



Perceived Organizational Support, Organizational Justice, and Psychological Capital: Their Impact on Organizational Citizenship Behavior Through Work Engagement

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Abstract

Background: The thermoforming manufacturing industry faces operational challenges related to resin price volatility, stringent quality requirements, and shift-based production coordination. Organizational Citizenship Behavior (OCB) can support operational effectiveness through voluntary employee contributions.

Objective: This study examines the effects of Perceived Organizational Support (POS), Organizational Justice (OJ), and Psychological Capital (PsyCap) on OCB through Work Engagement (WE) among permanent production employees in thermoforming manufacturing companies.

Methods: This study used a quantitative cross-sectional survey with structured questionnaires. Data were analyzed using Covariance-Based Structural Equation Modeling (CB-SEM) with the Robust Maximum Likelihood Satorra-Bentler estimator in LISREL 8.8.

Results: POS, OJ, and PsyCap positively influenced WE. POS, OJ, PsyCap, and WE also positively influenced OCB. WE partially mediated the relationships between POS, OJ, PsyCap, and OCB. OJ had the strongest effect on WE, while WE had the strongest effect on OCB.

Conclusion: Organizational support, organizational justice, psychological capital, and work engagement play important roles in strengthening OCB among thermoforming production employees. These findings indicate that organizational and personal resources can encourage voluntary extra-role behavior both directly and through greater work engagement.

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INTRODUCTION

The manufacturing industry is an important pillar of the Indonesian economy, contributing 18.98 percent to GDP in 2024 and employing 20.01 million workers, equivalent to 13.83 percent of the total working population in August 2024 (Statistik, 2024, 2025). Within this sector, plastic packaging has expanded alongside the growth of the food and beverage industry and e-commerce. In the rigid packaging segment, thermoforming technology plays an important role because it provides production efficiency, consistent product shapes, and hygienic packaging. The Indonesian thermoformed trays market is projected to increase from USD 196.15 million in 2024 to USD 293.96 million by 2032, indicating continued expansion of the industry (Research, 2025).

The development of the thermoformed packaging market is illustrated in Figure 1. The increasing market demand creates opportunities for manufacturers but also requires production

organizations to maintain operational reliability while managing workforce-related challenges.

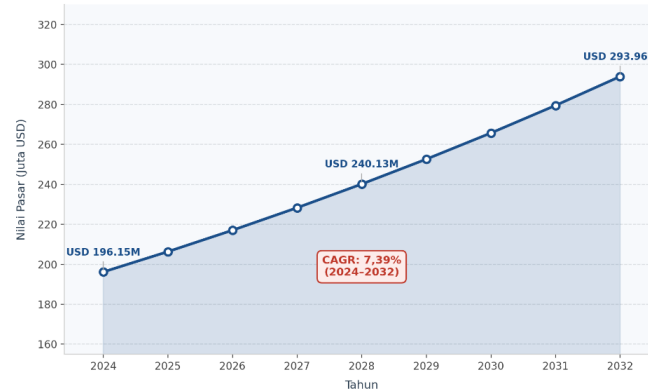


Figure 1. Indonesian Thermoformed Trays Market Graph 2024-2032

Source: Data Bridge Market Research (2025)

Market expansion is accompanied by pressure on the supply and cost of raw materials. Polypropylene and polyethylene terephthalate, which are widely used in thermoforming, are closely associated with naphtha-based petrochemical production. Naphtha prices have experienced substantial fluctuations due to geopolitical and energy-market developments, including the re-imposition of sanctions on Iran's petrochemical sector in 2019, Russia's invasion of Ukraine in 2022, and increased geopolitical tensions affecting energy markets in 2026 (Agency, 2022, 2026b; Executive Order 13846—Reimposing Certain Sanctions With Respect to Iran, 2018). After declining to approximately USD 556 per ton in 2025, naphtha prices increased to approximately USD 933 per ton in April 2026, exceeding the 2022 peak (Agency, 2026a; Economics, 2026).

The development of naphtha and polypropylene prices in the Asian market is presented in Figure 2. These fluctuations are relevant to thermoforming manufacturers because raw materials constitute a substantial component of production costs. Cost pressures can increase the importance of production efficiency, quality control, coordination between shifts, and employee behavior that supports daily operations.

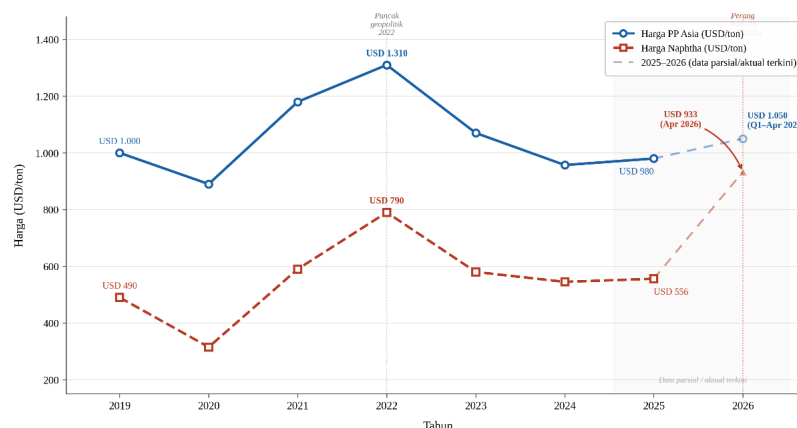


Figure 2. Asian Naphtha and Polypropylene (PP) Price Trends, 2019--2026

Source: World Bank (2024); Agency (2022); Agency (2026b); Agency (2026a); Trading Economics (2026)

In this operational context, Organizational Citizenship Behavior (OCB) is relevant because it reflects voluntary employee behavior that supports organizational functioning beyond formal job requirements. In thermoforming production, such behavior may include assisting colleagues during machine changeovers, reporting process anomalies, maintaining effective shift handovers, and supporting coworkers when operational problems arise (Jin et al., 2022; McManus et al., 2025; Pratiwi et al., 2024). Although OCB can contribute to operational effectiveness, it should remain

voluntary and should not become an additional mandatory burden for employees. Understanding the factors that encourage such behavior is therefore important for manufacturing organizations facing cost pressures and demanding production environments.

Previous studies have shown that organizational and personal resources can shape employee engagement and citizenship behavior. Perceived Organizational Support (POS) reflects employees' perceptions that the organization values their contributions and cares about their well-being, whereas Organizational Justice (OJ) concerns employees' evaluations of fairness within the organization. Psychological Capital (PsyCap) represents positive psychological resources that include self-efficacy, hope, optimism, and resilience. These resources can influence Work Engagement (WE), which represents a positive and fulfilling state of work-related motivation, and subsequently encourage OCB (Jin et al., 2022; Kurtessis et al., 2017; Mazzetti et al., 2023; Meng et al., 2026; Rahman & Karim, 2022). However, previous research has often examined these relationships separately or within service, healthcare, hospitality, and other organizational settings. Evidence that simultaneously examines POS, OJ, and PsyCap as predictors of WE and OCB among permanent production employees in the thermoforming manufacturing context remains limited.

This study integrates Job Demands-Resources Theory, Social Exchange Theory, and Conservation of Resources Theory to explain the relationships among organizational resources, personal resources, work engagement, and OCB. From the Job Demands-Resources perspective, POS and OJ represent organizational resources, while PsyCap represents a personal resource that can strengthen employees' capacity to remain engaged at work (Bakker et al., 2023; Bakker & Demerouti, 2017). Social Exchange Theory explains how organizational support and fair treatment may encourage employees to reciprocate through positive discretionary behavior (Kao et al., 2023; Kurtessis et al., 2017). Conservation of Resources Theory further explains how psychological resources can support engagement and behavioral outcomes by helping employees preserve and mobilize valuable personal resources (Mazzetti et al., 2023). Integrating these perspectives provides a broader explanation of how different types of resources may influence OCB directly and indirectly through WE.

Accordingly, this study examines the effects of POS, OJ, and PsyCap on OCB through WE among permanent production employees in thermoforming manufacturing companies in Tangerang and Semarang, Indonesia. The study contributes to the literature by examining these organizational and personal resources simultaneously within a manufacturing setting and by testing WE as a mediating mechanism. The findings are also expected to provide practical implications for human resource and operational managers in strengthening employee engagement and voluntary supportive behavior while maintaining fairness, employee well-being, and the voluntary nature of OCB.

METHOD

The model was constructed by adapting three main references: McManus et al. (2025) for the POS→WE→OCB path, Rahman & Karim (2022) for the OJ→WE→OCB path, and Jin et al. (2022) for the PsyCap→WE→OCB path. Modifications include: (1) adding OJ and PsyCap as simultaneous predictors, (2) measuring OJ as overall justice (Aldabbas et al., 2025; Ambrose & Schminke, 2009), and (3) repositioning POS from a moderator to a direct predictor. Contextual reinforcement was obtained from Park & Kim (2024) and Jufrizen et al. (2025). POS, OJ, and PsyCap are positioned as exogenous variables, WE as the mediator, and OCB as the endogenous variable. The exogenous variables are not connected by causal arrows; their correlations are estimated through the PHI matrix in CB-SEM. All hypotheses are one-directional and positive (one-tailed, $t > 1.65$).

A confirmatory, quantitative, cross-sectional, self-administered survey was conducted using Google Forms and hard-copy questionnaires. The data were analyzed using CB-SEM in LISREL 8.8 with a robust maximum likelihood estimator and the Satorra-Bentler correction. Pretest and descriptive analyses were conducted using SPSS 26.

The accessible population consisted of approximately 732 permanent production employees at two thermoforming facilities (Tangerang, approximately 380; Semarang, approximately 352). Purposive sampling was employed. Inclusion criteria were permanent employment status; employment in the production, maintenance, or QC departments; a minimum

tenure of ≥ 1 year; willingness to participate; and complete responses. Exclusion criteria included failure of the IMC, straight-lining, and duplicate responses.

The finite population formula was:

$$n = [\chi^2 \times N \times P(1-P)] / [d^2 \times (N-1) + \chi^2 \times P(1-P)]$$

With $N = 732$, $\chi^2 = 3.841$, $P = 0.50$, and $d = 0.05$:

$n = [3.841 \times 732 \times 0.25] / [(0.0025 \times 731) + (3.841 \times 0.25)] = 252.14 \approx 253$ minimum respondents.

The final sample consisted of 384 respondents (52.46% of the population). The respondent-to-indicator ratio was $384/43 \approx 8.9:1$, meeting the recommended ratio of 5:1–10:1 (J. F. Hair et al., 2019; J. Hair & Sabol, 2025).

Table 1

Analysis Stages

Stage	Activity	Tools
1	Data cleaning, reverse coding, descriptive, pretest (KMO $\geq 0,50$; loading $0,50-1,00$; $\alpha \geq 0,70$)	SPSS 26
2	Multivariate normality test (Mardia skewness & kurtosis) + ACM estimation	PRELIS 2
3	CFA per construct: GOF, SLF $\geq 0,50$ (ideal $\geq 0,70$), CR $\geq 0,70$, VE $\geq 0,50$	LISREL 8.8 (Robust ML)
4	CMB: Harman's single factor (<50% varians) + SB scaled $\Delta\chi^2$ test	SPSS + LISREL
5	Structural model: path coefficients, R^2 , hypothesis testing (one-tailed $t > 1,65$)	LISREL 8.8 (Robust ML)
6	Robustness: HTMT $< 0,90$, alternative WE model unidimensional	LISREL 8.8

Main GOF criteria: RMSEA ≤ 0.08 ; CFI ≥ 0.90 ; SRMR ≤ 0.08 ; NNFI ≥ 0.90 ; χ^2/df 2--5.

Mediation was classified as partial (both direct and indirect effects are significant), full (only the indirect effect is significant), or no mediation (the indirect effect is not significant).

The researcher holds an HR position at the company where the research was conducted. Mitigation measures include voluntary informed consent, anonymous questionnaires, distribution through division coordinators (rather than through HR channels), and explicit affirmation that participation would have no employment consequences. Residual social desirability bias is acknowledged as a limitation.

RESULTS AND DISCUSSION

Results

Research Implementation

The research was conducted from March to April 2026 among permanent production employees at two thermoforming manufacturing facilities in Tangerang and Semarang, using purposive sampling (Pratiwi et al., 2024).

The research instrument was a structured questionnaire using a seven-point Likert scale, complemented by two instructional manipulation check (IMC) items to assess and filter response accuracy. Google Forms links were distributed hierarchically through production division coordinators on each shift (morning, afternoon, and night), rather than through direct HR channels, as a mitigation measure against power bias and social desirability bias that could potentially arise from the researcher's position as an HR practitioner at the company where the research was conducted (Subsection 3.8.3). The measurement and structural models were tested using covariance-based structural equation modeling (CB-SEM) in LISREL 8.8 with the robust maximum likelihood estimator, which produces Satorra-Bentler scaled chi-square statistics and robust standard errors (Dash & Paul, 2021; Muhamad & Zainuddin, 2025).

Readability Test

Readability testing was conducted with five prospective respondents who understood the manufacturing work context. Several statements required simplification of their wording, but all

revisions were editorial in nature and did not change the substantive meaning of the original items.

Pretest

After the readability test, the research proceeded to the pretest stage with 40 respondents who had characteristics similar to those of the main research respondents. This stage aimed to assess the initial quality of the instrument using three key indicators processed with IBM SPSS Statistics 26: the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA), with a minimum threshold of 0.50; factor loadings in the range of 0.50–1.00; and Cronbach's alpha of at least 0.70 (J. F. Hair et al., 2019; J. Hair & Sabol, 2025).

Table 2

Pretest Results Summary

Construct/Dimension	KMO	Loading Range	α
POS (8 item)	0,881	0,841–0,895	0,952
OJ (6 item)	0,754	0,658–0,890	0,852
PSE (3 item)	0,667	0,820–0,934	0,853
POP (2 item)	0,500	0,968	0,931
PHO (4 item)	0,751	0,878–0,911	0,921
PRE (3 item)	0,717	0,870–0,918	0,865
WV (3 item)	0,739	0,892–0,930	0,896
WD (3 item)	0,702	0,878–0,940	0,883
WA (3 item)	0,757	0,915–0,928	0,910
OCB (8 item)	0,815	0,715–0,884	0,928

All constructs and dimensions met the three initial validity and reliability criteria. POS demonstrated the highest quality (KMO = 0.881; α = 0.952). The reverse-coded OJ items remained valid, and the optimism dimension (KMO = 0.500) was still adequate because the factor loadings and reliability remained high.

The pretest demographic profile showed a male majority (97.50%), married status (60%), an age range of 21–30 years (45%), high school/vocational education (87.50%), functional staff positions (97.50%), a most common tenure of 6–10 years (32.50%), and a Tangerang location (85%). This composition indicates that the pretest respondents matched the target research characteristics, namely permanent production employees in thermoforming manufacturing companies.

Main Data Collection

The main data collection yielded 503 raw responses, which were cleaned in stages.

Table 3

Data Cleaning Summary

Stage	N	Eliminated	%
Raw data	503	–	–
Workplace screening	501	2	0,40%
IMC	459	42	8,38%
Inclusion criteria	384	75	16,34%
Total valid	384	119	23,66%

Based on Table 3, the largest elimination occurred at the inclusion-criteria stage (75 respondents, or 16.34%), mainly due to mismatches in employment status, work division, or tenure of less than one year. A total of 42 respondents (8.38%) failed one of the IMC items, indicating inattention when reading the questionnaire statements. The final sample of 384 respondents represents 52.46% of the total accessible population (~732 employees), exceeding the minimum requirement of 253 respondents based on the finite population formula. The respondent-to-observed-indicator ratio was 8.9:1, meeting the 5:1 to 10:1 recommendation for

CB-SEM (J. F. Hair et al., 2019; J. Hair & Sabol, 2025) and falling within the 300–500 range suggested by Kline (2023) for models with higher complexity.

Respondent Demographics

The demographic profile of the 384 research respondents is presented in the following table to provide an overview of respondent characteristics and assess the representativeness of the sample relative to the population of permanent production employees.

Table 4

Respondent Demographics

Characteristic	Dominant Category	%
Gender	Male	98,96%
Marital status	Married	65,89%
Age	41–50 years	23,96%
Education	High School / Vocational	80,73%
Position	Functional Staff	97,66%
Tenure	> 15 years	31,77%
Location	Tangerang (50,78%), Semarang (48,70%)	99,48%

The male dominance (98.96%) is consistent with the characteristics of the manufacturing industry (BPS, 2024). The majority of respondents were married (65.89%) and had a high school or vocational education (80.73%). The age and tenure distributions were relatively evenly spread, ranging from ≤ 20 years (16.41%) to > 50 years (15.36%), suggesting that the sample was broadly representative across age groups. Tenure ranged from 1–5 years (23.44%) to > 15 years (31.77%), further supporting the representativeness of perceptions across different career stages. The concentration of respondents in Tangerang and Semarang (99.48%) aligns with the locations of the company's main production units.

Descriptive Statistics

Descriptive statistics for the aggregate scores of each construct were calculated to provide an overview of the response distribution on the seven-point Likert scale. The categories followed conventional thresholds of 1.00–3.00 (Low), 3.01–5.00 (Medium), and 5.01–7.00 (High).

Table 5

Aggregate Score Descriptive Statistics (N = 384)

Construct	Mean	SD	Category
POS	5,256	0,989	High
OJ	5,185	1,015	High
PsyCap	5,227	0,818	High
WE	6,324	0,933	High
OCB	5,517	0,897	High

All constructs fell into the high category (mean > 5.00). WE had the highest mean (6.324), followed by OCB (5.517), POS (5.256), PsyCap (5.227), and OJ, which had the lowest mean (5.185) and the largest standard deviation (1.015), indicating uneven perceptions of fairness.

Item-level analysis identified five priority intervention items (high SLF and mean below the variable average): POS6, OJ5, PSE3, WV3, and OCB5.

Common Method Bias

CMB was controlled through procedural (block separation, IMC, and reverse-coded items) and statistical (Podsakoff et al., 2024) strategies. Harman's single-factor test showed that the unrotated first factor explained 45.589% of the total variance across 43 indicators, which is below the conventional threshold of 50%. Although this result indicates an acceptable level of common method bias, Podsakoff et al. (2024) emphasize that Harman's single-factor test has low sensitivity and should not be the sole basis for assessing CMB. Therefore, the researcher complemented this

assessment with the Satorra–Bentler scaled difference chi-square test, comparing the five-factor model with three alternative models.

Table 6

Model Comparison

Model	SB χ^2	df	RMSEA	CFI	Δ SB χ^2	p
Five-factor	1056,31	844	0,026	0,997	–	–
Four-factor (POS+OJ)	2229,61	849	0,065	0,98	1173,30	< 0,001
Three-factor	3092,83	855	0,083	0,97	2036,52	< 0,001
One-factor	4479,62	860	0,100	0,95	3423,31	< 0,001

Based on Table 6, the five-factor model was significantly superior to all alternative models. Combining POS and OJ into one factor (the four-factor model) resulted in significant degradation (Δ SB χ^2 = 1173.30; p < 0.001), confirming that both are empirically distinct constructs. Combining all antecedents (the three-factor model) and all indicators into one factor (the one-factor model) resulted in progressively greater degradation, with RMSEA increasing from 0.026 to 0.100 and CFI decreasing from 0.997 to 0.950. These findings reinforce the conclusion that CMB did not pose a serious threat to the validity of the research findings and that the five-factor structure is the most appropriate representation of the data.

Multivariate Normality Test

Mardia's test (1970) rejected the assumption of multivariate normality (skewness z = 23.585; kurtosis z = 9.399; p < 0.001). Accordingly, the estimator was switched to Robust Maximum Likelihood (Robust ML) with the Satorra–Bentler correction (Cain et al., 2017; Kamath et al., 2025).

CFA per Construct

The Confirmatory Factor Analysis (CFA) stage was conducted to assess the quality of the measurement model for each latent construct separately before integrating them into the full measurement model. The evaluation criteria referred to in Subsection 3.10.5 were as follows: Standardized Loading Factor (SLF) $\geq$ 0.50 (ideally $\geq$ 0.70), Composite Reliability (CR) $\geq$ 0.70, and Average Variance Extracted (AVE) $\geq$ 0.50 (J. F. Hair et al., 2019; J. Hair & Sabol, 2025).

Table 7

CFA Summary

Construct	SLF Range	CR	AVE	RMSEA	CFI
POS	0,740–0,800	0,919	0,587	0,033	0,998
OJ	0,742–0,788	0,895	0,586	0,015	1,000
PsyCap (2nd order)	0,832–0,880	0,918	0,736	0,030	0,996
WE (2nd order)	0,965–1,002*	0,987	0,957	0,034	0,999
OCB	0,659–0,742	0,884	0,488	0,005	1,000

All constructs demonstrated adequate convergent validity and reliability. POS (CR = 0.919; AVE = 0.587) and OJ (CR = 0.895; AVE = 0.586) demonstrated very good measurement properties. The SLFs of the reverse-coded OJ items increased from the pretest, consistent with the exclusion of respondents who failed the IMC (Bloy et al., 2025; Curran, 2016). PsyCap had item SLFs above 0.69. The optimism dimension (CR = 0.678) was slightly below the recommended threshold but was considered acceptable because the higher-order construct met the required criteria (CR = 0.918; AVE = 0.736). Self-efficacy was the most dominant dimension (second-order SLF = 0.880).

WE had item SLFs above 0.85 (CR = 0.909–0.922; AVE = 0.768–0.797) and a higher-order CR of 0.987. The SLF for vigor of 1.002 represents a boundary estimate (Aygün et al., 2026; Jöreskog, 1999), confirming vigor as the most dominant manifestation of WE among production workers.

OCB had SLFs ranging from 0.659 to 0.742, with a CR of 0.884. The AVE of 0.488 was slightly below the recommended threshold but was considered acceptable because the CR

exceeded 0.70.

Full Measurement Model

After the per-construct CFAs were deemed adequate, all constructs were tested simultaneously in the full measurement model to assess measurement quality when all five latent constructs were estimated together. Covariances among the constructs were estimated without imposing causal restrictions.

Table 8

Full Measurement Model GOF

Index	Result	Conclusion
χ^2/df	1,225	Good Fit
RMSEA	0,024	Close Fit
SRMR	0,029	Good Fit
CFI	0,997	Excellent
NNFI	0,997	Good Fit
GFI	0,889	Marginal

RMSEA of 0.024 (close fit) and CFI of 0.997 (excellent fit) confirmed excellent model fit. GFI (0.889) was marginal but reasonable for 43 indicators (J. F. Hair et al., 2019; J. Hair & Sabol, 2025). The measurement model was therefore deemed adequate for structural analysis.

Discriminant Validity

Under the Fornell-Larcker criterion, POS, OJ, PsyCap, and WE met the required criteria. OCB ($\sqrt{AVE} = 0.698$) did not meet the criterion because its correlation with WE (0.858) exceeded the square root of its AVE.

As a robustness check, the HTMT results showed that all pairs were below 0.90, with the highest value observed between WE and OCB (HTMT = 0.844). Thus, discriminant validity could still be maintained.

Structural Model and Hypotheses

The structural model showed very good fit: $\chi^2/df = 1.251$; RMSEA = 0.026 (close fit); CFI = 0.997 (excellent fit); SRMR = 0.065.

Table 9

Direct Hypothesis Results (H1--H7)

Hypothesis	Path	β	t-value	Conclusion
H1	POS $\rightarrow$ WE	0,336	6,308***	Accepted
H2	OJ $\rightarrow$ WE	0,448	7,604***	Accepted
H3	PsyCap $\rightarrow$ WE	0,197	3,205***	Accepted
H4	POS $\rightarrow$ OCB	0,309	4,676***	Accepted
H5	OJ $\rightarrow$ OCB	0,135	1,937*	Accepted
H6	PsyCap $\rightarrow$ OCB	0,131	1,729*	Accepted
H7	WE $\rightarrow$ OCB	0,402	4,693***	Accepted

*p < 0,05 one-tailed; ***p < 0,001

All seven direct hypotheses were supported using a one-tailed test ($t > 1.65$). OJ was the strongest predictor of WE ($\beta = 0.448$), while WE was the strongest predictor of OCB ($\beta = 0.402$). H5 and H6 were significant but had smaller effect magnitudes.

Table 9 reports the R^2 values: WE = 0.787 (78.73%, substantial) and OCB = 0.802 (80.16%, substantial), according to Cohen's criteria (1988); Sommet (2023). The high R^2 values can be explained by population homogeneity (permanent production employees working within a uniform organizational context), the close theoretical relationships among the constructs within the JD-R framework, and the use of higher-order constructs for PsyCap and WE, which aggregate highly correlated dimensions.

Mediation Hypotheses

Mediation testing was conducted to examine the role of WE as a mediator across three hypotheses (H8–H10). The significance of the indirect effects was evaluated using the Indirect Effects of KSI on Y output in LISREL 8.8. The types of mediation were classified as follows: significant direct and indirect effects = partial mediation; only a significant indirect effect = full mediation; and a nonsignificant indirect effect = no mediation.

The partial mediation model was significantly better than the full mediation model ($\Delta SB\chi^2 = 36.03$; $p < 0.001$).

Table 10

Mediation Results (H8--H10)

Hypothesis	Path	Direct β (t)	Indirect β	t indirect	Nature
H8	POS→WE→OCB	0,309 (4,676)	0,111	3,985***	Partial
H9	OJ→WE→OCB	0,135 (1,937)	0,152	4,408***	Partial
H10	PsyCap→WE→OCB	0,131 (1,729)	0,065	2,503*	Partial

All three mediation hypotheses were supported, indicating partial mediation. POS had the strongest direct path ($\beta = 0.309$), consistent with a dual SET and JD-R mechanism. OJ had the largest indirect effect ($\beta = 0.152$) but a weaker direct path. PsyCap had the smallest effects for both the direct and indirect paths, consistent with COR.

Discussion

H1: POS → WE ($\beta = 0.336$; $t = 6.308$)

POS, the second-strongest predictor of WE, functions as a job resource that fulfills socioemotional needs through psychological availability (Demerouti & Bakker, 2023), consistent with McManus et al. (2025) and Kurtessis et al. (2017); (Meng et al., 2026). The POS2 item (SLF = 0.800) represents protective benevolence that contributes to psychological safety among production employees.

H2: OJ → WE ($\beta = 0.448$; $t = 7.604$)

OJ was the strongest predictor of WE. This dominance can be explained by attentional salience: fairness evaluations occur during every shift through daily allocative decisions, giving OJ greater weight than POS. This finding is consistent with Ho et al. (2025) and Rahman and Karim (2022). The OJ2 item (SLF = 0.788) represents trust-based perceptions of justice formed through accumulated long-term experience.

H3: PsyCap → WE ($\beta = 0.197$; $t = 3.205$)

The magnitude of the effect was lower than that of both job resources, consistent with the JD-R perspective that personal resources function as amplifiers of motivational processes (Bakker & Demerouti, 2017; Demerouti & Bakker, 2023), and with the findings of Mazzetti et al. (2023). The self-efficacy dimension was dominant (SLF = 0.880); item PSE3 (SLF = 0.731) represents confidence in lateral technical communication between operators.

H4: POS → OCB ($\beta = 0.309$; $t = 4.676$)

POS was the only antecedent with a strong direct path to OCB, which can be explained by felt obligation within SET. Among production workers, reciprocation is action-oriented and therefore may not require motivational transformation, differing from findings in the hospitality context that report full mediation (Park & Kim, 2024). This finding is consistent with Kao et al. (2023).

H5: OJ → OCB ($\beta = 0.135$; $t = 1.937$)

The direct path was significant under a one-tailed test but relatively weak. The indirect path through WE was substantially stronger (indirect $\beta = 0.152$; $t = 4.408$). In a low-autonomy context with tangible physical demands associated with OCB, justice may operate more effectively through prior motivational transformation. This finding is consistent with Sridadi et al. (2023) in

structured contexts. The marginal t-value, which falls between 1.65 and 1.96, indicates that the strength of the path may be sensitive to sample variation.

H6: PsyCap → OCB ($\beta = 0.131$; $t = 1.729$)

This was the weakest direct path. From a COR perspective, personal resources may largely require conversion through engagement before translating into discretionary behavior. This pattern is similar to that reported by Jin et al. (2022), although the direct effect was smaller, potentially because the present model involves greater contextual demands.

H7: WE → OCB ($\beta = 0.402$; $t = 4.693$)

WE was the strongest predictor of OCB, confirming its role as a central motivational mechanism (Bakker et al., 2023; Corbeanu & Iliescu, 2023). Item WV3 (SLF = 0.894) was the strongest indicator of WE and may serve as a sensitive leading indicator of attention quality during the first hour of a shift.

H8–H10: WE Mediation

All three resources demonstrated partial mediation, with distinct patterns across the direct and indirect paths. POS had the strongest direct path ($\beta = 0.309$), OJ had the largest indirect effect ($\beta = 0.152$), and PsyCap had the smallest effects for both the direct and indirect paths.

The model explained 78.73% of the variance in WE and 80.16% of the variance in OCB. OJ was the strongest driver of WE, POS was the resource with the most prominent dual direct and indirect pathways, and PsyCap functioned as a complementary personal-resource amplifier. This configuration is relevant to operational outcomes such as reject rates, anomaly detection, shift coordination, and passive behaviors.

The model did not test the direct causal relationship between OCB and reject or defect rates. OCB is positioned as a supportive behavior relevant to process stability (Jin et al., 2022; Organ, 1988; Pratiwi et al., 2024), rather than as a substitute for technical system improvements. In an industry with limited control over global resin prices, the configuration of resources that fosters extra-role behavior represents one relevant pathway for maintaining profit margins.

CONCLUSION

This study demonstrates that Perceived Organizational Support (POS), Organizational Justice (OJ), and Psychological Capital (PsyCap) positively influence Work Engagement (WE) among permanent production employees in thermoforming manufacturing companies in Indonesia. OJ emerged as the strongest predictor of WE, while WE had the strongest positive effect on Organizational Citizenship Behavior (OCB). POS, OJ, and PsyCap also had direct positive effects on OCB. These findings indicate that organizational and personal resources contribute to employee engagement and voluntary extra-role behavior in the manufacturing context.

Work Engagement partially mediates the relationships between POS, OJ, PsyCap, and OCB. Theoretically, the findings support the complementary application of Job Demands–Resources Theory, Social Exchange Theory, and Conservation of Resources Theory to explain how organizational and personal resources shape employee behavior. From a managerial perspective, manufacturing companies should strengthen organizational support, ensure fairness and transparency in decision-making, develop employees' psychological resources, and create working conditions that sustain engagement without turning voluntary extra-role behavior into an obligatory burden. This study is limited by its cross-sectional design, reliance on self-report data, and focus on permanent employees from two thermoforming manufacturing companies. Future research should consider longitudinal and multisource designs, broader industrial contexts, nonpermanent employees, and more detailed dimensions of organizational justice.

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AUTHOR CONTRIBUTION STATEMENT

Gregorius Augusto Revo Gumbara and Aryana Satrya contributed to the conceptualization, methodology, data collection, data analysis, interpretation of results, and preparation of the manuscript. Both authors have read and agreed to the published version of the manuscript.

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