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 to credit card balances and balances overdue by 90 days or more. Our results are robust to various inequality measures and suggest that inequality not only correlates with credit card usage, but might also encourage risky borrowing, or the type of borrowing that goes beyond a household's ability to repay. In addition, we find a strong positive relation between credit card balances and mortgages overdue, suggesting that households struggling to make mortgage payments are juggling balances in multiple credit cards, thus extending their borrowing beyond their 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.

Keywords: income inequality, credit cards 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 on 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. The results from the cross-sectional regressions presented here support this conjecture.

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 have relied primarily on survey data (e.g. Hake & Poyntner, 2022; Jestl, 2023; Loschiavo, 2021). We are one of a small number of papers that utilize credit bureau data (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 level. 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 quite 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 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 index has a high and statistically significant standardized coefficient of 0.236, indicating that a one-standard-deviation increase in the Gini coefficient leads to 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 suggest 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. "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). 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 financial development (Escudero, 2023) and, therefore, studies of this relation on alternative experimental settings are needed and of value to this line of research (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 et al., 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). This makes Poland an area of particular interest for researchers and policymakers, especially given the scarcity of studies on former socialist economies in Central and Eastern Europe.

The remainder of the paper is organized as follows. Section 2 provides a survey of previous studies on income inequality and debt. Section 3 presents the stylized facts on the development of the consumer credit markets in Poland. Section 4 briefly describes the data and the methodology of the research, Section 5 presents and discusses the empirical findings and, finally, Section 6 summarizes the study.

2. Related research

Inequality has attracted attention of researchers and policymakers for decades however it gained a new surge of interest after the release of Piketty's (2014) book "Capital in the Twenty-First Century." He documented the rising long-term trend in income and wealth inequality recorded in the United States and other developed markets and stimulated research on antecedents and consequences of inequality. The broad array of intertwined perspectives for inequality studies include the economic (e.g. Cowell & Van Kerm, 2015; Kierzenkowski & Koske, 2013; Mdingi & Ho, 2021), political (e.g. Ballas et al., 2017; Elkjaer & Klitgaard, 2021; MacKinnon et al., 2024; O'Neill, 2017), and social (e.g. Cooper & Pugh, 2020; Dwyer, 2018; Lindh & McCall, 2023; Schneider, 2016; Schröder & Neumayr, 2023) among others.

From the standpoint of economics, the crucial questions refer to the relationship between income inequality and economic growth (e.g. Chemwok et al., 2023; Greenwood & Jovanovic, 1990; Hien, 2022; Kuznets, 1955; Mdingi & Ho, 2021; Montazeri Shoorekchali & Zahedgharavi, 2022). The critical mechanism goes through financial development with a predominant role of banking.

After the Global Financial Crisis there was a surge in research on the relation between inequality and debt crises (Bazillier et al., 2021; Bazillier & Hericourt, 2017; El-Shagi et al., 2020; Galbraith, 2012; Medialdea García & Sanabria Martin, 2022; Rajan, 2011; Stockhammer, 2015; van Treeck, 2014; Xu, 2022; Zungu & Greyling, 2023). The core hypothesis is that income inequality contribute to banking crises by stimulating the accumulation of unsustainable

household debt and the creation of credit bubbles. Goda et al. (2017) place income and wealth inequality as central to the recent crisis arguing that it played a pivotal role on both the supply and demand sides of the market of the toxic securities. Bazillier et al. (2021) suggest that the inequality increases household debt only after a country reaches a certain threshold of economic and financial development, that allows for credit constraints to be relaxed and for larger segments of the population to finance their consumption with credit.

Although many studies posit that higher income inequality spurs credit booms, some authors argue that the opposite might be true. Loschiavo (2021) provides evidence from Italian survey data that, because of imperfect information, higher income inequality reduces available credit, which in turn results in less borrowing and lower debt levels among low-income groups. Coibion (2020) shows similar results for US households. Vijverberg (2024) adds to the emerging literature on factors affecting borrower behavior (e.g. Berisha & Meszaros, 2018; Branten, 2022; Kłopocka, 2017; Walega & Walega, 2021) by looking at the impact of income inequality on household debt. Using US state-level data he suggests that inequality has either a negative or negligible impact on household debt. Jestl (2023) explores the Eurosystem Household Finance and Consumption Survey data and finds heterogeneous effects across euro area countries. Hake & Poyntner (2022) using survey data for European Emerging Economies (Central, Eastern, and Southeastern Europe) find support for both the aforementioned supply-side channel, and a demand-side channel ("Keeping up with the Jones'").

Another strand in the literature proposes that the causality may run in the other direction and suggests that financial development drives economic inequality (Bazillier & Hericourt, 2017; Berisha & Meszaros, 2018; Cournède & Mann, 2018; de Haan & Sturm, 2017; Demirguc-Kunt & Levine, 2009; Zungu & Greyling, 2023). Lin & Neely (2020), in their seminal book, convince that financialization of the economy is a fundamental cause of the surge in inequality across US society in the past four decades. They argue that though the rise of finance is not the sole cause of upward trending inequality, it plays a pivotal role because it promotes and complements other inequality-inducing developments like globalization, technological advancement, changing employment relationships. Denk & Cournède (2015) provide evidence that financial expansion tends to raise income inequality as larger credit and stock market participation among high versus low-income earners supports the previous ones with better investment opportunities and higher returns on their savings. This is in line with findings of Denk & Cazenave-Lacroutz (2015) that typically, being credit-constrained is much more probable among households in the lowest quintile of the income distribution than in the top one. This discrepancy can be attributed, in part, to the greater likelihood of low-income households to face negative income shocks, and consequently to seek credit in order to smooth consumption. They also propose another channel linking household finance to inequality, i.e. lower credit interest rates for high- than low-income earners. Bobek et al. (2023, p. 2246) emphasize that financial chains "can act as a giant mechanism for a systematic transfer of value from the bottom of society to the top—mediated by financial markets and housing/mortgage markets—with the full support of the state and its central bank".

Other studies demonstrate that financial development provides opportunities to reduce inequality. Law et al. (2014) imply that the relationship between financial development and

income inequality is influenced by institutional quality, indicating that higher-quality finance contributes to a more equitable distribution of income. With robust institutions in place, financial development has the potential to diminish inequality, enabling individuals with lower incomes to invest in both human and physical capital. Parvez et al. (2023) and Mookerjee & Kalipioni (2010) prove that greater availability of banking services and better regulatory quality reduces income inequality. Similarly, Zhang & Ben Naceur (2019) reveal that financial development (measured by access, depth, efficiency, and stability) can significantly reduce inequality and poverty. The influence of financial sector development on income inequality appears to be primarily channeled through the banking sector (Gimet & Lagoarde-Segot, 2011; Zhang & Ben Naceur, 2019). However, Seven & Coskun (2016) reveal that neither banks nor stock markets have a significant impact on poverty reduction in emerging countries. In Africa, as suggested by Koudalo & Wu (2022), the scarcity of financial resources induce banks to discriminate poor groups from financial access, exacerbating inequality. The potential positive effects of household indebtedness are surpassed by negative consequences when it shifts to over-indebtedness (Wang & Ward, 2023). High leverage exposes household to insolvency risk and contributes to financial fragility. Over-indebtedness gives multifaceted negative effects, including social and financial exclusion, and exacerbates inequality of opportunities (CPEC, 2013; Leandro & Botelho, 2022). The meaningful role of financial literacy in enhancing individuals' financial decisions and reducing financial vulnerability is emphasized (Gathergood, 2012; Klapper & Lusardi, 2020; Lusardi et al., 2020; Swiecka et al., 2020; Walega & Walega, 2021).

3. The development of Polish credit market for households

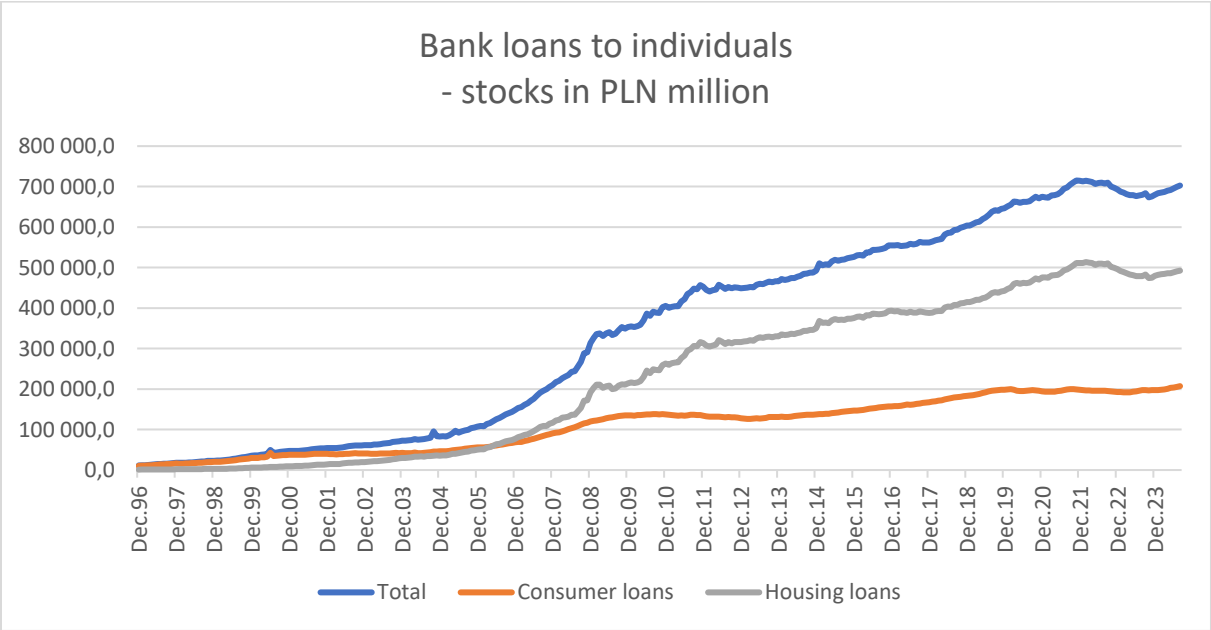
Over the past three decades, Poland has witnessed an outstanding development in its retail credit market, reflecting a dynamic interplay of political, economic, social, regulatory, and technological factors. In the early 1990s, after the collapse of communism, profound legal and economic reforms resulted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

The retail credit market expanded substantially, offering a diverse range of products to meet the evolving needs of households. 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 in the early 2020s occurred with the COVID-19 pandemic and the war in Ukraine, a.o. the unpreceded level of uncertainty and the rise in the inflation and interest rates. The

Covid-19 accelerated a digital revolution, started in the early 2000s with the onset of online banking. The implementation of new technologies was targeted mainly at providing the cutting-edge products and improving the productivity and efficiency of internal processes. 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).

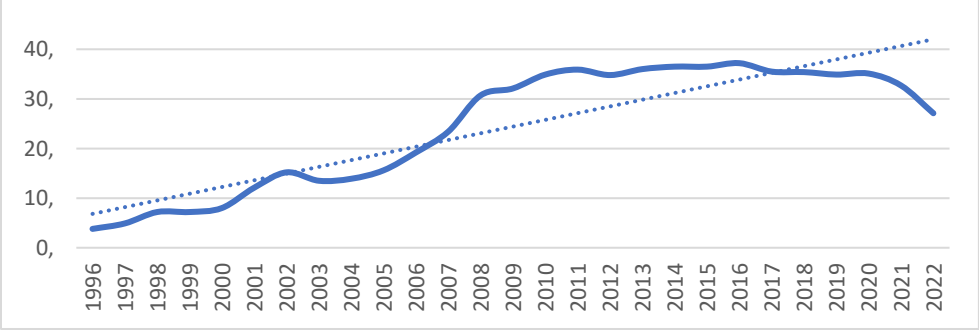
Throughout these three decades, Poland's retail credit market has emerged as an increasingly important source of funds for households striving to satisfy their housing and consumption needs (Walega & Walega, 2021). In 1996-2022, liabilities of individuals revealed a long-standing increasing trend both in absolute terms (Figure 1) and as a percentage of GDP (Figure 2), however recent years of uncertainty and high level interest rates witnessed a decline of households borrowing. The most profound developments took place in the market for mortgages. Consumer credit (including credit cards loans) was also subject to considerable evolution.

Figure 1 Bank loans to individuals - stocks in PLN million



Source: Narodowy Bank Polski data.

Figure 2 Liabilities of households as a percentage of GDP



Source: Eurostat data.

4. Data and methods

Our empirical analysis combines two datasets: (1) the unique bank-originated data on individual loans gathered and provided at the city-level by BIK (Biuro Informacji Kredytowej - 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 the Central Statistical Office in Poland. Thanks to use of the novel city-level data we are able to perform our analysis at the high level of disaggregation in spatial terms i.e. for all cities in Poland. The local perspective of income inequality analysis is particularly adequate for this paper objective and it is a strong advantage of our research. The novelty of our approach is in line with the modern trend to utilize data that are based on transactional or administrative sources rather than representative samples. Our research covers all credit card loans granted to city dwellers in Poland. We analyze both new production and accumulated loan portfolio, 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 banking industry in Poland. BIK gathers and processes information from banks, cooperative saving and credit unions, non-banking loan providers and other entities. At present its database embraces information about 159 million accounts belonging to 25 million individual clients, as well as information on credit history for more than one million companies, farmers, and other entities (*O nas*, n.d.).

Our analysis explores data covering credit card loans taken out in all Polish 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 the new production sold in 2018.

Concerning the inequality indicators, we use data provided by the Central Statistical Office in the experimental study on Income stratification of city dwellers (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, therefore the resulting statistics are accessible only at the provincial level or even broader spatial aggregations. This limitation proves challenging for researchers aiming to conduct in-depth socio-economic analyses as the variations in personal incomes become most influential at the local level. To address the absence of data at lower levels of spatial aggregation the Central Statistical Office conducted an experimental study based on taxable personal incomes earned in 2018 by city dwellers who were in paid employment. This data is derived from the administrative registers of the Ministry of Finance. The broad array of income distribution measures was considered with regard to the established position of the measure in the relevant literature, computational complexity,

correlation with other ratios of income distribution to avoid information redundancy. As a result, a database containing information on median taxable income, Gini coefficient, percentile ratio P90/P10, and income share ratio S80/S20 for cities was released.

The most common measure of inequality used in empirical studies is the Gini coefficient. The value of the Gini coefficient is determined based on the formula

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

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. Its values belong to the interval of [0, 1]. The Gini coefficient equals zero when all people have the same level of income and equals one when one person receives all the income. In other words, the smaller the Gini coefficient the more equal the distribution of income. The Gini coefficient summarizes the differences in income between each individual in the population and every other individual. These differences are calculated as absolute arithmetic differences, meaning that a difference between two high-income individuals contributes the same to the index as a difference between two low-income individuals. When the income of a person above the median increases, the Gini coefficient will always rise. Similarly, a decrease in the income of a person 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.

Table 1 introduces most and least unequal cities. When it comes to the highest Gini coefficient, two cities stand out in our database: Podkowa Leśna (0.57) and Konstancin Jeziorna (0.55) primarily followed with some other cities constituting the agglomeration of Warsaw - the capital city of Poland. Warsaw takes 8th position in the ranking with the score 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 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

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

where

Q(0.8) represents fifth (the highest) quintile,

$Q(0.2)$ represents first (the lowest) quintile,

x_i represents the income of ith unit in the population.

The S80/S20 spectrum ranges from 33.09 for Podkowa Leśna to 6.92 for Nowe Skalmierzyce, so the first and the last cities are the same for S80/S20 ratio and Gini coefficient.

The measure that allows to determine how much the incomes of taxpayers with very high and very low incomes differ is the ratio of the 90th to the 10th percentiles (P90/P10). The greater the income inequalities among taxpayers, the higher the value of this indicator. For Biały Bór, the city with the highest score in the country, this indicator reached a value of 26.37. This means that a person at the threshold of the top 10% of the Biały Bór population ordered by income earned an income that was 26.37 times greater than that of a person at the threshold of the bottom 10% of the Biały Bór population. The lowest P90/P10 score i.e. 6.21 was registered for Błażowa.

We perform the ordinary least squares estimation of multiple linear regression models, using credit card loans indicators as dependent variables and income inequality measures (Gini coefficient, P90/P10, S80/S20) as independent variables, controlling for other standard bank loans determinants. 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 P90/P10 or S80/S20,

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 reveals banks' dues from credit card accounts run by them. It represents total balance covering recent transactions and the remaining balance carried over from the previous months as of 31 December 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 understood as 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.

Standard control variables derive from statistics available at the city-level on economic (income, unemployment, housing) and demographic factors provided by the Central Statistical Office. We add also mortgage indicators (number of mortgages per 1000 people, number of mortgages in arrears i.e. overdue 90 days or more per 1000 people) provided by BIK as control variables to account for the interrelationships in the loan portfolio. We include province dummies to account for province-level determinants of credit market participation such as business environment, culture etc. Table 2 introduces the descriptive statistics of our dependent and independent variables. Table 3 provides the correlation matrix for median income and income inequality indicators.

Table 1 Most and least unequal cities

City	Population	Median income (PLN)	Gini
Most unequal			
Podkowa Leśna	3 854	52 525	0.5766
Konstancin-Jeziorna	17 086	43 272	0.5547
Puszczykowo	9 698	39 681	0.5348
Łomianki	16 977	48 692	0.5276
Józefów	20 605	43 717	0.5225
Milanówek	16 306	43 480	0.5172
Sopot	36 046	41 686	0.5003
Warszawa	1 777 972	55 110	0.4826
Brwinów	13 531	48 542	0.4666
Szczawno-Zdrój	5 608	37 150	0.4664
Least unequal			
Węgliniec	2 860	43 376	0.3435
Sokółka	18 210	38 604	0.3431
Chorzele	3 078	36 089	0.3391
Łaszczów	2 154	31 472	0.3383
Janikowo	8 758	36 994	0.3368
Hajnówka	20 690	37 231	0.3359
Górzno	1 370	33 244	0.3309
Lubawa	10 381	37 327	0.3282
Zbąszynek	5 021	48 183	0.3212
Nowe Skalmierzyce	4 770	41 459	0.3124

Table 2 Descriptive statistics

	N	Min	Max	Average	SD
Credit card debt per capita (in PLN)	930	61.529	1583.383	306.261	134.462
New credit card debt per capita (in PLN)	930	18.959	368.384	119.698	52.307
Credit card debt to median monthly income (in %)	930	2.60	37.87	10.57	3.79
Credit card debt in arrears per capita (in PLN)	930	71.224	162.659	24.329	14.449
GINI index	930	0.3124	0.5766	0.3930	0.0262
S80/S20 index	930	6.92	33.09	12.64	2.72
P90/P10 index	930	6.21	26.37	12.21	2.80
Median income (in PLN)	930	23865.0	55110.3	34452.5	4445.6
Apartments per 1000 people	930	255.4	898.7	372.677	53.2419
Number of women per 100 men	930	89.00	125.00	107.56	4.13
Unemployment rate measured as the share of registered unemployed in the population of working age (%)	930	0.00	11.10	1.49	2.46
Number of mortgages per 1000 people	930	16.700	216.957	57.688	20.492
Number of mortgages in arrears per 1000 people	930	0.000	3.633	0.803	0.551

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

Table 3 Pearson correlation coefficients for median income and income inequality measures

	Median income	Gini	P90/P10	S80/S20
Median income	1	0.151	-0.243	-0.130
Gini	0.151	1	0.664	0.845
P90/P10	-0.243	0.664	1	0.925
S80/S20	-0.130	0.845	0.925	1

5. Empirical results and discussion

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

In this section we reveal our empirical assessment of inequality and credit card debt relationship in three aspects, namely, (1) credit card debt accumulation, (2) household leverage in credit card debt, and (3) credit card debt in arrears.

Table 4 focuses on the 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) concentrates 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 rather focus on the discrepancy between the tails.

Table 4

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Credit card debt per capita (in PLN)			New credit card debt per capita (in PLN)		
Gini	0.429*** (297.3)			0.297*** (74.2)		
S80/S20		0.372*** (3.260)			0.210*** (0.803)	
P90/P10			0.243*** (2.920)			0.144*** (0.749)
Median income	0.233*** (0.001)	0.275*** (0.002)	0.239*** (0.002)	0.248*** (0.000)	0.264*** (0.000)	0.247*** (0.000)
Apartments per 1000 people	0.159*** (0.068)	0.149*** (0.084)	0.184*** (0.077)	0.124*** (0.022)	0.128*** (0.023)	0.148*** (0.024)
Unemployment	-0.061*** (0.989)	-0.063*** (1.041)	-0.072*** (1.219)	0.021 (0.310)	0.019 (0.323)	0.015 (0.361)
Number of women per 100 men	0.000 (0.833)	0.017 (0.865)	0.020 (0.896)	0.075*** (0.285)	0.093*** (0.291)	0.099*** (0.300)
Number of mortgages per 1000 people	0.229*** (0.285)	0.308*** (0.265)	0.324*** (0.299)	0.325*** (0.081)	0.381*** (0.086)	0.390*** (0.096)
Number of mortgages in arrears per 1000 people	0.120*** (9.165)	0.111*** (8.752)	0.150*** (11.990)	0.004 (2.401)	0.008 (2.435)	0.028 (3.227)
Quantification $\beta Ineq * SD$	57.684	50.020	32.674	15.535	10.984	7.532
Adjusted R-squared	0.733	0.702	0.642	0.575	0.544	0.526
Std. Err.	69.428	73.443	80.423	34.091	35.327	36.006
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	930	930	930	930	930	930

Note: The table reports standardized coefficients. Robust standard errors are in parentheses. All specifications include province dummies. * Statistical significance at the 10 % level, ** statistical significance at the 5 % level, *** statistical significance at the 1 % level.

Models (1) to (6) confirm the (very) significant positive association between the credit card debt utilization and 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 index is associated with a 0.429 standard deviation increase in the credit card debt per capita (approximately 57.7 PLN, equivalent to 15.34 USD based on the

exchange rate as of 31 December 2018 used in what follows) and a 0.297 standard deviation increase in new credit card debt per capita (approximately 16 PLN, equivalent to 4.13 USD). The alternative measures of inequality, namely S80/S20 and P90/P10, also produce statistically significant and economically meaningful results for credit card debt per capita (a 0.372 and 0.210 standard deviation increase with one standard deviation increase in the respective inequality ratio) and new credit card debt per capita (a 0.243 and 0.144 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 association with credit card debt per capita and new credit card debt per capita. A one-standard-deviation increase in the median income gives a 0.233 to 0.275 standard deviation effect for credit card debt per capita and a 0.247 to 0.264 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 0.124 to 0.184, indicating that higher housing wealth correlates with greater credit card borrowing.

In Models (1) to (3), the Beta coefficients for unemployment are negative (from -0.061 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 so 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 number of women per 100 men in Models (4) to (6) indicate that cities with higher female-to-male ratios tend to have more new credit card debt per capita. This demographic factor does not turns out to be statistically significant for total credit card balances. This suggests that women are more prone than men to use credit cards for transactions but not necessarily for revolving debt.

Finally, we control the effect of mortgage development to credit card utilization. We find a very strong positive relationship between mortgage penetration (measured with the number of mortgages per 1000 people) and credit card debt utilization. The Beta coefficients in Models (1) to (3) indicate that a one-standard-deviation increase in the number of mortgages per 1000 people gives a rise in credit card debt per capita ranging from 0.229 to 0.324 standard deviation (that equals 30.79 to 43.57 PLN, equivalent to 3.76 to 11.59 USD, respectively). The estimates in Models (4) to (6) reveal that the effect for new credit card debt per capita falls between 0.325 and 0.390 standard deviation (16.99 and 20.40 PLN, equivalent to 4.52 and 5.43 USD, respectively). As expected, cities with higher mortgage penetration are more likely

to see increased credit card debt utilization. Presumably, mortgage debt creates a broader culture of credit use and boosts household propensity to borrow in different forms. Simultaneously, it might be a supply-side effect of banks cross-selling activities. Interestingly, number of mortgages in arrears per 1000 people shows a strong positive relationship with total credit card debt per capita (Models (1) to (3)), however, it is not significant for new credit card debt per capita (Models (4) to (6)). It implies that overdue mortgages are associated with higher credit card debt accumulation due to the use of revolving credit card debt in financial hardship.

The adjusted R-squared values range from 0.526 to 0.733 and prove high explanatory power of estimated models.

Table 5 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 income inequality link to credit card debt in arrears.

Table 5

	(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	0.438*** (7.422)			0.236*** (36.8)		
S80/S20		0.367*** (0.080)			0.239*** (0.440)	
P90/P10			0.232*** (0.075)			0.195*** (0.384)
Median income	-0.119*** (0.000)	-0.078*** (0.000)	-0.114*** (0.000)	0.131*** (0.000)	0.173*** (0.000)	0.165*** (0.000)
Apartments per 1000 people	0.238*** (0.002)	0.232*** (0.002)	0.269*** (0.002)	0.223*** (0.015)	0.220*** (0.015)	0.238*** (0.014)
Unemployment	-0.042** (0.031)	-0.044* (0.032)	-0.051** (0.036)	0.001 (0.131)	0.004 (0.128)	-0.001 (0.134)
Number of women per 100 men	0.027 (0.029)	0.053** (0.029)	0.063** (0.030)	-0.037 (0.230)	0.003 (0.237)	0.011 (0.232)
Number of mortgages per 1000 people	0.274*** (0.008)	0.355*** (0.009)	0.372*** (0.010)	0.045 (0.044)	0.088** (0.040)	0.100** (0.040)
Number of mortgages in arrears per 1000 people	0.126*** (0.240)	0.120*** (0.244)	0.159*** (0.323)	0.179*** (1.300)	0.166*** (1.211)	0.184*** (1.395)
Quantification $\beta Ineq * SD$	1.66	1.39	0.88	3.41	3.45	2.82
Adjusted R-squared	0.651	0.611	0.550	0.385	0.385	0.369
Std. Err.	2.239	2.365	2.544	11.332	11.333	11.473
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	930	930	930	930	930	930

Note: The table reports standardized coefficients. Robust standard errors are in parentheses. All specifications include province dummies. * Statistical significance at the 10 % level, ** statistical significance at the 5 % level, *** statistical significance at the 1 % level.

Models (1) to (3) suggest a strong relationship between income inequality and credit card debt relative to income. Specifically, the Gini index has a high and statistically significant

standardized coefficient of 0.438 (Model (1)), indicating that a one-standard-deviation increase in the Gini coefficient leads to a 0.438 standard deviation increase in the credit card debt to median monthly income ratio (i.e. 1.66 percentage points). Similarly, the coefficient of S80/S20 ratio in Model (2), and the coefficient of P90/P10 ratio in Model (3) are significant and positive (0.367 and 0.232, respectively). This shows that as inequality rises, households rely more on credit relative to their income. This strong positive correlation of inequality and relative credit card debt burdens should be interpreted in the context of results for income variable. Median income exhibits a negative relationship with the credit card debt-to-income ratio across Models (1) to (3), with standardized coefficients from -0.119 to -0.078. This suggests that higher income links to relatively lower levels of credit card debt leverage, despite higher levels of credit card debt accumulation, as revealed in Table 4.

Housing wealth (as measured by apartments per 1000 people) has positive and significant effects on the credit card debt relative to income. A one-standard-deviation increase in this control variable leads to a 0.238/0.232/0.269 standard deviation increase in the credit card debt leverage ratio, depending on the specification. This evidence is consistent with results presented in Table 4 showing strong positive correlation of housing wealth and credit card borrowing. Similarly, estimates for other control variables, namely unemployment, number of women per 100 men, number of mortgages per 1000 people, number of mortgages in arrears per 1000 people, coherently mirror correlations with credit card debt accumulation reported in Table 4, what is according to expectations as we control for income.

It is worth emphasizing that mortgage penetration is one of the strongest predictors of credit card debt-to-income ratios (standardized coefficients ranging from 0.274 in Model (1) to 0.372 in Model (3)). This could be due to the significant financial commitment that mortgages represent, leading households to rely on additional credit sources like credit cards to manage expenses. The reliance on credit cards may reflect both a need to sustain household consumption while balancing mortgage payments and the easier access to credit that typically accompanies higher mortgage borrowing. Number of mortgages in arrears per 1000 people also shows positive and statistically significant effects across Models (1) to (3), with standardized coefficients from 0.120 to 0.159. This variable's significance highlights a correlation between mortgage repayment difficulties and an increased credit card debt-to-income ratio, suggesting that households facing challenges with mortgage payments may turn to credit cards to meet immediate financial obligations, increasing their credit card debt leverage. This result implies that mortgage arrears are an indicator of financial vulnerability, and households struggling with home loan repayments are also more likely to accrue other types of debt, in particular credit card debt.

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 levels rather than overall credit card debt we analyze if income inequality corelates with financial risk taking. The Gini index remains positive and significant (standardized coefficient of 0.236), 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 0.239) and P90/P10 (standardized coefficient of 0.195) ratios.

Regarding control variables, median income has a positive and significant effect on credit card debt in arrears per capita (standardized coefficient ranging from 0.131 to 0.173), suggesting that though higher income households experience lower debt burden relative to income, they represent higher levels of arrears per capita in absolute terms, corresponding with higher overall credit card balances. Unemployment and feminization ratio are not found to be significant here, indicating that they have little explanatory power for arrears. One more time mortgage variables turn out to be important drivers of credit card debt. Both variables are positively associated with credit card debt in arrears, though with a slightly lower significance level in case of the number of mortgages per capita. Households with mortgages may have higher fixed costs and financial commitments, which can increase the risk of falling behind on other debts, especially during periods of financial hardship. The very significant relationship between mortgages in arrears and credit card debt in arrears (standardized coefficients ranging from 0.166 to 0.184) underscores that households already facing arrears in one type of debt, such as mortgages, may have limited resources to meet other obligations, making them vulnerable to arrears on credit card payments as well. These results highlight the interconnectedness of different debt types in shaping household financial health.

6. Conclusion

Drawing on prior research, in particular “income inequality and debt-financed consumption as a cause of financial fragility hypothesis” (Medialdea García & Sanabria Martin, 2022) we test if income inequality contributes to risky borrowing for consumption in the form of relatively easily available credit card loans. Our results add a new evidence from Poland - a leading example of the post-communist European Emerging Economy, which witnessed simultaneously a very dynamic financial development and a huge increase in inequality.

Contradictory to prior research we focus on inequality and delinquent debt relationship. Using the Credit Information Bureau data on credit card debt and city-level variation in income inequality, we reveal that higher level of inequality is linked to higher level of credit card debt accumulation, higher leverage and higher levels of credit card debt in arrears. These results are robust to different inequality measures. We argue that there is a need for financial education and policy interventions targeting inequality to decrease household financial vulnerability.

The findings in our study contribute to a broad body of literature linking income inequality to household debt. The positive relationship between income inequality and credit card debt is found in both sets of models. 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 levels of credit card debt in absolute terms and lower levels of 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). They find a positive relationship of household income with the number of credit commitments but a negative one with the probability of over-indebtedness and with the subjective perception of debt burden.

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. Additionally, we find the strong relationship between credit card debt and mortgages in arrears, indicating that households struggling with one type of debt, often face limited resources to meet their obligations and are more likely to revolve other types of debt, such as easily available but expensive credit card debt, and get beyond their ability to pay back. This finding emphasizes the interconnectedness of various debt types in influencing household financial health. We suggest that overdue credit card debt may serve as a marker of household financial vulnerability connected to high risk of over-indebtedness, which gives a variety of socio-economic consequences (Bialowolski & Weziak-Bialowolska, 2021; Cifuentes et al., 2020; CPEC, 2013; Hojman et al., 2016; Leandro & Botelho, 2022). We support the notion of Loschiavo (2021) that income inequality can become self-sustaining phenomenon. High inequality is linked to high levels of expensive revolving credit card debt, high leverage and delinquent credit card debt. Borrowing beyond the ability to pay back expose households to multifaceted negative effects, including insolvency, social and financial exclusion, and exacerbates inequality of opportunities.

Our study is not free from certain limitations. We acknowledge that the set of data on income inequality that we use is only available as a cross-section. The study is based on correlational analysis and causal effects between the indicators are not examined. Moreover, the study is limited to cross-city comparison and it does not take into account household-level data which could provide further insight into differences across sociodemographic groups. The other promising path for further exploration is to disentangle the supply- and demand-side effects on credit card debt burden. Given that perceived economic inequality can induce present-oriented and shortsighted behavior (Bak & Yi, 2020) we focus on credit card debt but we acknowledge that other types of household debt - such as mortgages, which are rather thoughtfully planned as a crucial, long-term factor for household financial health - deserve examination as well.

To sum up, this study reveals that income inequality correlates with credit card dependency and financial fragility in emerging markets like Poland. These findings have critical policy implications, 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 call for particular attention of policymakers and regulatory authorities. The challenge lies in creating a social and legal framework that encourages the 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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