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Economic Growth and Employment in the Korean Agri-Food Industry: Examining the Buffering Effect and Sensitivity of Temporary Employment*

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Abstract

Purpose: This research article investigates the intricate relationship between economic growth and employment in the Korean agri-food industry. **Research design, data and methodology:** Drawing on Okun's law, which proposes a negative correlation between economic growth and unemployment, the study explores the applicability of this law to different sectors. By focusing on the agri-food industry, the study examines the impact of economic growth on both full-time and temporary employment. **Results:** The findings highlight the industry's role as a buffer, absorbing workers from other sectors, particularly manufacturing. Moreover, the study reveals that temporary employment is more sensitive to economic growth fluctuations compared to full-time employment. **Conclusions:** The research emphasizes the importance of implementing employment programs that support transitioning workers in the agri-food industry, facilitating knowledge and skill transfer to ensure sustained employment. Furthermore, it recommends government and company support for temporary employment during buffering periods to ensure safe job transitions. This study provides valuable evidence to understand the nuanced relationship between economic growth and employment in the Korean agri-food industry.

Keywords : Agri-Food industry, ARDL, Buffering effect, Economic growth, Employment, Impulse response function.

JEL Classification Code: J01, L66, Q18

1. Introduction

Various perspectives exist regarding the intricate relationship between the economy and employment. Okun's Law postulates an empirically established inverse correlation between economic growth and unemployment (Okun, 1963). However, this correlation may not hold true in industries that exhibit a preference for temporary and daily workers, commonly referred to as "temporary and daily workers." Sectors such as the service industry and the public sector utilize these workers as a means of buffering against economic shocks. Moreover, temporary and daily workers demonstrate heightened sensitivity to economic conditions compared to regular workers, potentially impeding the stability and quality of employment over the medium to long term (Park et al., 2013; Atkinson, 1984). Consequently, the employment response to economic conditions exhibits variations dependent on specific industries and occupations (Raies, 2023; Obst, 2022).

Many studies have examined the relationship between the economy and employment. Hwang (2009) conducted an empirical analysis of the cyclical behavior of full-time and

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temporary daily workers in Korea. The rotation of temporary and daily workers has a larger range of fluctuation than that of full-time workers, and while the circulation of temporary and daily workers precedes real GDP, the rotation of permanent workers lags behind real GDP. In addition, temporary and daily job rotation was time-reversible, while full-time job rotation was time-irreversible. Jung (2015) revealed that there is a cross-correlation between the business cycle and employment through the manufacturing job market. The variability of manufacturing employment by occupational status was found to be greater for temporary and daily workers than for full-time workers, suggesting that this heterogeneity can respond more sensitively depending on personal characteristics. These findings suggest that we need to look at the relationship between employment and the economy on a case-by-case basis.

Lee and Lee (2020) used the ARDL cointegration model to examine whether jobs respond sensitively to growth through employment elasticity. In particular, the sensitivity of jobs in each industry to growth was shown through short- and long-term employment elasticity by classifying them into service and manufacturing industries. Park et al. (2013) pointed out and analyzed the widening gap between the economy and employment, where economic growth slowed down after the global financial crisis, while the number of employed people continued to increase. As a result of the analysis, it was found that there was a buffering effect through job creation in the service industry and the public sector as the economy worsened.

Despite the substantial body of research on the relationship between the economy and employment in various industries, there remains a paucity of studies that have specifically investigated this dynamic within the food industry. Prior research has predominantly focused on the manufacturing and service sectors. These studies have consistently revealed that the service industry exhibits a higher degree of sensitivity to economic fluctuations compared to the manufacturing industry. Consequently, it becomes imperative to propose a comprehensive plan aimed at mitigating employment market imbalances within the food industry. Such a plan should center around analyzing the intricate relationship between the economy and employment, with a particular emphasis on the food industry encompassing food manufacturing and restaurant sectors . By conducting a thorough examination within this domain, actionable insights can be derived to address employment challenges and promote a more balanced employment landscape in the food industry (Abdelgawwad & Kamal, 2023).

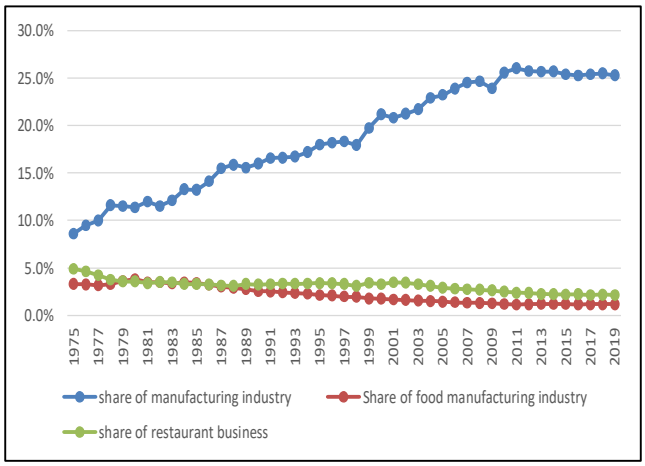
The core-periphery strategy theory provides insights into the division of the workforce into core and periphery segments. The core represents industries capable of effectively managing labor through internal reorganization or relocation, while the periphery comprises industries that possess the agility to swiftly adjust labor inputs in response to market changes. Scholars such as Atkinson (1984, 1987) and Hunter et al. (1993) have employed the core-periphery model to argue that peripheral forces serve as a buffer, safeguarding core personnel from adverse market conditions. Consequently, in pursuit of the dual objectives of maintaining stable employment and enabling quantitative flexibility for workers, temporary and daily workers are often employed as a means to buffer against external shocks. In industries that are more susceptible to economic fluctuations, such as the food manufacturing industry, the utilization of temporary and daily workers is commonly preferred for this purpose. Therefore, it becomes crucial to examine whether the food industry can be categorized as a peripheral industry within the core-periphery strategy framework and analyze the correlation between the food industry's economy and employment dynamics.

This study aims to empirically investigate the correlation between the food industry's economy and employment dynamics. Specifically, we explore whether the food industry, encompassing food manufacturing and the restaurant sector, functions as a buffer, absorbing employment shocks during economic downturns. Moreover, we analyze whether temporary and daily workers in the food industry display greater sensitivity to economic conditions compared to regular workers. To achieve this, we employ the impulse response function and the autoregressive distributed lag (ARDL) model as analytical tools. The impulse response function enables us to assess the impact of economic shocks on the number of regular workers and temporary and daily workers in the food industry, thus determining the industry's buffering effect. Furthermore, the ARDL model allows us to examine the time-lagged relationship between the economy and employment within the food industry. By leveraging this model, we can analyze the degree of sensitivity exhibited by regular workers and temporary and daily workers to fluctuations in the broader economic landscape. Overall, this research seeks to shed light on the dynamic interplay between the food industry's economy and employment, with a particular focus on the buffering role of the industry and the differential responsiveness of workers to economic fluctuations.

This study is structured as follows: Chapter 2 provides an overview of the current employment situation in the food industry, while Chapter 3 outlines the methodology used to analyze the relationship between the economy and employment in this sector. In Chapter 4, the results of the study on the relationship between economic conditions and employment in the food industry are presented. Finally, Chapter 5 summarizes the research findings and draws conclusions and implications.

2. Food industry in Korea

The real GDP of the food industry has shown a steady increase, but its share in the total GDP has been declining. The food manufacturing industry and the restaurant industry both have a relatively low share of real GDP, with the restaurant industry having a larger share than the food manufacturing industry. Although the share of the manufacturing industry has been increasing, it experienced a temporary decline during the 1998 Asian financial crisis and the 2009 financial crisis, while the share of the food manufacturing and restaurant industries remained unchanged as shown in <Figure 1>.



Note: Manufacturing is the figure excluding food manufacturing.
Source: Bank of Korea, Economic Statistics System.

Figure 1: Share of GDP

The number of workers in the food manufacturing and restaurant industries continues to increase. The number of workers in the food manufacturing industry continues to increase, although the rate of increase slowed slightly during the 1998 IMF and 2009 financial crises. The number of restaurant workers more than doubled from 690,000 in 1998 to 1.53 million in 2019. Looking at the share of the total number of workers, the share of the food manufacturing industry continued to decline, while the portion of the restaurant industry maintained 10% and recently rose to 11%.

Dividing the total number of workers into full-time workers and temporary daily workers shows different trends. Looking at the ratio of full-time workers to the total number of workers, the manufacturing and food manufacturing industries show a high rate, while the restaurant industry has a low rate. The number of full-time workers in the food manufacturing industry increased in the 2000s, and the number of full-time workers in the restaurant industry accounted for half of the total number of workers in the restaurant industry. The ratio of food manufacturing and restaurant industries to total regular workers was maintained at a low level.

The number of temporary and daily workers in the food manufacturing and restaurant industries is smaller than that of regular workers, and the proportion of temporary and daily workers in the restaurant industry is greater than that of the food manufacturing and manufacturing industries. The definition of temporary and daily workers differs depending on the working period, but in this study, it was recalculated to enable comparison with regular workers by representing the sum of temporary workers and daily workers. The number of temporary daily workers in the restaurant industry was almost the same as the number of regular workers. During the 2009 financial crisis, the number of regular workers decreased, but the number of temporary daily workers increased significantly. During the financial crisis, it is highly likely that a large portion of the food service industry was absorbed as temporary daily workers.

The ratio of full-time workers to total workers was in the order of manufacturing, restaurant, and food manufacturing, but the ratio of temporary and daily workers was in the order of restaurant, manufacturing, and food manufacturing. In other words, the food service industry has more temporary daily workers than regular workers, and the share of temporary daily workers in the manufacturing and food manufacturing industries is on the decline.

3. Method

3.1. Impulse Response Function

The impulse response function is used to analyze the impact of economic growth rates in the manufacturing, food manufacturing, and restaurant industries on employment in each industry. The shock response function can be used to examine whether the food industry serves as a buffer to absorb labor when the economy declines. The impulse response function measures the response of variables in the model when a 1 standard deviation impact of a specific variable in the model occurs, using coefficients estimated in a vector autoregression (VAR) model. Therefore, a vector autoregressive model is constructed for each industry using economic growth and employment data.

Table 1: Number of Workers

	1980	1990	1998	2005	2009	2015	2019
Total number of workers (10,000)							
Total industry	322	537	674	923	1061	1385	1518
Manufacturing	186 (57.8%)	294 (54.9%)	227 (33.6%)	280 (30.3%)	265 (25.0%)	324 (23.4%)	326 (21.5%)
Food manufacturing	14 (4.2%)	19 (3.6%)	19 (2.8%)	21 (2.2%)	20 (1.8%)	24 (1.8%)	28 (1.9%)
Restaurant business	-	-	69 (10.2%)	107 (11.6%)	113 (10.7%)	141 (10.2%)	169 (11.1%)
Number of full-time workers (10,000)							
Total industry	292	498	577	714	808	1,071	1,174
Manufacturing	178 (61.1%)	283 (56.7%)	216 (36.4%)	253 (35.4%)	239 (29.5%)	298 (27.8%)	300 (25.6%)
Food manufacturing	12 (4.2%)	17 (3.5%)	17 (2.9%)	16 (2.2%)	15 (1.9%)	20 (1.9%)	24 (2.1%)
Restaurant business	0	0	33 (5.7%)	35 (5.7%)	31 (5.0%)	51 (3.8%)	62 (5.3%)
Number of temporary daily workers (10,000)							
Total industry	21	23	56	115	144	188	206
Manufacturing	4 (18.0%)	4 (18.2%)	5 (8.6%)	19 (16.6%)	19 (13.3%)	17 (9.0%)	16 (7.7%)
Food manufacturing	1 (5.4%)	2 (7.4%)	2 (3.2%)	4 (3.2%)	3 (2.4%)	3 (1.6%)	3 (1.3%)
Restaurant business	0	0	9 (16.1%)	31 (16.5%)	43 (27.0%)	50 (30.0%)	56 (27.2%)

Note: The number of manufacturing workers is the number of workers excluding the number of food manufacturing workers. Source: Ministry of Employment and Labor.

$$\begin{bmatrix} flabor_{it} \\ plabor_{it} \\ fgdp_{it} \\ mgdp_{it} \\ rgdp_{it} \end{bmatrix} = \mathrm{A}_0 + \sum_{k=1}^{n} A_k \begin{bmatrix} flabor_{it-k} \\ plabor_{it-k} \\ fgdp_{it-k} \\ mgdp_{it-k} \\ rgdp_{it-k} \end{bmatrix} + \varepsilon_t \quad (1)$$

The variables $flabor_{it}$ and $plabor_{it}$ represent regular workers and temporary daily workers in each industry, while $fgdp_{it}$, $mgdp_{it}$, and $rgdp_{it}$ represent the real gross domestic product of the food manufacturing, manufacturing, and restaurant industries. A is the estimated matrix from the VAR system, and the response of employment to economic shocks can be estimated through the VAR model. By dividing employment by industry into regular and temporary daily workers, we can analyze the impact of economic shocks on employment by industry. Therefore, the shock response function is estimated in the VAR model by including the economy of each industry as is and only changing the number of regular and temporary daily workers in the manufacturing, food manufacturing, and restaurant industries. Through the shock response function of VAR, we can examine how the number of workers responds to a 1-percentage-point GDP structural shock over a 10-year period, showing the effect of the economic shock on the number of regular and temporary daily workers in each industry.

3.2. ARDL

In order to analyze the time-lag effect of each industry's economy on employment in the food industry, the Autoregressive distributed lag (ARDL) proposed by Pesaran et al. (2001) was used. The ARDL model examines which type of employment, between full-time and temporary daily workers in the food industry, responds more sensitively to changes in the economy. The function to analyze the effect of the food manufacturing, restaurant, and manufacturing industries on employment in the food industry is as follows:

$$\mathrm{lnlabor}_{i,j,t} = \alpha_1 + \alpha_2 lnfgdp_t + \alpha_3 lnrgdp_t + \alpha_4 lnmgdp_t + \epsilon_{i,j,t} \quad (2)$$

Taking the logarithmic function, where i represents the industry, j represents regular and temporary daily workers, $labor_{i,j,t}$ represents the number of workers in each industry, and fgdp, rgdp, and mgdp represent the real GDP of the food manufacturing, restaurant, and manufacturing industries, respectively. α_1 to α_4 represent the long-run equilibrium relationship between the number of workers and economic growth. The ARDL model has the advantage of simultaneously estimating short-term and long-term coefficient values, and it can confirm how long the lag affects employment. Additionally, the ARDL model can be used regardless of the unit root test result, and analysis is possible

even with a small sample size (Pesaran & Shin, 1999).

In this study, an error correction model (ECM) using the ARDL model is constructed. The ECM applied to the ARDL model differs from the existing ECM in that it uses time lag for the error correction term instead of the difference between the actual and estimated values.

$$\Delta\text{lnlabor}_{i,j,t} = \alpha_0 + \sum_{k=1}^{p} \gamma_k \Delta lnlabor_{i,j,t-k} + \sum_{k=1}^{p} \delta_k \Delta lnfgdp_{i,j,t-k} + \sum_{k=1}^{p} \theta_k \Delta lnrgdp_{i,j,t-k} + \sum_{k=1}^{p} \rho_k \Delta lnmgdp_{i,j,t-k} \quad (3)$$

Δ represents the first-order difference, p represents the lag order, and $\gamma, \delta, \theta, \rho$ represent the short-term equilibrium relationship. By determining the appropriate order of business fluctuations by industry, we can determine which variables respond more quickly to changes in the number of workers. For example, if the number of workers in the food manufacturing industry is smaller than that in the restaurant industry, it can be interpreted that the number of workers in the food manufacturing industry is more sensitive to changes. Table 2 shows the dependent and explanatory variables selected to analyze the response of the number of regular and temporary daily workers in the food manufacturing and restaurant industries.

Table 2: Selection of Model Variables

Dependent variable		Independent variable
i	j	
Food manufacturing	Number of full-time workers	Manufacturing, Food manufacturing, Restaurant business GDP, 1998 dummy, 2009 dummy
	Number of temporary daily workers	
Restaurant business	Number of full-time workers	
	Number of temporary daily workers	

4. Data

The data collected for analysis included the real GDP and the number of workers (total, regular, and daily temporary) in the manufacturing industry (excluding food manufacturing), food manufacturing, and restaurant industries. Real GDP data by economic activity was obtained from the Bank of Korea's economic statistics system. Since the food manufacturing industry is part of the manufacturing industry classification, the real GDP of the manufacturing industry was recalculated by excluding the food manufacturing industry for analysis. The number of workers by economic activity was collected from the Survey on Labor Status at Enterprises (1976-1997) and Current Status of Labor at Enterprises (1998-2019) provided by the Ministry of Employment and Labor. As the workplace labor status survey investigated the number of businesses with 5 or more employees, the number of workers after 1998 was collected as the number of workers corresponding to the number of businesses with 5 or more employees for consistency of data. The data for the GDP and the number of workers in the manufacturing and food manufacturing industries were collected from 1976 to 2019, while the data for the number of workers in the food service industry was collected from 1998 to 2019.

We investigated the presence of unit roots in the number of workers and GDP by industry. Based on the results of the Augmented Dickey-Fuller (ADF) test, we could not reject the null hypothesis that both real GDP and the number of workers have a unit root, indicating that all time series variables are unstable. We further analyzed the presence or absence of unit roots for the first difference and found that there is no unit root in the following variables: total number of workers in the food industry, regular workers in the food industry, temporary daily workers in the food industry, all manufacturing workers, total GDP, GDP in the food industry, and GDP in the manufacturing industry. To complement the results of the ADF test, we conducted the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test, which tests the null hypothesis that there is no unit root. As a result of the KPSS analysis, we found that the unit root exists in the number of workers in the food industry and real GDP by industry, as the null hypothesis that the unit root does not exist in all numbers of workers and real GDP was rejected.

Table 3: Unit Root Test Results

	ADF		KPSS	
	level	first difference	level	first difference
Food manufacturing full-time workers	2.24	-3.61**	0.89**	0.20
Food manufacturing temporary daily workers	0.51	-5.58**	0.83**	0.09
Restaurant business full-time workers	0.49	-2.15**	0.38*	0.15
Restaurant business temporary daily workers	1.01	-4.00**	0.76**	0.50*
Food manufacturing GDP	2.52	-3.01**	1.09**	0.75**
Restaurant business GDP	2.92	-1.92*	1.11**	0.47*
Manufacturing GDP	3.33	-2.71**	1.17**	0.86**

Note: *, ** and *** denote significant at the 10%, 5% and 1% levels.

Table 4: Statistic Description

		Mean	Standard deviation	Min	Max	Obs
Total number of workers	Food manufacturing	191,684	37,940	105,266	280,996	44
	Restaurant business	1,186,038	235,146	690,568	1,609,712	22
Number of full-time workers	Food manufacturing	162,900	31,253	91,816	243,784	44
	Restaurant business	412,072	83,781	301,613	596,214	22
Number of temporary Daily workers	Food manufacturing	23,385	8,316	9,669	37,398	44
	Restaurant business	376,129	142,874	92,070	555,251	22
GDP by economic activity	Total	693,498	615,779	14,473	1,898,193	44
	Manufacturing	190,661	154,151	12,455	467,348	44
	Food manufacturing	14,050	4,947	4,305	22,265	44
	Restaurant business	23,875	12,427	6,103	40,313	44

Source: Bank of Korea, Economic Statistics System. Ministry of Employment and Labor.

In general, there is a long-term equilibrium relationship between GDP and the number of workers in each industry. To analyze this relationship, Pesaran et al.'s cointegration method was used, which allows for analysis regardless of the unit root test results. While Engel-Granger's approach requires the variables to have the same unit root, the ARDL-bound test method can be applied even if the unit root test results differ, and can be used for small sample sizes (Pesaran & Shin, 1999). The presence of cointegration for each model was determined by the bound test value proposed by Pesaran et al. (2001). The results indicated that there is a long-term equilibrium relationship between the number of full-time workers in the restaurant industry and most of the economic and employment variables, except for the economy.

Table 5: Statistic description

Variable	GDP		GDP by economic activity	
	F-stat.	Cointegration	F-stat.	Cointegration
Food manufacturing full-time workers	4.03	cointegration	4.31	cointegration
Food manufacturing temporary daily workers	8.97	cointegration	6.12	cointegration
Restaurant business full-time workers	0.70	no cointegration	1.37	no cointegration
Restaurant business temporary daily workers	21.3	cointegration	5.76	cointegration

Note: Pesaran et al. (2001) set the range of F values through the Bound test value to test the null hypothesis that cointegration does not exist.

5. Results

5.1. Impulse Response Function

5.1.1. Employment response to aggregate GDP shock

Based on the analysis, a positive shock to total real GDP results in a decrease in the number of regular and temporary daily workers in the food manufacturing industry. It appears that when the economy improves, the number of full-time workers in the food manufacturing industry decreases, and this trend continues in the aftermath of the shock. This implies that the improvement in the overall economy of the country leads to a shift in employment away from the food manufacturing industry, with regular workers in this industry moving to other industries. Furthermore, the number of temporary daily workers in the food manufacturing industry experiences a significant decline due to the economic shock, but it recovers after 5 years. This indicates that when the economy improves, employment shifts to other industries, similar to regular workers in the food manufacturing industry, and the impact is more significant. However, over time, the number of temporary daily workers in the food manufacturing industry seems to increase again. Conversely, during an economic downturn, there is a buffering effect in which employment is absorbed from the main industry to the food manufacturing industry, but the continuity of employment in this industry is low.

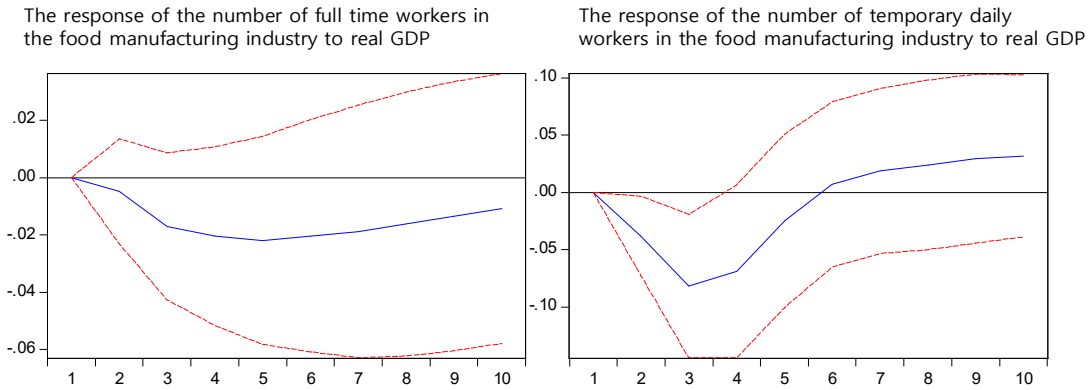


Figure 2: Food manufacturing employment impulse response function results for real GDP

For a positive shock in total real GDP, the number of full-time workers in the restaurant industry decreases while the number of temporary daily workers increases. Following the economic improvement, there is a decrease in the number of full-time workers for about two years, followed by an increase. This indicates a shift in employment towards other industries, similar to what was observed in the food manufacturing industry. The number of temporary daily workers in the restaurant industry was found to increase rapidly during the period of economic improvement, possibly due to an increase in dining out. Conversely, if the economy deteriorates, regular workers in the restaurant industry have a buffering effect, but the situation for temporary daily workers worsens.

The previous analysis focused on the employment response of the food manufacturing and restaurant industries to overall real GDP shocks. However, it is also important to examine how employment changes in response to changes in GDP by industry. To do this, we need to analyze the shock response of each industry (including the number of regular and temporary daily workers) to changes in real GDP by industry (specifically, food manufacturing, manufacturing, and restaurant).

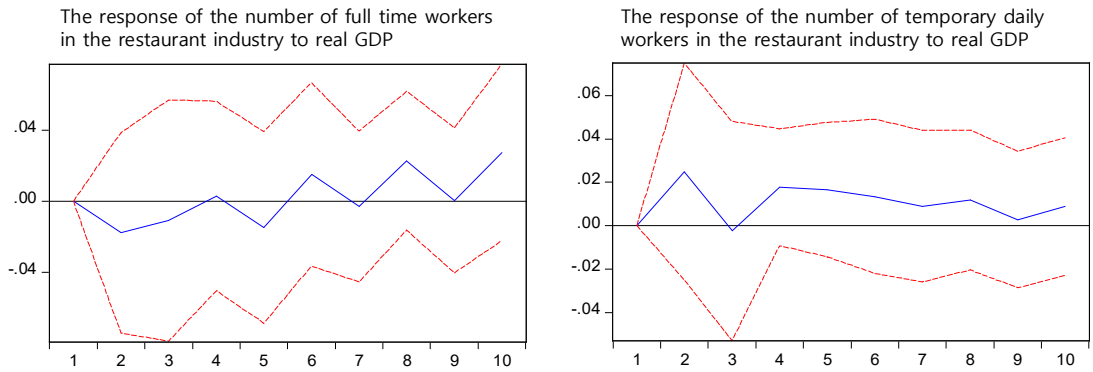


Figure 3: Restaurant Employment Impact Response Function Results for Real GDP

An increase in food manufacturing GDP leads to an increase in the number of full-time workers in the food manufacturing industry but a decrease in the number of temporary daily workers. This is different from the overall GDP shock response, which showed that an increase in overall GDP reduced the number of full-time workers in the food manufacturing industry. The increase in regular workers in the food manufacturing industry occurs only when the food manufacturing economy improves, while the number of daily workers decreases in the short term.

On the other hand, an increase in manufacturing GDP results in a slight decrease in the number of full-time workers in the food manufacturing industry and a relatively larger decrease in the number of daily workers. This implies that when the manufacturing economy deteriorates, the number of workers in the food manufacturing industry may increase, which can act as a buffering effect to some extent during a manufacturing industry recession.

Finally, an increase in the food service industry GDP reduces the number of regular and daily workers in the food

manufacturing industry. This means that when the restaurant industry improves, the number of regular workers in the food manufacturing industry decreases, and this shock effect continues for a significant period of time.

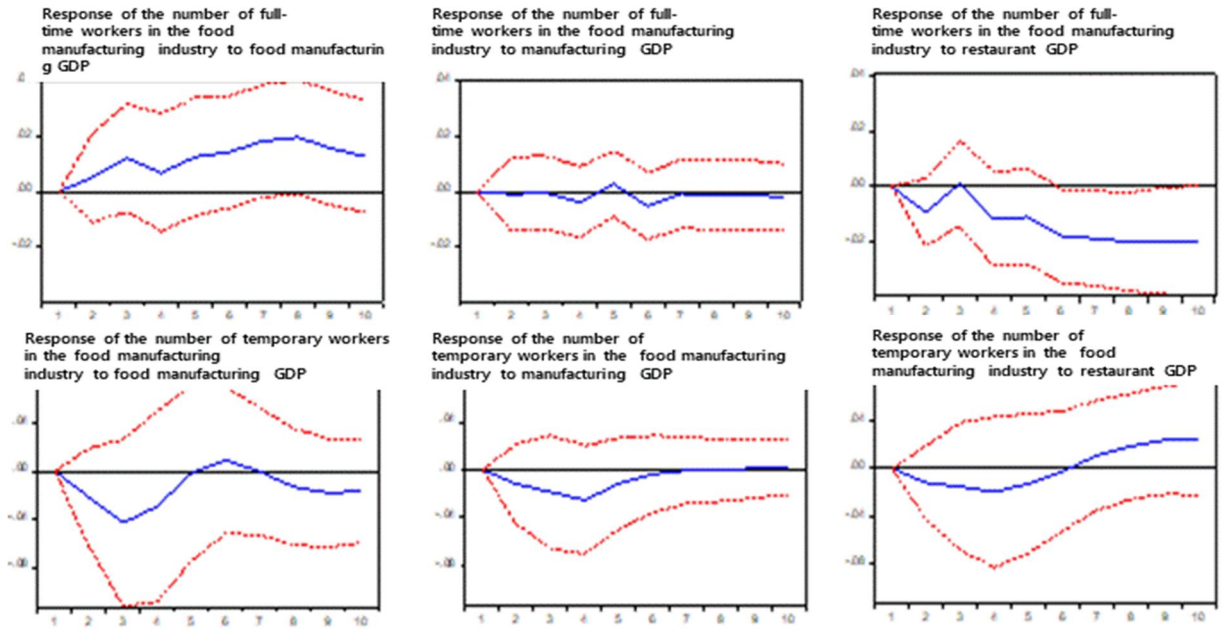


Figure 4: Food manufacturing employment impulse response function results for GDP by industry

This suggests that some workers may switch to the food manufacturing industry when the food service industry deteriorates, but this effect may diminish within 5 years.

An increase in food manufacturing GDP leads to an increase in both regular and daily workers in the restaurant industry. As the food manufacturing industry improves, the number of full-time workers in the restaurant industry continues to increase for a long time, but the number of daily workers initially rises and then declines in the short term. On the other hand, an increase in manufacturing industry GDP has a minor impact on the number of full-time workers in the restaurant industry. The number of daily workers in the restaurant industry, however, increases significantly, and this effect persists for a long time.

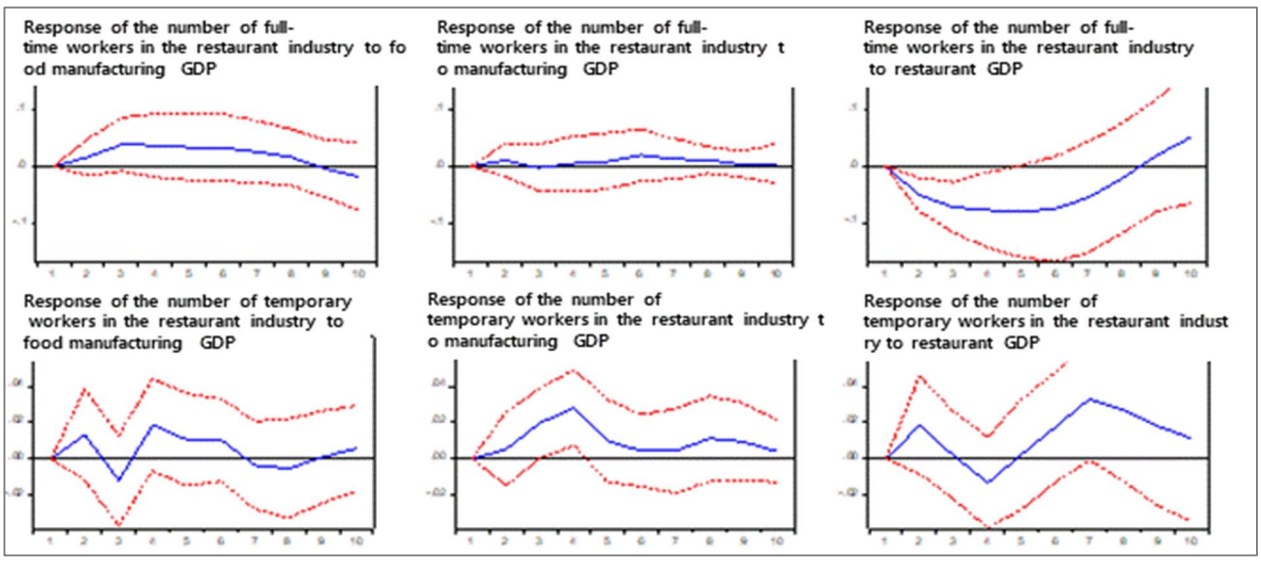


Figure 5: Restaurant Employment Response to GDP Shock by Industry

An increase in restaurant industry GDP reduces the number of regular workers in the restaurant industry while increasing the number of daily workers. When the restaurant business improves, the number of regular workers in the industry decreases, and this is interpreted as the booming business in the restaurant industry expanding daily employment rather than regular employment. However, there may be analytical limitations due to the small amount of available data on the number of workers in the restaurant industry from 1998 to 2019.

5.2. ARDL results

5.2.1. Long-run Equilibrium Relationship between Real GDP and Industry-wise Workers

The cointegration analysis did not yield significant results, except for daily workers with temporary employment in the restaurant industry in the expected long-run equilibrium relationship between industry-wise GDP and the number of workers. Since this study used annual data, it is suggested that examining the response of the number of workers per year to GDP through the short-term equilibrium relationship, instead of the long-run equilibrium relationship between GDP and the number of workers, would be more appropriate.

Table 6: Long-Run Equilibrium Relationship between the Economy and Employment

GDP by economic activity	Food manufac-turing full time worker	Food manufac-turing temporary worker	Restaurant business full time workers	Restaurant business temporary daily workers
Food manufacturing GDP	2.81	1.81	4.20	-0.68*
Restaurant GDP	-7.66	-0.46	-7.79	0.42
Manufacturing GDP	4.00	-1.11	1.93	0.77**

Note: *, ** and *** denote significant at the 10%, 5% and 1% levels.

5.2.2. Short-Run Equilibrium Relationship between Total Real GDP and Workers in the Food Industry

The employment of full-time workers in the food manufacturing industry is more sensitive to changes in total real GDP compared to temporary daily workers. While regular workers are more responsive to economic fluctuations, temporary daily workers' employment is negatively related to the economic cycle. In other words, during good economic times, the response of temporary daily workers in the food manufacturing industry shows a negative relationship. This suggests that there is room for temporary daily workers to switch to other industries as the economy improves. Conversely, when the economy deteriorates, workers in other industries can be absorbed into temporary daily jobs in the food manufacturing industry. The employment of full-time and temporary daily workers in the restaurant industry reacts the same to changes in total real GDP. This indicates that when the economy improves, both the restaurant business and temporary daily worker employment increase in the short term.

5.2.3. Short-run Equilibrium Relationship between GDP by Industry and Workers in the Food Industry

The employment of full-time workers in the food manufacturing industry is more sensitive to changes in the food manufacturing industry and the manufacturing business. It has a negative relationship with the food manufacturing industry and a positive relationship with the manufacturing industry. When the food manufacturing industry improves, the number of regular workers in the same industry decreases, and when the manufacturing industry improves, the number of regular workers in the food manufacturing industry increases. This suggests that workers in the food manufacturing industry tend to move to the manufacturing industry when the food manufacturing and manufacturing industries improve, and they respond more sensitively than workers in the restaurant industry. Conversely, if the economy of the two industries deteriorates, worker migration will reverse, resulting in a buffering effect on employment in the food manufacturing industry.

The employment of full-time workers in the food manufacturing industry appears to be less sensitive to changes in the restaurant business compared to changes in other industries. The employment of temporary daily workers in the food manufacturing industry responds most sensitively to the food service industry, followed by the food manufacturing industry. Although it responds most sensitively to the restaurant business, the estimation coefficient was not statistically significant. Changes in the food manufacturing industry respond more sensitively to the labor of temporary daily workers in the food manufacturing industry than to fluctuations in the manufacturing industry. The boom in food manufacturing and the manufacturing industry reduces the number of temporary and daily workers in the food manufacturing industry.

The employment of full-time workers in the restaurant industry responds equally to GDP by industry, and the employment of temporary daily workers in the restaurant industry responds most sensitively to the economy of the restaurant industry. The number of full-time workers in the restaurant industry responded positively to the food manufacturing industry, restaurant industry, and manufacturing business. Changes in the restaurant business have a rapid impact on the number of temporary daily workers in the restaurant industry and have a positive relationship.

Table 7: Short-run Equilibrium Relationship between Economy and Employment in Food Manufacturing Industry

	0	1	2	3	4	5	EC_{t-1}	Adjust R^2
Dependent variable: The number of full-time workers in the food manufacturing industry								
GDP	0.01						-0.12***	0.09
Dependent variable: The number of temporary workers in the food manufacturing industry								
GDP	-0.85**	-0.85*	-0.78*	-1.21**			-0.30***	0.66
Dependent variable: The number of full-time workers in the restaurant business industry								
GDP	1.45*						-0.06**	0.09
Dependent variable: The number of temporary workers in the restaurant business industry								
GDP	0.31*						-0.41***	0.68

Note: *, ** and *** denote significant at the 10%, 5% and 1% levels.

Table 8: Short Term Equilibrium Relationship between Economy by Industry and Employment in the Food Manufacturing Industry

GDP by economic activity	0	1	2	3	4	5	EC_{t-1}	Adjust R^2
Dependent variable: The number of full-time workers in the food manufacturing industry								
Food manufacturing GDP	-0.39*						-0.04***	0.49
Restaurant GDP	-0.37**	0.18	0.36***	-0.22**				
Manufacturing GDP	0.46***							
Dependent variable: The number of temporary workers in the food manufacturing industry								
Food manufacturing GDP	-0.41	-0.57	-1.33***				-0.11***	0.70
Restaurant GDP	-0.05							
Manufacturing GDP	-0.40	-0.44*	-0.38*	-0.69***				
Dependent variable: The number of full-time workers in the restaurant business industry								
Food manufacturing GDP	0.26	-0.35	0.45*	1.05			-0.40**	0.51
Restaurant GDP	-1.88	0.55	1.49*	0.86				
Manufacturing GDP	1.76*	1.45*	0.78	0.36				
Dependent variable: The number of temporary workers in the restaurant business industry								
Food manufacturing GDP	-0.49	1.69***					-0.99***	0.86
Restaurant GDP	0.42*							
Manufacturing GDP	-0.13	-0.78*						

Note: *, ** and *** denote significant at the 10%, 5% and 1% levels.

The stability of the estimation coefficient was tested using the Cumulative Sum of Recursive Residuals (CUSUM) test. This test is used to check the stability of estimated coefficients by continuously changing the variables used, and has the advantage of not requiring prior representation of structural changes. If the CUSUM falls within the critical line of the 5% significance level, the estimation coefficient of the corresponding function can be judged to be stable and therefore reliable. As a result of the CUSUM test, it was confirmed that all ARDL models are stable, indicating that the estimated ARDL models are reliable.

6. Conclusion

If the economy deteriorates, the food industry can create a buffer that absorbs employment. The decline in real GDP increased the number of regular and temporary daily workers in the food manufacturing industry, and the number of regular workers in the restaurant industry also increased. It can be seen that the employment buffering effect of the food industry alleviated the slump in employment in other industries, such as the service industry and the public sector, and provided jobs. However, since the increase in employment due to this buffering effect lasts for a short period of time, employment is not sustainable. In addition, since the impact of temporary daily workers is greater than that of full-time workers, the quality of employment can be lowered, which can weaken the growth of the food industry and further deepen income polarization. Therefore, labor policies for the food industry that can resolve the instability of the food industry labor market through temporary employment absorption by the food industry's buffering action are needed.

In order to alleviate the cycle in which the food industry absorbs employment due to economic downturn and then loses employment when the economy improves, a stable employment guarantee system, such as guaranteeing full-time jobs and improving job conversion programs, is needed. In addition, through government support for employment in the food industry, employment programs centered on the

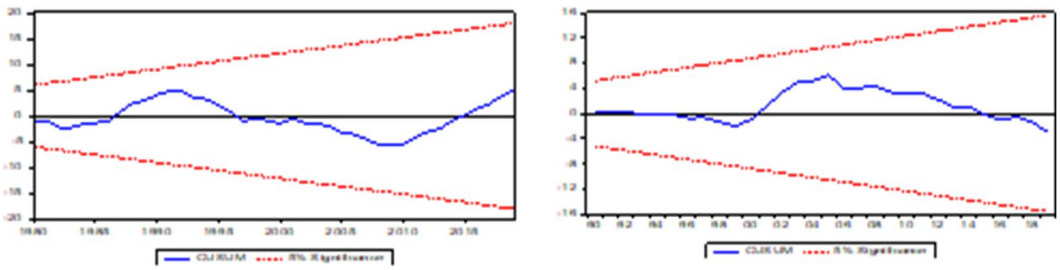
food industry, such as support for small businesses to maintain employment and free employment agencies, are needed so that the buffering effect of employment can work well in times of economic downturn. Employment change should be prevented by providing programs that enable young people to transfer their know-how and on-the-job training to the food industry as an opportunity. Since the middle-aged can achieve relatively long-term employment absorption through employment transition to the food industry due to the buffering effect, a program that can help them settle down is necessary.

In the study, it was observed that the number of regular and temporary daily workers in the food manufacturing industry responds more sensitively to other industries than to the same industry. Moreover, while the number of full-time workers in the restaurant industry responds equally to the economy of each industry, the number of temporary and daily workers responds more sensitively to the economy of the same industry. These findings suggest that the food manufacturing industry absorbs employment by responding sensitively to job instability caused by economic recession in other industries. The temporary and daily jobs in the food industry show a negative economic cycle with the domestic economy. When the economy deteriorates, employment absorption into temporary daily workers in the food manufacturing industry may occur first.

In the restaurant industry, when the economy in the same industry deteriorates, employment deteriorates and at the same time absorbs employment in other industries. In particular, temporary and daily workers respond most sensitively to the same-industry economy, while the manufacturing industry shows a counter-cyclical trend. Both the food manufacturing and restaurant industries, which represent the food industry, respond sensitively to domestic economic conditions as well as other industries. Therefore, it is necessary to continuously monitor whether a buffering effect in the food industry can occur due to economic deterioration in not only the food industry but also other industries. A plan for rapid employment absorption needs to be devised when a buffer effect occurs, as the transition to temporary and daily workers can occur quickly.

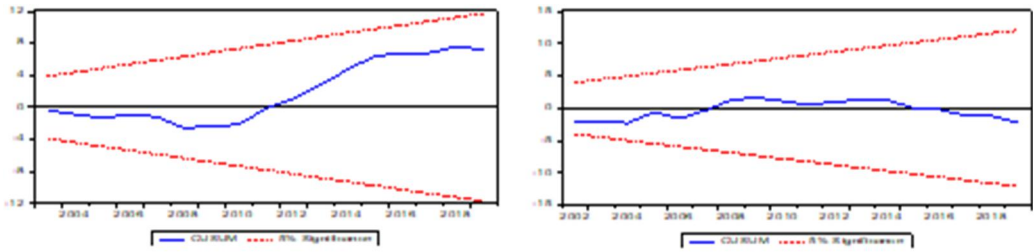
This study is subject to certain limitations that should be acknowledged. Unlike previous crises such as foreign exchange or financial crises, the COVID-19 pandemic had a minimal direct impact on the manufacturing industry. However, due to the implementation of measures such as social distancing, the contraction of the real economy led to a significant shock in the demand for the food industry. Consequently, the buffering effect that would typically arise from economic deterioration did not effectively mitigate the impact. The Ministry of Agriculture, Food and Rural Affairs (2020) has also highlighted the substantial shock experienced by the food service industry during the pandemic, while the food manufacturing industry faced a lower level of impact. Therefore, as this study utilized data up until 2019, it is crucial to analyze employment changes in the food industry considering the effects of COVID-19 by incorporating employment indicators up to 2021 for a more accurate assessment. Despite this limitation, this study remains valuable as it demonstrates the buffering role of the food industry in response to broader economic conditions.

A. GDP and food manufacturing workers CUSUM test results



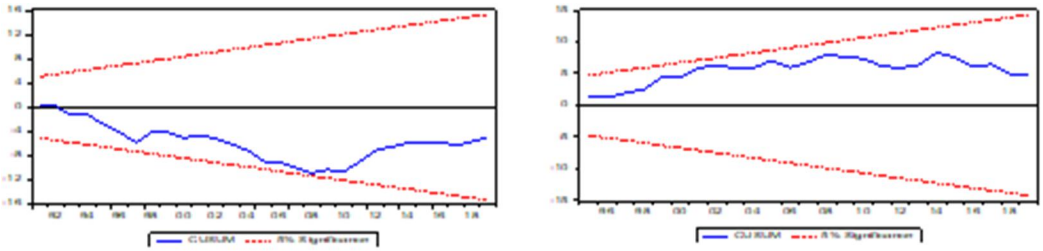
a. Full-time Workers b. Temporary Workers

B. GDP and restaurant business workers CUSUM test results



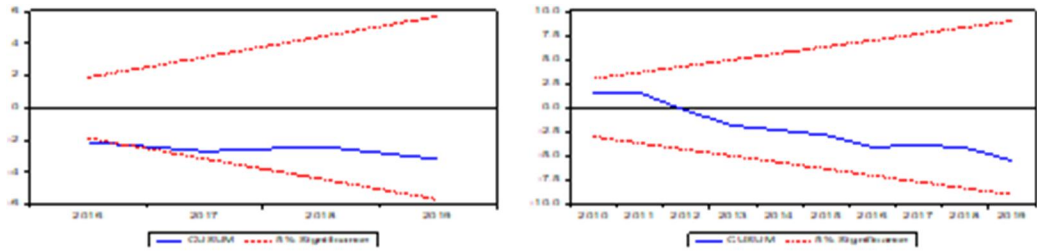
a. Full-time Workers b. Temporary Workers

C. GDP by economic activity and food manufacturing workers CUSUM test results



a. Full-time Workers b. Temporary Workers

D. GDP by economic activity and restaurant business workers CUSUM test results



a. Full-time Workers b. Temporary Workers

Figure 6: CUSUM test results

References

Abdelgawwad, N. A., & Kamal, A. L. M. (2023). Contributions of Investment and Employment to the Agricultural GDP Growth in Egypt: An ARDL Approach. *Economies*, *11*(8), 215.

Atkinson, J. (1984). Manpower Strategies for Flexible Organizations. *Personnel Management, 16*(8), 28-31.

Bank of Korea. Economic Statistics System, available on https://ecos.bok.or.kr.

Hunter et al. (1993). The flexible firm: strategy and segmentation, *British Journal of Industrial Relations*, *31*(3), 383-407.

Hwang, S. (2009). Comparing Cyclical Behaviors of Temporary and Permanent Employment, *Quarterly Journal of Labor Policy, 9*(1), 221-245.

Jung, H. S. (2015). Manufacturing Business Fluctuations and Employment, *Nodong review*, 67-78.

Lee, Y. H., & Lee, C. M. (2020). The Relationship between Growth and Employment Examined through Employment Elasticity: Focusing on the Chungbuk Province, *Journal of Korean Economy Studies*, *38*(1), 67-97.

Ministry of Agriculture, Food and Rural Affairs. (2020). 2020 business report of an agency specializing in food industry information analysis.

Ministry of Employment and Labor. available on http://kosis.kr/.

Obst, T. (2022). Dynamic version of Okun's law in the EU15 countries—The role of delays in the unemployment-output nexus, *Scottish Journal of Political Economy*, *69*(2), 225-241.

Okun, A. M. (1963). Potential GNP: its measurement and significance, *Cowles Foundation for Research in Economics at Yale University*.

Park, S. J., Park, C. H., & Oh, Y. Y. (2013). Diagnosis of Structural Factors in Changes in the Economy-Employment Relationship and Policy Implications, BOK issue note No. 2013-8.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, *16*(3), 289-326.

Pesaran, M. H., & Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, *In S. Strom (Ed.), Econometrics and Economic Theory in 20th Century: The Ragnar Frisch Centennial Symposium*, Chapter 11, 371-413. Cambridge: Cambridge University Press.

Raies, A. (2023). Sustainable Employment in Developing and Emerging Countries: Testing Augmented Okun's Law in Light of Institutional Quality, *Sustainability*, *15*(4), 3088.

Shin, S. H., & Cho, D. C. (2012). An Empirical Study on Employment during Crises in Korea, *KDI Journal of Economic Policy*, *34*(4), 91-116.