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Psychological contract's effect on job mobility: Evidence from Chinese construction worker

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ABSTRACT
The subject of this study is that the psychological contract (PC) approaches to job mobility within the construction industry with special reference to migrant construction workers in China. Using a semi-structured interview to elicit a full range of the PC's content of construction worker, we unravel the mechanism of such contract to influence the informal job mobility of workers through the lens of the evolutionary game framework. The results demonstrate that, in the case of fulfilling PC, the informal job mobility of workers is under control, and both workers and employers benefit from this situation. This study deepens the understanding of the PC's effect on the job mobility of construction workers in China during the course of economic change. The theoretical and practical implications are discussed.

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Psychological contract; migrant construction worker; job mobility; evolutionary game theory

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1. Introduction

In view of the fast pace and dynamic of economics, the nature of jobs has turned towards contractual jobs. Many studies suggest that a growing turnover rate is approaching, and has proved to be a bramble for HR practices across industries. Unexceptionally, one of the major challenges facing Chinese construction industry is to retain construction workers, especially high-skilled performers (Sun, Wang, & Shen, 2018). The changes of relationship between workers and employers result from the rapid changes in society and construction industries for decades (Schalk & Roe, 2007). The subject of this study is that the psychological contract (PC) approaches to the job mobility within the construction industry with special reference to migrant construction workers in China.

A clear, consistent link between a high turnover and a significant negative impact of organisation performance (e.g., lower productivity, lower employee trust, and loss of tacit knowledge base of the organisation) are well-established by a considerable of studies. As Hillmer, Hillmer and McRoberts (2005) suggested, the costs of addressing

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a co-worker who intends to quit by hiring and supervising a new replacer sum up to 70% of the annual salary.

The perspective of the PC is more often used to approach the insight of worker turnover. Thus, the concept of the PC has always achieved substantial prominence in turnover management discourse. By conducting two independent studies on the turnover intention and actual quit of construction workers in China and Philippi respectively, Chih et al (2016) demonstrated a significantly stronger positive role of the PC breach in predicting turnover intention of construction workers. As a cognitive response, turnover intention has been one of the three most investigated responses of under-fulfilment of the PC (Zhao, Wayne, Glibkowski, & Bravo, 2007). Increased unfulfillment has proved to be always significant related to higher turnover intention, lower job satisfaction, and lower affective commitment (Flood, Turner, Ramamoorthy, & Pearson, 2001). Turnover intention can act as a more direct and proximal predictor of actual quit and, as such, is defined as the last stage before quit (Hom, Caranikas-Walker, Prussia, & Griffeth, 1992). In our context, we define the PC unfulfillment PC as the construction worker's perception regarding the discrepancy between what were promised and what were actually delivered. By involving an assessment of what they have received compared to what were promised under certain conditions, construction workers figure out whether PC are fulfilled.

A review of the previous literature on employee turnover (e.g., Fu, 2007; Paillé & Dufour, 2013) suggests that there are four types of mobility channels: intent to quit the job, intent to quit the organisation, intent to quit the employer, intent to quit the profession, all of which might leave the industry. In order to maintain their personal and/or professional advantages or limit some uncomfortable experiences, workers endeavour first to search out job alternatives within their industries. Such the willingness to remain in the same industry is also strengthened by the job embeddedness view to avoid some on and off – the job sacrifices (e.g., loss of employee benefit or job seniority, loss of social network). Migrants are widely viewed in Chinese society as moving frequently between jobs (Zhang, 2010). In our migrant construction worker context, the informal job mobility refers to situations in which worker voluntarily and plausibly changes employer, without an application for resignation in advance when his/her task remains unfinished. The occurrence of informal job mobility may be attributed to two core choice: (a) the leaver immediately ends the uncomforting relationship with the current employer without reference to the ease of movement and availability of job alternatives (Shipp, Furst-Holloway, Harris, & Rosen, 2014), (b) the leaver seeks out a better job alternative (e.g., a better pay and benefits), and perceives the ease of movement. As an employed job seeker (Boswell, Zimmerman, & Swider, 2012), construction worker searching for another potential employers may target better employment conditions in terms of pay or status, or exit of hardship relationship with the current employer.

While the processes of forming and fulfilling or breaching PC has captured an overwhelming attention from scholars and practitioners, however, there were little, if any, studies on its content in a specific context; with a great emphasis on its idiosyncrasy and dynamic in nature (Millward & Brewerton, 2000), yet such an insight is critical to elicit a corpus of the desired workplace attitudes and behaviours based

upon PC. The identification of context-specific contents helps inform where the PC under-fulfilment has occurred and what lie behind employee turnover. In addition, despite a well-documented domain regarding the employee response to the PC unfulfillment in terms of intent to leave, we argue that some issues associated with turnover cognitions remain unresolved. For example, what the psychological state of a voluntary leaver will be in the case of a higher level of PC fulfilment. In this vein, a feeling of guilt may occur, and subsequently result in some level of psychological costs (Sun, Aryee, & Law, 2007).

The employment relationship between construction workers and employers entails a series of trading interactions and an examination of costs and inducements for both where personal preferences and circumstance dictates. Rabin (1993) pointed out that, in a game relationship, a player's utility depends on not only monetary income but also psychological gratification. Evolutional game theory is based on limited rationality. In this regard, an overwhelming majority of migrant construction workers possess little knowledge and poor logical thinking and, thus, are limited rational players. Overall, the application of evolutionary game techniques appears to be a useful framework to resolve and shed light on the evolution of worker–employer interactions.

Curiously, research on construction workers' job mobility from a PC approach remains scant. Accordingly, the aim of this study is to use a comprehensive semi-structured research instrument to elicit a full range of the PC's content of construction worker, and unravels the PC's mechanism to influence the informal job mobility of workers through the lens of the evolutionary game framework (Weibull, 1997).

In seeking to address these issues, this study endeavours to fill some of the above-mentioned gaps in three ways. First, the identification of a context-specific content with reference to construction worker may extend the literature on PC. Second, we introduce the notion of psychological cost (conceptualised as monetary equivalents on worker's values) (Sun et al., 2007) in our model to represent worker's psychological state when turnover cognition happens. Three, we adopt an underdeveloped turnover channel: intent to change employer within the same industry with or without geographical relocation, which may enrich the literature on turnover cognition.

2. Background

Migrants work under informal employment conditions without formal written contracts, about 65% of them have no access to a formal, written contract, and approximately 20% of migrants end up working in this industry (National Bureau of Statistics of the People's Republic of China (NBSC), 2017),

Subject to various factors, such as lack of *hukou* in urban areas (Zhang, 2010), uneducated profiles, and low social standing, construction workers have less access to pay equality, job security, social insurance, paid leave, promotional opportunities, general training (Sun, Wang & Shen, 2018), welfare services (Nielsen, Smyth, & Zhai, 2010), permanent resident status (Xu, 2013), supervisor support, and distributive justice than general blue-collar workers or local workers in urban China have. These discriminations gradually shape migrant construction workers' distinctive expectations or beliefs with regards to their employers or working conditions. Migrant cohorts are

characterised as (a) inferior to employers, (b) undereducated, (c) having poor cognitive processing and reasoning, (d) undiplomatic, and (e) ignorant of laws. Comparatively, employers can be described as (a) superior to migrant workers; (b) inferior to general contractors, who indirectly trigger many under-fulfilment problems; (c) concerned about their reputations with a concern about in future where all workers may quit due to his/her notoriety; and (d) time-varying in their decisions to execute contracts, as whether general contractors fulfil their contracts directly affect the performances of subcontractor employers towards workers.

Migrant construction workers were selected for several reasons. First, the practice of not signing formal written contracts, together with workers' ignorance of laws, leaves migrant workers vulnerable, with a lack of legal standing to challenge employers in court (Swider, 2015). Consequently, compared to other labour cohorts, migrant construction workers have only to resort to PC so as to obtain psychological security. Second, without effective preventive and remedial measures (Ngai, & Huilin, 2010), migrant construction workers in China are prone to suffer from PC breach. Once there is PC breach, migrants are in such weak position that it is impossible for them to recover all losses, which induces worker' burnout, and followed by tragic events (e.g., migrant riot, self-burning). Third, compared to the older-generation migrants, the new ones have higher expectations with regards to wages, working conditions, social insurance, career planning, and work-life balance (Franceschini, Siu, & Chan, 2016), their PC represents a dynamic process. Nowadays, tackling their dynamic expectations is a pressing challenge for construction managers.

2.1. Data collection

We conducted a semi-structured interview with construction workers over six months in 2016 in Shanghai; we gathered qualitative and quantitative (Yin, 2009) data about these workers' job satisfaction and primary concerns by completing a questionnaire and keeping a field journal, noting observations about the respondents; and we also interviewed construction managers and labour subcontractors. During all field survey, we kept daily notes of impressions and recorded informal observation as we participate in activities such as conflict coordination, reimbursement negotiation, gossip among some workers. In addition, whenever possible, one of us attended meetings as a passive note-taker. We sometimes had lunch with construction and had conversations as we walked to and from work, deepening our understanding of what, how and why construction workers know, feel and think.

Our interviews are twofold. It began with the personal background of construction worker (e.g., age, tenure, hometown etc.) and objective questions (e.g., how to get this job, how to contact your employer). The second part focused on open-ended questions (Eisenhardt, 1989) that let them relate (a) their overall perceptions and evaluations of organisational routines and procedures, remuneration package, work-family balance, psychological stress, industrial rules and prospect, job satisfaction, and a detailed chronology of job experience, and so on; (b) what they expect from employers or what employer has promised, what you think employers expect from you, what promises are important to you, the discrepancy between what were

promised and what were delivered, how to face or address these discrepancies, and so on; and (c) when or what conditions intent to leave was triggered, how to decide movement, what influence your decision, and so on. These probing questions help establish details. We also gathered secondary data on-site and from the media about construction worker' safeguarding rights incidents.

The most frequent words or phrases respondents said are: wages in arrears, delayed payment, a shortage of safety equipment, safety incidents, long time work hour, overtime, poor board and lodging, injury, unamiable employer, hard working condition, no insurance. The survey yielded 259 cases. Respondents were from different provinces (29% from north, 24% form south, 31% from east, 16% from west), and are from rural areas. Ages ranged from 18 to 63 (mean 42 years); almost half receive a junior-level education nobody receive a high-level education; nobody hold a supervisory or managerial position. Job tenure ranged from 1 years to 27 years, with an average of 17 years. Specifically, of the respondents, 135 (53%) planned to move, 178 (69%) were over 40 years of age, 94 (40%) served for 5–15 years, 144 (56%) graduated from junior school, 153 (59%) earned 25–35$ in daily wages, 185 (72%) rated workmate quantity as less than 15, and 232 (90%) did not sign an employment contract with their employers.

2.2. PC content

Building on the social exchange theory (Blau, 1964), the PC is conceptualised as a set of beliefs and expectations held by employers and employees about their mutual commitments and obligations (Conway & Briner, 2009). A PC may overlap a formal written contract (if any), but most are informal and unwritten or include tacit details that the formal contract does not include (Rousseau, 2000). Reviewing our field journals, we attempt to define expectations regarding their employers, which constitute the PC's content of workers. Iterations of data collection and analysis allowed us to move inductively from specific observations to more general categorisations.

Focusing on the worker's perception, we identify their PC's content, and classify such content into three levels in accordance with the levels of importance workers attach to these contents. Being paid on time is what workers care about most (Ngai & Huilin, 2010), followed by job security (Gallagher, Giles, Park, & Wang, 2015), whereas general blue-collar and white-collar workers care most about higher incomes, promotion opportunities, and welfare benefits (Wang, Guo, & Cheng, 2015a). Specifically, the top level includes: (a) wage is paid fairly and punctually, not in arrears (Wang, Guo, & Cheng, 2015b); (b) health insurance is provided, injured workers are sent to medical facilities at the time of injury (Chen & Chan, 2010), and medical expenses are paid or compensated proactively; and (c) workers cannot be fired without a valid reason. The second level includes: (a) a skills training program or technical guidance is provided (Sun et al., 2018); (b) safety equipment is equipped to protect workers at construction sites; (Ismail, Doostdar, & Harun, 2012); (c) workers cannot be forced to operate in a high-risk environment (Swider, 2015); and (d) workers are permitted to ask for leave, especially during crop planting and harvest seasons. The bottom level includes: (a) the work schedule and working hours are

arranged reasonably to avoid worker burnout (Choi & Peng, 2015); (b) performance incentives are set up to reward workers; and (c) humanised management (Choi & Peng, 2015), to respect and care about workers, is preferred. Usually, employers do not need to perform all of these activities; however, workers view employers in a more positive light if they perform more of these activities.

Worker's PC also specifies what actions they should perform, which are categorised into two levels in accordance with the activities' perceived importance to employers. The first level consists of four items: (a) following employers' commands and job arrangements and accepting assigned work shifts; (b) carrying out assignments wholeheartedly and volunteering to do extra work; and (c) being punctual, not being absent without leave and giving advance notice when quitting. Three items are included in the secondary level: (a) being available for overtime; (b) obeying working regulations and acting with care on the job site; and (c) attending vocational skills training to improve performance.

The higher the frequency is, we define, the more important that content. However, contents most important to some may be less important to others, that is, importance of PC content varies with each interviewees. In this point, Steps are taken to assess the importance every interviewees attach to every PC content by all authors and three assistants (5 = 'very important', 1 = 'little important'). Then, levels of importance are conceptualised as latent variables, and confirmatory factor analyses (CFA) are conducted to capture distinctions. The CFA results reveal that the three factor model, χ^2 ($df = 45$, $N = 259$) = 64.86, CFI =.95, RMSEA =.041, presents a good fit to the data, demonstrating clear distinction.

As Rousseau and Mclean Parks (1993) noted, the PC can be situated anywhere along a continuum from relational to transactional, which represents different contents. They also identified five dimensions that help differentiate between transactional and relational contracts: tangibility, time frame, focus, scope, and stability. Transactional items are labelled as specific, tangible, narrow in scope, stable, and economically oriented, which occurs within a specific timeframe. Relational items are labelled as open-ended, long-term, broad in scope with the focus on economical components as well we socioemotional elements (e.g., trust, loyalty, security). Despite the two distinct contract forms, their content items have been argued by some empirical studies to fall into two independent constructs (Coyle-Shapiro & Kessler, 2000), which indicates that worker could hold both transactional and relational content items; namely, transactional and relational aspects can, and do, coexist. Regardless of where PC locates within the transactional-relational continuum, they should remain interactive and dynamic at various level of conditions. With its nature and content depending on the circumstances of the industry and the role of the individual within it (Rousseau, 2000), the PC's content is thus specific to individuals, and involves individual-level understanding regarding obligations and reciprocity (Herriot, Manning, & Kidd, 1997). In the present study, the contract forms and emphasise on its dimensions between construction workers and employers should represent dynamic in a changing work context.

Gibbons and Henderson (2012) argued that building and refining relational contracts requires solving two distinct problems: credibility and clarity. A growing body

of cases in which workers' rights were violated by employers almost disintegrated the credibility of both sides and cut off opportunities for future collaboration. Furthermore, the poor literacy and cognitive underpinnings and the improvidence of migrant cohorts create significant impediments to clear communication. Thus, we argue that the practical difficulties in developing credibility and clarity between workers and employers suggest that building and refining a shared understanding of a rational contract, which is identically described as an informal implicit agreement to a PC, will be challenging.

The common practice of subcontracting in the construction industry facilitates employer's (subcontractor) use of kinship and placed-based social networks to find and recruit migrants (Swider, 2015), which fosters a collective work unit consisting of only a handful of workers (at most dozens). In the relationship-oriented work unit, workers' sense of belonging and reciprocal obligation for other is developed. Sentiment and trust originating from the commonality and identity and kinship (Ryan, 2011) implicitly force everyone to keep in step with others. Therefore, when leaving his employer for higher wage, a worker would incur some psychological costs, especially when he perceived that his employer has fulfilled PC. Psychological costs are perceived as concerns: (a) the nuisance to employer (e.g., work halt) and subsequent offence; (b) the severance of social connections (Li, Sun, & Cheng, 2017) to employer; (c) a decline of sentiment and trust with others (Ngai, & Huilin, 2010); d) the spread of a bad reputation, such as infidelity, through the workgroup. PC fulfilment is a matter of degree; however, employer's poor fulfilment buffers leaver's concerns. Traditionally, migrants are considerate in return, and always respect leaders, accept wilfully some level of unequal exchange, and make large commitments to leaders (Liu, Liu, & Ren, 2007). Therefore, if employers well-fulfil PC, workers feel a significant amount of responsibility towards their employers (e.g., owing a big favour), undertake more obligations with great pleasure, and owe high psychological costs (Sun et al., 2007). Indeed, the theory and research on perceived organisational support (Rhoades & Eisenberger, 2002) and work status congruence (Holtom, Lee, & Tidd, 2002) suggest that workers come to feel obligated to do their best in the interest of employers that have supported them in exchange for employers' lasting PC fulfilment.

Nevertheless, usually pictured as undiplomatic, these migrant cohorts are intuitively predisposed to seek job alternatives with a view to limiting further damage in the face of an ill-performing employer. Critically, we argue that the use of an emotional and intuitive response, rather than engagement in deliberative cognition, exerts a more powerful influence on integrating employers' under-fulfilment into workers' decision making (Bear & Rand, 2016).

3. Evolutionary game model

Understood as a formal object, the concept of a game in evolutionary game theory is just as it is in classical game theory. Thus, players are assumed to have utility functions, which assign cardinal utility indices to outcomes. In addition, it is generally assumed that the mathematical expectation of utility (assessed in terms of objective,

frequency-based probabilities) is the relevant measure of a player's success. In other words, at the level of an individual decision, the evolutionary process tends to select behaviour that maximises expected utility. Evolutionary game theory diverges from classical game theory only when it comes to the analysis of beliefs. In the classical theory, players have beliefs about one another, which are grounded in, or at least consistent with, ideal rationality and common knowledge; their strategy choices are rational in the sense that they maximise subjectively expected utility, when their subjective beliefs are themselves rational. Evolutionary game theory does not require the rationality of beliefs (Sugden, 2001).

3.1. Assumptions

The real-employment settings are conceptualised as the following assumptions, which are helpful in establishing an evolutionary game framework and simplifying calculations.

Assumption 1: All the players in the game – labour subcontractor employers (not general contractor employers) and construction workers – are limited rational 'economic agents.' Each player's objective is to maximise income. In addition, both employers and workers pay close attention to their interpersonal relationships, and workers possess the virtue of 'gratitude.'

Assumption 2: The job mobility strategy space of construction workers is $\Omega_1 = \{\text{yes, no}\}$. Similarly, the performance strategy space of employers is $\Omega_1 = \{\text{yes, no}\}$. Usually, before game begins, neither party can accurately predict how his counterpart will behave. Because workers hold poor cognitive processing, an intuitive rather than a deliberative decision-making process is adopted to reflect workers' responses to their employers' behaviours.

Assumption 3: A wide range of job embeddedness studies (see Lee, Mitchell, Sablynski, Burton, & Holtom, 2004) on turnover have implied that it may be more difficult to seek out job alternatives in other industries, especially for unskilled aging workers. The difficulty of moving across industries (e.g., the length of time required to learn new techniques and adapt to a new workplace) reins in workers' impulses to choose a job in another industry.

Assumption 4: Our game model is defined as a limited repeated interaction. A worker does not necessarily change her/his employer the moment that his employer enters unfulfillment due to his potential expectation about a future in which the employer may well-fulfil, and compensate previous under-fulfilment. In addition, an immediate quit is easy to offend his/her employer, which may cut off opportunities for future collaboration.

Assumption 5: Workers either fulfil or breach PC subjectively and discrepantly. Workers breach when their employers have fulfilled heavy but nonmonetary psychological costs, which are conceptualised as monetary equivalents on worker's values.

Assumption 6: An employer may discriminate, subjectively and discrepantly, among construction workers in terms of fulfilment. The use of social interpersonal networks among co-workers, along with sufficient prior inquiries of co-workers, contributes to a worker's understanding of how well a potential employer behaves. Workers always move towards better-performing employers if they move at all.

Assumption 7: Employers' fulfilment involves both time and monetary costs but gains incremental income, such as interest on money that would have been paid as wages to construction workers.

Assumption 8: Changing jobs when an employer fulfils incurs psychological costs (e.g., owing a favour or damaging social relations without incurring material costs) for workers. Otherwise, the only cost to workers might be that of conscientiousness. Employers' fulfilment increases the earnings (e.g., the non-occurrence of wage arrears) of workers and vice versa (e.g., saving recruitment costs).

Assumption 9: Changing jobs when an employer defects incurs few psychological costs for workers. Psychological costs are therefore related to the extent to which employers fulfil. The more actions that employers take to fulfil PC's content, the higher the psychological costs might be.

Assumption 10: The basic wages for a job are set at roughly the same level among employers. However, the extent of fulfilling PC varies by employers.

Assumption 11: Job search theory has revealed that job mobility also involves material costs, such as residence-moving costs, transportation costs, and living costs. In turn, employers must incur costs to recruit replacers.

3.2. Parameters

Based on the assumptions, we construct the following variables, with the value of each variable constrained to be greater than zero.

- When employers breach PC but workers keep stay, employers' incomes include workers' regular contributions to profits, P, and the money earned by breaching PC (e.g., interest income on wages not paid), P_1. The workers' incomes are the wages, S, that they receive from employers.
- When employers breach PC and workers leave, workers' incomes increase by S1 relative to their basic wages S, and mobility costs Mc. We argue that job mobility can benefit workers, as they move from their former employers (e.g., ones that withheld wages for long time) to a potential employer (e.g., ceteris paribus, this potential employer offers a performance-related or annual reward whereas former employer did not). However, although an employer may seem better-performing when workers move towards him, he may become an ill-performing employer over time. Even if workers choose a better-performing employer at first, that

employer will likely become ill-performing in the future under certain conditions (e.g., payment delays or non-payment of workers may someday result from general contractors withholding payments to subcontractor, because subcontractor' PC fulfilment are subjected to his/her employer' fulfilment: general contractor) (Tran & Carmichael, 2012). Then, workers will seek out a new, better-performing employer.

- When employers fulfil PC and workers keep stay, employers' fulfilment costs are *Ic*, employers' incomes increase by P_2, and workers' incomes increase by S_2 relative to their basic wages *S*.
- When employers fulfil PC but workers move anyway, employers' fulfilment costs are *Ic*, workers' incomes increase by S_3 relative to their basic wages *S*, workers' mobility costs are *Mc*, and workers' psychological costs are*Pc*.
- After workers have moved to other employers, their former employers incur cost *Rc* to recruit replacers.

Based on the assumptions and variables, we establish the payoff matrix shown in Table 1.

We assume that a worker moves with probability x $(0 \leq x \leq 1)$ and keep stay with probability $1-x$. Similarly, we assume that an employer fulfils probability y $(0 \leq y \leq 1)$ and breach probability $1-y$.

According to the fitness function in evolutionary game theory (Cheung & Friedman, 1998), we assume that, for a construction worker, the expected income of the mobility is $Ud1$, the expected income of the non-mobility is $Ud2$, and the average expected income is Ud. Based on this terminology, we express the following equations:

$$Ud1 = y(S+S3-Mc-Pc)+(1-y)(S+S1-Mc) = (S+S1-Mc)+y(S3-S1-Pc) \quad (1)$$

$$Ud2 = y(S+S2)+(1-y)S = S+yS2 \quad (2)$$

$$Ud = xUd1+(1-x)Ud2 = S+x(S1-Mc)+yS2+xy(S3-S2-S1-Pc) \quad (3)$$

Similarly, we assume that, for an employer, the expected income of the PC fulfilment employers is $Ut1$, the expected income of the PC breach is $Ut2$, and the average expected income, is Ut. Based on this terminology, we can express the following equations:

$$Ut1 = x(P-Ic-Rc)+(1-x)(P-Ic+P2) = (P+P2-Ic)-x(Rc+P2) \quad (4)$$

$$Ut2 = x(P-Rc+P1)+(1-x)(P+P1) = (P+P1)-xRc \quad (5)$$

Table 1. A general payoff matrix for both construction workers and employers.

		Construction worker changes employer			
		Yes		No	
Employer fulfil PC	Yes	$P-Ic-Rc$	$S+S_3-Mc-Pc$	$P-Ic+P_2$	$S+S_2$
	No	$P+P_1-Rc$	$S+S_1-Mc$	$P+P_1$	S

$$Ut = yUt1 + (1-y)Ut2 = (P + P1) + y(P2-P1-Ic)-xRc-xyP2 \tag{6}$$

Next, we construct the following replicator dynamics equations about x and y.

$$F(x) = \frac{dx}{dt} = x(Ud1-Ud) = x(1-x)\left[(S1-Mc) + y(S3-S1-S2-Pc)\right] \tag{7}$$

$$F(y) = \frac{dy}{dt} = y(Ut1-Ut) = y(1-y)[P2-(Ic + P1)-xP2] \tag{8}$$

According to the basic hypothesis, we can arrive at $S_3=S_2+S_1$. In other words, after construction workers successfully move to other employers, their incremental incomes relative to base wages have two components: the incremental income, S_2, associated with their former employers fulfilling PC and the incremental income, S_1, associated with their new employers fulfilling PC. Therefore, equation (9) can be condensed to the following:

$$F(x) = x(1-x)\left[(S1-Mc)-yPc\right] \tag{9}$$

4. Stability analysis

Hirshleifer (1977) pointed out that in the evolutionary game model, the trajectory emitted from an arbitrarily small neighbourhood will evolve towards a certain asymptotically stable balance point, which is called the evolutionary stable strategy (ESS). Given that the population share of mutants is sufficiently small, a certain strategy is said to remain evolutionarily stable (Taylor & Jonker, 1978).

When the functions $F(x)$and $F(y)$both equal zero, we obtain $x_1=0$, $x_2=1$, $x_3=\frac{P2-(Ic+P1)}{P2}$ and $y_1=0$, $y_2=1$, $y_3=\frac{S1-Mc}{Pc}$. Correspondingly, we obtain five evolutionary equilibrium points: $E_1(0,\ 0)$, $E_2(0,\ 1)$, $E_3(1,\ 0)$, $E_4(1,\ 1)$, and $E_5(\frac{P_2-(Ic+P_1)}{P_2},\ \frac{S_1-Mc}{P_c})$. According to equation (9), if $y=\frac{P2-(Ic+P1)}{P2}$, all x are ESSs; if $y\neq\frac{P2-(Ic+P1)}{P2}$, only $x^*=0$ and $x^*=1$ are ESSs. If $0<y<\frac{P2-(Ic+P1)}{P2}$, $x^*=1$ is an ESS, which means that construction workers should choose to move when the probability that employers fulfil PC is less than a specified value. If $\frac{P2-(Ic+P1)}{P2}<y<1$, $x^*=0$ is an ESS, which means that construction workers may not move when the probability that employers will fulfil PC is greater than a specified value.

Similarly, according to equation (8), if $x=\frac{S1-Mc}{Pc}$, all y are ESSs; if $x\neq\frac{S1-Mc}{Pc}$, only $y^*=0$ and $y^*=1$ are ESSs. If $0<x<\frac{S1-Mc}{Pc}$, $y^*=1$ is an ESS, which means that employers may breach PC when the probability that construction workers will move is less than a specified value. If $\frac{S1-Mc}{Pc}<x<1$, $y^*=0$ is an ESS, which means that employers should fulfil PC when the probability that construction workers will move is greater than a specified value.

Based on the above logic, evolutionary equilibrium stability depends on $[(S_1-Mc)-Pc]$ and $[P_2-(Ic+P_1)]$.

The first portion of the first term, $[S_1-Mc]$, is the net earnings of construction workers that move, namely, the earnings from the new job minus the mobility costs.

According to the above hypothesis, $[S_1-Mc]$ is greater than zero; otherwise, construction workers do not move. As a result, we can consider only whether $[S_1-Mc]$ belongs to [0, 1]. From these net monetary earnings of construction workers that move, we also subtract psychological costs (Pc) to arrive at $[(S_1-Mc)-Pc]$. If $[(S_1-Mc)-Pc]>0$, the net monetary earnings from moving outweigh the psychological costs of leaving the former employer; therefore, the workers are likely to move. Otherwise, they may not move.

The latter portion of the second term, $[Ic+P_1]$ is the net income of employers that breach PC, including the saved fulfilment costs (Ic) and the money earned (P_1) by breaching PC (e.g., interest income on wages not paid). We subtract this net income from the net income (P_2) of employers that fulfil PC to arrive at $[P_2-(Ic+P_1)]$. If $[P_2-(Ic+P_1)]>0$, the net income of employers that fulfil PC is greater than that of those that breach; if $[P_2-(Ic+P_1)]<0$, the net income of employers that fulfil PC is less than the net income of employers that breach. As a result, we can consider only whether $[P_2-(Ic+P_1)]$ is greater than zero. If $[P_2-(Ic+P_1)]>0$, then $\frac{P2-(Ic+P1)}{P2}$ must belong to [0, 1].

Friedman (1991) pointed out that the Jacobian matrix helps in demonstrating whether an evolutionary game system is stable. As for equilibrium points in a discrete system, equilibrium points in an evolutionary system reach stability only when the Jacobian matrix satisfies Det(J)>0 and Tr(J)<0. After solving for the partial derivatives with respect to x and y, we establish the following Jacobian matrix:

$$J = \begin{bmatrix} (1-2x)\left[(S1-Mc)-yPc\right] & -x(1-x)Pc \\ -y(1-y)P2 & (1-2y)\left[(P2-P1-Ic)-xP2\right] \end{bmatrix}$$

As was previously mentioned, whether an evolutionary equilibrium point is stable depends on the values of $[(S_1-Mc)-Pc]$ and $[P_2-(Ic+P_1)]$, both of which are either positive or negative (equalling zero is meaningless, and thus is neglected). Therefore, four cases are extracted to analyse the stability of the system. Namely, the whole employment regime are conceptualised as four cases (conditions).

Case 1: $(S_1-Mc)<Pc$ and $[P_2-(Ic+P_1)]>0$

In this case, the net monetary income of workers who move is less than their psychological costs, namely, $\frac{S1-Mc}{Pc}$ belongs to [0, 1], and the net income of a better-performing employer is greater than that of a bad one, namely, $\frac{P2-(Ic+P1)}{P2}$ belongs to [0, 1]. Based on those values, five equilibria are drawn: E_1, E_2, E_3, E_4, and E_5, Table 2 shows the results of the Jacobian matrix local stability analysis.

Table 2. Case 1: Analysis of the local stability of equilibria.

Equilibrium	Sign of DetJ	Sign of TrJ	Result
$E_1(0, 0)$	Positive	Positive	Unstable
$E_2(0, 1)$	Positive	Negative	Stable
$E_3(1, 0)$	Positive	Negative	Stable
$E_4(1, 1)$	Positive	Positive	Unstable
$E_5\left(\frac{P2-(Ic+P1)}{P2}, \frac{S_1-M_c}{Pc}\right)$	Negative	Zero	Saddle

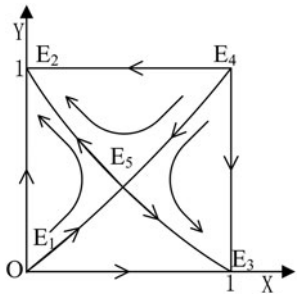

Figure 1. Case 1: evolutionary phase diagram.

Table 3. Case 2: Analysis of the local stability of equilibria.

Equilibrium	Sign of DetJ	Sign of TrJ	Result
$E_1(0, 0)$	Negative	Uncertain	Saddle
$E_2(0, 1)$	Negative	Uncertain	Saddle
$E_3(1, 0)$	Positive	Negative	Stable
$E_4(1, 1)$	Positive	Positive	Unstable

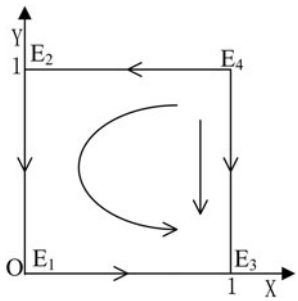

Figure 2. Case 2: evolutionary phase diagram.

Based on the results, we can draw the system's phase diagram (see Figure 1). As Figure 1 shows, from any initial state, the system will converge towards E_2 and E_3, indicating that both E_2 and E_3 are ESSs. E_2 occurs when employer fulfils PC, a moving worker incurs high psychological costs, and reluctantly do so. E_3 occurs when employer breaches PC, and a moving worker incurs little or no psychological costs, and leave for a better employer.

Case 2: $(S_1-Mc)<Pc$ and $[P_2-(Ic+P_1)]<0$

In this case, the net monetary income of a moving worker is less than psychological costs, namely, $\frac{S1-Mc}{Pc}$ belongs to [0, 1], and the net income of a better-performing employer is less than that of a bad one, namely, $\frac{P2-(Ic+P1)}{P2}$ is negative. Thus, four equilibria are captured: E_1, E_2, E_3, and E_4, its results of the Jacobian matrix equilibrium local stability analysis are shown in Table 3

Similarly, the system's phase diagram is presented in Figure 2. From any initial state, the system finally converges towards E_3, demonstrating E_3 is an ESS. The net income of a better-performing employer is less than that of a bad one; therefore, employer reluctantly fulfil PC, which in turn causes a moving worker incur few or no psychological costs.

Table 4. Case 3: Analysis of the local stability of equilibria.

Equilibrium	Sign of DetJ	Sign of TrJ	Result
$E_1(0, 0)$	Positive	Positive	Unstable
$E_2(0, 1)$	Negative	Uncertain	Saddle
$E_3(1, 0)$	Positive	Negative	Stable
$E_4(1, 1)$	Negative	Uncertain	Saddle

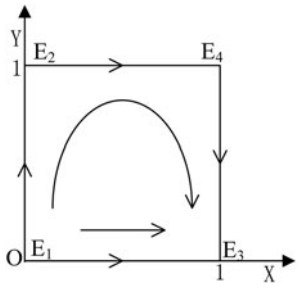

Figure 3. Case 3: evolutionary phase diagram.

Table 5. Case 4: Analysis of the local stability of equilibria.

Equilibrium	Sign of DetJ	Sign of TrJ	Result
$E_1(0, 0)$	Negative	Uncertain	Saddle
$E_2(0, 1)$	Positive	Positive	Unstable
$E_3(1, 0)$	Positive	Negative	Stable
$E_4(1, 1)$	Negative	Uncertain	Saddle

Case 3: $(S_1-Mc)>Pc$ and $[P_2-(Ic+P_1)]>0$

In this case, the net monetary income of a moving worker is greater than their psychological costs, namely, $\frac{S1-Mc}{Pc}$ is greater than 1, and the net income of a better-performing employer is greater than that of a bad one, namely, $\frac{P2-(Ic+P1)}{P2}$ belongs to [0, 1]. Thus, four equilibria are drawn: E_1, E_2, E_3, and E_4, Table 4 presents the results of the Jacobian matrix equilibrium local stability analysis.

We can draw the system's phase diagram (see Figure 3). As shown in Figure 3, from any initial state, the system ultimately converges towards E_3, representing E_3 is an ESS. An employer fulfils PC but not to the extent that a moving worker weight psychological costs over the net income of movement, so he/she continues to move.

Case 4: $(S_1-Mc)>Pc$ and $[P_2-(Ic+P_1)] <0$

In this case, the net monetary income of a moving worker is greater than psychological costs, namely, $\frac{S1-Mc}{Pc}$ is greater than 1, and the net income of a better-performing employer is less than that of a bad one, namely, $\frac{P2-(Ic+P1)}{P2}$ belongs to [0, 1]. Resultantly, four equilibria are captured: E_1, E_2, E_3, and E_4, its results of the Jacobian matrix local stability analysis are shown in Table 5.

Then, the system's phase diagram is presented in Figure 4. From any initial state, the system ultimately converges towards E_3, implying E_3 is an ESS. The net income

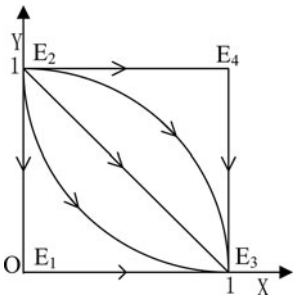

Figure 4. Case 4: evolutionary phase diagram.

of a better-performing employer is less than that of a bad one; expectably, employer breach PC. As such, having realised that movement will increase earnings and current employer is breaching PC, worker proactively move.

Taken all together, two stable points (E_2 and E_3) are identified in four cases. Specifically, E_2 exists only in case 1, and E_3 exists in cases 1, 2, 3, and 4. E_2 means that employer implements PC, which effectively decreases the probability of movement, worker keeps stay. Conversely, E_3 means that employer does not implement PC, worker will always move. The coexistence of E_3 in four cases (employment conditions) uncovers that the frequent movement of worker and under-fulfilment of employer is a necessary consequence of the ongoing employment regime. As shown in Figure 1 for case 1, the connecting line made up of points E_1, E_5, and E_4 is the boundary dividing the upper left and bottom right domains of convergence. Initial states in the upper left domain would converge towards E_2 while initial states in the bottom right domain would converge towards E_3. Consequently, converging towards E_2 or E_3 is determined by the connecting line that depends on E_5.

E_2 represents the desired status of government and migrants. The above discussion of how equilibria evolve towards E_2 may provide a clear guidance on regulating labour market to government.

5. Discussion

This study builds a theoretical framework to draw several findings regarding the relationship between the PC and the job mobility of migrant construction workers in the Chinese context, and makes some contributions in five ways. Through the lens of evolutionary game framework, rather than social exchange theory, first contribution is as follows: (1) Despite some similarity with social exchange theory on the conclusion, this process-oriented game model facilitates us to gain insight into the process of where and how PC under-fulfilment happens, as well as to suggest some targeted strategies. Building on the mathematical model, sensitivity analysis technique is utilised to determine how and the degree to which the outcome is affected by certain parameter change while others keep unchangeable. (2) Not just drawing the conclusion that in the case of fulfilling PC, the informal job mobility of workers will be under control, game framework is also utilised to demonstrate a major failure of the current employment regime in this industry. The coexistence of E_3 in four cases

uncovers that the ongoing employment regime fails to control informal job mobility of migrants, and also fails to incentive employer to retain leavers. These findings also verify our field observations in construction sites. (3) We advance job mobility at work by incorporating the concept of psychological contract and the operationalisation of tangible (psychological cost) and intangible cost (mobility cost), as well as benefits, into an evolutionary game framework for the employment exchange relationship. We extent a leaver's utility function beyond monetary costs and include in it the psychological costs that arising from 'betrayal'.

Second, we shed new light on the nature of the economic and the PC both of which can reinforce and support each other in a given workplace to yield synergetic effects on worker's emotions and behaviours (Sonnenberg, Koene, & Paauwe, 2011), and improves the understanding of where PC breach happen (what PC's contents were broken) and how to make mobility decision under different conditions. However, our findings indicate that the content of the PC and its effect on job mobility may not be consistent across workers with different levels of economic considerations. This portion of the content of the PC is important and suggests a novel boundary condition on the relationship between PC and job mobility. In a specific-context employment, a joint consideration of both economic and PC helps get a comprehensive insight into job motivation, work attitudes, and well-beings. As for migrant construction workers, who are both peasants and workers, we identified the contents and role of their PC breach in the job mobility process. Such an identification not only responds to the call for further work on migrants' quality of work life (Qiu et al., 2011) but it addresses the criticism that prior studies are limited to examining either the antecedents (e.g., Cohen, 2012) or consequences (e.g., Deery, Iverson, & Walsh, 2006) of PC breach.

Third, this study advances the job mobility, psychological contract, and construction labour management literatures by integrating these concepts into a process framework of the employment game, a novel contribution given the absence of such a fine-grained understanding in prior research. A good deal of attention has been devoted to the relationship between PC breach and negative job outcomes (e.g., job dissatisfaction, emotional exhaustion, turnover) in prior work, however, how these negative job outcomes occur after PC breach remains a relatively underdeveloped field in the literature. We focus on the process model, together with PC's components, to present how PC breach causes job mobility, enabling us to better predict how and why PC breach happens, and how to tackle PC breach and its negative outcomes. In addition, few researches focused on migrant construction workers job mobility from PC perspective. We approach a combination of economic and psychological elements to job mobility of migrant construction worker, offering a relatively comprehensive and practice relevant view of mobility that helps manger apply a package of measures to minimising the undesired effect. We emphasise the underdeveloped role of psychological cost as a driving factor for the behaviour of workers in turnover cognition. To some degree, this study explains why the financial model of payment-turnover cannot accurately predict job mobility in emerging economies (e.g., China).

Fourth, resolving employment for 280 million migrant (NBSC, 2017) workers has been long a salient challenge for central and local government. Such migrant job

issues as online activism, outrage, may have fuelled social unrest, labour action and social problems which authorities worry about the most (Cheng, Wang, & Chen, 2014). Our specific attentions to migrant construction worker, counting 55 million (NBSC, 2017) and representing the largest segment of migrants, may provide some underpinnings for academic research and policy discussions targeting at making migrants happier and ameliorating their quality of work life in urban China. The analysis of these issues has depended on specific assumptions regarding employment rules, industries climate, and players' beliefs, anyway, we at least demonstrated a major failure of the current employment regime and the necessity of updating players' beliefs and condition of certain parameters in the model.

Fifth, we advances Rousseau and Mclean Parks (1993) and Rousseau and Tijoriwala, (1998) research on psychological contract in two ways. (1) In the choice of assessment methodology, use of standardised assessment with qualitative and quantitative analysis can and should capture appropriately and validly the generalisable aspects of setting-specific PC content across workers in a relatively stable context. Subjective descriptions and self-report as to PC' content, fulfilment and breach, and features, help to capture the most direct origins of information with worker' perspectives unfiltered. (2) In the feature-oriented assessment, we proposed a new contractual characteristic: *importance*. In our context of migrants, we found that *importance* also helps differentiate between transactional-relational contracts. In comparison to other characteristics (e.g., tangibility, time frame), we argued that *importance* is the closest predictor to migrant' negative attitudes and behaviours (e.g., anger, turnover). *Importance* characteristic of PC content is particularly pertinent to the understanding of 'the motivational intensity' or 'the impetus to act' (Warr, Bindl, Parker, & Inceoglu, 2014) in the face of PC breach. Our interview materials and PC content analysis furtherly uncovered that in migrant' PC content, (a) transactional items are all important, such as payment, social insurance, safety protection, which would incur worker' intensively negative attitudes and behaviours once these important items are breached; (b) both important (e.g., payment, safety protection) and less important (e.g., trust, respect) items are included in relational contracts, the breach of less important ones usually incur little negative response. Here, we identified *importance* as an additional characteristic to Rousseau and Mclean Parks (1993) research on transactional-relational contracts. (a) We have furtherly advance the foundation of transactional-relational contract characteristic. The *importance* of PC, more so than PC' content, are generalisable across various employment settings (e.g., blue/white collar, occupation). PC' content depends on employment settings due to the inherent idiosyncrasy of PC, whereas the underling characteristics (dimensions) of contract keep generable. Suggesting a common and comprehensive set of characteristics (dimensions) is sufficient yet parsimonious and manageable to describe transactional-relational continuum. (b) The *importance* explicitly incorporates where workers place certain item along a transactional-relational continuum and the extent to which workers take certain item as their first choice or preference. (c) Consistent with the principle of requisite variety, the *importance* is integrated into existing dimensions framework. Such an operationalisation will strengthen the development of a coherent body of knowledge of transactional-relational continuum (McLean Parks, Kidder, &

Gallagher, 1998), where findings across research can be compared and understood and provide a consistent guidance to researchers and practitioners.

The results also have implications for policy-makers and subcontractors. We demonstrate that how workers perceive PC under-fulfilment, and assess their gain and loss before and after job mobility under different conditions, appears to provide a viable route to tackle its adverse outcomes (turnover). In emerging economics, migrant workers contribute significantly to urban development but suffer various discriminations (Cheng, Smyth, & Guo, 2015; Wang, Guo, & Cheng, 2015a), including wage, working situation, job security, social insurance coverage, and organisation identification discrimination. As environment. As Schalk and Rousseau (2001, p. 141) said 'the management of psychological contracts is a core task for firms that attempt to develop 'people-building' rather than 'people-using' organisations'. This study provides clear guidance regarding migrant workers' concerns and ways to relieve their informal job mobility in the Chinese construction industry. Informal job mobility has broad consequences for the construction industry, such labour shortages, labour cost increases, and the growing likelihood of quality and safety accidents. Once this situation grows out of control, the whole construction industry will suffer consequences. Therefore, a sustainable job environment and controlled job mobility are beneficial to both migrant workers and economic and social development. Our findings contribute to a better understanding of job mobility issues by focusing on the contents and affect of the PC, and we emphasise its importance in relieving migrant workers' informal job mobility.

In light of these conclusions, we also provide some implications for managerial practices. First, building on the legitimacy and willingness of both construction worker and employer, a private contract is one way to establish a legal framework, and should be support to stipulate what obligations employer must fulfil, what obligations worker must obey, how to penalise violators, and leave adequate room to negotiate in a changing condition. Such a sophisticated private contract may ameliorate employer–worker disputes (Goetz & Scott, 1981). Second, the government can develop a contract system with specific terms that cover as much of the PC as possible. For example, a wage is paid monthly to workers because spiking wage arrears have been an issue facing migrant workers over the years. By switching to a formal, written contract, the obligations of both parties can be specified. Therefore, the government can develop an official standard form contract for employers and workers, tighten subsequent oversight, and crack down on any violations of contracts. Finally, the study provides clear guidance on the aspects of workers' PC that managers should pay attention to, so managers can assess the degree to which the two types of contracts, written and psychological, and then develop worker' emotional and psychological attachment, identification with and involvement with this organisation, are functional by gauging construction migrant workers' turnover intentions. However, with PC of new generation migrants changing, a single pattern of monetary interventions (e.g., pay rise) may not always prove effective such job control-oriented inducements (e.g., job autonomy) as promote both the intrinsic and extrinsic value of this job, should be considered.

6. Limitations and future research

There are several limitations to this study that suggest valuable research directions. First, we examined the PC only in a typical industry and country, the construction industry in China. Thus, our findings may not generalise to other countries or industries due to varying economic situations, cultural norms, or governance practices. Second, this study did not consider possible firm-level factors (e.g., talent strategies or HR systems) or individual differences (e.g., needs of different strengths) that may shape the contents of workers' PC and drive our findings. Thus, it would be a valuable extension to study whether such factors drive the functioning of the PC. Third, our findings were drawn through the lens of the mathematical calculation of a pure theoretical model and lack empirical support, which may limit their practicability. Therefore, the use of a longitudinal survey and subsequent empirical inference are encouraged to confirm our results and provide greater insight into the temporal dynamics through which PC affects the job mobility process, which may strengthen our results' generalisability.

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