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Social Strain or Self-Control?: An Empirical Test of Explanations of Employee Theft

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ABSTRACT

Research on crime and deviant behavior has revisited theoretical questions raised by white-collar offending in relation to mainstream criminological theory. Since most of these offenses go unreported to the police, particularly those committed in the workplace, studying employee theft presents significant challenges for criminology researchers. Occupational crime, which occurs within organizations and falls under offense-based definitions of white-collar crime, remains difficult to measure using official crime statistics. To address this gap, we use self-reported crime data to estimate a beta-binomial regression model of employee theft. This model examines the theoretical predictors of occupational offending among casino employees in Macau ($N = 281$), focusing on whether Agnew's general strain theory or Gottfredson and Hirschi's self-control theory generalizes to an East Asian sample. Our findings support both general theories of crime. Specifically, a measure of economic strain and a behavioral indicator of low self-control were each independently and significantly associated with a criminal variety scale of employee theft, even after controlling for criminal opportunity, work commitment, and respondents' demographic characteristics. These results suggest that Agnew's general strain theory and Gottfredson and Hirschi's self-control theory apply not only to white-collar offending but also to crime and deviant behavior in an East Asian context.

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Employee theft is a considerable social problem, as it is reportedly responsible for about 7% of annual revenue losses and 33% of bankruptcies in the U.S. alone (Statistic Brain Research Institute 2018). Moreover, recent estimates in the country show that it has grown and is a costlier problem than generally recognized, with industry surveys finding that three-fourths (75%) of workers have stolen at least one time from their workplace (California Restaurant Association [CRA] 2019), 95% of companies suffered significant damage, and the estimated damage of workplace pilferage is $50 billion annually (California Restaurant Association [CRA] 2019; Statistic Brain Research Institute 2018). Additional data from the Association of Certified Fraud Examiners (ACFE) show that corporate theft has increased more than 10% during the past 20 years (Association of Certified Fraud Examiners [ACFE] 2002, 2018). Other studies demonstrate that small amounts of initial stealing in the workplace can quickly escalate to enormous losses (Chun 2019); most offenders (60%) are men (Statistic Brain Research Institute 2018); "time theft" – where employees are paid for hours that they did not actually work – victimizes approximately three-quarters of businesses, affecting losses of up to 7% of their gross payrolls (Osterhaus 2015); and "sweet hearting" – an offense which consists of employees providing "discounts" to their friends and family – results in annual losses exceeding $200 billion to companies every year (Brady, Voorhees, and Brusco 2012). For companies, it takes up to two years, on average, to discover workplace malfeasance (Statistic Brain Research Institute 2018).

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Multiple studies indicate that employee theft has increased over time. This is evident when comparing the recent 75% prevalence rate of employee theft (California Restaurant Association [CRA] 2019) to the estimated 50–60% prevalence rate reported in earlier studies (Krippel et al. 2008; Wimbush and Dalton 1997). Other research suggests that between 35% and 70% of surveyed employees admit to having stolen from their employer (Boye and Slora 1993; Hollinger and Clark 1983; Kamp and Brooks 1991; Slora 1989). According to a recent survey of businesses by the National Retail Federation (NRF) (2021), the average cost of internal theft per case in 2020 was $1,551.66, which is an increase from the past few years, although much lower than the 2016 average of $1,922.80 per case. Employee theft, thus, imposes major costs on both productivity and profitability (Bennett, Marasi, and Locklear 2018). The most frequently committed offense is theft of cash (Association of Certified Fraud Examiners [ACFE] 2002).

Recent research on employee theft among casino workers found a prevalence rate of only 14% (Pontell et al. 2022), much lower than Clark and Hollinger's (1983) conservative estimate that they derived from 35% of surveyed retail employees reporting having committed at least one of the seven offenses included in their employee theft index (see also Friedrich and Schwartz 2008). Given the relatively high levels of surveillance in casinos compared to other workplace environments (Austrin and West 2005), it is plausible that criminal motivation rather than opportunity matters more in decisions to engage in theft, at least in the casino industry. Notably, an economics-based strain measure of financial pressure – consistent with Agnew's (1992, 2006) general strain theory – was associated with employee theft, whereas an attitudinal measure of self-control – based on Gottfredson and Hirschi's (1990) general theory of crime – had no such relationship (Pontell et al. 2022). Because the estimated statistical relationships were bivariate in nature, Pontell and colleagues could not definitively say whether Agnew's general strain theory or Gottfredson and Hirschi's general theory of crime better explains employee theft, although both prominent theories of crime have been applied to white-collar crime with inconclusive results (Benson and Moore 1992; Craig and Piquero 2016; Kabiri et al. 2024; Langton and Piquero 2007; Langton, Piquero, and Hollinger 2006; Nguyen, McNealey, and Thomas 2024; Piquero, Schoepfer, and Langton 2010; Schoepfer, Piquero, and Langton 2014; Simpson and Piquero 2002; Van Wyk, Benson, and Harris 2000). This study tests these theories in the context of employee theft in casinos, adding to past research comparing general strain and self-control theories in predicting occupational crime in nursing homes (see Van Wyk, Benson, and Harris 2000).

This paper is organized as follows. First, it examines the criminology of employee theft. Second, it presents a review of general strain and self-control theories, along with research applying these theories to employee theft. Next, an overview of the gaming industry in Macau provides the historical and cultural context for the study. The paper then details the survey research methodology used to obtain self-reported data on employee theft from Macau casino workers, including the survey questionnaire, data collection process, and statistical methods for analyzing the self-reported crime data. Lastly, findings from the statistical analysis are discussed, with conclusions that highlight key insights and suggest directions for future research.

Theoretical perspectives and related literature

The criminology of employee theft

Employee theft is a type of occupational crime occurring within organizations, categorized under offense-based definitions of white-collar crime, when considering lower-level employees rather than higher status managers or executives (Kennedy 2016; Sutherland 1983). As Friedrichs (2002) defines it, occupational crime refers to "illegal and unethical activities committed for individual financial gain – or to avoid financial loss – in the context of a legitimate occupation" (243). Although *employee theft* is a poorly defined concept with no scholarly consensus on which behaviors are included (Greenberg and Barling 1996; Kennedy 2016), it broadly falls under "abuse of trust" crimes: offenses that involve

duplicity or surreptitiousness to obtain money or property without the use of physical force (Benson et al. 2024; Edelhertz 1970). As stated by Kennedy (2016), in an extensive review of the literature, "The literature on employee theft is clear that the factors most likely to be associated with employee theft intentions, as well as the actual occurrence of employee theft, are job dissatisfaction, perceptions of inequality/injustice, pay dissatisfaction, and the presence of workplace or role-based stressors" (10). Job dissatisfaction can manifest in unproductive work behaviors and different types of occupational deviance (De Cremer 2006; Lau, Tung Au, and Ho 2003).

Occupational offenders are not necessarily individuals in positions of power, and they may not fully align with the stereotypical profiles of common street criminals (Benson et al. 2024). On one hand, Sutherland (1940) challenged conventional criminological wisdom that crime is a lower-class phenomenon by calling attention to "crime in relation to business" (1). Yet, lower-level employees within a business may share individual characteristics and social circumstances akin to lower-class persons; thus, crime theories mainly developed to explain street offending among lower-class persons could, nevertheless, be used to explain the deviant behaviors of these employees (Benson 2021; Cullen, Agnew, and Wilcox 2018; Simpson 2019). While traditional criminological theories view employment as a buffer against crime, white-collar criminologists understand that the workplace can be a setting that offers several opportunities for theft (Cullen, Agnew, and Wilcox 2018; Friedrichs 2009; Shover and Hochstetler 2006).

With employee theft, as with crime in general, the presence of criminal opportunity is a necessary condition for it to occur. According to Cohen and Felson (1979), opportunity consists of two essential ingredients: a suitable target (i.e. business, person, or property) and the absence of capable guardianship (i.e. blocking access or providing surveillance). Opportunities, thus, play an important role in employee theft, although the opportunity structures for this crime differ as compared with street crime. Employee theft requires that offenders (a) have legitimate access to a business, (b) be spatially separated from their victims, and (c) maintain a superficial appearance of legitimacy (Benson et al. 2024). Employee thieves usually have specialized knowledge about the businesses that they victimize, which allows them to carry out workplace offenses with impunity (Clark and Hollinger 1981). Indeed, Felson and Eckert (2019) call white-collar crimes such as employee theft "crimes of specialized access" (143). Employees' legitimate access to businesses affords them the opportunity to both commit and conceal their criminal acts (Benson et al. 2024). Employees can be well-positioned to both recognize suitable targets to steal and the lack of capable guardians to deter crime, thus increasing their opportunity to successfully commit theft (Clarke 1995; Mustaine and Tewksbury 2002). And, familiarity with the surveillance systems of their workplaces can enhance employees' opportunity to engage in occupational offending. When afforded the opportunity, most employee thieves choose to steal fungible items such as cash, which can be used to pay for desired goods and services (Bamfield 2012).

While opportunity structures are undoubtedly central to understanding employee theft, they alone cannot explain why some individuals choose to offend when such opportunities arise, while others do not. To fully explain variation in occupational offending, it is essential to examine individual-level differences in motivation and disposition. In this context, two general theories of crime – Gottfredson and Hirschi's (1990) self-control theory and Agnew's (1992, 2006) general strain theory – offer competing insights into the key drivers of employee theft.

General strain and self-control theories: competing explanations of crime

The general theoretical perspectives proposed by Agnew (1992, 2006) and Gottfredson and Hirschi (1990) significantly advanced the field of criminology upon their emergence in the 1990s and have since largely dominated criminological research. Both perspectives have gained popularity due to their general nature, which posits that they can account for all crimes at all times and in all places (see Tittle et al.). A considerable body of research has provided evidence for Gottfredson and Hirschi's (1990) general theory of crime – often referred to as self-control theory – in a wide array of deviant and criminal behaviors (Holtfreter et al. 2010; Langton, Piquero, and Hollinger 2006; McGloin et al. 2007;

Perrone et al. 2004; Pratt and Cullen 2000; Reisig and Pratt 2011; Reisig, Wolfe, and Pratt 2012; Unnever, Cullen, and Pratt 2003; Vazsonyi et al. 2001). According to Gottfredson and Hirschi, all forms of crime are the same in that they involve force and fraud in the pursuit of self-interest and that participation in such acts depends on the inability to exercise self-control. Moreover, those who lack self-control are more likely to be impulsive, lack diligence and tenacity, are unable to delay gratification, cannot solve problems through verbal means, and have low tolerance for frustration or discomfort. They argue that self-control, established early in childhood, remains stable throughout the life course. Consequently, it precedes key variables posited by competing theories based on learning and strain, rendering motivational factors such as delinquent attitudes and peer influence and negative emotions like anger, anxiety, and depression spurious in their estimated relationships with crime and deviance.

However, Agnew's (1992, 2006) general strain theory maintains that individuals commit crime in response to adverse events and experiences (i.e. failure to achieve positively valued goals, removal of positively valued stimuli, and/or confrontation with negative stimuli). These strains or stressors produce negative emotions such as anger, anxiety, and depression, which, in turn, create pressure that may motivate some individuals to cope through deviance or crime. According to this perspective, crime and other harmful behaviors may serve as a coping mechanism to alleviate psychological distress. As with Gottfredson and Hirschi's (1990) general theory of crime, numerous studies have found varying levels of support for Agnew's theory and the impact of negative emotions on decisions to engage in crime and other deviant behaviors (e.g. Agnew 2002; Agnew and Brezina 1997; Agnew and White 1992; Aseltine, Gore, and Gordon 2000; Baron 2004; Ellwanger 2007; Mazerolle and Piquero 1997; Paternoster and Mazerolle 1994; Piquero and Sealock 2000).

Applying general strain and self-control theories to employee theft

Both theories make different predictions about criminological risk factors that lead to employee theft. According to Agnew's (2006) general strain theory, economic strains contribute to income-generating crimes, as the negative emotions of fear or anxiety may be alleviated through employee theft (see also Agnew 2016). In the context of white-collar crime, the second and third types of social strain outlined by Agnew (1992):57–9) in his initial formulation of general strain theory – namely, strain resulting from the loss of positively valued stimuli and strain arising from confrontation with negative stimuli – are collectively referred to as "economic problems" by Agnew, Piquero, and Cullen (2009):43). This financial strain can create pressure to engage in white-collar offending, as it often involves ongoing hardships and lifestyle changes, which are harder to ignore or excuse than the failure to achieve positively valued monetary goals. Yet, Agnew, Piquero, and Cullen (2009) acknowledged that general strain theory's first identified strain – the failure to achieve positively valued goals – along with work-related strains and stressors, can increase the likelihood of white-collar crime via the negative emotions of anger and frustration (see also Wang, Ma, and Xia 2022). General strain theory has been applied to white-collar crime through the "fear of falling" hypothesis (Langton and Piquero 2007; Schoepfer and Piquero 2006; Weisburd et al. 1991; Wheeler 1992), which is the proposition that white-collar workers offend due to trepidation over losing everything they have achieved (see also Severson, Kodatt, and Burruss 2019). Self-reports from white-collar criminals suggest that their occupational offenses are driven less by greed and more by a desire to maintain their existing socioeconomic status, which is typically middle-class (Benson 1985; Cressey 1953; Rothman and Gandossy 1982). Hence, according to Agnew's general strain theory as applied to white-collar crime, the desire to maintain one's standard of living can motivate employee theft (Benson and Chio 2019).

However, Gottfredson and Hirschi's (1990) self-control theory predicts that any relationship between economic problems and negative emotions, such as anxiety or fear, and employee theft would be spurious. This is because both the tendency to experience negative emotions and economic problems and the tendency to engage in employee theft stems from a lack of self-control, which precedes and, thus, explains both. Yet, Agnew's (1992, 2006) general strain theory predicts that

economic problems and occupational crimes are independently linked, as individuals may alleviate feelings of anxiety by engaging in workplace theft. In this view, two individuals with similar levels of self-control can respond differently to the same social context (i.e. workplace environment); one might perceive a desperate need for money to pay off debts or other economic problems, thereby motivating them to offend (see Simpson and Geis 2008).

Past research on employee theft

Criminological research applying Agnew's (1992, 2006) general strain theory and Gottfredson and Hirschi's (1990) self-control theory to employee theft, either alone or in tandem, has yielded inconclusive results. In the first test of the relationship between employee theft and self-control, Langton, Piquero, and Hollinger (2006) examined a sample of 224 college students and found that both behavioral and attitudinal measures of self-control were independently and statistically related to employee theft intentions, thus lending support for Gottfredson and Hirschi's self-control theory. In another study examining workplace deviance among private bankers in Iran, Kabiri et al. (2024) found that measures of workplace and subjective strain, consistent with Agnew's general strain theory, were both directly and indirectly related to workplace misconduct through negative emotions and deviant motivation. However, a study by Van Wyk, Benson, and Harris (2000) applying strain and self-control theories to occupational crime in nursing homes found that strain-based variables were associated with both theft and abuse, whereas their attitudinal measure of self-control had no significant relationship with either occupational offense type. Building on these studies, the current research pits general strain theory and self-control theory against one another to assess their relative explanatory power in the context of employee theft among casino workers in Macau, China – a unique cultural and occupational setting.

Internal theft and fraud in casinos

Previous studies have examined gambling behaviors and addictions as major determinants of workplace theft in the gaming industry (Kelly and Hartley 2010). In particular, most research has focused on how pathological gambling can affect economic crime outside of casinos (e.g. Albanese 2008; Crofts 2003; Meyer and Stadler 1999). Few works have examined employee theft and misappropriation within casinos (Bunn and Glynn 2013; Gerber and Hu 2014; Marden and Edwards 2005; Ooi 2014; Pontell et al. 2022). Professionals in the gaming industry operate under the assumption that both internal and external threats are ever-present and that non-security staff – such as dealers, waitresses, and cashiers – are generally not to be fully trusted (Bunn and Glynn 2013).

Macau casinos

The current study employs data collected from employees in the Macau casino industry. As a Portuguese colony, gaming was legalized in Macau in 1847 and has gone through various stages of growth. Now, as part of China (an SAR, or Special Administrative Region), it has gained the reputation as the "Monte Carlo of the Orient," with the highest revenues in the world (Direcção de Inspecção e Coordenação de Jogos [DiCJ] 2021).

The first casino monopoly franchise was granted in 1937 to the Tai Xing Company, which allowed only Chinese games and limited the industry. This changed dramatically 25 years later when the Macau government granted monopoly rights to all forms of gambling to the Sociedade de Turismo e Diversoes de Macau [STDM]) in 1962 (Veng Mei Leong (2004). Between 1986 and 2001, three licenses were granted to a subsidiary of STDM, Wynn Resorts, and Galaxy Casinos. By 2019, six foreign companies – SJM Holdings, MGM China, Wynn Resorts, Melco Crown Entertainment, Galaxy Entertainment Group, and Sands China – held all six gaming licenses in Macau (Cohen 2019).

Media coverage of employee thefts in casinos highlights the breadth of such offenses and the potential for substantial financial losses. Cases involving VIP room thefts and related crimes can not only significantly impact the stock price of the victimized company but, through cascading effects, influence the broader industry as well (Lopez 2015; Pontell et al. 2022). Finally, companies' reluctance to report employee thefts means that minor offenses may go undetected for extended periods, suggesting that the problem is far more widespread than recorded cases indicate. Like other forms of white-collar crime, only the tip of the iceberg is visible. Moreover, even small losses per incident can accumulate into substantial financial damage over time.

Casinos present unique accounting and disclosure challenges that go far beyond those found in other large business enterprises. As Skolnick (1978) observed in his study of legalized casino gambling in Las Vegas, "the world of casino gambling offers a portfolio of anonymous expenditure" (45), thereby making enforcement against offenses (e.g. money laundering, loan sharking, and corruption) extraordinarily difficult. Moreover, the internal operation of casinos is intricate and challenging due to two interrelated factors. First, casinos house vast amounts of liquid assets in the form of gaming chips and cash, thus making them attractive targets for misappropriation. Second, as gaming transactions occur, these assets are not immediately recorded or counted. Money constantly changes hands among thousands of individuals without a clear record of their identities, the number of participants, or the exact amounts exchanged. At individual gaming tables, thousands of chip exchanges can take place daily. These conditions create ample opportunities for a range of criminal activities, including employee theft, which sometimes involves customer accomplices (Santaniello 1982).

The massive growth of these distinctive crime-facilitative environments presents numerous enforcement challenges for casino operators (Needleman and Needleman 1979). Offenses of all kinds, not only directly impact profits, but can also affect stock prices when major incidents are exposed and become public knowledge. These concerns require a comprehensive array of surveillance, prevention, and control measures designed to promote compliance and minimize opportunities for theft.

Data and methods

Because employee theft is significantly underreported, official crime statistics on these occupational offenses are likely to provide an unreliable and/or invalid account of their true nature and extent (see Kennedy 2016; see also Kivivuori 2011). This issue is particularly relevant in industries where reputation is a key concern, such as the gambling industry. To address the limitations of relying on crimes known to the police to measure employee theft, this study employs a self-report methodology to both more accurately estimate and predict occupational offending in casinos located in the world's gambling capital – Macau, China.

Survey methodology

The target sample for this survey consisted of individuals currently employed in the Macau gaming sector at the time of the study, as well as those who had worked in the industry at any point within the previous 12 months. To identify eligible participants, the first question served as a screening tool, asking whether respondents had ever worked in the Macau gaming sector during this timeframe. The survey introduction emphasized complete anonymity to encourage honest responses. The core structure of the survey questionnaire was adapted from the Self-Report of Offending survey (Young Adult; Wave 3, 2000–2) conducted as part of the *Project on Human Development in Chicago Neighborhoods* (Earls et al. 2002). To ensure relevance for Macau gaming employees, the questions were modified and presented in both Chinese and English to facilitate data collection.

The formal survey was conducted in Macau between September and December 2017. Respondents were recruited through a convenience-based snowball sampling approach administered via an online platform.[1] The survey link was distributed through social network tools and social media mobile applications. To encourage participation, a lucky draw with supermarket coupons was offered as an

incentive. Participation was voluntary, only those who completed the questionnaire were included in the final sample, and a total of 281 valid responses were collected and used for analysis.

Dependent variable

Employee theft encompasses a wide range of financially motivated workplace offenses rather than a single act (Kennedy 2016). As Greenberg and Barling (1996) argue, "Instead of suggesting that there is only one definition of employee theft, therefore, perhaps a more appropriate approach would be to accept that employee theft takes many different forms which are both profuse in number and elaborate in design" (50). In line with this view – and following the self-report method for measuring delinquency and crime (Junger-Tas and Haen Marshall 1999; Krohn et al. 2010) – this study used six distinct offense types to capture the full extent of workplace theft in the gaming sector: (1) theft in the workplace (i.e. taking anything from work without permission), (2) falsification of documents (i.e. altering client, guest, or service provider records), (3) computer fraud (i.e. modifying workplace computer services or information without authorization), (4) bribe offering (i.e. providing benefits or rebates to others inappropriately), (5) bribe accepting (i.e. granting unauthorized access or services in exchange for gifts), and (6) white-collar exploitation (i.e. extracting tips or gifts from clients, guests, or service providers).[2] Respondents indicated past-year involvement in each deviant behavior using a dichotomous (yes/no) format.

These six offenses were summed into a criminal variety scale, a bounded count variable ranging from 0 (i.e. no offenses) to 6 (i.e. all offenses reported). According to Sweeten (2012), criminal variety scales are the preferred way to measure offending since they are easy to compute, indicate high reliability and validity, and are not skewed by the high incidence of minor offenses. These scales allow criminologists to reliably assess individual differences in criminal propensity (i.e., criminality) in a theoretically meaningful and empirically useful way.

Theoretical variables

Our main independent variables consisted of measures representing either Agnew's (1992, 2006) general strain theory or Gottfredson and Hirschi's (1990) self-control theory.[3] To assess Agnew's theory, we included two measures of social strain: one specific to the workplace and another representing a more generalized form of subjective strain. More specifically, we used job satisfaction as an objective measure of work-related strain, given that past research has linked it to occupational crime (Kabiri et al. 2024; Nguyen, McNealey, and Thomas 2024; Wang, Ma, and Xia 2022). This approach is consistent with general strain theory's extension to white-collar crime (Agnew, Piquero, and Cullen 2009). Job satisfaction ($\alpha = .75$) was comprised of eight items from the *Macao Gaming Employee Life Survey* (Institute for the Study of Commercial Gaming at the University of Macau 2009). Respondents rated their agreement with each item on a 5-point Likert scale, ranging from 1 (*Totally disagree*) to 5 (*Totally agree*). The items included: "The job income is fairly reasonable," "The stress level of my job is low," "My job has opportunities for promotion or increase in salary," "My job is secure," "My job always provides me opportunities for learning something new," "It is not easy for me to look for another job with comparable salary and welfare benefits," and "Overall, I am totally satisfied with my job." Job satisfaction was measured by aggregating the items; higher values showed more job satisfaction.

Another measure, financial pressure, served as an economic-related strain indicator and was derived from a survey item asking respondents to select one answer to describe their current level of financial pressure. Response options included: "No stress at all," "Slightly," "Moderately," "Very," or "Extremely." This measure aligns with general strain theory's extension to white-collar crime (Agnew, Piquero, and Cullen 2009), as employees feeling financial pressure may resort to theft as a means of addressing their economic problems (Cressey 1953; Langton and Piquero 2007; Schoepfer and Piquero

2006; Weisburd et al. 1991; Wheeler 1992). This variable was moderately related to job satisfaction ($\tau b = -0.15$, $p \leq 0.01$, two-tailed test).

To apply Gottfredson and Hirschi's (1990) general theory of crime to employee theft, we included two measures of self-control – one attitudinal and one behavioral – consistent with previous research testing their theory (e.g. Langton, Piquero, and Hollinger 2006; Nguyen, McNealey, and Thomas 2024). For the attitudinal measure of self-control ($\alpha = .79$), we used the Brief Self-Control Scale (SCS), a shortened version of Tangney, Baumeister, and Boone's (2004) SCS which was composed of 13 survey items. Unger et al. (2016) developed the Chinese version of the Brief SCS. Respondents rated how well each statement described them on a 5-point Likert scale, ranging from 1 (*Not at all like me*) to 5 (*Very much like me*), with higher values indicating higher self-control (e.g., "I am good at resisting temptation"). The attitudinal self-control scale was measured by aggregating the items. On the other hand, the behavioral measure of low self-control was based on a survey item asking respondents whether they had participated in gambling activities in the past 12 months. This included spending money on various casino table games, slot machines, sports betting, mahjong, horse/greyhound racing, internet casinos, and other games of chance. This measure was coded as a dichotomous variable (No = 0, Yes = 1). Both self-control measures were moderately related ($r_{pb} = -0.17$, $p \leq 0.01$, two-tailed test).

Control variables

To reduce the likelihood of spurious results, we controlled for variables that prior research and theory have identified as being associated with employee theft. We controlled for a measure of work commitment, which past research on occupational crime and deviance has linked to Hirschi's (1969) social control theory concept of *commitment* (Hollinger 1986; Huiras, Uggen, and McMorris 2000; Nguyen, McNealey, and Thomas 2024). Specifically, beyond their level of job satisfaction, employees with greater career "stakes in conformity" are expected to be less involved in property deviance. The measure of work commitment ($\alpha = .76$) was constructed as an index using four items from the *Macao Gaming Employee Life Survey* (Institute for the Study of Commercial Gaming at the University of Macau 2009). The items included: "I have confidence in the future of the gaming industry," "As a gaming employee, I feel proud of myself," "I consider my job in the gaming industry as a lifelong career," and "The characteristics, job contents, requirements, and career prospects of my occupation fully matched my expectations before I joined the industry." Respondents rated their level of agreement with each statement on a 5-point Likert scale, ranging from 1 (*Totally disagree*) to 5 (*Totally agree*). Higher index scores reflected greater work commitment among respondents.

Regardless of an employee's propensity to offend (Gottfredson and Hirschi 1990) or criminal motivation (Agnew 1992, 2006), workplace offending cannot occur without the opportunity to do so, and job characteristics can influence the availability of such opportunities (Harris and Benson 1999; Kennedy 2016; Mustaine and Tewksbury 2002). In crime research, opportunity can be confounded with strain and self-control unless it is explicitly controlled for in statistical analyses. Doing so ensures that individual differences in offending are attributed to variations in criminal motivation or propensity rather than differences in criminal opportunity (see e.g. Gottfredson and Hirschi 1990:220). To that end, we considered an employee's occupational position (junket promoter or junket collaborator, managerial members or professionals, non-managerial members [table game and cage], and non-managerial members [others]); work duration (ranging from 1 year or less to 10 years or more); and shift work status (yes, no, or sometimes).

The white-collar crime literature identifies several demographic variables associated with workplace theft (Benson and Chio 2019). We accounted for individual employee demographics, including age, sex, and marital status. Age was measured as an ordinal variable, while sex and marital status were treated as binary variables. Education level and monthly income were each categorized into three groups.

Analytic strategy

Given that the outcome – employee theft – is a bounded count variable representing the total number of internal theft or fraud types potentially committed by employees, we employed a beta-binomial regression model. We used a six-item variety scale of self-reported employee theft that consisted of the following offense types: workplace theft, document falsification, computer fraud, bribe offering, bribe accepting, and white-collar exploitation. Crime researchers have commonly modeled variety scales as over-dispersed count variables using negative binomial regression (Burt and Simons 2013; Sweeten, Piquero, and Steinberg 2013; Vogel and South 2016). However, as Britt, Rocque, and Zimmerman (2018) note, this approach assumes the crime count has no upper bound. In contrast, variety scales are inherently bounded – they represent composite measures of the number of different types of crimes an individual has committed. As a result, estimating a negative binomial regression model, which does not account for this upper bound, can result in implausible predicted criminal variety scores. Yet, like the negative binomial regression model, beta-binomial regression effectively accounts for over-dispersion through the inclusion of a dispersion parameter (Hilbe 2013).

The application of the beta-binomial model to the employee theft variety scale is straightforward – by treating each offense type in the scale as a trial (i.e. committed or not committed), the regression estimates the probability of an individual casino employee committing y occupational offenses out of N possible types (see Britt, Rocque, and Zimmerman 2018:596–7). Whereas the negative binomial model uses a log-link function to estimate the effects of covariates on the expected count of crimes (MacDonald and Lattimore 2010), the beta-binomial regression model employs a logit-link function (Hilbe 2013). Accordingly, the regression coefficients in the multivariable model are expressed as the log-odds of an employee committing an additional offense for a one-unit change in the predictor, holding other variables constant (Wagner, Riggs, and Mikulich-Gilbertson 2015). When exponentiated, these coefficients yield adjusted odds ratios (ORs), which indicate the change in the odds of reporting an additional occupational offense given a unit change in the predictor, controlling for other relevant variables (Britt, Rocque, and Zimmerman 2018). We utilized Stata 16's *betabin* command to estimate this beta-binomial regression model, specifying a logit link function and setting the number of trials to six (Hardin and Hilbe 2014; StataCorp 2019).

Findings

Table 1 presents descriptive statistics for all variables included in the regression analysis. On average, respondents in this sample of casino employees committed 0.23 offense types ($SD = 0.70$). Approximately 14% of respondents reported committing at least one of the six offenses (statistics not shown). Regarding the theoretical predictors in the analysis, respondents reported an average job satisfaction score of 23.01 ($SD = 4.35$), indicating a relatively moderate level of work-related strain given the maximum observed score of 38 on this scale. A similar pattern emerged for the work commitment variable, with an average score of 11.19 ($SD = 2.52$), suggesting a moderate level of work-related social bonding. Turning to the measure of economic-related strain – financial pressure – we observe that 42.35% of respondents selected "Moderately" to describe their current level of financial pressure, making it the modal category for this ordinal measure. At the same time, one-third (33.45%) of respondents selected either "No stress at all" or "Slightly," while nearly one-fourth (24.2%) reported feeling "Very" or "Extremely" high levels of financial pressure – indicating considerable variability in economic-related strain among these casino employees. Turning to the self-control measures – beginning with the attitudinal measure – respondents, on average, reported relatively high levels of self-control ($M = 42.86$, $SD = 6.15$) on the Brief Self-Control Scale, given that the maximum observed score was 65. Furthermore, based on the behavioral measure of self-control, fewer than one-third of respondents (32.38%) reported participating in gambling activities in the past year, suggesting that only a small proportion of casino employees engaged in gambling themselves.

Table 1. Descriptive statistics of study variables ($N = 281$).

Variables		*M*	*SD*	*Min*	*Max*	*Skewness*	
Employee theft (bounded count)		0.23	0.70	0	6	4.21	
Job satisfaction (work-related strain)		23.01	4.35	8	38	−0.02	
Brief SCS (attitudinal measure of self-control)		42.86	6.15	19	65	0.12	
Work commitment		11.19	2.52	4	20	0.25	
Variables	Categories					*f*	%
Financial pressure (economic-related strain)	No stress at all					31	11.03
	Slightly					63	22.42
	Moderately					119	42.35
	Very					47	16.73
	Extremely					21	7.47
Gambling participation (behavioral measure of low self-control)	No					190	67.62
	Yes					91	32.38
Occupational position	Junket promoter or junket collaborator					14	4.98
	Managerial members or professionals					56	19.93
	Non-managerial members (table game and cage)					116	41.28
	Non-managerial members (others)					95	33.81
Work duration	1 year or less					32	11.39
	2–3 years					50	17.79
	4–5 years					51	18.15
	6–7 years					40	14.23
	8–9 years					27	9.61
	10 years or more					81	28.83
Work shifts	Yes					224	79.72
	No					20	7.12
	Sometimes					37	13.17
Age	21–29					89	31.67
	30–39					110	39.15
	40–49					46	16.37
	50 or above					36	12.81
Sex	Female					130	46.26
	Male					151	53.74
Marital status	Not married or separated					138	49.11
	Married					143	50.89
Education level	Junior secondary school (7th to 9th grade) or below					82	29.18
	Senior high school (10th to 12th grade)					114	40.57
	Bachelor's degree or above					85	30.25
Monthly income	20,000 (MOP) or less					147	52.31
	20,001–30,000 (MOP)					100	35.59
	30,001 (MOP) or more					34	12.10

Turning to job characteristics that approximate crime opportunities, a plurality of respondents (41.28%) held non-managerial positions in casino table or cage game operations, while a small minority (4.98%) were employed as junket promoters or collaborators. In terms of work experience, nearly three in ten respondents (28.83%) reported having worked in the gaming sector for 10 years or more, while just over one in ten (11.39%) had one year or less of experience in the casino industry. Although the vast majority of casino employees reported always working shifts (79.72%), a notable proportion indicated "sometimes" working shifts (13.17%).

In terms of respondent demographics, seven out of ten employees (70.82%) were under the age of 40, more than half were male (53.74%) or married (50.89%), and three in ten (30.25%) held a bachelor's degree or higher. A majority (52.31%) reported earning a monthly income of 20,000 MOP or less (roughly 2,492 USD based on the average exchange rate in 2017).

Table 2 presents the results of the beta-binomial regression analysis of employee theft, with a focus first on the measures of economic and work-related strain. Given that financial pressure is an ordinal predictor, we treated it as a categorical variable by creating dummy variables for each response category. The first category, "No stress at all," was omitted and served as the reference group. This approach allows for the estimation of potentially non-linear effects of economic pressure on occupational offending. The analysis revealed a statistically significant relationship between reporting "very"

Table 2. Beta-binomial model estimating effects of strain and self-control on employee theft in casinos ($N = 281$).

Variables		
Financial pressure (economic-related strain; reference category: No stress at all)		
Slightly	1.1139	
	(0.9252)	
Moderately	1.5692	
	(1.4413)	
Very	2.7297	*
	(2.4497)	
Extremely	2.2836	†
	(1.9288)	
Job satisfaction (work-related strain; higher values = higher job satisfaction)	0.0538	
	(1.0006)	
Gambling participation (behavioral measure of low self-control; 0 = no, 1 = yes)	1.0367	*
	(2.4507)	
Brief SCS (attitudinal measure of self-control; higher values = higher self-control)	−0.0019	
	−(0.0585)	
Work commitment (higher values = higher work commitment)	0.0030	
	(0.0370)	
Occupational position (reference category: Junket)		
Managerial members or professionals	−1.2658	†
	−(1.8704)	
Non-managerial members (table game and cage)	−1.4797	*
	−(2.1675)	
Non-managerial members (others)	−1.2256	†
	−(1.9322)	
Work duration (reference category: 1 year or less)		
2–3 years	0.4070	
	(0.4104)	
4–5 years	1.3733	
	(1.4821)	
6–7 years	2.4116	**
	(2.6171)	
8–9 years	1.9026	†
	(1.8429)	
10 years or more	1.9072	*
	(1.9814)	
Work shifts (reference category: Yes)		
No	−0.2298	
	−(0.1996)	
Sometimes	1.1704	*
	(2.3008)	
Age (reference category: 21–29)		
30–39	0.8032	
	(1.5061)	
40–49	0.4197	
	(0.5265)	
50 or above	0.4280	
	(0.5691)	
Sex (0 = female, 1 = male)	0.7004	†
	(1.6873)	
Marital status (0 = not married or separated, 1 = married)	−0.8008	†
	−(1.7268)	
Education level (reference category: Junior secondary school or below)		
Senior high school (10th to 12th grade)	−0.3537	
	−(0.7749)	
Bachelor's degree or above	−0.3425	
	−(0.5857)	
Monthly income (reference category: 20000 [MOP] or less)		
20,001–30,000 (MOP)	−0.9473	†
	−(1.9369)	
30,001 (MOP) or more	−1.1424	†
	−(1.7112)	
Intercept	−7.1241	**
	−(2.9374)	

(*Continued*)

Table 2. (Continued).

Variables	
Pseudo R^2	0.2133

Note: *T*-values are in parentheses below estimated coefficients. ** $p \leq 0.01$, * $p \leq 0.05$, † $p \leq 0.10$ (two-tailed tests).

high financial pressure and engaging in workplace theft ($b = 2.7297$, $t = 2.4497$, $p \leq 0.05$). Specifically, the odds of an employee who reported "very" high financial pressure committing an additional workplace offense were 15.33 times higher [exp(2.7297) = 15.33] than those of an employee reporting "no stress at all." Although only marginally significant ($b = 2.2836$, $t = 1.9288$, $p \leq 0.10$), employees experiencing "extremely" high financial pressure were also found to be 9.81 times more likely to commit another occupational crime compared to those in the reference group. These findings suggest that economic strain plays a meaningful role in occupational offending among casino employees, particularly at the higher end of the financial pressure spectrum, though the effect appears to level off – indicating a possible saturation point. By contrast, the measure of work-related strain, job satisfaction, was not significantly associated with employee theft ($b = 0.0538$, $t = 1.0006$, $p > 0.10$). Thus, economic strain, but not work-related strain, emerged as a significant predictor of workplace theft in this context.

Turning to the measures of self-control, we found that the behavioral measure ($b = 1.0367$, $t = 2.4507$, $p \leq 0.05$), but not the attitudinal measure ($b = -0.0019$, $t = -0.0585$, $p > 0.10$), was significantly associated with employee theft. In other words, after controlling for the Brief Self-Control Scale, gambling participation – the behavioral indicator of low self-control – emerged as a fairly robust predictor of occupational offending in Macau casinos. Specifically, the odds of a casino employee who also gambled reporting an additional work-related offense were 2.82 times higher than the odds for a non-gambling employee.

Regarding the control variables, beginning with work-related social bonding, we found that the measure of work commitment was not statistically significantly associated with occupational offending ($b = 0.0538$, $t = 1.0006$, $p > 0.10$). In other words, all else being equal, the degree of commitment to the gaming industry did not appear to influence the variety of workplace theft among casino employees in Macau.

With respect to work-related measures of opportunity, we found evidence supporting the notion that job characteristics can shape the structure of criminal opportunities in the workplace. Occupational position was significantly associated with occupational offending. Specifically, employees working in casino table or cage game operations were significantly *less* likely to commit an additional offense compared to junket promoters or collaborators, who served as the reference category ($b = -1.4797$, $t = -2.1675$, $p \leq 0.05$). The odds of a table or cage game employee reporting another occupational offense were approximately 77.23% *lower* than those of a junket promoter or collaborator (calculated as $[\exp(-1.4797) - 1] \times 100 = -77.23$). Also, marginally significant relationships were observed for both managerial members or professionals ($b = -1.2658$, $t = -1.8704$, $p \leq 0.10$) and other non-managerial members ($b = -1.2256$, $t = -1.9322$, $p \leq 0.10$), suggesting a similar pattern of reduced offending relative to the junket employee.

Concerning work duration, significant positive relationships were observed for employees with 6–7 years ($b = 2.4116$, $t = 2.6171$, $p \leq 0.01$) and 10 or more years of experience ($b = 1.9072$, $t = 1.9814$, $p \leq 0.05$), compared to those with one year or less. A marginally significant relationship was also found for employees with 8–9 years of experience ($b = 1.9026$, $t = 1.8429$, $p \leq 0.10$). These findings suggest a non-linear temporal effect of work experience on the likelihood of committing workplace thefts.

Regarding shift work status, employees who reported "sometimes" working shifts had 3.22 times higher odds of reporting another occupational offense compared to those who always worked shifts, the reference group ($b = 1.1704$, $t = 2.3008$, $p \leq 0.05$). These findings suggest that unstructured work schedules may be linked to the likelihood of committing workplace thefts.

In terms of employee demographic characteristics, no statistically significant relationships were observed for age or education. However, marginally significant associations were found for sex, marital status, and monthly income.

Discussion and conclusion

Research on crime and deviant behavior has revisited theoretical questions raised by white-collar offending, particularly in relation to conventional criminological theory (Benson 2021; Cullen, Agnew, and Wilcox 2018; Simpson 2019). Because most of these offenses, particularly those committed in the workplace, go unreported to the police, studying employee theft presents significant challenges for researchers, despite its status as a serious social problem and a significant form of white-collar crime (Kennedy 2016). Occupational crime, which occurs within organizations and aligns with offense-based definitions of white-collar crime (Benson et al. 2024; Edelhertz 1970; Sutherland 1983), is difficult to measure using official crime data (Kivivuori 2011). To address this gap, this paper tested explanations for workplace offending using self-reported crime data from a survey of casino employees in Macau. These data were used to estimate a beta-binomial regression model examining the theoretical predictors of employee theft, with particular focus on the general crime theories of Agnew (1992, 2006) and Gottfredson and Hirschi (1990).

Our findings supported both general theories of crime. Specifically, a measure of economic strain and a behavioral indicator of low self-control were each independently and significantly associated with a criminal variety scale of employee theft, even after controlling for criminal opportunity, work commitment, and respondents' demographic characteristics. Criminological theory now emphasizes that criminal opportunity is a necessary condition for all crimes, as no offense can occur without it. However, opportunity alone is insufficient – there must also be an offender motivated to act (Clarke 1995; Cohen and Felson 1979; Cullen, Agnew, and Wilcox 2018; Felson and Eckert 2019). This is especially relevant in casino environments, where employees routinely handle large volumes of cash and chips as part of their daily work. Yet, employee theft appears to be less prevalent in the Macau gaming industry than in other sectors such as convenience stores, restaurants, and gas stations – possibly due to higher levels of surveillance in casinos compared to these other "high-crime" industries (Austrin and West 2005; Kennedy 2016; Pontell et al. 2022). This discrepancy suggests that the employee theft literature underappreciates the theoretical relevance of offender-based predictors drawn from conventional criminological theories. Overall, these results indicate that Agnew's (1992, 2006) general strain theory and Gottfredson and Hirschi's (1990) self-control theory are applicable not only to occupational offending, but also to criminal and deviant behavior in an East Asian context (Agnew 2015; Gottfredson 2018).

Regarding Gottfredson and Hirschi's (1990) self-control theory, our findings support their expectations about occupational crime, thereby contributing to the employee theft literature by applying their general theory of crime to a distinct workplace and cultural context – casinos in Macau, China (Langton, Piquero, and Hollinger 2006; Nguyen, McNealey, and Thomas 2024; Van Wyk, Benson, and Harris 2000). Specifically, Gottfredson and Hirschi argued that workplace offending should be less common overall, as employed individuals are expected to exhibit higher levels of self-control than those who are unemployed. However, among employees, individuals with lower self-control are still more likely to exploit criminal opportunities when they arise (see Hirschi and Gottfredson 1987). Although employee theft was relatively uncommon in our sample of casino employees, we nonetheless found that those with lower self-control had significantly higher odds of committing multiple occupational offenses. Notably, support for the theory was evident through the behavioral measure of self-control, gambling participation, which Gottfredson and Hirschi have suggested may be one of the strongest indicators of low self-control. Based on this finding, screening for gambling behavior during the hiring process may be a useful preventive measure to reduce the likelihood of recruiting individuals with a higher propensity for workplace offending.

Yet, at the same time, our analyses challenge Gottfredson and Hirschi's (1990) theoretical assumption that any observed relationship between social strain and employee theft should be spurious or fully attributable to low self-control. In contrast, consistent with Agnew's (1992, 2006) general strain theory, our findings suggest that strain originating outside the workplace – but not within it – was significantly associated with occupational crime. Although prior research on employee theft has linked job satisfaction – a work-specific indicator of strain – to workplace offending (see Kennedy 2016; Wang, Ma, and Xia 2022), the present study found no such association. A related, though conceptually distinct, measure – work commitment – previously associated with employee deviance (e.g. Huiras, Uggen, and McMorris 2000; Nguyen, McNealey, and Thomas 2024), was also unrelated to employee theft in our analysis. Rather, it was financial pressure – an indicator of economic-related strain – that emerged as a significant predictor of employee theft, particularly among those reporting "very" high levels of financial strain. The fear or anxiety resulting from such "economic problems," as outlined by Agnew, Piquero, and Cullen (2009) in their extension of general strain theory to white-collar crime, can manifest in workplace misbehavior in the form of theft or fraud. While this study does not offer a direct test of the "fear of falling" hypothesis (Piquero 2012), it provides preliminary support for the proposition that employees experiencing financial pressure – regardless of their objective income level – may engage in financial crimes as a coping mechanism (Agnew 2016; Cressey 1953; Langton and Piquero 2007; Weisburd et al. 1991; Wheeler 1992). Based on this finding, mental health counseling services – particularly those grounded in cognitive behavioral therapy (see e.g. Beck 1979; Burns 2024; Ellis 2016) – may assist casino employees in managing economic strain and the negative emotions associated with it in more constructive, non-criminal ways. Given the mental health stigma that persists in East Asian societies, our finding offers a particularly meaningful contribution to the literature by applying Agnew's (1992, 2006) general strain theory within this unique research context (Agnew 2015).

In sum, we employed self-reported data and estimated a beta-binomial regression model to examine predictors of employee theft among casino workers in Macau, China. In doing so, we assessed the applicability of two prominent general theories of crime – Agnew's general strain theory (Agnew 1992, 2006) and Gottfredson and Hirschi's self-control theory (Gottfredson and Hirschi 1990) – within a non-Western cultural and occupational context. Our findings offer empirical support for both perspectives: economic strain and low self-control were each independently and significantly associated with a criminal variety scale of employee theft, even after accounting for criminal opportunity, work commitment, and demographic characteristics. These results suggest that both strain and self-control theories can help explain white-collar offending beyond Western societies, reinforcing their theoretical generalizability across diverse cultural and contextual environments.

Future research should consider more refined measures of strain and self-control, particularly within cross-cultural settings. Specifically, while our measure of financial pressure logically coheres with theoretical propositions from the white-collar crime literature, it was not a direct indicator of the "fear of falling" concept. Similarly, the use of a single behavioral measure – gambling participation – as a proxy for low self-control, although theoretically grounded, is a relatively crude indicator. Future research would benefit from using a composite index of multiple analogous behaviors (e.g. risky sex and substance use) to more robustly capture behavioral manifestations of low self-control. We recognize that the measurement of core criminological constructs may require further adaptation and validation in East Asian contexts. Nonetheless, we view this analysis as a modest but meaningful step toward testing competing theoretical explanations of occupational offending in an underexplored and culturally distinct research setting.

Notes

1. Convenience-based snowball sampling and Internet-mediated surveys can introduce sampling bias, thus potentially limiting generalizability (Barratt et al. 2015). However, this approach was appropriate given that Macau's gaming sector accounts for about one-fourth of the city's labor force (Sheng and Gu 2018), and

computer and mobile device usage is widespread (Xie et al. 2020). Our recruitment strategy yielded a sample ($N = 281$) large enough to meaningfully assess predictors of employee theft and approximate key characteristics of the target population: casino workers in Macau. Compared to official labor force data, our sample was somewhat younger, more educated, and more male, but similar in income and shift work patterns (see page 28 of https://www.dsec.gov.mo/getAttachment/fb62032a-34c6-4d51-bf8d-4c48bbdb94d4/C_IE_PUB_2017_Q4.aspx).

2. Our use of multiple indicators is also consistent with Clark and Hollinger's (1983) classic research, which conceptualized employee theft broadly and employed a variety of offense types as indicators of occupational crime within the workplace.
3. Agnew (2013) has argued that strain and self-control can have both independent and interactive effects on crime and delinquency. In contrast, Gottfredson and Hirschi (1990) contend that any association between strain and criminal behavior is spurious, as both stem from low self-control. If strain exerts an independent effect net of self-control, however, the theories represent competing rather than integrated explanations. While some studies have tested integrated models, findings remain inconclusive and are rarely situated in East Asian contexts. A full theoretical integration – one that would require additional conceptual development – is beyond the scope of this study; see Yang and Li (2025) for an example of such work in a Chinese setting.

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Author contributions

CRediT: **Christopher Contreras:** Conceptualization, Formal analysis, Methodology, Software, Validation, Writing – original draft, Writing – review & editing; **Henry N. Pontell:** Conceptualization, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing; **Jianhong Liu:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – review & editing.

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