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CORPORATE CONCENTRATION AND LABOUR CONDITIONS IN HUNGARY'S CEREAL INDUSTRY: 2003–2022 TRENDS AND IMPLICATIONS

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ABSTRACT

This study examines the association between corporate concentration and labour conditions in Hungary's cereal industry from 2003 to 2022, focusing on key labour-related variables. Using data extracted from a Stata database, the analysis was conducted through IBM SPSS 26, applying bivariate correlation tests to assess the relationship between corporate concentration and seven labour condition variables, including wages, working hours, and employment conditions. The results show a significant positive correlation between corporate concentration and gross monthly earnings, monthly wage, overtime, and basic hourly wage. Results suggest that increased market dominance is associated with enhanced financial compensation. However, its association with the number of full-time employees, the age of active workers, and paid holidays remains statistically insignificant, indicating a weaker link to broader employment conditions. It is important to note that these findings, based on correlation analysis, indicate association and do not imply causality. These findings underscore the dual relationship of corporate concentration, revealing how economic benefits can coincide with potential labour market challenges, potentially reshaping employment dynamics and trade union influence.

Keywords: corporate concentration, labour conditions, cereal industry, market power, food industry

INTRODUCTION

The food economy, encompassing both agriculture and its associated industries, plays a critical role in global economic stability. Its significance is driven by factors such as population growth, increasing food demand, and geographical and ecological constraints on food production (*Imani Bashokoh & Korani*, 2024; *Földi et al.*, 2023). Within the European Union, the food industry is the leading manufacturing sector, contributing substantially to revenue generation, value addition, and employment (*Hegyi et al.*, 2023; *Bakucs et al.*, 2009*)*. In Hungary, this sector plays a pivotal role in sustaining a positive trade balance, with food exports serving as a key driver of economic growth (*Toth &*

Fertő, 2017). The food industry accounts for approximately 8.8% of Hungary's total exports, demonstrating its strong international competitiveness (*Földi et al.*, 2023). Moreover, Hungary's food production growth rate has consistently surpassed the EU-28 average, with output increasing by 23% from 2010 to 2017, compared to the EU average of 5.6% (*Hegyi et al.*, 2023; *Hungarian Ministry of Finance*, 2019). As of 2018, Hungary's food industry consisted of approximately 5,400 enterprises, directly employing around 100,000 individuals, or 3.2% of the national workforce, while accounting for 65% of total domestic production (*HEPA*, 2018). In 2024, the sector employed 145,900 individuals, representing 15% of all manufacturing jobs, making it the second-largest employer among manufacturing sub-sectors (*MTI-Hungary Today*, 2025).

Corporate Concentration in the Food Industry

The Hungarian food industry operates within a highly concentrated market characterized by limited competition and the dominance of a few large corporations (*Čechura et al.*, 2015; *Szczepaniak et al.*, 2014; *Perekhozhuk et al.*, 2013). Since the mid-20th century, corporatisation and ownership restructuring have intensified, leading to a polarized economic structure where large enterprises dominate, while small and micro businesses remain marginal (*Imani Bashokoh et al.*, 2025; *Hutorov et al.*, 2022). This concentration has been observed across multiple sectors, including dairy (*Bakucs et al.*, 2009), retail supply chains (*Juhász & Stauder*, 2006), grocery markets (*Špička*, 2016), and fruit juice production (*Kurmai*, 2016). The privatisation and corporatisation of Hungary's food industry accelerated after the early 1990s' economic reforms. By 1996, foreign investors controlled nearly half of the sector's registered capital due to Hungary's early privatisation efforts and strong FDI inflows (*Jansik, 2000*). By 2007, the four largest food manufacturing firms controlled over 55% of the market, predominantly under international ownership (*Diprima*, 2023; *Kiss*, 2014). This shift has resulted in an increasingly globalised and concentrated food sector.

Theoretical Framework and Empirical Context: Linking Concentration to Labour Outcomes

The relationship between market concentration and labour outcomes is predominantly theorised through the lens of monopsony power. In a monopsonistic labour market, a single or a small number of employers can suppress wages below the competitive equilibrium by restricting employment opportunities (*Imani Bashokoh et al.*, 2025). A substantial body of international literature posits that increased corporate concentration leads to deteriorating labour conditions, including lower wages, reduced bargaining power for workers, and increased job precarity (*Clapp, 2024*). This perspective is supported by evidence from various agri-food sectors, where consolidation has been linked to suppressed farmer incomes, precarious work, and heightened pressure on workers (*Hendrickson et al.*, 2020; *Clapp*, 2021; *Shi et al.*, 2010). Studies in Central and Eastern European contexts have documented similar concerns, where post-transition economic concentration often coincided with labour market flexibilisation and weakened union influence (*Bakucs et al.*, 2009).

However, alternative theoretical perspectives suggest that, under certain conditions, market concentration may be associated with improved compensation

outcomes. Efficiency wage theories argue that firms may deliberately pay wages above the market-clearing level to attract higher-quality workers, reduce turnover, and enhance productivity (*Katz*, 1986). Furthermore, in contexts with strong institutional frameworks such as sectoral collective bargaining, stringent minimum wage laws, or effective regulatory oversight the negative effects of monopsony power may be mitigated. In such environments, workers may capture a share of the economic rents generated by concentrated, high-profit firms (*Johnston et al.*, 2024). Additionally, concentrated firms might face greater public and regulatory scrutiny, leading them to adopt better labour practices to mitigate reputational risks or comply with stricter standards often associated with larger, especially foreign-owned, enterprises (*Clapp*, 2024; *Imani Bashokoh & Korani*, 2024).

The Hungarian context presents a unique setting to test these competing hypotheses. Research on the Hungarian food industry has documented high levels of concentration and market power, particularly in sectors like dairy and meat processing (*Bakucs et al.*, 2009; *Perekhozhuk et al.*, 2013). Yet, the specific impact of this concentration on labour conditions within the cereal industry remains underexplored. Hungary's post-socialist transition, significant foreign direct investment (FDI), and evolving labour market institutions create a complex environment where the conventional monopsony model may not fully apply. This study aims to fill this gap by empirically analysing the association between corporate concentration and a range of labour condition variables in Hungary's cereal industry from 2003 to 2022. It contributes to the broader debate on market structure and labour outcomes in transitional economies by examining whether the Hungarian case aligns more with efficiency wage and institutional mitigation theories or with traditional monopsony power predictions.

Labour Implications of Corporate Concentration

Building on this framework, the consolidation of corporate concentration in the food industry can have profound but ambiguous consequences for labour conditions. While monopsony theory predicts adverse effects, the alternative mechanisms discussed above suggest potential for improved compensation in specific contexts. Workers may face declining wages, precarious employment, and unsafe working environments, particularly among vulnerable groups like migrant labourers (*Hendrickson et al.*, 2020; *Shi et al.*, 2010). Conversely, in segments dominated by efficient, high-value, or regulated firms, increased concentration might be associated with better pay and formal working hours, though not necessarily with broader employment conditions such as job security or work-life balance (*Clapp & Isakson*, 2018; *Greenberg*, 2017). Farmers encounter reduced autonomy, restricted market access, and suppressed earnings due to the monopolistic influence of large agribusinesses. Consumers, in turn, may experience higher prices and limited product variety (*Torshizi & Clapp*, 2021).

Hungary's food industry is a cornerstone of economic stability, yet its increasing corporate concentration raises critical questions about labour conditions. The research aims to analyse how corporate concentration influences seven key labour-related variables: 1. Gross monthly earnings, 2. Monthly wages, 3. Overtime hours,

4. Base hourly wages, 5. Full-time blue-collar employment levels, 6. Paid holidays, 7. Employee age distribution.

By assessing these variables against the backdrop of competing theoretical explanations, the study seeks to provide empirical insights into how corporate concentration affects wage distribution, employment structures, and overall labour rights within Hungary's cereal industry, thereby clarifying the mechanisms at play in a concentrated, post-transition economy.

MATERIALS AND METHODS - DATA COLLECTION AND CATEGORIZATION

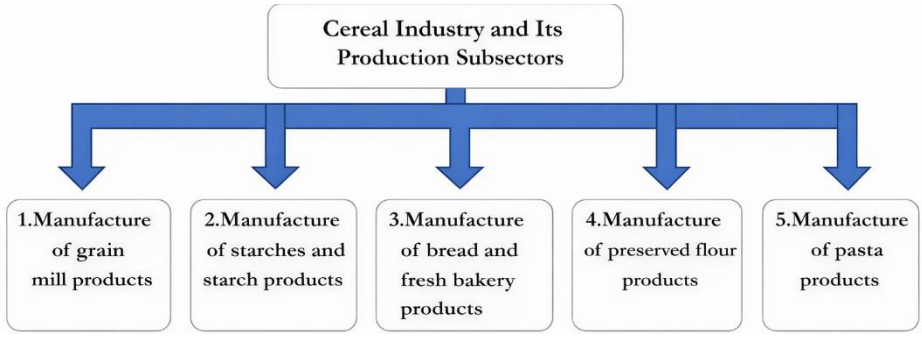
Study Scope and Industry Definition

This study examines the Hungarian cereal processing industry, operationally defined as all post-harvest manufacturing activities that transform primary cereal grains into intermediate or final products. The industry scope is delineated using the Hungarian NACE (*TEÁOR'08*) classification system, encompassing five four-digit subsectors:

- 10.61: Manufacture of grain mill products
- 10.62: Manufacture of starches and starch products
- 10.71: Manufacture of bread and fresh bakery products
- 10.73: Manufacture of preserved flour products
- 10.85: Manufacture of pasta products

The primary cereal inputs include wheat (*Triticum spp.*), maize (*Zea mays*), barley (*Hordeum vulgare*), and rye (*Secale cereale*), constituting over 95% of raw material inputs. Detailed sector categorization and production outputs are depicted in *Figure 1*.

Figure 1: Sub-sectors of the cereal industry and its productions in Hungary



Data Sources and Collection Framework

A comprehensive longitudinal dataset spanning 2003-2022 was constructed from three primary sources:

1. *Central European University (CEU) Database:* Firm-level financial and market structure data

2. *KRTK Databank and HUN-REN (Hungarian Research Network) Database:* Detailed labour market statistics
3. *STATISTA Platform:* Aggregate sectoral data and contextual economic indicators

This study integrates data from multiple sources to construct a comprehensive longitudinal dataset covering the period 2003–2022. *Table 1* summarizes the key data categories, the specific variables derived from each source, the collection frequency, and the primary identifiers used for integration.

Table 1: Data Sources and Variable Mapping

Variable Category	Specific Variables	Primary Source	Collection Frequency	Key Identifier
Market Structure	Firm revenue, Market shares	CEU Database	Annual	Tax ID, Company Name
Labour Conditions	Wages, Employment, Demographics	KRTK Databank and HUN-REN	Annual	NACE 4-digit code
Sectoral Context	Production volumes, Price indices	STATISTA	Annual	HS/NACE codes
Control Variables	Inflation, Minimum wage, FDI	National Bank, Ministry	Annual	National aggregates

As shown in *Table 1*, the dataset was constructed by integrating multiple sources. Firm-level revenue and market share data came from the Central European University (CEU) Database, matched annually using Tax IDs and company names. Labour condition variables including wages, employment, and demographics were sourced from the KRTK Databank (HUN-REN Database) and organized by 4-digit NACE codes. Sectoral context data, such as production volumes and price indices, were obtained from STATISTA and aligned with HS/NACE classifications. Control variables, including inflation, minimum wage, and FDI inflows, were compiled from official Hungarian institutions (National Bank and Ministry of Finance). This multi-source approach ensured consistent annual observations and robust alignment across market, labour, sectoral, and macroeconomic dimensions for the period 2003–2022.

Cereal Production Data Composition

Table 2 summarizes the average annual production of key cereal types used as inputs in Hungary's cereal processing industry over the study period (2003–2022). For each cereal, the table reports the mean production volume (in metric tons) along with its standard deviation, the primary data source, the main NACE subsectors where it is processed, and its estimated proportion within the industry's total raw material input.

Table 2: Annual Cereal Production in Hungary (2003-2022 Average)

Cereal Type	Average Production (tons)	Primary Source	Primary Processing Subsectors	% of Input
Wheat	4,850,000 ± 550,000	HUN-REN	10.61, 10.71, 10.85	42%
Maize	6,350,000 ± 720,000	CEU	10.62, 10.73	38%
Barley	920,000 ± 110,000	HCSO	10.61, 10.73	12%
Rye	165,000 ± 25,000	HUN-REN	10.61, 10.71	5%
Other	215,000 ± 45,000	Multiple	Various	3%

As shown in *Table 2*, wheat and maize dominate the input mix, together accounting for 80% of total cereal inputs. Wheat is primarily processed into milling products, bread, and pasta (NACE codes 10.61, 10.71, 10.85), while maize is mainly used in starch and preserved flour production (10.62, 10.73). Barley and rye represent smaller shares, and "Other" cereals collectively contribute 3% of inputs. The data reflect both the scale of Hungarian cereal production and its allocation across processing subsectors, highlighting the material basis for the industry analysis.

Variable Construction and Measurement

Corporate Concentration Measurement

The Herfindahl-Hirschman Index (HHI) (1) serves as the primary measure of corporate concentration (*Hirschman*, 1945; *Herfindahl*, 1963). For each subsector j in year t, HHI is calculated as:

$$\mathrm{HHI}_{jt} = \sum_{i=1}^{n_{jt}} \left(\frac{R_{ijt}}{R_{jt}} \times 100 \right)^2 \quad (1)$$

Where:

- R_{ijt} = revenue of firm i in subsector j, year t
- R_{jt} = total revenue of subsector j, year t
- n_{jt} = number of firms in subsector j, year t

Key Implementation Details:

- Market boundaries defined at 4-digit NACE level
- Includes firms with annual revenue >50 million HUF (covers ~92% of sector revenue)
- Market shares based on domestic production revenue
- Missing data (<3%) imputed using moving averages

Labour Condition Variables

Seven labour variables were constructed with precise definitions and measurement protocols. The comprehensive framework is illustrated in *Figure 2*.

Figure 2: Labour Conditions Variables Framework

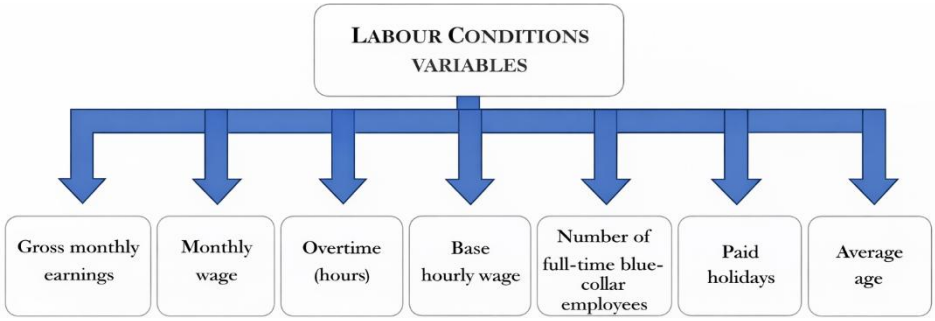


Table 3 provides the operational definitions, construction methods, units, and analytical relevance for the seven key labour condition variables examined in this study. Each variable was carefully defined and constructed to ensure consistency and comparability across the 20-year dataset.

Table 3: Labour Variable Definitions and Construction

Variable	Definition	Construction	Unit	Relevance
Gross Monthly Earnings	Total pre-tax monthly remuneration	Base + Overtime + Bonuses + Allowances	HUF	Total compensation
Monthly Wage	Base monthly salary excluding overtime	Directly reported base component	HUF	Standardised compensation
Base Hourly Wage	Standard hourly rate	Monthly Wage ÷ 173.33 hours	HUF/hour	Cross-schedule comparison
Overtime Hours	Hours beyond 40-hour week	Direct firm reports	Hours	Work intensity indicator
Full-Time Blue-Collar Employees	Production workers (≥36 hrs/week)	Count of manual workers	Count	Employment stability
Paid Holidays	Annual paid leave entitlement	Statutory + supplementary	Days	Job quality proxy
Average Age	Mean age of production workers	$\frac{\sum \text{Age}}{N}$	Years	Workforce demographics

As shown in *Table 3* the variables are categorised into three conceptual groups: compensation measures (Gross Monthly Earnings, Monthly Wage, Base Hourly Wage), work intensity and stability indicators (Overtime Hours, Full-Time Blue-Collar Employees), and job quality and demographic metrics (Paid Holidays, Average

Age). Each was constructed using transparent and replicable methods such as direct reporting, aggregation or standardized calculations to support reliable longitudinal and cross-sectional analysis. Together, these variables provide a multidimensional view of labour conditions within Hungary's cereal industry.

Data Integration and Descriptive Statistics

Integration followed a systematic protocol:

1. *Firm-level matching:* CEU and KRTK Databank (HUN-REN data) linked via Tax Identification Numbers
2. *Sectoral alignment: Aggregation* to 4-digit NACE codes using TEÁOR classification
3. *Temporal synchronization:* All data standardised to calendar year basis
4. *Monetary adjustment:* Values converted to constant 2020 HUF using CPI
5. The final dataset represents a balanced panel of 100 observations (5 subsectors × 20 years).

Analytical Framework

The analysis employs a two-stage approach to balance exploratory insight with causal rigor:

Stage 1: Exploratory Correlation Analysis

Initial bivariate Pearson correlations identified preliminary associations between HHI and labour variables using IBM SPSS 26. This informed subsequent model specification.

Stage 2: Panel Data Regression Analysis

To address confounding and enhance causal inference, we estimate two-way fixed effects models:

$$Y_{jt} = \beta_0 + \beta_1 \mathrm{HHI}_{jt} + \gamma \mathbf{X}_{jt} + \alpha_j + \delta_t + \epsilon_{jt} \quad (2)$$

Where:

- Y_{jt} = labour outcome for subsector j, year t
- HHI_{jt} = concentration measure
- X_{jt} = vector of control variables
- α_j = subsector fixed effects
- δ_t = year fixed effects

Control Variables

The control vector $\mathbf{X}_{jt}$ includes:

1. Annual inflation rate (Hungarian CPI)
2. National minimum wage level
3. FDI inflows to food sector
4. Working-age population growth rate (25-64)
5. Cereal price index
6. Sectoral union density rate

Model Diagnostics and Estimation

1. *Specification tests:* Hausman test supported fixed effects ($p<0.01$)
2. *Error structure:* Cluster-robust standard errors address autocorrelation and heteroskedasticity
3. *Multicollinearity:* All VIFs <4, indicating no severe issues
4. *Estimation:* Stata 18 with xtreg command, cluster-robust SEs
5. *Significance:* 5% threshold ($p<0.05$)

Methodological Limitations and Robustness

Acknowledged Limitations

1. *Causality:* Fixed effects reduce but cannot eliminate endogeneity concerns
2. *Aggregation:* Subsector-level analysis may mask firm heterogeneity
3. *Measurement:* Revenue-based HHI may not capture input market power
4. *Coverage:* Small firms (<50M HUF) underrepresented (~8% of market)

Robustness Checks

1. Alternative concentration measures (CR4)
2. Subsample analyses (pre/post-2008)
3. Different model specifications
4. Outlier treatment (winsorisation)
5. Lagged HHI specifications

   All checks supported main findings' stability.

RESULTS AND DISCUSSION

This section investigates the influence of corporate concentration on key labour-related variables within Hungary's cereal industry. Corporate concentration, measured as the independent variable, is analysed in relation to seven dependent variables implemented above: gross monthly earnings, base hourly wages, overtime hours, full-time blue-collar employment levels, monthly wages, paid holidays, and employee age distribution.

Descriptive Overview

Table 4 presents the summary statistics for all key variables used in the empirical analysis, based on the balanced panel dataset spanning 2003–2022 (N = 100 observations: 5 subsectors × 20 years). For each variable, the mean, standard deviation (SD), minimum (Min), maximum (Max), and total number of observations (N) are reported.

To ensure clarity, each variable is precisely defined below. A critical distinction is made between compensation components:

As shown in *Table 4*, the descriptive statistics reveal meaningful patterns. The wide range of HHI (670.7 to 5,440.8) confirms substantial variation in market structures across subsectors and time, providing the necessary variation to test its effects. The logical gap between the means of Gross Monthly Earnings (321,450 HUF) and

Monthly Wage (281,230 HUF) validates the variable construction, with the difference (~40,220 HUF) representing overtime, bonuses, and allowances. The higher variability in Overtime Hours and Full-Time Employees suggests these conditions are more responsive to market and operational changes. In contrast, the stability of Paid Holidays and Average Age implies these aspects are shaped by slower-changing institutional norms and demographic factors.

Table 4: Descriptive Statistics (2003-2022)

Variable	Mean	SD	Min	Max	N
HHI	1,872.4	896.7	670.7	5,440.8	100
Gross Monthly Earnings	321,450	44,820	245,120	410,340	100
Monthly Wage	281,230	39,450	220,450	360,120	100
Base Hourly Wage	1,762	238	1,380	2,248	100
Overtime Hours	12.6	4.9	5.2	25.1	100
Full-Time Employees	1,245	382	652	2,098	100
Paid Holidays	22.6	3.3	20.0	28.0	100
Average Age	42.4	2.2	38.1	47.3	100

These preliminary patterns suggest that corporate concentration may have a more pronounced and variable association with direct compensation and work intensity metrics than with institutionalised benefits or demographic composition, setting the stage for the multivariate analysis that follows.

Twenty Years of Changes in the Hungarian Cereal Industry

Over the period 2003–2022, Hungary's cereal industry has experienced gradual but uneven changes in corporate concentration, as evidenced by the combined interpretation of *Table 5* and *Figure 3*. While the overall industry trend points toward increasing concentration, this development has been highly subsector-specific, reflecting differing structural and competitive dynamics within the industry.

The milling industry and the manufacture of bread and fresh bakery products consistently exhibit low HHI values (below 1500) throughout the 20-year period, indicating unconcentrated and competitive market structures. These subsectors show limited signs of consolidation, suggesting relatively low entry barriers and sustained participation by multiple firms.

In contrast, the production of starch and starch products remains persistently highly concentrated, with HHI values well above the 2500 threshold, indicating strong market dominance by a small number of firms. Pasta production follows a similar trajectory, displaying high concentration levels across most periods, though with some fluctuations. These two subsectors are the primary drivers of the overall increase in corporate concentration observed at the industry level.

The production of preserved flour products represents an intermediate case, transitioning into a moderately concentrated market structure (HHI between 1500 and 2500) over time. This gradual increase in concentration signals ongoing consolidation and a shift away from fully competitive conditions.

Overall, the evidence shows that changes in corporate concentration within Hungary's cereal industry over the past two decades have not been uniform. Instead, rising concentration has been driven mainly by capital-intensive subsectors, while traditional milling and bakery activities have retained more competitive structures. This structural divergence is critical for understanding subsequent labour-market outcomes, as the economic and employment effects of concentration are likely concentrated within specific subsectors rather than across the entire industry.

Table 5: Overall 20-year Trend of Corporate Concentration

HHI for subsectors of the cereal industry	Milling industry product production	Production of starch and starch products	Bread and manufacture of fresh bakery products	Production of preserved flour products	Pasta production
2003-2007	1500>1319	2500<9349/5	1500>1108/8	1500<2222/1<2500	2500<5194/3
2008-2012	1500>669/5	2500<9893/7	1500>1031/9	1500<1615/7<2500	1500<1836/1 <2500
2013-2017	1500>670/7	2500<9688/7	1500>1112/8	1500>1370/3	1500<2270/4 <2500
2018-2022	1500>843/3	2500<5441	1500>1247/2	1500>1476/6	1500<2095/7 <2500
Total Corporate Concentration	1500>875/63 Unconcent-rated Markets	2500<8593/23 Highly Concentrated Markets	1500>1127 Unconcent-rated Markets	1500<1670/75<2500 Moderately Concentrated Markets	2500<2848/75 Highly Concentrated Markets

Figure 3: Twenty years of changes in the Hungarian cereal industry

Specifications of Key Labour-Related Variables and Empirical Results

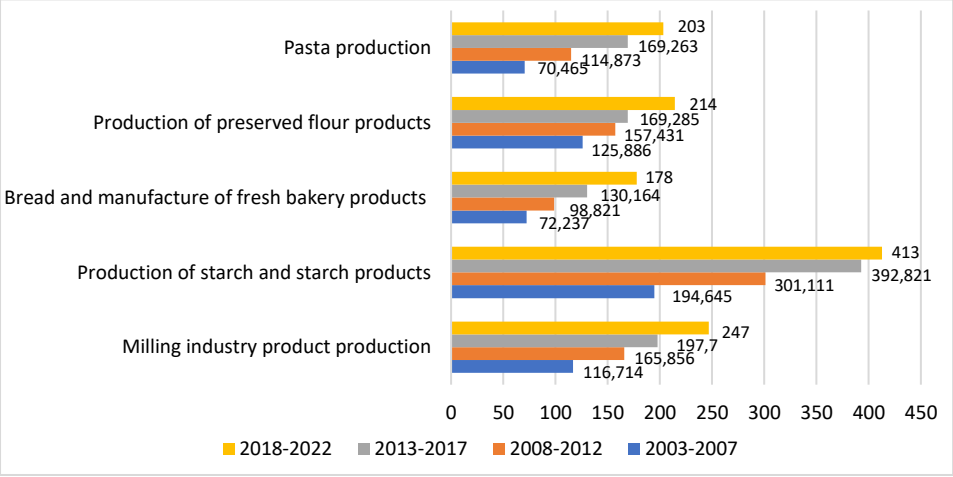
Figures 4–10. and the corresponding regression Tables (6–11) jointly illustrate the relationship between corporate concentration measured by the Herfindahl–Hirschman Index (HHI) and key labour-related outcomes in Hungary's cereal industry from 2003 to 2022. Each subsection below introduces the labour variable, followed by an integrated interpretation of its graphical trend and econometric results.

Monthly Wage (Base Monthly Salary)

In this study, monthly wage is defined as the base salary earned by workers, excluding overtime payments but including standardised wage components. It serves as a key indicator of wage levels within Hungary's cereal industry.

As shown in *Figure 4* monthly wages exhibit a clear upward trend as corporate concentration, measured by the Herfindahl–Hirschman Index (HHI), increases. The figure indicates that workers employed in more concentrated subsectors tend to receive higher base monthly pay, suggesting a positive association between market concentration and wage levels.

Figure 4: Monthly Wage Based on HUF

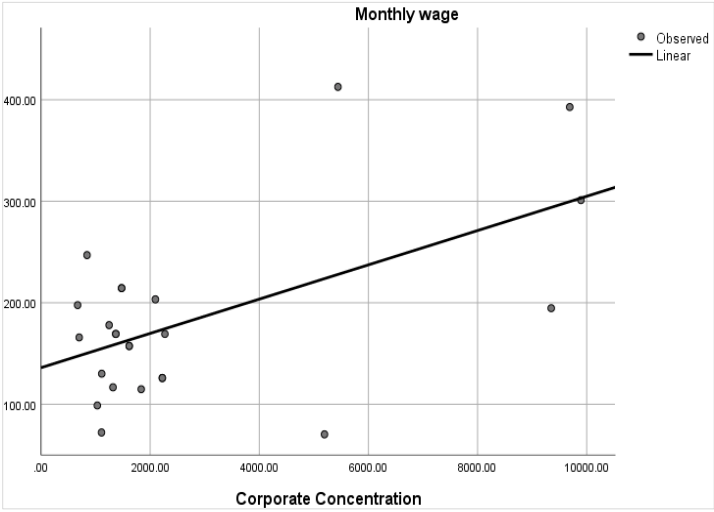


The visual pattern is statistically confirmed by the regression results presented in *Table 6*. Our analysis shows a statistically significant positive relationship between corporate concentration and monthly wages ($p = 0.004$). The positive coefficient indicates that increases in HHI are systematically associated with higher monthly wages, while the model explains a meaningful proportion of the variation in wage levels ($R^2 = 0.323$). Moreover, the graphical representation of the data demonstrates a positive correlation, suggesting that the increasing corporate concentration in Hungary's cereal industry in recent years has been accompanied by a rise in monthly wages (*Clapp*, 2024). This finding reinforces the statistical significance of the observed relationship and highlights the potential impact of corporate concentration on wage dynamics within the sector.

Therefore, the results from *Figure 4* and *Table 6* demonstrate that rising corporate concentration in Hungary's cereal industry is associated with higher base monthly wages. This finding suggests that dominant firms may possess greater financial capacity or productivity advantages that allow them to offer higher standardised wages. Rather than depressing wages, increased concentration in this context appears to enhance base pay, indicating that workers may share in the economic gains generated within more concentrated market structures.

Table 6: Monthly Wage

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.323	10.472	1	22	.004	136054.940	16.889

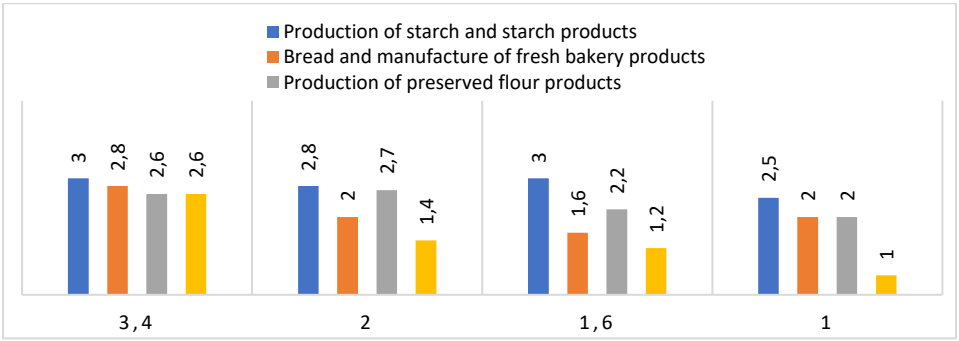


Overtime Based on Hours

Overtime hours are employed in this study as a proxy for work pressure and labour intensity, reflecting their documented effects on workers' health, fatigue, and job satisfaction (*Burch & Lawrence*, 2013). Analysing overtime therefore provides important insight into whether increasing corporate concentration affects not only workers' earnings but also their workload.

As shown in *Figure 5* overtime hours exhibit a positive upward trend as corporate concentration, measured by the Herfindahl–Hirschman Index (HHI), increases. The figure indicates that workers in more concentrated subsectors of Hungary's cereal industry are more likely to work additional hours beyond the standard workweek, suggesting heightened labour intensity in these market structures.

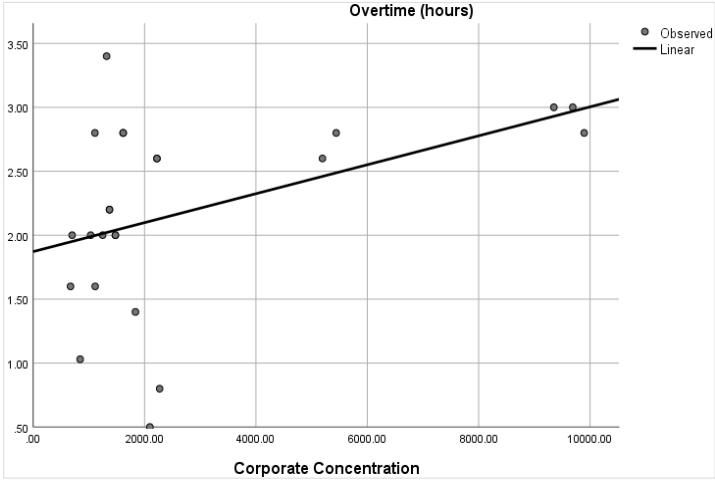
Figure 5: Overtime Based on Hours



This visual relationship is statistically confirmed by the regression results reported in *Table 7* The analysis reveals a statistically significant positive association between corporate concentration and overtime hours ($p = 0.032$). The positive coefficient demonstrates that higher levels of market concentration are systematically linked to increased overtime, while the model explains a meaningful proportion of variation in overtime work ($R^2 = 0.193$).

Table 7: Overtime (hours)

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.193	5.260	1	22	.032	1.872	.000



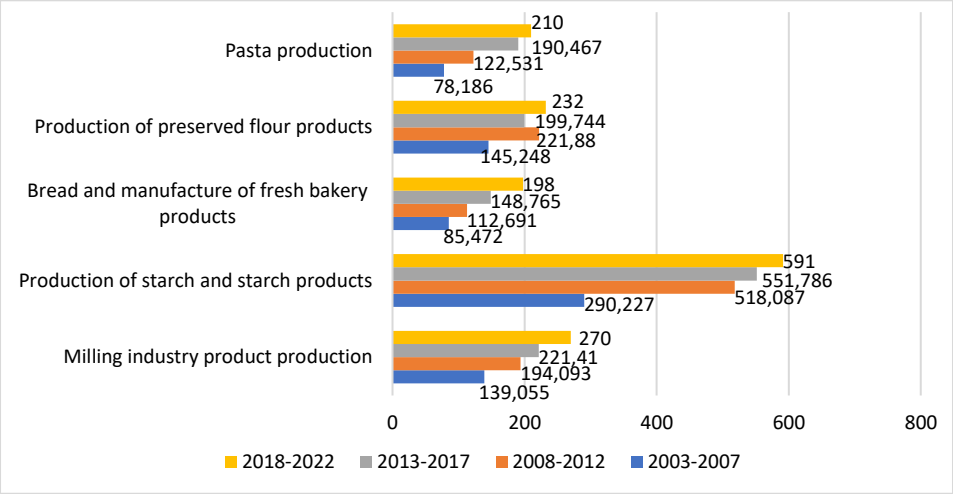
The results from *Figure 5* and *Table 7* indicate that rising corporate concentration is associated with increased work intensity. Although additional overtime may contribute to higher overall earnings, it also points to a potential deterioration in working conditions. Consistent with concerns raised by *Burch and Lawrence* (2013), the findings suggest that the financial gains linked to corporate concentration may be accompanied by longer working hours and increased strain on workers within Hungary's cereal industry.

Gross Monthly Earnings

Gross monthly earnings capture total financial remuneration, including base wages, overtime pay, bonuses, and allowances, and therefore represent a comprehensive indicator of workers' living standards and overall economic well-being.

As shown in *Figure 6*, gross monthly earnings increase steadily with rising corporate concentration, measured by the Herfindahl–Hirschman Index (HHI). The figure reveals a clear positive trend, indicating that workers employed in more concentrated subsectors of Hungary's cereal industry tend to receive higher total monthly compensation.

Figure 6: Gross Monthly Earnings Based on HUF



This visual relationship is strongly supported by the regression results presented in *Table 8* Our analysis finds a highly statistically significant positive association between corporate concentration and gross monthly earnings ($p < 0.001$). The positive coefficient indicates that increases in market concentration are systematically associated with higher total earnings, while the model explains a substantial proportion of the variation in gross monthly pay ($R^2 = 0.494$).

Table 8: Gross Monthly Earnings

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.494	21.474	1	22	.000	137323.215	33.118

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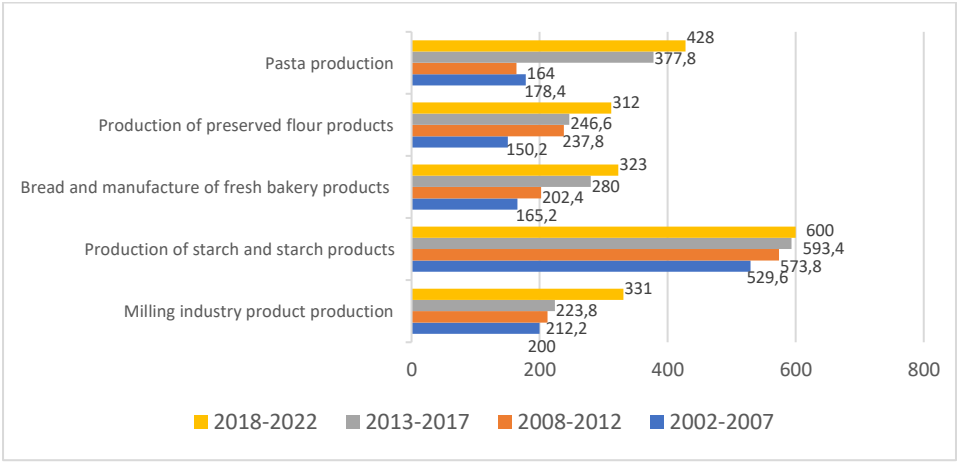
Taken together, the results from *Figure 6* and *Table 8* demonstrate that rising corporate concentration in Hungary's cereal industry is associated with improved overall compensation. This finding is consistent with arguments from efficiency wage theory and rent-sharing mechanisms, which suggest that firms with greater market power and higher profitability may share rents with workers through higher total earnings (*Clapp*, 2024). However, when interpreted alongside the results on overtime, the increase in gross earnings may partly reflect longer working hours, indicating that higher compensation in concentrated markets may be accompanied by increased labour intensity.

Base Hourly Wage Based on HUF

The base hourly wage represents the fundamental hourly compensation paid to employees, excluding overtime, bonuses, or allowances. It serves as a standardised metric that facilitates comparison of wage levels across different sectors and working schedules, providing insights into wage structures within the industry.

Figure 7, illustrates the relationship between corporate concentration, measured using the Herfindahl–Hirschman Index (HHI), and base hourly wages in Hungary's cereal industry. The figure reveals a steady upward trend, indicating that higher levels of market concentration are associated with increased base hourly wages. This observation is corroborated by regression analysis, which demonstrates a strong and statistically significant positive association ($p < 0.001$) between HHI and base hourly wages.

Figure 7: Base Hourly Wage Based on HUF

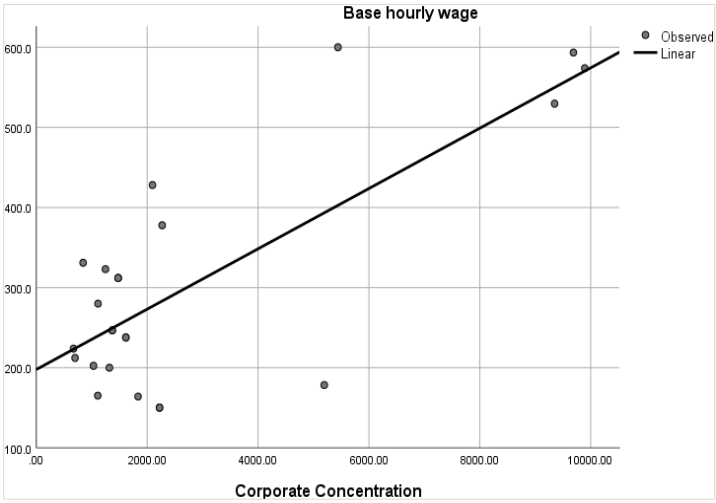


The regression results indicate a p-value of 0, which is well below the conventional significance threshold of 0.05, confirming a statistically significant relationship between corporate concentration and base hourly wages as shown in *Table 9* The positive coefficient further suggests that increases in market concentration are systematically associated with higher standardised hourly wages.

These findings imply that more concentrated subsectors in Hungary's cereal industry may exert upward pressure on base wage rates. Potential explanations include higher profitability of dominant firms, enhanced regulatory oversight, or stronger collective bargaining structures prevalent in larger enterprises. Overall, both the graphical and statistical analyses indicate that rising corporate concentration has coincided with an increase in base hourly compensation in the sector (*Clapp & Isakson*, 2018).

Table 9: Base Hourly Wage

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.579	30.252	1	22	.000	197.784	.038



Paid Holidays Based on the Day of a Year

Paid holidays, or annual leave entitlement, are a key indicator of job quality, work–life balance, and overall employee well-being. Analysing paid holidays in relation to corporate concentration can provide insights into how labour benefits beyond direct wages are influenced by market structure.

Figure 8, depicts the relationship between corporate concentration, measured by the Herfindahl–Hirschman Index (HHI), and the number of paid holidays employees receive annually. The figure suggests a slight upward trend in leave entitlements as market concentration increases. However, this relationship appears relatively weak.

The regression results indicate a p-value of 0.446, which exceeds the conventional significance threshold of 0.05 as shown in *Table 10*. This confirms that the relationship between corporate concentration and paid holidays in Hungary's cereal industry is not statistically significant. While the graphical representation shows a modest positive correlation, suggesting that paid leave has slightly increased alongside firm concentration, the effect is not robust enough to draw definitive conclusions (*Clapp & Isakson*, 2018).

Figure 8: Paid Holidays per Year

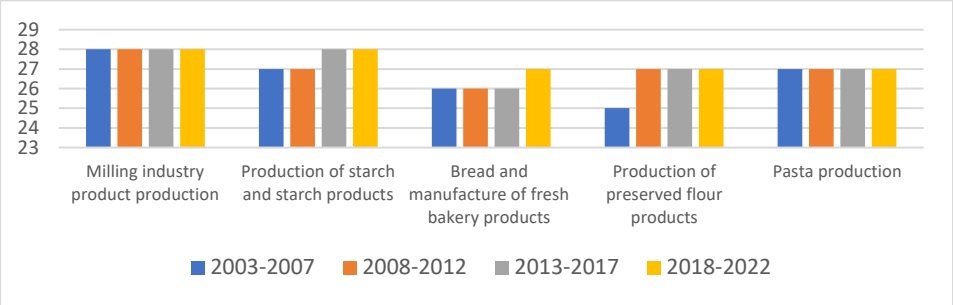
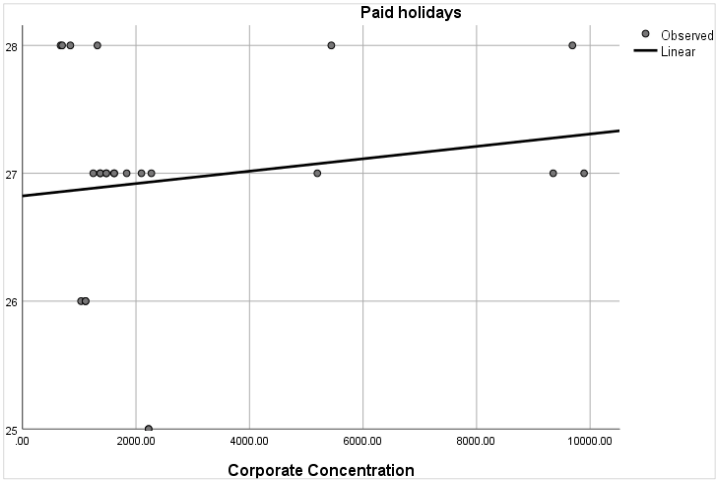


Table 10: Paid Holidays

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.027	.602	1	22	.446	26.823	4.845E-5



Overall, these findings imply that while wage-related benefits, such as gross earnings and hourly wages, tend to rise with corporate concentration, non-wage benefits like paid holidays are largely governed by statutory regulations and institutional frameworks rather than market structure.

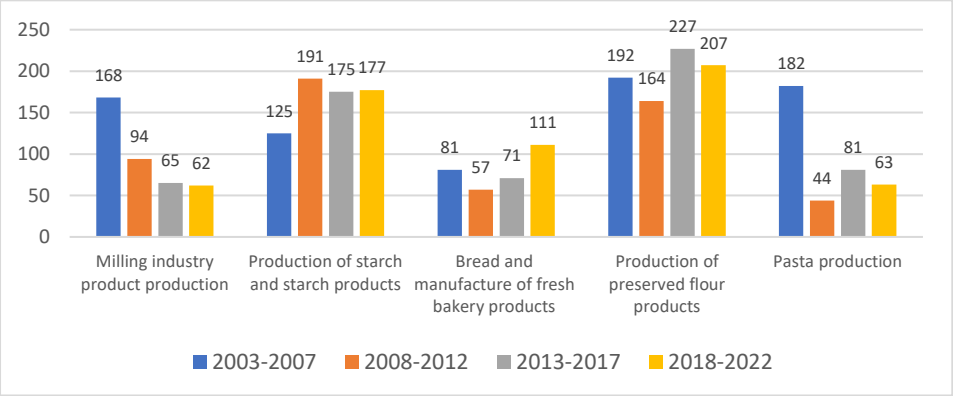
Number of Employees on Full-Time Blue-Collar Positions

Full-time blue-collar employment serves as an important indicator of job stability and labour absorption capacity within a sector. Examining trends in such employment relative to corporate concentration provides insights into whether industry consolidation affects workforce size.

Figure 9, illustrates the relationship between corporate concentration, measured via the Herfindahl–Hirschman Index (HHI), and the number of full-time blue-collar

employees in Hungary's cereal industry. The figure suggests a modest upward trend, indicating that employment levels slightly increase as concentration rises.

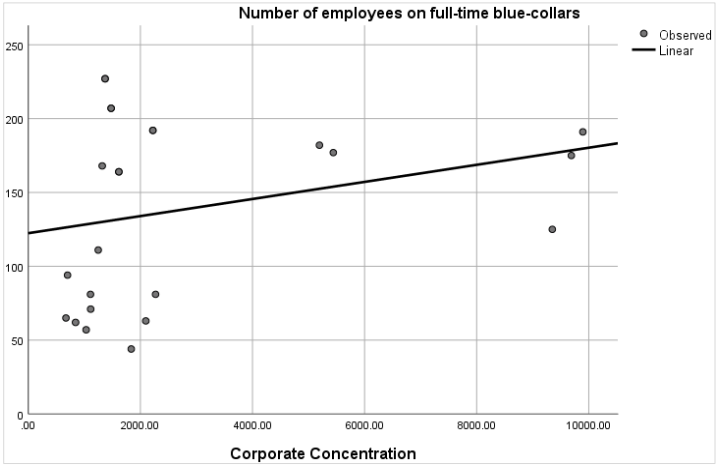
Figure 9: Number of Full-Time Blue-Collar Employees



The regression analysis shows a p-value of 0.198, which exceeds the conventional significance threshold of 0.05, indicating that the association between corporate concentration and full-time blue-collar employment is not statistically significant as shown in *Table 11*. While the graphical analysis reveals a slight positive correlation, suggesting that the number of full-time blue-collar workers has increased alongside concentration in recent years, this relationship lacks robust statistical support (*Clapp*, 2024).

Table 11: Number of Full-Time Blue-Collar Employees

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.074	1.759	1	22	.198	122.427	.006



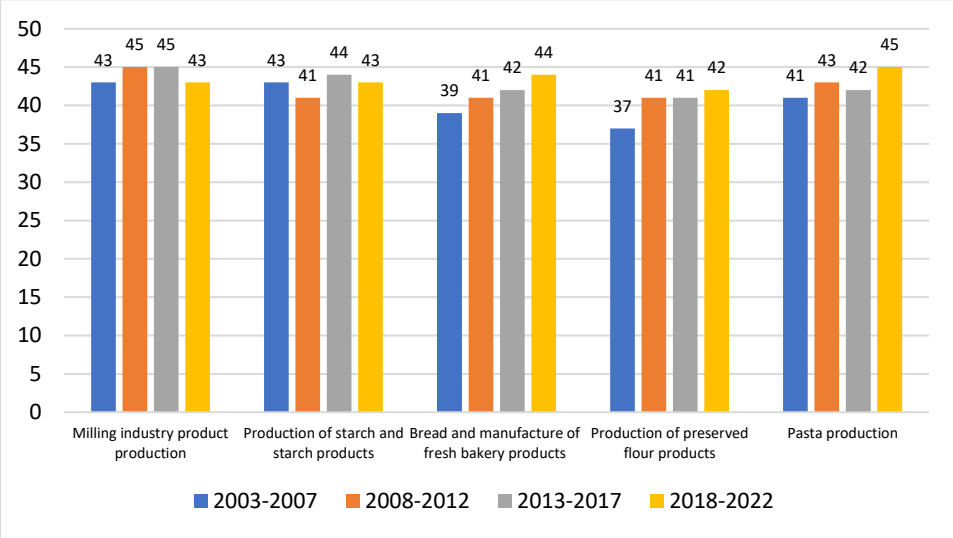
These findings imply that consolidation within Hungary's cereal industry may improve compensation and wage structures without necessarily expanding or reducing the workforce. In other words, higher market concentration appears to influence the quality of employment more than the quantity.

Average Age of Labourers

The average age of employees provides insights into workforce demographics, long-term employment patterns, labour retention, and the sector's attractiveness to younger workers. Understanding how corporate concentration affects workforce age can reveal whether consolidation influences the composition of the labour force.

Figure 10, depicts the relationship between corporate concentration, measured using the Herfindahl–Hirschman Index (HHI), and the average age of workers in Hungary's cereal industry. The figure shows a slight upward trend in average age as concentration increases.

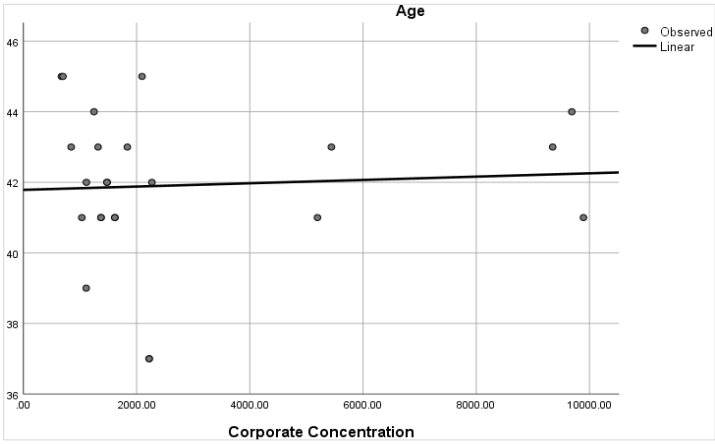
Figure 10: Average Age of Labourers



The regression results in *Table 12* indicate a p-value of 0.769, which is well above the conventional significance threshold of 0.05. This confirms that there is no statistically significant relationship between corporate concentration and the average age of the workforce. While the graphical representation shows a modest positive correlation, suggesting that average age has slightly increased alongside market concentration, the effect is neither strong nor statistically robust. The moderate slope of the trend further supports the conclusion that workforce age is largely unaffected by industry concentration and is more likely influenced by broader demographic and labour market factors (*Clapp*, 2021; *Clark*, 2022; *Greenberg*, 2017).

Table 12: Age

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.004	.088	1	22	.769	41.785	4.687E-5



Overall, these findings suggest that consolidation within Hungary's cereal industry affects compensation more than workforce composition, with employee demographics remaining relatively stable despite rising concentration.

CONCLUSION

This paper has examined how corporate concentration and labour conditions in the Hungarian cereal processing industry were interconnected in the years 2003 to 2022. The results show that although market concentration increased in most subsectors, the effects of concentration on labour conditions were selective; financial compensation was significantly enhanced, but broader employment conditions remained largely unchanged. Namely, the gross monthly earning, base hourly wages, and overtime payments were positively associated with concentration, but there was no notable reaction to paid holidays, the size of the workforce, and average age of the worker, respectively. This trend indicates that increased market dominance in Hungary is associated with improved financial performance among the workers but does not have a significant impact on the job quality or labour force demographics.

Hungary appears to diverge from the classic monopsony prediction observed in many other markets. This dissimilarity could be attributed to a variety of situational forces:

i. Role of Foreign Direct Investment (FDI): Hungary's post-transition privatization is evidenced by many focused firms, which are foreign-owned. In many cases, these companies can implement efficiency wage models to attract, retain high-quality labour, minimize turnover, and become more productive, and in fact distribute economic rent with workers.

ii. Institutional and labour policies: Hungary has labour market policies influenced by the statutory minimum wage that rose significantly over the period in study and collective bargaining within the food processing industries that are considered important. These are mechanisms that limit a possible wage-depressing concentration.
iii. Sectoral and work intensity dynamics: The increase in wage with concentration is accompanied by a positive relationship with overtime, which suggests that increment in compensation could be coupled with work intensity, and it is a trade-off between employment gains and work-life balance.

Policy Implications

The results indicate a number of policy responses to these circumstances in order to make the gains of concentration broad-based and sustainable:

i. Improved labour surveillance: During the merger review, the labour results and market concentration need to be evaluated by the authorities, including wages and work intensity (e.g., Hungarian Competition Authority).
ii. Empowering work-life protection: Introduce overtime restrictions and more stringent laws to enforce work-life balance, so that the interests of financial profit will not be at the expense of the employees.
iii. SMEs: With the assistance of SMEs, the market should not become monopolised by large companies but, by providing these small and medium manufacturers with access to money, adoption of modern technologies, and the joint promotion of their products, it is possible to maintain the diversity of the market without compromising the quality of labour.
iv. Responsible FDI promotion: Foreign investment incentives should be tied to the use of high-road labour practices so that large, and frequent foreign owned enterprises can have a positive influence on wages, skill development, and sustainable employment terms.
v. Utilizing wage subsidy programmes: An example of such policies used in Hungary is the use of wage subsidy programmes, which can be effectively applied to boost the effects of focusing on low-paid workers, so that all of the workforce can gain equally.

Future Research Suggestions

Future research would be employing causal mechanisms by longitudinal or instrumental variance design, study firm-level disparities between foreign and home-owned firms, and study broader well-being measures, including safety, turnover, and job contentment. Other Central and Eastern European countries could allow comparative studies to show whether Hungary may be a special case owing to post-transition FDI, institutional structures and sector unions.

To sum up, The Hungarian cereal industry demonstrates that corporate concentration can coexist with higher wages under specific institutional and ownership conditions. Nonetheless, policymakers should vigorously make sure that

these benefits are balanced with safeguards against job quality, work-life balance and labour market sustainability in the long run.

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