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Predictors of employment tenure based on the anchoring and adjustment heuristics

Predictores de permanencia en el empleo basados en el heurístico de anclaje y ajuste

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Abstract

The objective of this work is to identify variables that affect the propensity of industrial workers to leave employment prematurely, and based on the above, to design a predictive model to estimate the probabilities probability that a candidate will remain at least one year. It uses as a frame of reference the approach of Psychosocial Factors; the Theory of Self-Determination (Gagné and Deci, 2005); the Theory of Discrepancy (Locke, 1970); and the Behavioral Economy (Kahneman and Tversky, 1979, 1984, 1996 and 2000). We conducted quantitative research, correlative scope and nonexperimental cross-sectional design. The questionnaire was used as an information-gathering tool and descriptive statistics, logistic regression and the unsupervised learning algorithm of K-Means were used as analysis and modeling tools. It was found that the probability of rotating is a function of sociodemographic and psychosocial factors, and that it is possible to characterize a stability-rotation profile in employment. The variables associated with the anchoring and adjustment heuristic influence the probability of a minimum stay of one year in a candidate to fill a vacancy. However, among the socio-demographic factors, the most relevant predictors are age and the number of previous jobs, while, in terms of psychosocial profile, the main predictors are salary and benefits and relationship with superiors. The perception of uncertainty regarding the labour market does not have a significant influence on the probability of permanence.

JEL Code: C19, D91, J24
Keywords: staff turnover; intention to rotate; anchoring and adjustment heuristic; psychosocial factors

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Resumen

El objetivo de este trabajo es identificar variables que inciden sobre la propensión de los trabajadores industriales a dejar el empleo de manera prematura, y con base en lo anterior, diseñar un modelo predictivo para estimar las probabilidades de que un candidato permanezca la menos un año en el empleo. Se utiliza como marco de referencia el enfoque de los Factores Psicosociales; la Teoría de la Autodeterminación (Gagné y Deci, 2005); la Teoría de la Discrepancia (Locke, 1970); y la Economía Conductual (Kahneman y Tversky, 1979, 1984, 1996 y 2000). Se realizó una investigación de tipo cuantitativo, alcance correlacional y diseño transversal no experimental. Como instrumento de recolección de información se utilizó el cuestionario y como herramientas de análisis y modelado se usó estadística descriptiva, regresión logística y el algoritmo de aprendizaje no supervisado de K-Means. Se encontró que la probabilidad de rotar es una función de factores sociodemográficos y psicosociales, y que es posible caracterizar un perfil de estabilidad-rotación en el empleo. Las variables asociadas al heurístico de anclaje y ajuste ejercen influencia sobre la probabilidad de permanencia mínima de un año en un candidato a ocupar una vacante. Sin embargo, entre los factores sociodemográficos los predictores más relevantes son la edad y el número de empleos anteriores, mientras que, en lo referente al perfil psicosocial, los principales predictores son salario y prestaciones y relación con los superiores. La percepción de incertidumbre respecto al mercado de trabajo no ejerce una influencia relevante sobre la probabilidad de permanencia.

Código JEL: C19, D91, J24
Palabras clave: rotación de personal; intención rotadora; heurístico de anclaje y ajuste; factores psicosociales

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Introduction

Staff turnover is "the voluntary departure of a worker from the company where they work" (Carrillo & Santibáñez, 2001). This phenomenon can represent an obstacle to innovation, quality, and training efforts since projects in this field can become unproductive when workers make premature decisions to change employment.

According to Estrada (2022), in addition to the direct cost of recruitment—which includes recruiters' salaries, time spent on the search, and advertising costs—it is necessary to consider indirect costs related to reduced productivity. In this context, the cost of losing an employee, filling the vacancy, training the new employee, and recovering productivity would be approximately USD 2 843 for the case of Ecuador. Other estimates, such that by Catalyst (cited by SH-Sistemas Humanos, 2017), indicate that replacing a worker can represent between 50% and 60% of their annual salary.

According to the Survey on Absenteeism and Staff Turnover in the Manufacturing Industry in San Luis Potosí, Mexico (Secretaría de Desarrollo Económico, 2020), in 2019, the staff turnover rate in this production sector averaged 4.0% monthly, or 48% annually. The average monthly staff turnover rate in San Luis Potosí and Villa de Reyes municipalities was 3.8% and 5.6%, respectively. Nonetheless, turnover rates differ according to the position held by employees. In the case of operating personnel, in 2019 the staff turnover rate averaged 4.8%, while for administrative personnel, it was 1.2% per month.

During 2020 and 2021, the staff turnover rate was reduced to 1.5% (Asociación de Ejecutivos de la Gestión del Talento Humano de San Luis Potosí, A.C. [ADERIAC], 2021) because of the contraction in the supply of employment resulting from the COVID-19 pandemic. In the post-pandemic scenario, no updated information regarding staff turnover in San Luis Potosí is available. Nonetheless, 41% of large companies at the national level report an unusual pattern of employee resignations associated with physical and emotional exhaustion or the search for better salaries and benefits (OCC Mundial, 2022). Therefore, it is estimated that staff turnover rates are at levels close to the pre-pandemic stage.

Based on the above, this research explores the causes of staff turnover in the industry from a psychosocial risk perspective. Based on statistical analysis, a model was formulated to estimate the probability of remaining in employment, taking into account the worker's uncertainty level concerning the perceived ease or difficulty of finding a new job.

Theoretical framework

In this research, the Psychosocial Factors approach (ILO, 1986:12), Discrepancy Theory (Locke, 1970), Self-Determination Theory (Gagne & Deci, 2005), and Behavioral Economics (Kahneman & Tversky, 1979, 1984, 1996, and 2000) are taken as a framework to explain staff turnover.

According to the International Labor Organization, Psychosocial Factors (PF) are "interactions between work, environment, organizational conditions, worker capabilities, needs, culture, and personal situation outside work, all of which can influence health, performance, and job satisfaction" (ILO, 1986: 12). PFs can become risk factors, generators of stress and job dissatisfaction, and eventually triggers of staff turnover due to deficiencies in organizational design or management.

One way to explain the above is through the demand-control and demand-control-support models (Karasek, 1979, 1985, 1989, and 1998), which postulate that stressful reactions originate when high demands and low job control are combined, whereas the effects of stress are cushioned or moderated when there is support from peers and superiors. In this regard, authors such as Knardahl et al. (2017) identify among the psychosocial factors related to early exit from the labor market: low job control or job strain, the demands of work, effort-reward imbalance, low social support, and repetitive work.

Ismail et al. (2015) indicated that the concepts of stress and job satisfaction are significantly correlated, while Byrd et al. (2000) and Simmons et al. (1997) identified several daily stressors that negatively affect job satisfaction, such as low wages, inadequate training, and lack of equipment.

Based on the above, it can be inferred that job satisfaction plays a central role in understanding the causes of staff turnover and connecting this concept with psychosocial factors. Davis and Newstrom (2000) defined job satisfaction as "the set of favorable or unfavorable feelings and emotions with which

employees regard their employment" and related staff turnover to low satisfaction levels. For Skiner and Roche (2021: 1) job satisfaction is the main predictor of staff turnover intentions and "is positively associated with feeling respected and supported and working in an environment open to change." Other authors, such as Cymbal et al. (2021), suggest that staff turnover and satisfaction are multifaceted processes, as the latter could be a predictor of the former, but only when combined, for example, with low salary levels and with technical-level positions. Complementing the previous idea, Ruotsalainen et al. (2023) found that when employees work in self-organized teams, their satisfaction levels improve, and their staff turnover intentions are reduced, which again refers to the demand-control-support model.

According to Subramanian and Shin (2013), other factors that can be directly related to staff turnover intentions are rewards, responsibility, standards, compliance, and leadership. In activities associated with high levels of stress and responsibility, such as working in institutions dedicated to the care of older adults, Gandhi, Yu, and Grabowsky (2021) identified other factors related to staff turnover, including the location of the facilities and whether it is a for-profit or non-profit institution, i.e., the symbolic value they attach to their work activity.

The elements mentioned above can also be interpreted in a structured way through the Self-Determination Theory (Gagné & Deci, 2005), which postulates that work motivation can be controlled or autonomous. The latter comprises what is known as intrinsic motivation, that is, the involvement of people in activities simply because they find them interesting or even fun, and extrinsic motivation, which implies that people perform tasks to obtain certain types of results or because of the need to do them. In this context, Akosile and Ekemen (2022) found an important relation between staff turnover intention and job satisfaction, with both intrinsic and extrinsic motivation as mediators.

On the other hand, the Discrepancy Theory (Locke, 1970) complements the frame of reference regarding intrinsic motivation. Alfaro et al. (2012), based on Locke (1970), maintain that each person has a structure of values ordered from greater to lesser importance, and each experience of job satisfaction or dissatisfaction is the result of a dual judgment where the degree of value-perception discrepancy and the relative importance of the value for the individual is evaluated. In perspective, staff turnover would be related to the degree of discrepancy the worker perceives between what they expect from their employment and what they actually receive. Recent studies have found that subjective socioeconomic status is significantly related to both labor burnout and staff turnover intention (Shan et al., 2022).

If psychosocial variables, intrinsic and extrinsic motivation, and the value-perception discrepancy are considered as factors influencing the decision to stay or not in employment, the result is a complex decision-making framework, where not only rational criteria based on calculation and estimation of probabilities of success can intervene, but also heuristic models involving, for example,

perceptions, memory, and intuitions. This is the scenario of the bounded rationality model (Kahneman, 2003) where the search for satisfaction is opposed to optimization.

As part of this approach, Kahneman and Tversky (1979) propose the Prospective Theory, which divides decision making into two stages: editing (analysis of alternatives, organization, and reformulation of options); and evaluation (assessment of utility based on potential outcomes) (Esguerra, 2015). An interesting finding is that loss aversion exerts a greater influence on the decision than gain expectancy. Kahneman and Tversky (1979, 1984, 1984, 1996, and 2000) conclude that, in a situation of uncertainty, if what stands out are gains, the tendency is to avoid taking the risk of the decision, while if what stands out are losses, the tendency to assume the risk is greater.

According to Garcia-Badell and Blanco (2016: 113), citing Tversky and Kahneman (1974), there are rules called "heuristics," which are used to solve complex problems and decide under uncertainty. These rules are the representativeness heuristic, where the consumer calculates "the probability that A belongs to B, based on how much A resembles B"; the accessibility heuristic, which consists in "calculating the probability of an event occurring based on the ease of imagining it"; and the anchoring and adjustment heuristic, according to which any "valuation requires a starting point or anchor that is adjusted during decision making."

The above suggests that, when deciding to change employment, a frame of reference is constructed based on the experience of current and previous employment. A priori, the decision would be based on the anchor provided by past experiences, and as time goes by, an adjustment is made that consists of adapting expectations to results.

Hardie et al. (1993) and García-Badell and Blanco (2016) explain this mechanism using an example from the real estate market: if "the first anchor house that a person visits stands out a lot in a certain factor, this factor will be much more decisive in the rest of the process. For example, if the first home visited has a good deal of light, the other homes will seem dark, and differences in other factors such as qualities may go unnoticed."

If the findings of behavioral economics are transferred to the labor market, a hypothesis can be formulated suggesting that a person will make decisions to remain in employment based on the anchor provided by their previous employment experiences, their sociodemographic profile and the needs associated with it, the fit between their psychosocial profile and the characteristics of the company, and the degree of uncertainty they perceive in the labor market (Figure 1).

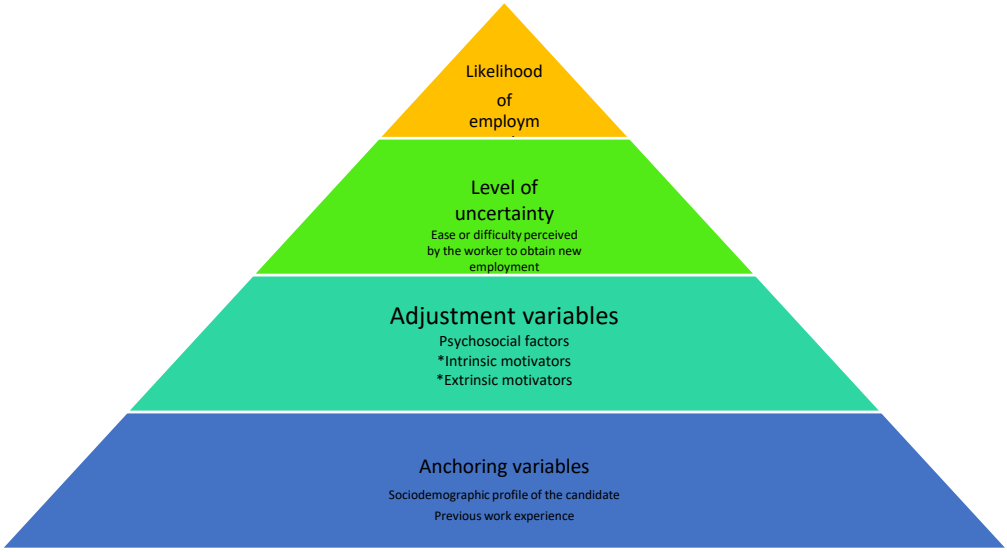

Figure 1. Employment stability model as a function of anchoring factors, adjustment factors, and level of uncertainty
Source: created by the authors

Contextual framework

The study was conducted among workers in the industrial parks in Soledad de Graciano Sánchez, Villa de Reyes, and San Luis Potosí, Mexico. This industrial zone comprises 281 large companies—with 250 or more workers (INEGI[1], 2023)—of which 2 are automotive assemblers, and 235 are related to the auto parts sector (Méndez, 2020). According to INEGI (2022), the number of employees in the manufacturing industry in San Luis Potosí amounts to 288 883 people.

Materials and methods

The research questions the present study is based on are as follows:

Is the influence of the variables associated with the anchoring (sociodemographic profile and previous work experiences) and adjustment (psychosocial factors) heuristic relevant to the probability of a vacancy candidate staying for at least one year?

[1] National Institute of Statistics and Geography (Spanish: Instituto Nacional de Estadística y Geografía)

Is it possible to characterize a psychosocial profile of stable workers compared to those prone to staff turnover in less than one year?

This study aims to identify the factors that influence the propensity of industrial workers to remain at least one year in employment and, based on these, to design a predictive model to estimate the probability that a candidate will leave in less than one year.

The hypotheses are as follows:

H1: The variables related to the anchoring (sociodemographic profile and previous work experiences) and adjustment (psychosocial profile) heuristic influence the probability of a vacancy candidate staying for at least one year.

H2: It is possible to characterize a psychosocial profile of stable workers compared to those prone to staff turnover in less than one year.

This research is quantitative, correlational in scope, and cross-sectional in design. A survey was used as a data collection technique.

A questionnaire consisting of 3 parts was designed. The first part considers questions to define the sociodemographic profile of the interviewee (age, gender, marital status, place of residence, number of children, education, economic dependents, hierarchical level of their last position). The second part evaluates factors of work adjustment based on the Discrepancy Theory (Chiang *et al.*, 2010; Locke, 1970) and the Psychosocial Risk Factors defined in NOM-035-STPS-2018 (see Table 1). Finally, the third part includes questions on employment stability (length of service in current employment, duration in the last two jobs, and intention to change jobs). The first two parts represent the predictive variables, and a binary-type objective variable was constructed with the third.

Table 1
Correspondence between psychosocial factors, motivator types, and anchoring and adjustment heuristics

Psychosocial factors	Motivator type	Heuristics	Variable
Sociodemographic Profile	Extrinsic	Anchoring	Age Gender Place of residence (urban/rural) Marital status Education Number of children Number of other economic dependents Number of previous jobs Hierarchical level in last employment
Work environment conditions	Extrinsic	Adjustment	Comfort and safety at work
Workloads Lack of control over work	Intrinsic		Enjoyment of work
Working hours and staff turnover	Intrinsic		Stress level
Interference in the work-family correlation	Extrinsic		Availability of time for family

Leadership and negative relationships at work	Intrinsic		Relationship/support from hierarchical superiors
Workplace violence	Extrinsic		Relationship/support from hierarchical superiors Relationship/support from co-workers
Sense of belonging of the workers to the company	Intrinsic		Relationship/support from co-workers
Proactive participation and communication between the employer, its representatives, and workers	Intrinsic		Relationship/support from hierarchical superiors
Adequate distribution of workloads, with regular workdays	Intrinsic	Adjustment	Stress level
Performance evaluation and recognition	Extrinsic		Recognition of worker's achievements and efforts
	Extrinsic		Career growth opportunities
Remuneration	Extrinsic	Adjustment	Wages and benefits
Personal growth	Intrinsic		Continuing academic preparation

Source: created by the authors based on Secretaría del Trabajo y Previsión Social (2018), NOM-035-STPS-2018: Factores de riesgo psicosocial en el trabajo-Identificación, análisis y prevención.

The questionnaire was administered to a sample of 291 workers in the industrial zone of San Luis Potosí, which provides a confidence level of 95% and a margin of error of 6%.

Table 2
Characteristics of the sample

	Categories	Frequency per category	Relative frequency per category (%)
Genre	Females	162	55.670
	Males	129	44.330
Marital status	Single	148	50.859
	Married or living together	139	47.766
	Other marital status	3	1.031
Type of place of residence	Urban	278	95.533
	Rural	13	4.467
Number of children	0	136	46.735
	1	39	13.402
	2	65	22.337
	3	32	10.997
	4	13	4.467
	5	4	1.375
	7	2	0.687

Source: created by the authors using XLSTAT 2022

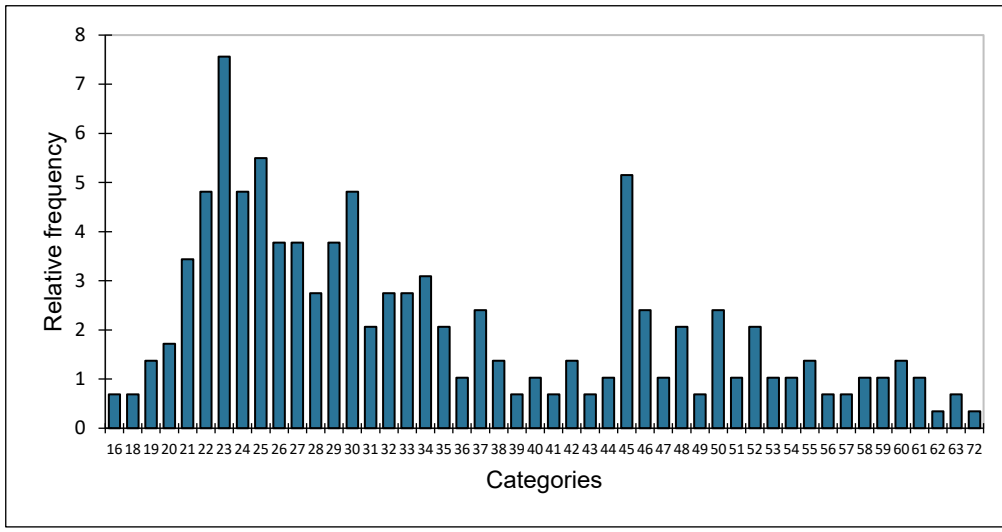

Figure 2. Age of respondents
Source: created by the authors using XLSTAT 2022

Convergent and discriminant validity

Data were analyzed following two approaches to evaluate the evidence of convergent and discriminant validity. On the one hand, correlations between the variables were analyzed using Pearson's r coefficient. Positive correlations were considered evidence of convergent validity, while negative correlations and the absence of correlation were considered evidence of discriminant validity. On the other hand, a Principal Component Analysis was performed. The Kaiser-Meyer-Olkin measure indicated that the analysis was adequate (KMO =.734) ($\chi 2$ =878 $p<0.0001$). For the extraction of the components, attention was paid to components with self-values higher than 1.00. According to the first criterion, 4 components were to be extracted, accounting for 57.6% of the variance.

Analysis techniques:

A questionnaire was used as a data collection instrument and descriptive statistics, logistic regression (Logit), and the K-Means unsupervised learning algorithm were used as analysis and modeling tools.

Results

Logistic regression

Logistic regression dates to the 1960s (Cornfield, Gordon, & Smith 1961). It consists of obtaining the probability that an event or individual corresponds to a category or subpopulation. "The logistic function is that which finds, for each individual according to the values of a series of variables (Xi), the probability (p) of presenting the studied effect" through a logarithmic transformation (Fiuza & Rodriguez, 2000:4).

From the variables that denote employment stability (number of previous jobs, length of service in the current job, duration in the last two jobs, and staff turnover intention), a dichotomous variable was constructed that indicates the occurrence or not of an event; in this case: non-duration (0) - duration (1) in periods of less than one year. Using this dichotomous variable as the dependent variable, and the sociodemographic and work adjustment variables as predictor variables, a logistic regression model was formulated to estimate the probabilities of a candidate remaining at least one year in employment.

The logistic model has the concrete form of a logistic curve. Starting from the dichotomous dependent variable (indicating the occurrence or non-occurrence of an event; in this case, staff turnover-no turnover), the model's estimation procedure, performed through the likelihood value, predicts an estimate of whether the event will occur. The logistic coefficient is calculated by comparing the probability of the occurrence of the event with the probability of non-occurrence so that the estimated coefficients are measures of the changes in the odds ratio.

Table 3
Goodness-of-fit statistics

Statistic	Complete
Observations	288
Total weights	288.000
GL	265
-2 Log (Likelihood)	250.034
R^2(Nagelkerke)	0.539
AIC	296.034
SBC	380.282
Iterations	6

Source: created by the authors using XLSTAT 2016

The coefficient of determination R^2 is considered to evaluate the model's goodness-of-fit, which summarizes the ratio of variance in the target variable attributable to the predictor (independent) variables. A supervised learning sample was used to calculate the area under the Receiver Operating Characteristic

(ROC) curve and the confusion matrix to determine whether the model is an adequate classifier. Both are constructed from the sensitivity (true positives/total positive values) and specificity (true negatives/total negative values) statistics.

In this case, a coefficient of determination of 0.53 is observed, while the area under the ROC curve is 88%, and the percentage of correctness in the confusion matrix is 80.21%.

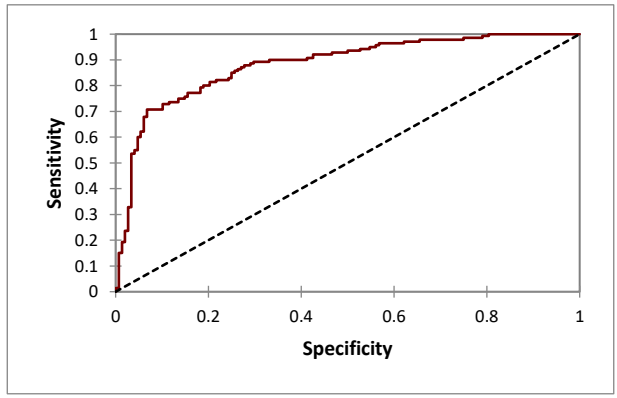

Figure 3. ROC Curve (AUC=0.882)
Source: created by the authors using XLSTAT 2016

Table 4
Confusion matrix for the estimation sample

from \ to	0	1	Total	Correct %
0	125	23	148	84.46%
1	34	106	140	75.71%
Total	159	129	288	80.21%

Table 5
Model Parameters

Source	Standardized coefficient	Standard error	Wald's Chi-square	Pr > Chi²	Odds ratio	Marginal effect
Age	0.125	0.022	32.766	< 0.0001	1.133	0.031
Number of Children	0.085	0.180	0.222	0.638	1.089	0.021
Number of other economic dependents (e.g., parents or siblings)	0.186	0.166	1.261	0.261	1.205	0.046
Spending more time with family	-0.023	0.067	0.119	0.731	0.977	-0.006
Working in a comfortable and safe place	-0.064	0.087	0.548	0.459	0.938	-0.016
Having opportunities for career growth	-0.122	0.087	1.935	0.164	0.885	-0.030

Having a better wage and benefits	0.190	0.091	4.317	0.038	1.209	0.047
Enjoying the work	0.005	0.073	0.004	0.947	1.005	0.001
Continuing academic preparation	-0.076	0.076	0.990	0.320	0.927	-0.019
Getting along with bosses at work	0.057	0.092	0.380	0.538	1.058	0.014
Living with less stress	0.011	0.084	0.016	0.900	1.011	0.003
Getting along with co-workers	0.036	0.090	0.162	0.687	1.037	0.009
Being recognized for achievements and effort	-0.058	0.075	0.587	0.444	0.944	-0.014
Gender (1: Female, 2: Male)-1	0.000	0.000				0.000
2	0.198	0.346	0.328	0.567	1.219	0.049
Marital Status (1: Single, 2: Married or living together)-1	0.000	0.000				0.000
2	0.477	0.376	1.614	0.204	1.611	0.119
Place of residence (1 urban, 2 rural)-1	0.000	0.000				0.000
2	-1.735	1.057	2.695	0.101	0.176	-0.364
Education (1: Primary, 2: Secondary, 3: Baccalaureate, 4: Undergraduate, 5: Graduate)-1	0.000	0.000				0.000
2	1.203	1.188	1.025	0.311	3.330	0.277
3	0.854	1.116	0.585	0.444	2.348	0.208
4	0.817	1.110	0.542	0.462	2.264	0.201
5	1.921	1.343	2.047	0.153	6.829	0.381
Hierarchical level of previous job: (3: Managerial; 2: Middle Management; 1: Operational)-1	0.000	0.000				0.000
2	-0.025	0.375	0.005	0.946	0.975	-0.006
3	-0.083	0.531	0.025	0.875	0.920	-0.021

Source: created by the authors using XLSTAT 2016

The table of model parameters shows the contribution of each independent variable. Age and the intention to obtain a better wage and benefits stand out among the continuous predictors. Among the categorical predictors, the main predictors are education and marital status. The Wald Chi-square test shows that most variables contribute to the model since their value differs from zero.

It is also possible to appreciate that the highest standardized coefficients are consistent with the highest odds ratios for both categorical and continuous predictor variables.

For example, a person whose marital status is married or living together has an odds ratio of 1.61, meaning they have a 61% greater probability of remaining in employment than single people. For this variable, the standardized coefficient is 0.131.

When the odds ratio is less than 1—for example, when the hierarchical level of the last job was middle management—the probability of staying at least one year is 2.5% lower than when it was operative.

The predictor age has the highest standardized coefficient (0.828) and an odds ratio of 1.133, meaning that each additional unit would represent a 13% higher probability of remaining.

Subsequently, the marginal effects of the means were calculated and compared with the odds ratios of each variable. It is worth mentioning that the marginal effects express "the average effect of the independent variable on the probability of the contrast category of the dependent variable happening" (Ballesteros, 2018: 6), while the odds ratios are the relative chances of an event happening as the predictor variable increases by one unit (if continuous) or as it changes category (if categorical).

Concerning the marginal effects, the highest values are consistent with high odds ratios but only for categorical variables, e.g., education. For continuous variables, all marginal effects are low but consistent with standardized coefficients since they have the same sign but smooth the effect of each independent variable on the dependent variable.

K-Means algorithm

The K-Means algorithm was also applied to characterize the staff turnover and no-turnover groups based on the work adjustment variables.

The K-Means algorithm is an unsupervised classification in which a set of patterns (data), usually multidimensional, is classified into groups (clusters) such that the group members are similar according to a predefined criterion. The clustering of a set forms a partition of its elements chosen to minimize some dissimilarity between members of the same group. The K-means find a local optimum by minimizing the distance measure between each datum and its nearest cluster centroid (Pakhira, 2009).

Table 6
Group centroids

Variable	Cluster1	Cluster2	Main centroid
Tenure Yes/No	0	1	7.4242
Spending more time with family	6.5283	6.8911	6.7662
Working in a comfortable and safe place	4.4906	5.6634	5.2597
Having opportunities for growth	6.7736	7.8218	7.461
Having a better wage and benefits	4.3019	7.8812	6.6494
Enjoying the work	6.2264	5.4752	5.7338
Continuing academic preparation	7.4528	5.2871	6.0325
Getting along with bosses	4.9057	3.0693	3.7013

Living with less stress	3.0755	4.5248	4.026
Getting along with co-workers	7.7358	3.1089	4.7013
Being recognized for achievements and effort	1.9811	4.495	3.6299
Perception of uncertainty	2.8491	2.8515	2.8506

Source: created by the authors using MINITAB 2023

Table 7
Contribution of variables in the K-Means model (Analysis of Variance)

Variable	Mean squares (Model)	Mean squares (Error)	F	Pr > F
Spending more time with family	18.384	8.548	2.151	0.120
Working in a comfortable and safe place	49.774	5.126	9.710	0.000
Having opportunities for career growth	69.292	4.303	16.105	<0.0001
Having a better wage and benefits	186.078	4.721	39.413	<0.0001
Enjoying the work	215.944	5.193	41.581	<0.0001
Continuing academic preparation	220.932	4.884	45.236	<0.0001
Getting along with bosses at work	44.600	3.888	11.472	<0.0001
Living with less stress	89.103	4.965	17.947	<0.0001
Getting along with co-workers	291.170	4.993	58.317	<0.0001
Being recognized for achievements and effort	131.397	4.868	26.990	<0.0001
Perception of uncertainty	0.460	0.895	0.514	0.599

Source: created by the authors using MINITAB 2023

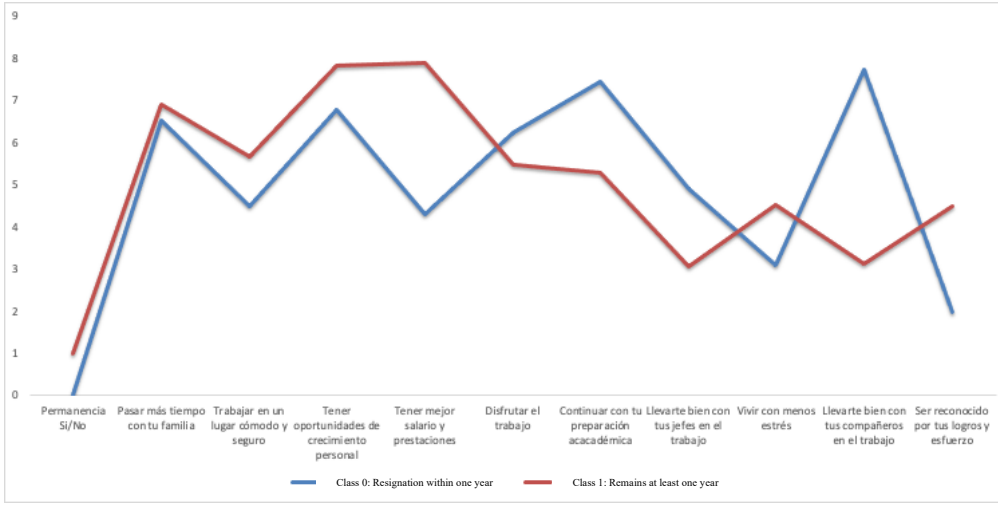

Figure 4. K-Means clusters; Class profile
Source: created by the authors using MINITAB 2023

The group with a tendency to remain in employment (1) shows higher mean values (centroids) in the variables spending more time with family, working in a comfortable and safe place, having opportunities for career growth, having better wages and benefits, living with less stress, and being recognized for achievements and effort. Meanwhile, the group with a tendency to staff turnover (0) shows higher values in the variables enjoying work, continuing academic preparation, getting along with bosses, and getting along with co-workers.

Conclusions

This paper has outlined a framework for explaining employment tenure and, consequently, the premature departure of a worker after employment in the manufacturing industry. Related research identifies the following as predictors of staff turnover: low job control or job strain, job demands, effort-reward imbalance, low social support, and repetitive work (Knardahl *et al.*, 2017); job satisfaction (Davis and Newstrom, 2000; and Skinner and Roche, 2021); rewards, responsibility, standards, compliance, and leadership (Subramanian and Shin, 2013).

On the other hand, Akosile and Ekemen (2022) found that intrinsic and extrinsic motivations are mediators of staff turnover intentions, while Karasek (1979, 1985, 1985, 1989, and 1998) pointed out that the effects of stress are buffered or moderated when there is support from peers and superiors.

Each predictor has been defined from different theoretical models such as the Psychosocial Factors approach (IT, 1984), the demand-control and demand-control-support models (Karasek, 1979, 1985, 1989, and 1998), the Discrepancy Theory (Locke, 1970), and the Self-Determination Theory (Gagné & Deci, 2005).

Taken together, these models explain staff turnover intentions because of how the relation between employee characteristics (needs, motivators), the vacancy profile (demands of the employment), and the psychosocial support of the company is posed.

This research helps to explain, at least partially, why the identified factors can be considered as predictors of staff turnover intentions, and for this purpose, it relies on findings from behavioral economics, specifically the anchoring and adjustment heuristic. Thus, it complements previous research findings by proposing that employees' premature departure can be characterized as a function of anchoring (sociodemographic profile and previous employment experiences) and adjustment (psychosocial profile) factors.

Based on the research questions, the following conclusions can be drawn:

The variables associated with the anchoring and adjustment heuristic influence a candidate's probability of remaining in a post for at least one year. Nevertheless, among the sociodemographic factors,

the most relevant predictors are age, education level, and marital status, while, regarding the psychosocial profile, the main predictors are wage and benefits and having opportunities for career growth.

The parameters obtained allow the formulation of a predictive model to estimate the probability of a candidate occupying a vacancy for at least one year. Using a supervised learning sample, the area under the ROC curve is 88%, and the percentage of success in the Confusion Matrix is 80.21%, so the model is considered an acceptable classifier.

The analysis of the marginal effects and odds ratios yields results consistent with the standardized coefficients of the categorical variables (education). For continuous variables, the sign of the marginal effects is also consistent with the standardized coefficients, although their contribution to the dependent variable is smoothed.

On the other hand, it is possible to characterize a psychosocial profile of stable workers in contrast to those with a propensity to staff turnover in less than one year. Using the K-Means unsupervised learning algorithm, it was found that people with a greater intention of staff turnover prioritize the factors of enjoying work, continuing with academic preparation, getting along with bosses, and getting along with co-workers. In contrast, people with a greater expectation of tenure attach greater importance to the factors of spending more time with family, working in a comfortable and safe place, having opportunities for career growth, and having a better wage and benefits.

It is interesting to note that according to the K-Means algorithm, the factors that characterize the no-turnover group are predominantly related to extrinsic motivation, while the traits of the staff turnover group correspond to intrinsic motivators. As stated above, according to Self-Determination Theory, both types of motivation are considered mediators between job satisfaction and staff turnover intention.

A strategy for retaining personnel in the manufacturing industry could consider the following elements:

- To use predictive models to assess the probability of tenure in candidates to fill vacancies, evaluating factors associated with the anchoring and adjustment heuristic such as the motivational factors the person prioritizes and the characteristics of previous employment.
- To evaluate the organization's psychosocial factors profile, identifying areas of opportunity based on the adjustment factors identified in the candidates that tend to stability.
- To evaluate the psychosocial profile of the candidates and, in each case, to make a comparison with the characteristics of the vacancy, identifying discrepancies that may lead to the premature departure of the employee.

References

Akosile, A. L., & Ekemen, M. A. (2022). The impact of core self-evaluations on job satisfaction and turnover intention among higher education academic staff: Mediating roles of intrinsic and extrinsic motivation. Behavioral Sciences, 12(7), 236. https://doi.org/10.3390/bs12070236

Alfaro, R., Leyton, S., Meza, A., & Sáenz, I. (2012). Satisfacción laboral y su relación con algunas variables ocupacionales en tres municipalidades. Disponible en https://bit.ly/3WWGULY y consultado el 30 de noviembre de 2022.

Asociación de Ejecutivos de la Gestión del Talento Humano de San Luis Potosí, A.C. [ADERIAC] (2021, Abril 4). Registra ZI reducción en la rotación de personal. En El Heraldo de San Luis Potosí. Disponible en https://bit.ly/3jIXaSr y consultado el 30 de diciembre de 2022.

Ballesteros, M. (2018). Promedio de los efectos marginales e interacciones en las regresiones logísticas binarias. Documento de Trabajo (Working Paper), Incasi. Disponible en https://n2t.net/ark:/13683/pkrn/gyx y consultado el 30 de diciembre de 2022.

Byrd, T. G., Cochran, J. K., Silverman, I. J. and Blount, W. R. (2000). Behind bars: An assessment of the effects of job satisfaction, job related stress and anxiety on jail employees' inclination to quit. Journal of Crime and Justice, 23(234), 69-93. https://doi.org/10.1080/0735648X.2000. 9721123

Carrillo, C. V., & Santibáñez, J. (2001). Rotación de personal en las maquiladoras. Plaza y Valdes.

Chiang, M., Vega, M. C., Martín, M. J., Rodrigo, M. J. M., & Partido, A. N. (2010). Relaciones entre el clima organizacional y la satisfacción laboral (Vol. 2). Universidad Pontificia Comillas.

Cornfield J, Gordon T, Smith WN (1961). Quantal response curves for experimentally uncontroled variables. Bull Int Stat Inst.,38: 97-115.

Cymbal, D., Litvak, S., Wilder, D., & Burns, G. (2022). An Examination of Variables that Predict Turnover, Staff and Caregiver Satisfaction, in Behavior-analytic Organizations, Journal of Organizational Behavior Management, 42:1, 36-55, https://doi.org/10.1080/01608061.2021.1910099

Davis, K., & Newstrom, J. W. (2000). Comportamiento humano en el trabajo, 10ª edición, editorial Mc Graw-Hill. México, DF.

Esguerra, G. A. (2015). Economía conductual, principios generales e implicaciones. Cuadernos hispanoamericanos de psicología, 15(1), 67-72. Disponible en https://bit.ly/3i3HlFD y consultado el 1 de diciembre de 2022

Estrada, R. (2022).El costo de la rotación de personal. Deloitte & Touche Ecuador Cía. Ltda. Disponible en https://bit.ly/3i6q1Qj y consultado el 30 de diciembre de 2022.

Fiuza, M., & Rodríguez, J. C. (2000). La regresión logística: una herramienta versátil. Nefrología, 20(6), 495-500. Disponible en https://www.revistanefrologia.com/es-la-regresion-logistica-unaherramienta-articulo-X0211699500035664 y consultado el 3 de enero de 2023.

Gagné, M.; Deci, E. (2005). Self-determination theory and work motivation. J. Organ. Behav. 26, 331–362. DOI: https://doi.org/10.1002/job.322

Gandhi, A., Yu, H., & Grabowski, D. C. (2021). High Nursing Staff Turnover In Nursing Homes Offers Important Quality Information: Study examines high turnover of nursing staff at US nursing homes. Health Affairs, 40(3), 384-391. https://doi.org/10.1377/hlthaff.2020.00957

García-Badell, G., & Blanco, M. (2016). ¿ Podemos ser" racionales" al comprar una casa? Una visión desde la Economía Conductual. Cuadernos de Estudios Empresariales, 26, 105. Disponible en https://bit.ly/3G9rbTd y consultado el 15 de diciembre de 2022.

Hardie, B., Johnson, E., y Fader, P. (1993). "Modeling loss aversion and reference dependence effects on brand choice". Marketing Science, 12(4), p. 378-394. Disponible en https://pubsonline.informs.org/doi/abs/10.1287/mksc.12.4.378 y consultado el 21 de enero de 2022.

INEGI (2023). Directorio Estadístico Nacional de Unidades Económicas (DENUE). Información para la actualización e incorporación de unidades económicas al DENUE. Datos a febrero de 2023. Disponible en https://www.inegi.org.mx/app/mapa/denue/default.aspx y consultado el 1 de marzo de 2023.

INEGI. 2022. Encuesta Nacional de Ocupación y Empleo. Indicadores Estratégicos de Ocupación y Empleo. INEGI. Primer trimestre de 2022. Disponible en https://www.inegi.org.mx/programas/enoe/15ymas/ y consultado el 1 de marzo de 2023

Ismail, A., Ghani, A. B. A., Subhan, M., Joarder, M. H. R. and Ridzuan, A. A. (2015). The relationship between stress and job satisfaction: An evidence from Malaysian peacekeeping mission. Mediterranean Journal of Social Sciences, 6(4), 647- 655. https://doi.org/10.5901/mjss.2015.v6n4s3p647

Kahneman D., Tversky A. (1979). Prospect theory: An analysis of decision under risk Econometrica, 47, 263–291. Disponible en https://www.jstor.org/stable/1914185 y consultado el 15 de diciembre de 2022

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. American psychologist, 39(4), 341. https://doi.org/10.1037/0003-066X.39.4.341 Disponible en https://psycnet.apa.org/record/1985-05780-001 y consultado el 21 de diciembre de 2022.

Kahneman, D., & Tversky, A. (1996). On the reality of cognitive illusions. Psychological Review, 103(3), 582–591. https://doi.org/10.1037/0033-295X.103.3.582 Disponible en https://psycnet.apa.org/record/1996-01780-007 y consultado el 22 de dciembre de 2022

Kahneman, D. (2000). Evaluation by moments: Past and future. Choices, values, and frames, 693-708. Disponible en https://bit.ly/3Gwhf7q y consultado el 2 de diciembre de 2022

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. American Psychologist, 58(9), 697–720. https://doi.org/10.1037/0003-066X.58.9.697 Disponible en https://bit.ly/3WzdUtX y consultado el 10 de diciembre de 2022

Karasek, R.A. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. Administrative Science Quarterly, 24: 285–308 https://doi.org/10.2307/2392498

Karasek, R. (1985) Job content instrument questionnaire and user's guide, Version 1.1. Department of Industrial and Systems Engineering, University of Southern California, Los Angeles. https://doi.org/10.1037/t03609-000

Karasek, R.A. 1989. "Control in the workplace and its health-related aspects". In Job Control and Worker Health, Edited by: Sauter, S.L., Hurrell, J.J. and Cooper, C.L. 129–160. Chichester: Wiley.

Karasek, R. (1998). Demand/control model: A social, emotional, and physiological approach to stress risk and active behaviour development. Encyclopaedia of occupational health and safety.

Knardahl, S., Johannessen, H. Sterud, T., Härmä, M., Rugulies, R., Seitsamo, J., Borg, V. (2017). The contribution from psychological, social, and organizational work factors to risk of disability retirement: a systematic review with meta-analyses. BMC Public Health 17(1):176. https://doi.org/10.1186/s12889-017-4059-4

Locke, E. A. (1970). Job satisfaction and job performance: A theoretical analysis. Organizational behavior and human performance, 5(5), 484-500.

Méndez, A. (2020). Industria manufacturera, clave en el desarrollo de San Luis Potosí. Mexico Industry. Disponible en http://bit.ly/3y1FWDR y consultado el 1 de marzo de 2023.

OCC Mundial (2022). Aadptabilidad laboral post-pandemia en México. Disponible en https://bit.ly/3Wz4UVD y consultado el 15 de enero de 2023.

Organización Internacional del Trabajo [OIT] (1986). Factores psicosociales en el trabajo: naturaleza, incidencia y prevención. Ginebra: Oficina Internacional del Trabajo. Disponible en https://bit.ly/3vLmPgo y consultado el 6 de enero de 2022.

Pakhira, M. K. (2009). A modified k-means algorithm to avoid empty clusters. International Journal of Recent Trends in Engineering, 1(1), 220. Disponible en https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=099b1b974feace8c4ed94088fc11b8bd250ed25f y consultado el 13 de enero de 2023.

Ruotsalainen, S., Elovainio, M., Jantunen, S., & Sinervo, T. (2023). The mediating effect of psychosocial factors in the relationship between self-organizing teams and employee wellbeing: A crosssectional observational study. International Journal of Nursing Studies, 138, 104415. https://doi.org/10.1016/j.ijnurstu.2022.104415

Secretaría de Desarrollo Económico (2020). Encuesta sobre Ausentismo y Rotación de Personal en la Industria Manufacturera en San Luis Potosí. Disponible en https://bit.ly/3Q2avl9 y consultado el 16 de enero de 2023.

Secretaría del Trabajo y Previsión Social (2018). NOM-035-STPS-2018. Recuperado de https://bit.ly/3IeLdOE el 12 de diciembre de 2022.

SH-Sistemas Humanos (2017). Rotación de personal. ¿Cuánto le cuesta a tu empresa?. Disponible en https://bit.ly/3i5qe6m y consultado el 30 de diciembre de 2022

Shan, Y., Liu, G., Zhou, C., & Li, S. (2022). The Relationship Between CDC Personnel Subjective Socioeconomic Status and Turnover Intention: A Combined Model of Moderation and Mediation. Frontiers in Psychiatry, 13. https://doi.org/10.3389/fpsyt.2022.908844

Simmons, C., Cochran, J. K. and Blount, W. R. (1997). The effects of job-related stress and job satisfaction on probation officers' inclinations to quit. American Journal of Criminal Justice, 21(2), 213-229. https://doi.org/10.1007/ BF02887450

Skinner, N., Roche, A. (2021) R-E-S-P-E-C-T: Psychosocial Factors Outdo Employment Conditions in Predicting Job Satisfaction and Turnover Intentions for AOD Nurses and Counsellors. Int J Ment Health Addiction. https://doi.org/10.1007/s11469-021-00676-y

Subramanian, I. D., & Shin, Y. N. (2013). Perceived organizational climate and turnover intention of employees in the hotel industry. World Applied Sciences Journal, 22(12), 1751-1759. Disponible en https://bit.ly/3i1M0I3 y consultado el 28 de diciembre de 2022

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. science, 185(4157), 1124-1131. https://doi.org/10.1126/science.185.4157.1124