Income inequality and risky borrowing: The city-level perspective from Credit Information Bureau data

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Abstract

Using city-level variation in income inequality and data on credit card debt from the Credit Information Bureau of Poland for 2018, we examine whether income inequality contributes to risky borrowing on credit cards. Cross-sectional regressions show that income inequality is positively related not only to credit card total balances and new originations, but also to debt-to-income (DTI) and 90 or more days past due ratios. Our results are robust to various inequality measures and suggest that inequality might encourage risky borrowing, or the type of borrowing that goes beyond a household's ability to repay. The positive relationship between income inequality and risky borrowing is consistent with upward comparisons that trigger a "keeping up with the Jones'" behavior among lower and middle-income households. In addition to the empirical analysis, we discuss the development of the Polish credit market, providing institutional context that helps explain these phenomena in the setting of an emerging economy.

Keywords: income inequality, credit card debt, household finance, credit bureau data, non-performing loans, financial vulnerability, unsustainable debt

Highlights

- We use credit bureau data and city-level variation in income inequality in Poland
- We find that higher level of inequality is linked to higher credit card debt use
- There is a strong positive relationship of inequality and overdue credit card debt
- Our results support the conjecture that income inequality drives risky borrowing
- This is consistent with a "keeping up with the Jones'" explanation of consumer debt

1. Introduction

In this study, we examine whether income inequality contributes to risky borrowing via credit cards. Our conjecture is of a positive relation between income inequality and risky borrowing because of upward comparisons that trigger a "keeping up with the Jones'" behavior among households. We present empirical results from cross-sectional regressions consistent with this conjecture. In addition to the empirical analysis, we discuss the development of the Polish credit market, providing institutional context that helps explain these phenomena in the setting of an emerging economy.

Our empirical analysis is conducted using data on income inequality and overdue credit card debt in Poland in 2018. We use data on credit utilization, balances and arrears for all 930 cities from the Credit Information Bureau in Poland. This empirical design presents several advantages in relation to previous studies. The first advantage is data quality. We are using firsthand information collected and tabulated by a credit bureau while previous studies connecting income inequality to borrowing have relied primarily on survey data (e.g. Hake & Poyntner, 2022; Jestl, 2023; Loschiavo, 2021). We are among the few papers that, in this context, utilize credit bureau data (Agarwal et al., 2023; Coibion et al., 2020), which is more accurate, comprehensive, and objective than survey data (Stavins, 2020). Credit card debt is particularly inaccurate in consumer surveys as many households tend to underreport their usage (Brown et al., 2015). In addition, instead of looking at variation in consumer debt balances as measures of risky borrowing, we use information on debt delinquencies, and more specifically on credit card debt in arrears, a more germane proxy for risky borrowing than changes in available credit or credit balances that might have institutional explanations at the country or regional levels. Our data gives us the ability to move the analysis downward from the country level to the local level of cities, in accordance with the recommendation to place more emphasis on narrower geographies in inequality and debt studies (Mdingi & Ho, 2021; Suss, 2023; Tontisirin et al., 2024).

For our analysis we build a cross-sectional dataset that combines (1) unique transaction-based data of the Polish credit bureau and (2) inequality measures for local communities (all Polish cities) derived from administrative data. The latter, while being extremely useful, is also rare. The most recent available administrative data collection of household data from Polish cities took place in 2018. However, this limitation might not be a weakness but a source of strength

given that most studies on the relation between income inequality and private debt apply macroeconomic time-series or panel data (see Escudero, 2023 for a review) which present the challenge of endogeneity from common trends in income inequality and credit market development, particularly relevant in the case of Poland during the post-soviet years.

We obtain the following key results from a battery of cross-sectional regressions on income inequality on consumer borrowing proxies and controls:

1. credit card debt utilization increases with income inequality,
2. household leverage in credit card debt increases with income inequality, and
3. credit card debt in arrears increases with income inequality.

The third result is of particular interest as it is an evident sign of household financial vulnerability. Similar to other studies (e.g. Bazillier et al., 2021; Vijverberg, 2024) we use alternative inequality measures to ascertain the robustness of our results. We apply the city-level controls on economic (income, unemployment, housing, mortgages) and demographic factors. In our main regression, the Gini coefficient has a high and statistically significant standardized coefficient of 0.236, indicating that a one-standard-deviation increase in the Gini coefficient is associated with a 0.236 standard deviation increase in the credit card debt in arrears (i.e. 3.41 PLN). This result supports our conjecture that income inequality drives risky borrowing.

Our study joins a growing number of existing papers on the relation between income inequality and household debt. The theoretical foundations of this line of research go back to the relative income hypothesis (Duesenberry, 1949), which suggests that household consumption is determined by its position in the income distribution. As income inequality grows, households from the lower and middle classes borrow more in order to match the consumption levels of wealthier social classes. The "keeping up with the Jones'" phenomenon implies that the impact of income inequality on consumer borrowing stems from conspicuous consumption (Christen & Morgan, 2005; van Treeck, 2014). As greater inequality drives a larger expansion of credit, it increases household economic distress (Boushey & Weller, 2008). Moreover lower-income households tend to borrow to sustain their living standards in the face of stagnant real wages (Iacoviello, 2008; Krueger & Perri, 2006). Empirical studies that document household increases in conspicuous consumption on credit have not only been documented in Poland (Burgiel, 2017 and Piotrowska, 2017) but also in many other countries including the United States and China (e.g. Solnick, et. al, 2007), Canada (Agarwal, et. al., 2020), Denmark (De Giorgi, et. al., 2016), Turkey (Dasdemir, 2018), and Nepal (Adhikari, 2022), to cite some recent examples. Fasianos et al. (2017) reveal the asymmetry of the income inequality to household debt effect. They find that household debt in the U.S. increases in response to rising inequality while there is no evidence that a decrease in inequality significantly affects household debt. In sum, there is no consensus on the sign or economic importance of the nexus between income inequality and household debt (Escudero, 2023) and, therefore, there is a need for additional empirical studies of this relation on alternative experimental settings (Demirguc-Kunt & Levine, 2009).

Although present day Europe is far less unequal than the United States (Blanchet et al., 2022; Piketty & Saez, 2014), within-country inequality in the EU has continued to grow (Charron, 2016; Iammarino et al., 2019). Poland is a leading example of the Central and Eastern European country which shifted from communist to capitalist system during the 1990s and witnessed both an ascension to the ranks of high-income economies and an outstanding increase in inequality in a generation's time (Brzezinski et al., 2020, 2022; Brzeziński & Kostro, 2010; Bukowski et al., 2023; Bukowski & Novokmet, 2021; Piatkowski, 2019). In terms of the rise of top incomes over the 1980-2017 period Poland ranks second in Europe, with the 15 percentage points change in the top decile pretax income share, just after Hungary (+17 pp), followed by Romania (+13 pp), Czech Republic (+12 pp), and Estonia (+11 pp). For comparison, an increase in the top decile share in the United States was estimated at almost 14 percentage points, and in Germany – the Western European country with the highest score – at 9 percentage points (Blanchet et al., 2022). Poland offers an interesting case study with potential external validity that extends beyond post-socialist or Central and Eastern European countries. As a large emerging market economy that during its transition to an open economy experienced high inflation, followed by rapid disinflation and stabilization, Poland illustrates how macroeconomic stability can spur the expansion of consumer credit markets in the context of rising inequality. This perspective may be relevant for other countries that transitioned from volatile to more predictable monetary regimes, where declining interest rates increased households' willingness to engage in credit-financed consumption.

We believe that our results will be appealing to readers beyond Poland and other emerging nations because the granularity of our data allows us to delve into a universal research question. It is important to point out that the effect of social comparisons on psychosocial stress and risk perceptions has been documented across social groups of different socio-economic strata, independent of geography and culture and extends beyond financial decisions to risky behavior in other areas of people's lives. Our basic hypothesis is grounded on experimental psychology studies showing that economic inequality is positively associated with risky behavior (Ferrer-i-Carbonell, 2005; Freund and Morris, 2006; Payne, et al, 2017 and Brown-Iannuzzi and McKee, 2019). A more unequal environment provides more opportunities for upward comparisons to those with more income, which generally leads people to feel they need more to be satisfied (Payne, et al, 2017). This perceived need affects people's risk attitudes, making them more short term oriented, and more willing to seek out high-risk, high-reward options.

The remainder of the paper is organized as follows. Section 2 presents the stylized facts on the development of the consumer credit markets in Poland. Section 3 briefly describes the data and the methodology of the research, Section 4 presents and discusses the empirical findings, Section 5 describes robustness checks and Section 6 concludes.

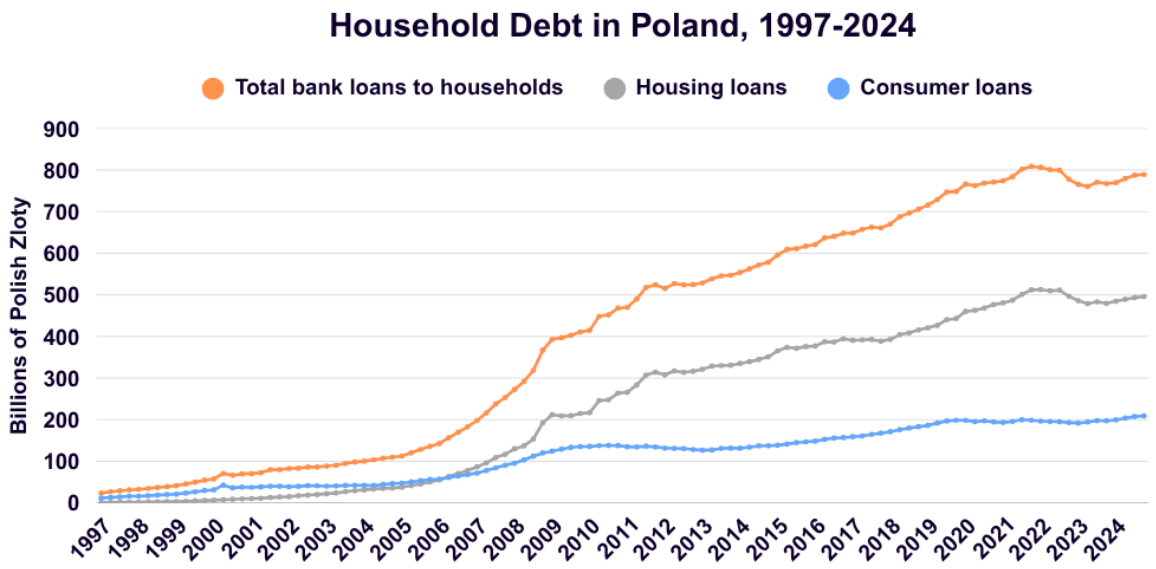
2. The development of the Polish consumer credit market

Over the past three decades, Poland has witnessed an outstanding development in its retail credit market, reflecting a dynamic interplay of political, economic, social, regulatory, and technological factors. In the early 1990s, after the collapse of communism, profound legal and economic reforms resulted in the transformation from a centrally planned economy (or "economy of shortages") into a market economy. The transition was not a smooth process, as initially Poland faced "a shock" with significant decline of GDP, hyperinflation and growing unemployment. In terms of the banking system the transition meant replacing the "monobank" model characteristic of a socialist economy with the modern two-tier model (Iwanicz-Drozdowska et al., 2018; Leszczyńska, 2011). The path to a highly competitive banking system required profound changes in the legal framework followed by a large-scale privatization, financial liberalization, the entry of foreign competitors, consolidation, and the EU accession (on 1 May 2004) (Iwanicz-Drozdowska et al., 2018). From the early 2000s to the present, the Polish banking system has not only expanded in scope but has also demonstrated resilience in the face of external shocks.

The retail credit market expanded substantially as well, offering a diverse range of products to meet the evolving needs of rising household incomes. Regulatory authorities implemented measures to ensure responsible lending practices, enhance consumer protection, and maintain the overall stability of the financial system (Pawłowska, 2011; Rytelewska & Kłopocka, 2010). A new set of challenges emerged in the early 2020s with the onset of the COVID-19 pandemic and the war in Ukraine, which included unprecedented levels of uncertainty, rising inflation, and higher interest rates. The Covid-19 pandemic accelerated the digitalization of financial services, which started in the early 2000s with the onset of online banking. The implementation of new technologies was targeted mainly at providing cutting-edge products and improving internal process productivity and efficiency. The integration of online platforms, fintech innovations, and digital banking services propelled the market into a new era of accessibility, efficiency and competition (Harasim, 2021; Iwanicz-Drozdowska et al., 2023; Miklaszewska et al., 2022).

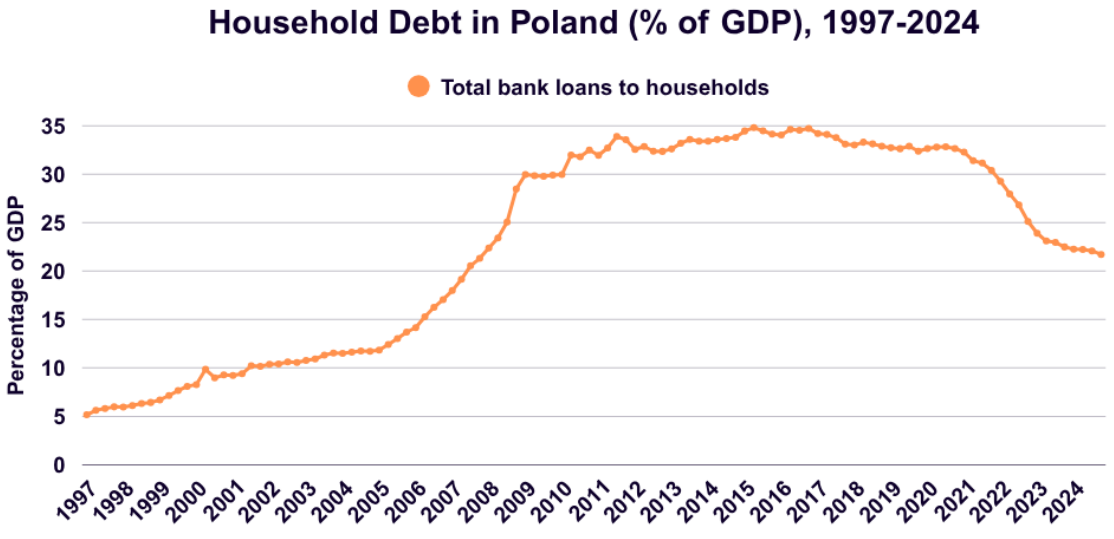
Throughout these three decades, Poland's retail credit market has emerged as an increasingly important source of funds for households striving to satisfy their housing and consumption needs (Walega & Walega, 2021). In 1997-2020, bank liabilities of households revealed a secular positive trend both in absolute terms (Figure 1) and as a percentage of GDP (Figure 2). However, household borrowing has leveled off in recent years because of heightened levels of uncertainty and increased interest rates. While the most profound reductions took place in the mortgage market, consumer credit, including credit cards loans,was also subject to a downward correction.

Figure 1 Household debt in Poland (Billions of Polish Zloty)



Source: authors' own based on NBP data.

Figure 2 Household debt in Poland (Percentage of GDP)



Source: authors' own based on GUS and NBP data.

2. Data and methods

Our empirical analysis combines two datasets: (1) unique bank-originated data on individual loans gathered and provided at the city-level by BIK (Biuro Informacji Kredytowej) – the nationwide Credit Information Bureau and (2) the results of an experimental study based on administrative sources on income stratification of city dwellers (GUS, 2020) conducted by GUS (Główny Urząd Statystyczny) - the Central Statistical Office in Poland. The GUS data that matches the BIK database is only available for the year 2018. Thanks to this novel city-level data we are able to perform our analysis at the highest possible level of geographic disaggregation (i.e. for all Polish towns and cities). The local perspective of our data is particularly well-suited for our research question, given that we have a large number of data points all observed at the same point in time and in the same country. This granularity allows us to avoid having to impose controls for time and country effects, which are characteristic of inequality-related studies, typically conducted on panel data involving multiple countries, with diverse institutional and cultural characteristics, and years. The novelty of our approach is in line with the modern trend to utilize first-hand data from transactional or administrative sources or natural experiments, rather than relying on representative samples. Our research covers all credit card loans granted to city dwellers in Poland. We analyze both new production and accumulated loan portfolios, the latter being classified into standard and non-performing loans.

BIK (Biuro Informacji Kredytowej - Credit Information Bureau) was established in 1997 based on the Banking Law - a fundamental act regulating banking activity in Poland - to support trust and safety of the banking industry. BIK gathers and processes information from banks, cooperative saving and credit unions, non-banking loan providers and other entities. Its nationwide database contains complete and comprehensive information on credit history, rent payments, utility charges, and many other obligations of over 25 million individuals. (*O nas*, n.d.). Checking records in the Credit Information Bureau (BIK) has become the gold standard when assessing the financial situation of potential clients.

Our analysis explores data covering credit card loans taken out in all Polish towns and cities (i.e., 930 geographies as of 2018). There are over 23 million inhabitants representing about 60% of the population of Poland. We analyze both the overall credit card balances as of 31 December 2018 and new credit card originations in 2018.

Measures for income inequality come from an experimental study on Income stratification of city dwellers conducted by the Polish Central Statistical Office (i.e. Statistics Poland) in 2018 (GUS, 2020). This study partially bridges the existing information gap in official statistics on spatial inequalities in personal incomes at the local level. Typically, Statistics Poland processes and releases household income data derived from sample surveys, with their resulting statistics being only available at the provincial, regional or national levels. This limitation proves challenging for researchers aiming to conduct in-depth socio-economic analyses, given that variation in personal incomes is most influential at the local level. Statistics Poland conducted an experimental study using data from all taxable personal incomes earned in 2018 by city dwellers in paid employment. This data was derived from the administrative registers of the Ministry of Finance. The income distribution measures constructed responded to their

use in previous studies, computational complexity, and correlation with other descriptive ratios of the income distribution to avoid redundancy. The resulting database contains information on median taxable income, and three income inequality measures: the Gini coefficient, the percentile ratio P90/P10, and the income share ratio S80/S20 for all Polish cities. We use all these measures in our study.

The income inequality measure most commonly used in empirical studies is the Gini coefficient, which is a number between 0 and 1, where 0 corresponds with perfect equality (where everyone has the same income) and 1 corresponds with perfect inequality (where one person has all the income, and everyone else has zero income). The value of Gini is determined by the formula

$$Gini = \left(\frac{1}{2N^2 m}\right) \sum_{i=1}^{N} \quad \sum_{j=1}^{N} \quad \left|x_i - x_j\right| \tag{1}$$

where

N is the number of units in the population,
m is the mean income of all units in the population,
x_i is the income of *i*th unit in the population.

The Gini coefficient is a normalized measure derived from the Lorenz curve, which reflects the extent to which the distribution of income deviates from perfect equality. When the income of an above-median household increases, the Gini coefficient will rise. Similarly, an income reduction of one household below the median will also lead to an increase in the coefficient. The Gini coefficient considers the full income distribution, rather than focusing solely on changes at the tails.

The S80/S20 ratio is the ratio of the total income earned by the top 20% of individuals with the highest income levels to the total income earned by the bottom 20% of individuals with the lowest income levels. It can be expressed as

$$\frac{S80}{S20} = \frac{\sum_{x_i \geq Q(0,8)} \quad x_i}{\sum_{x_i \geq Q(0,2)} \quad x_i} \tag{2}$$

where

Q(0.8) represents fifth (the highest) quintile,
Q(0.2) represents first (the lowest) quintile,
x_i represents the income of *i*th unit in the population.

Finally, The P90/P10 ratio measures how much the incomes of taxpayers in the 90th and 10th percent of the distribution differ from one another. The greater the income inequalities among taxpayers, the higher the value of this indicator.

Table 1 Most and least unequal Polish cities in 2018 according to the Gini coefficient

City	Population	Median income (PLN)	Gini	S80/S20	P90/P10
Most unequal					

Podkowa Leśna	3 854	52 525	0.5766	33.09	25.41
Konstancin-Jeziorna	17 086	43 272	0.5547	25.33	16.17
Puszczykowo	9 698	39 681	0.5348	24.15	17.36
Łomianki	16 977	48 692	0.5276	23.89	17.81
Józefów	20 605	43 717	0.5225	22.80	17.24
Milanówek	16 306	43 480	0.5172	21.90	17.29
Sopot	36 046	41 686	0.5003	21.91	18.30
Warszawa	1 777 972	55 110	0.4826	18.54	15.16
Brwinów	13 531	48 542	0.4666	17.20	15.30
Szczawno-Zdrój	5 608	37 150	0.4664	19.81	19.10
Least unequal					
Węgliniec	2 860	43 376	0.3435	9.86	9.63
Sokółka	18 210	38 604	0.3431	8.23	7.46
Chorzele	3 078	36 089	0.3391	7.93	6.97
Łaszczów	2 154	31 472	0.3383	8.46	7.98
Janikowo	8 758	36 994	0.3368	8.39	7.67
Hajnówka	20 690	37 231	0.3359	7.67	7.04
Górzno	1 370	33 244	0.3309	7.18	7.64
Lubawa	10 381	37 327	0.3282	7.68	7.20
Zbąszynek	5 021	48 183	0.3212	7.75	7.20
Nowe Skalmierzyce	4 770	41 459	0.3124	6.92	6.35

Table 1 shows the most and least unequal Polish cities in 2018 according to the Gini coefficient. The cities with the highest Gini coefficients are Podkowa Leśna (Gini=0.57), a city of 3,854 people located 25 km south-west of Warsaw, the capital and most populated city in Poland, and Konstancin Jeziorna (Gini=0.55), a spa town in Piaseczno County, 20 km south of Warsaw. They are followed by other cities in the general vicinity of Warsaw. Warsaw itself ranks 8th with a Gini of 0.48. Nowe Skalmierzyce sits at the other end of the inequality spectrum, reporting the lowest Gini coefficient across all cities (0.31).

The ranking of income inequality based on S80/S20 is almost identical to the ranking obtained using the Gini coefficient. The cities with the highest Gini coefficients, Podkowa Leśna and Konstancin Jeziorna also have the highest S80/S20 ratios. These ratios indicate that for these cities, the income of the highest 1/5th of all households was about 33 and 25 times larger than the income of all households in the lowest 1/5th of the distribution, respectively.

The city with the highest P90/P10 score in the country is Biały Bór, with a value of 26.37. This value indicates that the household that marks the 90th percentile of the distribution earned 26.37 times more than the household that marked the 10th percentile of the distribution. The lowest P90/P10 score (i.e. 6.21) was registered for Błażowa.

Pairwise correlations between the income inequality measures (Gini, S80/S20, and P90/P10) show all three measures being positively correlated with each other, with the lowest Pearson correlation coefficient for Gini and P90/P10 (0.664) and the highest one for S80/S20 and P90/P10 (0.925). Median income has a low and slightly negative correlation with P90/P10 (-

0.243) and S80/S20 (-0.130), and a weak positive correlation with Gini (0.151). These results suggest that, while related, the three inequality indicators capture similar yet not identical aspects of the income distribution, and their relationship with median income is limited.

We perform ordinary least squares estimation of multiple linear regression models, using credit card loans indicators as dependent variables and income inequality measures (Gini coefficient, S80/S20, P90/P10) as independent variables, while controlling for other determinants of income inequality and credit card debt. The baseline specification takes the following form:

$$CrC = \propto_0 + \beta Ineq + \sum_{i=1}^{k} \gamma_i Z_i + \varepsilon, \quad (3)$$

where

CrC represents a given credit card debt indicator,
$Ineq$ represents a given inequality measure: Gini coefficient or S80/S20 or P90/P10,
Z represents a set of control variables and
ε is the error term.

Credit card debt indicators include:

- credit card debt per capita (in PLN),
- new credit card debt per capita (in PLN),
- credit card debt to median monthly income (in %),
- credit card debt in arrears per capita (in PLN).

Credit card debt is the total balance of recent credit card transactions and the remaining balance carried over from the previous months as of December 31, 2018. New credit card debt represents the sum of new transactions for all months of 2018. Credit card debt to median monthly income indicates financial leverage. The higher the ratio, the greater the financial risk faced by credit card users (and lenders). Credit card debt in arrears is the amount due that has not been paid by the debtor for 90 days or more past the due date. This type of debt results in additional fees, penalty interest, and negative entries in the credit history. It usually signals (and exacerbates) considerable financial difficulties of the debtor.

Table 2 Descriptive statistics of the variables used in the analysis

	Min	Max	Average	SD
Dependent Variables - Measures of Risky Borrowing				
Credit card debt per capita (in PLN)	61.529	1583.383	306.261	134.462
New credit card debt per capita (in PLN)	18.959	368.384	119.698	52.307
Credit card debt to median monthly income (in %)	2.60	37.87	10.57	3.79
Credit card debt in arrears per capita (in PLN)	71.224	162.659	24.329	14.449
Independent Variables - Measures of Income Inequality				
GINI index	0.3124	0.5766	0.3930	0.0262
S80/S20 index	6.92	33.09	12.64	2.72

P90/P10 index	6.21	26.37	12.21	2.80
Control Variables				
Median income (in PLN)	23865.0	55110.3	34452.5	4445.6
Apartments per 1000 people	255.4	898.7	372.677	53.2419
Number of women per 100 men	89.00	125.00	107.56	4.13
Unemployment rate measured as the share of registered unemployed in the population of working age (%)	0.00	11.10	1.49	2.46
Number of mortgages in arrears per 1000 people	0.000	3.633	0.803	0.551

Note: 1 USD = 3.7597 PLN (as of 31 December 2018)[1]

Current studies on the relation between income inequality and financial risk-taking control for several confounding factors. Some of these factors are determinants of income inequality such as whether communities are urban or rural areas (Glaeser and Tobio, 2008), stock market participation (Favilukis, 2013 and Bilias, 2017), homeownership (Zhang, Sung, and Zhang, 2020; Parkhomenko, 2021; Kaas et al. 2019), heterogeneity in education levels and skills (Glaeser and Tobio, 2008); cultural attitudes towards risk and money in different racial and ethnic groups (Moeller, et. al., 2009); share of senior citizens in the population (Moeller, et. al., 2009); and share of women in the labor force and as head of household (Moeller, et. al., 2009). In addition, Agarwal et al., (2023) also control for indicators of local economic growth such as median income and unemployment rates (also Kuznets, 1995), population density, and banks' local market concentration to account for access to banking services and borrowing costs. Finally, studies centered around borrowing and overindebtedness in Poland also include controls for financial literacy (Świecka, 2025 and Kurowski & Malinowska 2022), consumer confidence (Kłopocka 2017), and family structure like number of children (Kotlińska et al. 2024). We have tried to incorporate as many of these controls as possible based on the appropriateness of the variable for the Polish context and data availability.

Control variables included in our analysis are:

- Median income (in PLN) and unemployment rates, to proxy for local economic conditions.
- Number of apartments per 1000 people to proxy for homeownership and therefore household wealth[2].
- Number of women per 100 men to account for the presence of women in the workforce and as head of household.
- Number of mortgages in arrears per 1000 people, to account for overindebtedness in other types of loans.

Descriptive statistics on our selected controls are described in Table 2. Income, unemployment, housing and demographic variables are obtained at the city-level from Statistics Poland. The number of mortgages in arrears (i.e. 90 or more days past due per 1000

[1] https://rss.nbp.pl/kursy/TabRss.aspx?n=2018/a/18a252

[2] Housing conditions in Poland still lag behind the EU average in key housing indicators. The country has one of the highest shares of people living in overcrowded homes and one of the lowest averages of rooms per person (European Commission. Eurostat, 2024). Houses and apartments used as primary residences constitute a major component of household wealth in Poland (NBP, 2017). For this reason, we use the number of apartments per 100 people as a proxy for local housing wealth. While we acknowledge that this indicator does not account for properties owned in other towns, data constraints prevent us from using a more direct indicator.

people) is obtained from BIK. Finally, we include province dummies to account for unobserved province-level determinants of credit market participation such as business environment, culture, distance from large cities, etc.

3. Empirical results and discussion

In this section we report the results of our empirical tests on the magnitude and significance of the relation between income inequality and credit card debt. We study three aspects of this relationship: (1) credit card debt accumulation, (2) household leverage in credit card debt, and (3) credit card debt in arrears.

Table 3 focuses on credit card debt utilization. Models (1), (2), and (3) examine credit card debt accumulation with total Credit Card Debt per Capita (in PLN) as the dependent variable. Models (4), (5), and (6) concentrate on the New Credit Card Debt per Capita (in PLN) as the dependent variable. For both dependent variables inequality is measured by, alternatively, Gini, S80/S20, or P90/P10. The Gini index gives an idea of the full income distribution, while S80/S20 and P90/P10 centers on the discrepancy between the tails.

Table 3 Credit card total balances and new originations regressed against income inequality measures and controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Credit card debt per capita (in PLN)			New credit card debt per capita (in PLN)		
Gini	0.471*** (261.227)			0.332*** (59.094)		
S80/S20		0.396*** (3.043)			0.222*** (0.646)	
P90/P10			0.260*** (2.837)			0.147*** (0.643)
Median income	0.365*** (0.001)	0.458*** (0.001)	0.434*** (0.001)	0.415*** (0.000)	0.464*** (0.000)	0.451*** (0.000)
Apartments per 1000 people	0.180*** (0.071)	0.181*** (0.088)	0.221*** (0.083)	0.146*** (0.055)	0.158*** (0.058)	0.180*** (0.056)
Unemployment	-0.059*** (0.983)	-0.063*** (1.060)	-0.072*** (1.224)	0.019 (0.465)	0.015 (0.485)	0.010 (0.498)
Number of women per 100 men	0.044** (0.820)	0.080*** (0.885)	0.094*** (0.911)	0.093*** (0.425)	0.119*** (0.445)	0.127*** (0.439)
Number of mortgages in arrears per 1000 people	0.171*** (7.739)	0.193*** (8.013)	0.245*** (10.882)	0.067** (2.701)	0.097*** (2.846)	0.126*** (3.033)
Quantification β *Ineq*SD*	63.33	53.25	34.96	17.37	11.61	7.69
Adjusted R-squared	0.709	0.653	0.583	0.534	0.484	0.463
Std. Err.	72.578	79.201	86.843	35.72	37.568	38.345
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Observations	930	930	930	930	930	930

Note: This table reports regressions according to Eq. 3. Credit card debt indicators (dependent variables) are represented by credit card debt per capita (in PLN) (models 1-3) and new credit card debt per capita (in PLN) (models 4-6). Both indicators are regressed against three income inequality measures: Gini, S80/S20, P90/P10. Controls include: median income, apartments per 1000 people, unemployment, women per 100 men, mortgages in arrears. All specifications include province dummies. This table reports standardized coefficients. Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Models (1) to (6) confirm the (very) significant positive association between credit card debt utilization and income inequality. This result holds regardless of which specification is estimated. Higher inequality increases both new credit card debt (Models (4) to (6)) and total balances including revolving debt (Models (1) to (3)). Regarding the size of the effects, a one-standard-deviation increase in the Gini coefficient is associated with a 0.471 standard deviation increase in credit card debt per capita (approximately 63.33 PLN, equivalent to 16.84 USD based on the exchange rate as of 31 December 2018 used in what follows) and a 0.332 standard deviation increase in new credit card debt per capita (approximately 17 PLN, equivalent to 4.62 USD). The alternative measures of inequality, S80/S20 and P90/P10, also produce statistically significant and economically meaningful results for credit card debt per capita (a 0.396 and 0.260 standard deviation increase with one standard deviation increase in the respective inequality ratio) and new credit card debt per capita (a 0.222 and 0.147 standard deviation increase with one standard deviation increase in the respective inequality ratio). These estimates highlight that a greater income gap within a city correlates with higher credit card debt levels.

Regarding control variables, across all models, median income has a positive and statistically significant relation with credit card debt per capita and new credit card debt per capita. A one-standard-deviation increase in the median income gives a 0.365 to 0.465 standard deviation effect for credit card debt per capita and a 0.415 to 0.464 standard deviation effect for new credit card debt per capita. This suggests that higher incomes are associated with greater credit card borrowing, potentially reflecting greater borrowing power and willingness to utilize credit for consumption.

The number of apartments per 1000 people is statistically significantly associated with credit card debt across all models. The standardized coefficient values for this variable range from 0.146 to 0.221, indicating that higher housing wealth correlates with greater credit card borrowing.

In Models (1) to (3), the Beta coefficients for unemployment are negative (from -0.059 to -0.072) and significant, indicating that a rise in unemployment correlates with a reduction in overall credit card debt per capita. In Models (4) to (6), however, this variable's coefficients are positive but not significant. The negative effect of unemployment may impact total debt more than new borrowing, possibly because the revolving credit card debt is charged with high interest rates and unemployed are less prone to maintain such expensive debt. On the other hand, they may tend to use new credit card debt, which is interest free, for liquidity reasons.

The statistically significant positive coefficients for the number of women per 100 men in Models (1) to (6) indicate that cities with higher female-to-male ratios tend to have higher average credit card balances and new originations. This suggests that women are more prone than men to use credit cards for transactions and for revolving debt.

We find a strong positive relationship between mortgage arrears and credit card utilization. The Beta coefficients in Models (1) to (3) indicate that a one-standard-deviation increase in the number of mortgages in arrears per 1000 people is associated with a rise in credit card debt per capita ranging from 0.171 to 0.245 standard deviation. The estimates in Models (4) to (6) reveal that the relationship with new credit card debt per capita falls between 0.067 and 0.126 standard deviations. Cities with higher mortgages in arrears ratios are more likely to see increased credit card debt utilization. Presumably, in times of financial hardship when households have problems meeting their mortgage obligations they become more willing to use expensive credit card debt as a source of liquidity.

The adjusted R-squared values range from 0.583 to 0.709 and prove high explanatory power of estimated models.

Table 4 reports estimates where inequality is regressed against variables quantifying the level of financial risk faced by households due to the credit card debt. Models (1) to (3) test the hypothesis that household leverage in credit card debt increases with income inequality. Models (4) to (6) assess whether credit card debt in arrears is positively associated with income inequality.

Table 4 Credit card debt to income and credit card debt arrears regressed against income inequality measures and controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Credit card debt to median monthly income (in %)			Credit card debt in arrears per capita (in PLN)		
Gini	0.485*** (6.297)			0.259*** (34.20)		
S80/S20		0.393*** (0.082)			0.254*** (0.162)	
P90/P10			0.253*** (0.070)			0.209*** (0.377)
Median income	0.028 (0.000)	0.119*** (0.000)	0.094*** (0.000)	0.167*** (0.000)	0.228 *** (0.000)	0.227 *** (0.000)
Apartments per 1000 people	0.252*** (0.002)	0.259*** (0.002)	0.296*** (0.003)	0.230*** (0.015)	0.223*** (0.009)	0.243*** (0.014)
Unemployment	-0.046** (0.031)	-0.050** (0.033)	-0.059** (0.037)	0.003 (0.126)	0.001 (0.166)	-0.005 (0.132)
Number of women per 100 men	0.045* (0.030)	0.083*** (0.030)	0.096*** (0.031)	-0.007 (0.241)	0.012 (0.110)	0.022 (0.230)
Number of mortgages in	1.192*** (0.212)	0.218*** (0.229)	0.271*** (0.295)	0.196*** (1.086)	0.198*** (0.819)	0.223*** (1.196)

arrears per 1000 people						
Quantification β *Ineq*SD*	1.84	1.49	0.96	3.64	3.64	3.01
Adjusted R-squared	0.619	0.552	0.481	0.383	0.379	0.362
Std. Err.	2.341	2.539	2.733	11.347	11.38	11.54
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	930	930	930	930	930	930

Note: This table reports regressions according to Eq. 3. Credit card debt indicators (dependent variables) are represented by credit card debt to median income (in %) (models 1-3) and credit card debt in arrears per capita (in PLN) (models 4-6). Both indicators are regressed against three income inequality measures: Gini, S80/S20, P90/P10. Controls include: median income, apartments per 1000 people, unemployment, women per 100 men, mortgages in arrears. All specifications include province dummies. This table reports standardized coefficients. Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively

Models (1) to (3) suggest a strong relationship between income inequality and credit card debt relative to income. Specifically, the Gini coefficient standardized coefficient estimate of 0.485 (Model (1)), indicating that a one-standard-deviation increase in the Gini coefficient is associated with a 1.84% increase in the credit card debt as a percent of median monthly income. The coefficient estimates for S80/S20 and P90/P10 are similarly positive and significant (0.393 and 0.253, respectively). This shows that as inequality rises, households rely more on credit relative to their income. Also, median income exhibits a positive relationship with the credit card debt-to-income ratios, suggesting that higher income is associated with higher credit card debt leverage.

Housing wealth (as measured by apartments per 1000 people) has a positive association with credit card debt relative to income. Coefficient estimates range between 0.25 and 0.29 standard deviations in all model specifications. Similarly, estimates for other control variables like unemployment, number of women per 100 men, and number of mortgages in arrears per 1000 people are consistent with those reported in Table 3.

Models (4) to (6) are of our particular interest as now the dependent variable is credit card debt in arrears per capita (in PLN). Shifting focus to overdue credit card debt rather than overall credit card debt we analyze if income inequality correlates with financial risk taking. The Gini index remains positive and significant (standardized coefficient of 0.259), indicating that as inequality increases, so does the amount of credit card debt in arrears. This relationship is likewise observed for the S80/S20 (standardized coefficient of 0.254) and P90/P10 (standardized coefficient of 0.209) ratios.

Regarding control variables, median income has a positive and significant effect on credit card debt in arrears per capita (standardized coefficient ranging from 0.167 to 0.228), suggesting that, as higher income households rely more on credit, they also experience higher arrears. Unemployment and feminization ratio are not found to be significant here, indicating that they have little explanatory power for arrears. The significant relationship between mortgages in arrears and credit card debt in arrears (standardized coefficients ranging from 0.196 to

0.223) underscores that, as households facing arrears in mortgages are more willing to extend credit card debt, they are also more prone to fall behind in paying due credit card balances.

Our results are highly significant for all inequality measures (Gini, S80/S20, and P90/P10 ratios) across all models highlighting that both “average” inequality and the gap between top and bottom income earners contribute to increased credit card debt reliance, both in absolute terms and relative to income. This evidence aligns with the "relative income hypothesis", proposed by Duesenberry (1949) and enjoying a renaissance in recent times, which emphasizes the role of relative consumption aspirations. Similarly, studies like Christen & Morgan (2005), van Treeck (2014) argue that rising inequality prompts lower-income households to borrow for conspicuous consumption, a phenomenon often termed "keeping up with the Joneses." Some authors (Hake & Poyntner, 2022; Loschiavo, 2021), however, based on survey data on the probability of having a loan (and planning to take out a loan) suggest the negative impact of higher income inequality on the availability of bank loans for low-income groups leading to lower debt diffusion at the bottom of the income distribution and higher debt diffusion at the top of the income distribution in highly unequal environment. Our dataset with city-level observations does not allow to address the issue of debt distribution across income groups within cities but it provides evidence that holding other factors fixed higher median income correlates with higher credit card debt in absolute terms and higher credit card debt leverage. This is in line with prior household-level results on the distribution of debt burden in Poland (Anioła-Mikołajczak, 2016; Wałęga & Wałęga, 2016). Our crucial result is a strong relationship between income inequality and credit card debt in arrears, suggesting that inequality not only correlates with credit card use but also contributes to risk-taking behavior. Our outcomes are in line with the insights of Boushey & Weller (2008), who linked rising inequality to household financial distress in the U.S. The findings reinforce the view that high inequality exacerbates not only borrowing but also default risk.

5. Robustness Checks

To ascertain whether our coefficient estimates are robust to outliers in terms of Gini coefficients and population, we delete the observations with the 5 highest and 5 lowest Gini coefficients and also the observations with 5 largest and 5 smallest populations from the database. To address the significant heterogeneity in city sizes across Poland, while re-estimating our baseline models we used population-weighted regressions. The robustness check results are presented in Tables 5 and 6.

Table 5 Credit card total balances and new originations regressed against income inequality measures and controls (population-weighted specifications, excluding inequality and city size outliers)

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Credit card debt per capita (in PLN)			New credit card debt per capita (in PLN)		
Gini	0.341*** (0.986)			0.279*** (0.488)		
S80/S20		0.241***			0.154***	

		(0.012)			(0.005)	
P90/P10			0.131*** (0.012)			0.066*** (0.005)
Median income	0.318*** (0.000)	0.412*** (0.000)	0.389*** (0.000)	0.364*** (0.000)	0.428*** (0.000)	0.407*** (0.000)
Apartments per 1000 people	0.266*** (0.001)	0.286*** (0.001)	0.318*** (0.001)	0.336*** (0.000)	0.361*** (0.000)	0.383*** (0.000)
Unemployment	-0.117*** (0.007)	-0.124*** (0.008)	-0.132*** (0.008)	-0.045*** (0.004)	-0.051*** (0.004)	-0.055*** (0.004)
Number of women per 100 men	0.133*** (0.008)	0.158*** (0.009)	0.164*** (0.009)	0.121*** (0.005)	0.141*** (0.005)	0.143*** (0.005)
Number of mortgages in arrears per 1000 people	0.121*** (0.054)	0.142*** (0.059)	0.184*** (0.062)	0.020*** (0.026)	0.053*** (0.028)	0.086*** (0.028)
Quantification β *Ineq*SD*	45.185	32.41	17.62	14.59	8.06	3.45
Adjusted R-squared	0.826	0.793	0.767	0.726	0.694	0.682
Std. Err.	52.763	57.580	61.014	27.715	29.266	29.838
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	910	910	910	910	910	910

Note: This table reports regressions according to Eq. 3. weighted by population excluding inequality and city size outliers. Credit card debt indicators (dependent variables) are represented by credit card debt per capita (in PLN) (models 1-3) and new credit card debt per capita (in PLN) (models 4-6). Both indicators are regressed against three income inequality measures: Gini, S80/S20, P90/P10. Controls include: median income, apartments per 1000 people, unemployment, women per 100 men, mortgages in arrears. All specifications include province dummies. This table reports standardized coefficients. Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Table 6 Credit card debt to income and credit card debt arrears regressed against income inequality measures and controls (population-weighted specifications, excluding inequality and city size outliers)

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Credit card debt to median monthly income (in %)			Credit card debt in arrears per capita (in PLN)		
Gini	0.390*** (0.031)			0.185*** (0.116)		
S80/S20		0.275*** (0.000)			0.146*** (0.001)	
P90/P10			0.151*** (0.000)			0.112*** (0.001)
Median income	-0.026*** (0.000)	0.081*** (0.000)	0.056*** (0.000)	0.134*** (0.000)	0.189*** (0.000)	0.188 *** (0.000)
Apartments per 1000 people	0.317** (0.000)	0.341*** (0.000)	0.377*** (0.000)	0.329*** (0.000)	0.338*** (0.000)	0.354*** (0.000)
Unemployment	-0.122*** (0.000)	-0.130*** (0.000)	-0.139*** (0.000)	0.008*** (0.001)	0.004*** (0.001)	-0.003*** (0.001)

Number of women per 100 men	0.175*** (0.000)	0.204*** (0.000)	0.210*** (0.000)	0.177*** (0.001)	0.131*** (0.001)	0.137*** (0.001)
Number of mortgages in arrears per 1000 people	0.151*** (0.002)	0.175*** (0.002)	0.223*** (0.002)	0.166*** (0.006)	0.172*** (0.007)	0.186*** (0.007)
Quantification β *Ineq*SD*	1.48	1.04	0.57	2.67	2.11	1.62
Adjusted R-squared	0.759	0.715	0.682	0.604	0.597	0.591
Std. Err.	1.644	1.788	1.888	7.573	7.642	7.694
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	910	910	910	910	910	910

Note: This table reports regressions according to Eq. 3. weighted by population excluding inequality and city size outliers. Credit card debt indicators (dependent variables) are represented by credit card debt to median income (in %) (models 1-3) and credit card debt in arrears per capita (in PLN) (models 4-6). Both indicators are regressed against three income inequality measures: Gini, S80/S20, P90/P10. Controls include: median income, apartments per 1000 people, unemployment, women per 100 men, mortgages in arrears. All specifications include province dummies. This table reports standardized coefficients. Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Coefficient estimates for all three inequality measures remain positive and statistically significant, suggesting that our results are robust to the exclusion of populations with extremely high and low inequality measures and extremely high and low populations. These additional tests support the robustness of our findings and indicate that the estimated effects capture general patterns observable across cities of different sizes.

Additionally, we reran the regressions excluding the 10 largest Polish cities from the dataset, which are also expensive cities to live in as they provide the most opportunities for conspicuous consumption. These results are very similar to those for the full data.

4. Conclusion

The purpose of our research is to investigate if income inequality contributes to risky borrowing for consumption in the form of relatively easily available credit. For this end, we use a novel database of credit card debt and income inequality for all 930 towns and cities in Poland during 2018. We find a positive and significant relation between income inequality and credit card debt in arrears that lend empirical support to this hypothesis. This relation remains robust after controlling for several cross-sectional determinants of income inequality drawn from the literature and checks for potentially biased estimates caused by outliers and variations in Gini coefficients being driven by the less populated cities in the country.

While our results add to the growing body of research on the Polish credit markets - a prime example of a post-communist European Emerging Economy - the results from our study are also relevant to a larger audience because the granularity of our data allows us to delve into a universal research question: do social comparisons encourage risk taking? And further, do

the risks taken by people in response to comparisons include financial decisions? The financial risks taken by households can be observed in their roles as investors and consumers. As investors, households will make asset allocation, security selection, and diversification decisions based on their degree of risk aversion. As consumers, households must decide how much of their income to spend and how much to save, and whether to consume or keep up with the consumption habits of their peer group. While we all face the pressure to belong and one way to do this is by having what everyone else has, how many of us decide that it is worth taking on expensive loans to fit in is up for debate.

Our study opens multiple avenues for future exploration. As Poland and other countries make more granular demographic data available for research, the creation of a panel involving many geographies and years could help us understand better how external determinants of inequality shape risk perceptions and attitudes. Also, gaining access to household-level data could help disentangle the effects of wealth and inequality on financial risk-taking, and the supply- and demand-side effects on credit card debt burden. Finally, our findings can aid policy makers by emphasizing the need for local interventions targeting inequality and financial education to mitigate the risks of over-indebtedness (Bazillier & Hericourt, 2017; Zungu & Greyling, 2023). Emerging economies facing a simultaneous rise in inequality and credit availability need particular attention. The challenge lies in creating a social and legal framework that encourages the responsible use of credit - described by Dwyer & DeMarco (2024) as a "double-edged sword" - to reduce inequality, rather than exacerbate it by creating excessive financial burdens.

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