n} x_i} - \frac{n+1}{n}, \qquad (3)$$

which enables the calculation of the Gini coefficient without the explicit construction of the Lorenz curve (Yitzhaki, 1998).

In applied calculations, where the available dataset is divided into five equal quantile groups (quintiles), which separate 20%, 40%, 60%, 80%, and 100% of the ordered data, the following formula may be employed:

$$G = 1 + \frac{1}{N} - \frac{2(Y_n + 2Y_{n-1} + 3Y_{n-2} + \ldots + nY_1)}{N^2\bar{Y}}, \qquad (4)$$

where Yn denotes the total income of the group with the highest incomes,
Y_1 – the total income of the group with the lowest incomes,

N – the number of groups,
$\bar{Y}$ – the average group income in percent.

Variations of these different interpretations and formulas for computing the Gini coefficient are also presented in the works of Damgaard and Weiner (2000), Dixon et al. (1987, 1988), and Glasser (1962). Thus, the literature presents several distinct discrete formulations, widely used in applied research and teaching materials, which should be understood as approximations of the integral definition of the Gini coefficient, based on the area between the line of absolute equality and the observed Lorenz curve (Kakwani, 1977).

To assess which method of PIT calculation—before or after the fiscal reforms of 2022—better fulfills the redistributive function of this tax in the Polish economy, Gini coefficients were computed using formulas (3) and (4).
The income data were obtained from a representative sample consisting of 115 observations, based on the average gross remuneration of economic entities – households – earning income in various areas of economic activity in the Polish economy, according to the Central Statistical Office of Poland. Labor Market. Wages and Salaries. Average monthly wages and salaries in enterprise sector (GUS, 2025). The objective of the analysis was a comparative evaluation of the two PIT calculation methods. Therefore, the breadth of the sample, its probable bias and the absolute values of the Gini coefficients are of secondary importance. The conclusions derived from these calculations are based on a comparison of the strength of the redistributive effect of PIT, or conversely, the level of residual income inequality, across the following situations: gross household income before taxation; post-tax income under the pre-2022 PIT methodology; and post-tax income under the PIT methodology introduced in 2022 (Table 1).

Table 1. Comparative Assessment of the Redistributive Function of Personal Income Tax Using the Old and New (Post-2022) Calculation Methodologies in the Polish Tax System

Gini Indicators	Household gross income before PIT	Income after PIT (old methodology, pre-2022)	Income after PIT (new methodology, post-2022)
G3 – Gini coefficient, formula (3)	0.5822	0.5569	0.5398
G4 – Gini coefficient, formula (4)	0.6324	0.6046	0.5850
Absolute deviation|G3 – G4|	0.0502	0.0477	0.0452
Relative deviation (G4-G3/G3), %	8.62	8.57	8.37

Source: own elaboration based on the data Central Statistical Office of Poland, Labor Market. Wages and Salaries. Average monthly wages and salaries in enterprise sector (2025), Lerman & Yitzhaki (1985), Yitzhaki (1998).

According to the commonly accepted interpretation of the Gini coefficient, higher values indicate greater inequality in income distribution, and vice versa (Shorrocks, 1982). As shown in Table 1, both methods of calculation yield somewhat different quantitative results, with deviations within 10%. This level of discrepancy can be considered acceptable both for simplified formulas of inequality measurement (see formulas 3 and 4 above) and for quintile-based computations, where the sample is divided into five equal groups, compared to more precise decile (10 groups) or vigintile (20 groups) partitions.

More importantly, both indicators, G3 and G4, demonstrate similar dynamics. This confirms the theoretical assumption that PIT fulfills its redistributive function both under the old (pre-2022) and new (post-2022) calculation methodologies. Moreover, the lower values of G3 and G4 observed under the new PIT methodology indicate a more effective fulfillment of the redistributive role after the fiscal changes introduced by the "Polish Deal" program in 2022.

To reinforce these findings, and as an independent rapid assessment method, we employed the evaluation of linear and exponential approximations of income data using the ordinary least squares (OLS) method (Table 2). For this purpose, the R^2 coefficient of determination was applied, as it represents one of the key metrics of regression

model quality in statistics and econometrics. In practice, R^2 is widely used both to assess model performance and to compare alternative models fitted to the same dataset in order to identify which explains the observed phenomenon more effectively.

Table 2. Quality Indicators of Linear and Exponential Approximations of Income Data Using OLS

R^2 Indicators	Household gross income before PIT	Income after PIT (old methodology, pre-2022)	Income after PIT (new methodology, post-2022)
R^2 for linear dependence	0.5263	0.5363	0.557
R^2 for exponential dependence	0.8823	0.879	0.8706

Source: Author's own calculations.

Thus, the R^2 indicator — commonly used for assessing the quality of regression models — may be interpreted in this context as a measure of the degree of deviation of actual observations from an assumed linear trend. Consequently, the higher the value of R^2, the closer the observations are to linearity. In the case of income data, closer adherence to a linear relationship simultaneously reflects a weakening of exponential growth, as confirmed by the results in Table 2.

The table demonstrates that R^2 values for linear approximation improve when moving from household gross income (before PIT) to disposable income after PIT under the pre-2022 methodology, and further to disposable income under the post-2022 PIT methodology. At the same time, R^2 values for exponential approximation show the opposite trend, indicating a weakening of exponential growth as we move in the same direction. These results support the earlier conclusions that the redistributive properties of PIT improved after the adoption of the new calculation methodology introduced by the "Polish Deal" program in 2022.

Conclusions

Changes in tax policy do not always lead to an improved performance of the functions assigned to the tax system. This particularly applies to the redistributive function, which is often considered secondary to the primary fiscal function of taxation. It is therefore important to evaluate fiscal reforms in terms of their redistributive outcomes. One way of conducting such evaluation is through the Lorenz curve and the Gini coefficient.

In scientific as well as didactic literature, several interpretations of the Gini coefficient are encountered. All of them, with varying degrees of simplification, represent approximations of inequality measurement based on the Lorenz curve, i.e., the degree of deviation of observed income distribution from perfect equality. In this study, two simplified and practically applicable formulas of the Gini coefficient were applied.

Given the study's focus on assessing relative changes in the redistributive effect of taxation, a limited sample of household income data was sufficient. For this purpose, a dataset of household incomes in Poland for 2023 was used. The redistributive function of PIT in the Polish tax system was analyzed after the changes introduced by the "Polish Deal" program in 2022. The primary basis for evaluating changes in the strength of the redistributive effect was the comparison of Gini coefficients calculated for the following situations: household gross income before taxation; post-tax income under the pre-2022 PIT methodology; and post-tax income under the new PIT methodology introduced in 2022. The results indicate that, following the reform, the redistributive function of PIT improved, pointing to the effectiveness of the reform in promoting a more equitable distribution of income. Additionally, the redistributive effect of PIT under both old and new methodologies was analyzed using deviations from linear and exponential approximations of income data. The underlying assumption was that the redistributive function should promote a more even income distribution—that is, drive the observed data toward linearity and greater flatness, while simultaneously moving away from exponential patterns. The regression quality assessments, based on the R^2 indicator, fully align with the results obtained through the Gini coefficient. This not

only strengthens the conclusions drawn from the Gini-based analysis but also highlights R^2 as a complementary method for quantitatively assessing the redistributive function of taxation.

References

- Act (2021). Act of October 29, 2021, amending the Personal Income Tax Act, the Corporate Income Tax Act, and certain other acts (*Journal of Laws* of 2021, item 2105, as amended).
- Act (2022). Act of June 9, 2022, amending the Personal Income Tax Act and certain other acts (*Journal of Laws* of 2022, item 1265, as amended).
- Atkinson, A. B. (1970). On the measurement of inequality. *Journal of Economic Theory*, 2(3), 244–263.
- Central Statistical Office of Poland, GUS (2025). Labor Market. Wages and Salaries. Average monthly wages and salaries in enterprise sector, [Online], [Retrieved September 02, 2025], stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5498/4/97/1/tabl19_przecietne_miesieczne_wynagrodzenia_brutto_w_sektorze_przedsiebiorstw.xlsx
- Ceriani, L., & Verme, P. (2012). The origins of the Gini index: Extracts from Variabilità e mutabilità (1912) by Corrado Gini. *Journal of Economic Inequality*, 10(3), 421–443.
- Cowell, F. A. (2011). Measuring inequality (3rd ed.). Oxford University Press.
- Dagum, C. (1998). A new approach to the decomposition of the Gini income inequality ratio. Empirical Economics, 23(4), 515–531. https://doi.org/10.1007/BF01669299
- Damgaard, C., Weiner, J. (2000). "Describing Inequality in Plant Size or Fecundity." *Ecology* 81, 1139-1142.
- Deresz, A.E., Podstawka, M.G. (2024), 'Evaluation of the PIT changes introduced in 2022 as part of the "Polish Deal"'. *Economic and Regional Studies*, 17(1), 98-114. [Retrieved September 02, 2025], https://doi.org/10.2478/ers-2024-0005
- Dixon, P. M., Weiner, J., Mitchell-Olds, T.; and Woodley, R. (1988). "Erratum to 'Bootstrapping the Gini Coefficient of Inequality.' " *Ecology* 69, 1307.
- Dixon, P. M.; Weiner, J.; Mitchell-Olds, T.; and Woodley, R. (1987). "Bootstrapping the Gini Coefficient of Inequality." *Ecology* 68, 1548-1551.
- Gini, C. (1955). "Variabilitá e mutabilita." (1912). Reprinted in *Memorie di metodologia statistica* (Ed. E. Pizetti and T. Salvemini.) Rome: Libreria Eredi Virgilio Veschi.
- Gini, C. (1936). "On the Measure of Concentration with Special Reference to Income and Statistics", *Colorado College Publication*, General Series No. 208, 73–79.
- Glasser, G. J. (1962). "Variance Formulas for the Mean Difference and Coefficient of Concentration." J. Amer. Stat. Assoc. 57, 648-654.

- GUS, Statistics Poland (2025), Central Statistical Office GUS, [Online], [Retrieved September 02, 2025], https://stat.gov.pl/

- Hajdys, D. (2021). Effects of the "Polish Deal" programme on local government units. Journal of Finance and Financial Law, 4(32), 167-187. https://doi.org/10.18778/2391-6478.4.32.11

- Janiszewska, M., & Janiszewski, J. M. (2025). Tax reliefs for innovation after the Polish Deal – An attractive solution for Polish entrepreneurs? A pilot study. Research Papers of Wrocław University of Economics and Business, 69(1). https://doi.org/10.15611/pn.2025.1.05

- Kakwani, N. C. (1977). Applications of Lorenz curves in economic analysis. Econometrica, 45(4), 719–728.

- Król, U. (2023). A theoretical analysis of the new Polish income tax system. *Copernican Journal of Finance & Accounting*, 11(4), 147-163. https://doi.org/10.12775/CJFA.2022.023

- Laska, K. (2023). Assessment of income differentiation of different-sized households in Poland. *Olsztyn Economic Journal*, 14(2), 45-60. https://doi.org/10.31648/oej.10571

- Lerman, R. I., & Yitzhaki, S. (1985). Income inequality effects by income source: A new approach and applications to the United States. The Review of Economics and Statistics, 67(1), 151–156.

- Lorenz, M. O. (1905). Methods of measuring concentration of wealth. Publications of the American Statistical Association, 9, 209–219.

- Sawulski, J., Szewczyk, N., Rafalska, K., & Smółko, M. (2023). Business power against redistribution: The case of watered-down tax reform in Poland. Business and Politics, 25(2), 133-151. https://doi.org/10.1017/bap.2023.3

- Sen, A. (1973). On economic inequality. Oxford University Press.

- Shorrocks, A. F. (1982). Inequality decomposition by factor components. Econometrica, 50(1), 193–211.

- Wyszkowska, D., Wyszkowski, A., & Dziekański, P. (2022). "Polish Deal" and financial autonomy of communes in Poland. Optimum. Economic Studies, 3(109), 120-135. https://doi.org/10.15290/oes.2022.03.109.09

- Yitzhaki, S. (1998). More than a dozen alternative ways of spelling Gini. In J. Silber (Ed.), Handbook of income inequality measurement (pp. 13–30). Springer.