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DISCUSSION
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Mary Davis

Piece Rate, Productivity, and Occupational Health in the Global Economy

Mixed Method Evidence from
Cambodian Garment Factories



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Piece Rate, Productivity, and Occupational Health in the Global Economy: Mixed Method Evidence from Cambodian Garment Factories

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ABSTRACT

Piece rate pay is a common form of compensation in developing-world industries, including the garment sector. While the piece rate may boost productivity, it has been shown to have unintended consequences for occupational safety and health, including increased accident and injury risk. Evidence from developing world industries and contexts is limited. This study explores the relationship between piece rate, worker health, and business strategy in a developing world case, the Cambodian garment sector. The research uses a mixed method study design, combining the results of a quantitative analyses of garment worker survey data with a qualitative assessment of managerial interviews at a subset of Cambodian factories.

Workers paid by the piece report significantly higher rates of occupational injury (Odds Ratio=5.87), while the relationship between piece rate and other health outcomes was mixed (some positive, some negative). Management interviews highlight an important role for piece rate in strengthening industry competitiveness and the business bottom line. The results are extrapolated to characterize potential piece rate implementation scenarios that offer a win-win for both businesses and workers versus those that are largely exploitative of workers. These results address important gaps in our understanding of how piece rate impacts the health and safety of workers, as well as business strategy and competitiveness in developing world sectors. More research is needed to generalize these results and develop recommendations around best practices.

Keywords: piece rate; occupational health; accident and injury risk; business strategy; developing world; Cambodia; garment sector

INTRODUCTION

Paying workers based on their own output levels, also known as performance pay or piece rate, has been identified as an effective strategy to boost worker productivity across developed world economies and business sectors (Gielen et al. 2010; Lazear 2000, 2007; Shearer 2004). However, there is a gap in the literature around how this relationship plays out in the developing world, where wages are often significantly lower and worker protections and labor laws are weaker by comparison. The number of workers paid piece rate in the developing world varies widely from country to country [recent evidence from the apparel sector ranged from 32% of workers in Vietnam to 83% of workers in Haiti (Borino, 2018)]. Present day use of the piece rate is more common in the developing world compared to advanced economies, where it has declined along with the waning importance of the manufacturing sector over time (Helper et al. 2010).

The lack of research on piece rate and productivity in the developing world represents a challenge when it comes to understanding the unintended consequences of the strategy on worker health and safety, as well as operating costs. In developed world studies, evidence suggests that gains in productivity may be offset by counterproductive worker behaviors, including those detrimental to health that ultimately increase operating costs and lower business profits (Artz and Heywood 2015; Freeman and Kleiner 2005; MacDonald and Marx 2001). Piece rate systems have been identified as a risk factor for occupational accidents (Artz and Heywood 2015), poor worker health behaviors and outcomes (Davis and Hoyt 2020; Artz et al 2021), and may require increased managerial oversight and quality control efforts (Freeman and Kleiner 2005). Additional evidence from the developing world garment industry reaches similar conclusions (Davis 2016). In general, research suggests that business strategies intended to get workers to work faster may come at a high cost to their health and increase the cost of production in ways that balance out productivity gains.

This paper contributes to the literature by using a mixed method study design that combines qualitative management interviews with quantitative analyses of worker survey data to understand the implementation and consequences of piece rate in the developing world garment sector, using Cambodia as the case country. This research explores the management strategy around compensation and piece rate pay, including the impact to productivity, profits, and factory operations, as well as self-reported health outcomes for a subset of workers in the Cambodian garment sector. Based on these results, an initial framework is presented that identifies when a piece rate strategy might be mutually beneficial to factories and workers, as well as an alternative scenario more likely to result in exploitative conditions for developing world workers.

COUNTRY SETTING

This research was conducted in collaboration with the organization Better Factories Cambodia (BFC), which has been operating in the country since 2001. BFC is a country partner in the larger

organization Better Work, which is jointly funded by the International Labour Organization (ILO) and the International Finance Corporation. The goal of BFC and other country-level Better Work programs are to improve working conditions and competitiveness of the global apparel industry.

Cambodia represents an interesting case country to explore the implications of incentive pay on developing world workers, although its unique historical and geopolitical circumstances make it challenging to generalize the results to other developing world contexts. Cambodia experienced a period of genocide and famine during the mid-1970s and lacked basic education and public health services during that time. Not surprisingly, the impact of such widespread trauma has generational effects on the physical and emotional health of the population; Cambodia continues to rank poorly compared to other low- and middle-income countries on indicators such as educational attainment, literacy, and infant mortality nearly a half century later (World Bank 2021).

As reported by Better Factories Cambodia, the majority of apparel factories operating in Cambodia are Chinese owned (70-75% of factories registered with BFC report Chinese ownership). Cambodian labor law affords many protections to workers, including a minimum wage of \$192 per month as of January 2021. The minimum wage is reset annually by the Cambodian government, and as such, wage growth for the domestic workforce is among the fastest in the world. Important to note is that the minimum wage law in Cambodia prevents total worker pay derived from piece rate and quota systems from falling below the legal minimum wage floor, which deviates from the system of other developing world countries without such base wage protections.

In addition to the minimum wage, Cambodian labor law affords workers a certain level of labor-related benefits. For example, overtime beyond the 48-hour work week is regulated and paid at a premium, workers have access to personal and medical leaves for a variety of purposes including the care of sick relatives, and health insurance is provided for occupationally related illness and injury. Infirmarys located at the factories conduct initial checkups and handle minor acute illness and injury, but do not provide routine or chronic care. The majority of Cambodians do not have health insurance to cover non-work health problems.

About 50% of Cambodian factories have unions, and many have multiple active unions (BFC 2018). There are no 'closed shops' in Cambodia, meaning that workers are not forced to join a union to work at any particular factory. In the past, strikes and violence around worker and management conflict were common, although they have become less prevalent over time (BFC 2018). The Cambodian economy was enjoying a period of significant growth and foreign investment prior to the pandemic but has suffered greatly as a result of COVID-19 and the coinciding loss of free-trade status to the EU consumer market (World Bank 2021).

METHODS

This research uses a mixed method design to explore piece rate as a business strategy in the developing world. The mixed method design allows the researcher to triangulate evidence from quantitative surveys of garment workers with qualitative management interviews and factory visits to provide a more complete picture of business strategy, profits, and health outcomes related to piece rate in the developing world garment context. The research highlights concerns unique to the Cambodian labor market as the specific case examined, including education, skills, and work ethic, that might impact the relationship and its generalizability to other developing world contexts.

Quantitative Methods

The data used in the quantitative analyses were collected by Better Factories Cambodia during annual surveys of workers and managers in a subset of their participating factories. The statistical approach closely replicates the methods of an earlier study of Vietnamese workers (Davis 2016). The survey data include information on worker demographic characteristics, factory operations, and worker compensation, which is further broken down by production quota and piece rate pay. Quota represents a category whereby worker pay is benchmarked to a specific output level. Although it is explored as its own pay category here, it is broadly understood as similar to piece rate in that it ties worker compensation directly to output with a similar underlying goal of speeding the pace of work. The two categories of piece rate and quota pay are not mutually exclusive, i.e., a worker could work simultaneously under both piece rate and quota systems. The sample includes survey data collected from Cambodian workers across 57 factories between 2015 and 2018. The majority of workers were surveyed only once over this time period, with roughly 15-16% of the sample representing a second observation on an individual worker.

A logit model is used to predict worker health outcomes related to wage incentives using the following equation:

$$I_i = \alpha_0 + \beta X_i + \delta W + \phi \text{PayType}_i + \kappa_t + \varepsilon_i$$

where i and t index workers and years, respectively, I is the presence of a physical or emotional health symptom (No=0, Yes=1), X is a vector of worker demographic characteristics, W is a vector of factory characteristics, PayType represents the presence of piece rate or quota (No=0, Yes=1), and κ represents year-specific dummy variables. Since the time period assessed was short (2015-2018) and repeat observations of workers within the overall sample was relatively small, the final model analyzed the dataset as a single cross-sectional panel with year dummies. Additional specifications that controlled for the small number of repeat observations were tested but not found to improve on the model described here.

Qualitative Methods

Factories for site visit were selected in advance by BFC staff among the available and willing group of factories that participate in the BFC program. BFC identified potential factories by emailing suppliers and brands with known interest in this topic, asking them to identify and nominate two factories for participation in this research. The original target sample size of factories was eight to 10; ultimately, eight factories were visited in Cambodia over a five-day period in December 2019.

Managers within a given factory were selected based on their knowledge of compensation and management operations, including but not limited to job titles such as General Manager and Human Resource Manager. Despite a concerted effort to interview a random sample of managers with a consistent level of experience and familiarity with compensation and management strategy at their factories, there was ultimately a great deal of variation along these criteria among the managers that presented themselves for interview. In some cases, high level conversations were possible with managers that oversaw operations across multiple factories, while in other cases mid-level managers provided context on daily operations but less big picture understanding of strategy. Due to the variability in management level within the factory organizations, the survey questions asked during the actual interviews differed somewhat in response to the specific knowledge and content expertise of the individual manager(s) present. As a result of this variability, it is challenging to make generalized conclusions about manager sentiment based solely on the results of these interviews.

The interviews took place over one to one and a half hours in the manager conference room or office. A Chinese translator was present for one of the interviews, while all others were conducted in English. Managers provided informed consent to participate in the study, and the interview protocol was approved by the Tufts University Institutional Review Board. In most cases, the information provided by the managers was cross-referenced with the most recent BFC annual compliance report that provided factory level information on compliance with international and domestic labor laws (BFC 2018).

RESULTS

Quantitative

Analysis of Worker Survey Data

Table 1 provides a summary of the worker and factory characteristics from the BFC surveys. Nearly 50% of workers are paid piece rate, while closer to 70% of workers face some sort of quota (hourly, daily, or weekly). The majority of surveyed workers are female, with over half of workers in their 20's. More than half of workers lack any education beyond primary school, a little over half are married, and approximately 10% identify as 'sewers.' A third of the sample have worked

at their factory for less than a year, but nearly 40% have been working at their current factory for over two years. The average factory size is nearly 3,000 employees.

The average worker reported 56 hours of effort per week, with an average monthly wage of just under \$250. Piece rate workers reportedly worked an average of 0.7 hours less than non-piece rate workers per week, but this difference was not statistically significant. Piece rate workers self-report earnings of \$0.60 more per month than non-piece rate workers, but again, this difference was not statistically significant. In other words, there was no discernable difference in total wages received or hours worked between piece rate or daily wage workers. Breaking these comparisons down by year to explore the impact of annual changes to the minimum wage did not provide evidence of statistically significant differences or discernable trends. However, it is important to note that these analyses are based on worker self-report of their last paycheck and subject to bias. Additional records on worker compensation from the factories would be helpful to tease out any trends in pay and hours worked across compensation type, as well as the impact of the increasing minimum wage over time.

Tables 2 and 3 summarize self-reported worker health in the total sample as well as comparatively by piece rate and quota pay, not controlling for other factors. Although there is no discernable statistical trend across categories in overall health ratings (Table 2), the more nuanced review of individual health concerns (Table 3) highlights a few potential areas of concern. These include statistically significant differences in reported hunger, various body aches, fatigue, dizzy, worry, sadness, and lower rates of life and job satisfaction.

To further explore these trends, Table 4 presents the results of a logit regression relating piece rate and quota to self-reported health outcomes, controlling for the worker and factory variables listed in Table 1 (for simplicity, the coefficients from the controls are not shown in the table). The results suggest that workers paid piece rate are significantly more likely to self-report hunger (OR=1.76) compared to their non-piece rate peers. Similarly, workers subject to quota experience significantly lower odds of hunger (OR=0.70) and stomachache (OR=0.58), higher odds of dizziness (OR=1.97), and higher odds of job satisfaction (OR=1.48) when controlling for other factors. Most striking is the relationship between piece rate and injury. Piece rate pay significantly increases the odds that a worker self-reports being injured on the job (OR=5.87). In other words, the odds of a piece rate worker being injured is nearly six times that of non-piece rate workers, suggesting that piece rate work represents a safety hazard in this particular context, in line with existing evidence from the developed world. However, there is no additional information on the severity or type of injury to help put these results in context, particularly as it is balanced against the potential benefits of piece rate pay described later in this paper. There is no statistically significant difference in injury rates for workers reporting quota pay.

Table 1: Summary Statistics for Worker Survey Data

	Definition	Data structure	N	Mean	Stat sig differences by piece rate	Stat sig differences by quota
Piece rate	Is your pay determined by piece rate?	0=No 1=Yes	2,457	47.9%		
Quota	Is there a production target or quota for you or your line?	0=No 1=Yes (includes hourly, daily, weekly quotas)	2,018	67.4%		
Sex	Are you male or female?	0=Male 1=Female	3,023	82.7%	Not significant	Not significant
Age	How old are you?	1=20 and under 2=21-30 3=31-40 4=over 40	2,924	1=12.5% 2=55.1% 3=27.7% 4=4.7%	p<0.01 (older workers more likely to receive piece rate)	Not significant
Education	What is your highest level of education?	1=Primary school or lower 2=Lower secondary school 3=Upper secondary school or higher	2,770	1=56.6% 2=27.9% 3=15.5%	p<0.01 (less educated workers more likely to receive piece rate)	Not significant
Marital status	What is your marital status?	0=No (single, divorced, widowed, or separated) 1=Yes (Married or domestic partnership)	2,690	52.9%	Not significant	Not significant
Sewer	What is your job in the factory?	Responded as sewer 0=No 1=Yes	3,096	10.4%	Not significant	p<0.05 (sewers more likely to face quota)
Tenure	How long have you been working in this factory?	1=One year or less 2=1-2 years 3=more than 2 years	2,843	1=32.4% 2=28.9% 3=38.7%	Not significant	Not significant
Monthly pay	Derived based on self-reported last paycheck	Continuous	898	\$242 (Med \$215; SD \$132)	Not significant	Not significant
Current employees	Number of employees	Continuous	2,976	1,066.9 (Med 981; SD 743.9)	Not significant	p<0.05 (larger factories more likely to use quota)
Hours worked	Weekly hours	Continuous	1,536	55.6 (Med 57; SD 13.2)	Not significant	Not significant

Table 2: Worker Overall Health Summary (Six Categories) by Piece Rate and Quota

	Total	Piece rate	No piece rate	Quota	No quota
Excellent	16.1%	15.7%	16.3%	15.2%	17.5%
Very good	8.2%	8.6%	6.7%	7.8%	6.9%
Good	23.7%	24.2%	22%	22.0%	26.9%
Fair	47.4%	46.4%	50.7%	50.5%	43.8%
Poor	3.4%	3.8%	3.5%	3.5%	3.7%
Very poor	1.2%	1.4%	0.8%	1.0%	1.3%

Statistical significance across categories determined by chi-square test (**<0.01; *<0.05)

Table 3: Worker Health Summary by Piece Rate and Quota

	Question	N	% total sample	% piece rate	% no piece rate	% quota	% no quota
Hungry	Often uncomfortably during the day; often too hungry to sleep at night	2,458	19.3%	21.8%**	16.3%	18.8%	21.3%
Thirsty	Often during the day; most of the time or always	2,617	50.7%	50.0%	52.5%	51.5%	52.1%
Headache/light-headedness	Always; often	2,691	13.8%	15.7%	13.0%	14.1%	12.5%
Backache	Always; often	2,693	15.6%	16.7%	14.9%	18.0%*	13.7%
Neckache	Always; often	2,624	11.6%	12.7%	11.3%	13.2%*	9.2%
Stomachache	Always; often	2,683	10.0%	11.9%**	8.6%	9.9%	12.0%
Cough	Always; often	2,614	8.5%	8.9%	8.2%	9.4%	8.7%
Tired	Always; often	2,654	14.9%	14.9%	16.0%	17.0%*	13.1%
Dizzy	Always; often	2,667	11.4%	12.3%	11.4%	14.2%**	8.2%
Worry (kut caraeun)	Always; often	2,579	14.9%	15.5%	15.8%	17.3%*	12.8%
Panic (kaeut khyâl)	Always; often	2,647	7.0%	7.9%	6.9%	8.4%	6.1%
Work even when sick	Yes, even if I'm very sick	2,688	6.9%	7.6%	6.7%	8.2%	6.5%
Injured	Always; often	2,628	2.8%	3.5%	2.2%	3.4%	2.6%
Poor health	Poor; very poor	2,736	4.6%	5.2%	4.3%	4.5%	5.9%
Sad	Always; often	2,464	5.9%	8.9%	7.2%	9.0%**	0%??
Life satisfaction	Very, somewhat satisfied	2,578	82.5%	83.9%*	83.5%	81.6%	83.1%
Job satisfaction	Very, somewhat satisfied	2,769	79.8%	77.2%*	81.5%	80.3%	77.1%

Statistical significance across categories determined by chi-square test (**<0.01; *<0.05)

Table 4: Logit Regressions of Worker Health Outcomes by Piece Rate and Quota

	Hungry	Thirsty	Head ache	Back ache	Neck ache	Stomach ache	Cough	Tired	Dizzy
Piece rate (Yes)	1.76**	0.80	1.30	1.44	1.17	1.19	0.99	0.96	0.98
Quota (Yes)	0.70*	1.02	1.20	1.16	1.19	0.58*	0.82	1.21	1.97**
Controls from Table 1	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>
N total	922	932	936	937	941	938	937	939	941

Odds ratios presented with corresponding p-values **<0.01; *<0.05

Table 4 contd.

	Worry	Panic	Sick	Injured	Poor Health	Sad	Life satisfaction	Job satisfaction
Piece rate (Yes)	1.14	1.13	0.94	5.87**	1.38	1.20	0.88	0.75
Quota (Yes)	1.23	1.35	1.62	0.83	0.70	1.32	0.91	1.48*
Controls from Table 1	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>Included</i>
N total	928	935	933	937	944	889	923	943

Odds ratios presented with corresponding p-values **<0.01; *<0.05

Qualitative

Summary of Management Interviews

Description of factories and managers

Managers in eight factories were interviewed in December 2019 for the purposes of this study. The surveyed factories made a range of apparel products and were internationally owned by corporate entities located in Malaysia, China, and Taiwan. All had long-term supply relationships with prominent buyers, and all serviced multiple buyers with the exception of one that reportedly produced apparel for a single buyer. The average factory was eight to 10 years old, with a range of three to 15 years in operation. All of the factories were part of a larger parent organization that included many other factories, operating both inside and outside of Cambodia. The physical size of operations ranged from one to four production buildings, with between 700 and nearly 4,000 (average 1,900) employees. All factories had active and recognized unions, with as many as four unions operating in a single factory. Workers in the surveyed factories worked a typical Cambodian work week of six days per week, 10 hours per day (eight regular hours plus two hours of overtime), although one factory reportedly limited overtime on the sixth day.

Between one and three managers were available for interview at each of the eight factories. A number of managers at the highest level of management were available for interview, including the general manager, as well as head of operations and executive director

that included responsibility over many factories both inside and outside of Cambodia. Additional managers available for interview included those heading factory departments such as HR, compliance, and sustainability. The total sample of managers available across the eight factories consisted of nine men and five women from a range of academic backgrounds, primarily within the business fields of management and accounting, as well as engineering. The average tenure with the company was 10 years, ranging from less than a year to 30 years. A single interview space and period of time was used to connect with all available managers in a given factory, as opposed to separate meetings with individual managers. Interviews lasted between one hour and one and a half hours.

Management strategy around piece rate compensation

Five of the eight factories used a piece rate system to compensate workers, while the other three factories paid workers a salary, more commonly known in Cambodia as the ‘daily wage.’ As noted previously, the minimum wage law in Cambodia prevents total worker pay derived from the piece rate or quota system to fall below the legal minimum wage floor. The use of piece rate in factories varied in the extent to which they implemented the incentive system across job types, from only sewers to all production-related jobs. Regardless of worker compensation as piece rate or daily wage, all factories were actively engaged in promoting incentives to recruit, retain, and motivate workers.

Changes to the piece rate are reportedly made with every new garment style based on the level of difficulty and internal production data; as noted by one manager, in order to be ‘not too hard, not too easy.’ When asked the question ‘Who makes the pay decisions?’ six of the factories explicitly noted that pay decisions are made by headquarters and apply to all Cambodian factories under the parent company. In other words, the compensation systems are largely determined by a top-down approach that does not consider worker input or feedback.

There was a bit more variety in manager responses when asked the related question ‘What information is used to make pay decisions?’, with answers diverging somewhat based on whether the factory paid piece rate or salary. For the group of piece rate factories, pay determination makes use of internal productivity data and staff expertise, including industrial engineers and line supervisors, and is updated with each new garment style and production process. One piece rate manager noted that if they see the piece rate or target isn’t working, they adjust and change it. In terms of worker input, another manager noted that if it was set too low that workers would complain, at which point the factory would collect production data to support or refute worker claims about the unfairly low piece rate. Although this manager didn’t explicitly note that workers’ concerns are incorporated into the piece rate setting process, the complaint review suggests that worker concerns may be considered in updating the piece rate after the fact, under certain conditions. Factories that paid salary reportedly drew on the expertise of their industrial engineers from within their corporate organization to make pay decisions based on an ‘average’ expectation of productivity. Others used data on an international standard they referred to as ‘general sewing data’ with an adjustment for the country context, as well as market surveys and competitiveness assessments. Yet another manager vaguely

described a process whereby a skilled sewer would use a clicker to make estimations on productivity (referred to by this manager as ‘scientific estimations’) to determine productivity targets.

When asked ‘How often do you change compensation?’, all but one factory said they change compensation (piece rate or bonus/targets) with each new style, as well as annual updates based on changes to the minimum wage. Only one factory deviated from this timeline, suggesting that they review compensation every month to remain ‘fair and competitive.’

When asked how their competitors compensated workers, half of managers said they didn’t know, and the other half were split between thinking that competitor factories were majority daily wage or majority piece rate. Although one manager suggested that overall market trends and competitiveness were important to setting pay, the lack of understanding about how their direct competitors were paying workers suggests room for improvement around communication of best practices in compensation. Managers reported no pressure from buyers with respect to worker compensation type – salary or piece rate. Uniformly, managers felt that buyers cared only about overall compliance with wage laws while receiving the cheapest price on their products.

The three factories that paid daily wage reportedly did so very reluctantly, and expressed a strict preference for piece rate as a productivity boosting approach. Those that paid daily wage reported high labor costs related to implementation, which pegs the piece rate to the minimum wage and dictates how overtime should be interpreted in that context. Only one factory had always paid daily wage, while the other daily wage factories converted in response to the Cambodian minimum wage law. Additionally, Cambodian labor law requires that the piece rate be set so that 60% of workers with average ability are able to earn at least the minimum wage (\$192/month in January 2021). The piece rate factories had varying success at meeting that criteria, and two were cited in their most recent BFC compliance report as failing to meet that standard. One manager argued that the 60% target was too high, and although it might be appropriate for high-skilled garment work, a 50% target would be more reasonable in the generally low-skilled sector in which this particular manager and factory was operating. The piece rate factories varied in their reports of average wages earned, ranging from \$220-280 per month to as high as \$330-350, including overtime pay. All piece rate factories were determined by BFC to be compliant with requirements related to hours worked beyond the minimum wage.

Implications of higher Cambodian minimum wage

The Cambodian minimum wage law and the annual increases have impacted not only the wage floor, but in most cases, how and when the factories set their piece rate. Prior to the minimum wage law, the piece rate took into account company standards, country context, internal productivity data, historical practice, and industrial engineering standards, and was reviewed on an as needed basis with changes in garment style and market trends. As a result of the minimum wage law, changes to the piece rate are now updated both as needed as well as annually to stay in compliance with the standards dictating the relationship between the minimum wage and the piece rate.

Although the practice of annual updates and reviews might suggest an ever-increasing piece rate in tandem with the annual increase to the minimum wage, managers acknowledged a steady erosion of the piece rate differential and financial incentives over time. One manager suggested that the minimum wage increasingly favors the low-skilled over the high-skilled worker as a means of increasing only the base of the lowest performing worker, while eroding the premium for high skilled labor and effort. Managers suggested that the minimum wage has changed how workers respond to work effort and incentives in the piece rate factories. Managers also noted that the compensation expectations for workers had greatly increased as a result of the minimum wage law. For example, one manager noted that prior to the minimum wage law, workers were mostly demanding overtime as a way to increase their incomes, while at present this is no longer the primary concern of workers. Managers also noted that the minimum wage law has required greater levels of communication between managers and workers so that they understand the wage setting process.

Almost all of the managers thought the minimum wage law was too high a standard for the garment industry, whether it be as a base salary or as a benchmark for the piece rate. As evidence, they described Cambodia as being among the countries with the fastest growing wages in the world; one manager suggested that wages represent 80% of the cost of a garment in their factory, in a market with generally small profit margins. One manager expressed support for the minimum wage and appreciated how it helped the country maintain labor market competitiveness across international borders. This manager believed that labor competition from abroad and Cambodians seeking employment in nearby countries would further tighten an already competitive labor market, and as a result, the Cambodian minimum wage needed to keep pace to retain its domestic workforce.

Piece rate and productivity in the developed vs developing world

There was unanimous agreement among managers that piece rate had a positive impact on both worker productivity and factory profits. The factories that compensated workers using a daily wage expressed a desire to use piece rate, but did not feel that it was the best option given the relatively high minimum wage and benchmarking standards to piece rate and overtime stemming from Cambodian labor law.

Managers were asked whether they thought that the evidence linking piece rate to productivity in the academic literature, which is almost uniformly focused on developed world factories and industries in the United States and Europe, could be generalized to the developing world context and specifically to their factory in Cambodia. Across the board, managers felt that the relationship between piece rate and productivity was strong in their settings. Multiple managers said that their companies had conducted wage experiments and confirmed this relationship, or that this was the explicit understanding relayed by international headquarters.

One factory had experienced a switch from piece rate to daily wage, which the manager noted was in response to the increasing minimum wage and specifically the interpretation of overtime rules under piece rate. In this case, the manager described a significant decline in efficiency after moving to daily wage, from 60-70% efficiency to 50% efficiency. In other words,

workers on daily wage in that factory were only productive about four hours of an eight-hour workday. In addition to the drop in productivity and output at this factory, absenteeism went up, and worker turnover became a problem as they lost high efficiency workers to competing factories paying piece rate and gained low efficiency workers in their place. This manager said that the factory had to balance out these losses in efficiency by becoming a more lean and automated operation, and that advanced technology and increased precision were critical to maintaining a competitive factory in the absence of piece rate incentives.

In addition to the internal evidence cited in support of piece rate's productivity effect, many managers felt that the link was likely stronger in the developing world compared to the developed world context. In one case, a manager expressed an opinion that developing country workers often lacked the work ethic and sophistication of developed country workers. One manager pointed to the low education rate of workers in their factory (citing that 38% lacked formal education beyond primary school) as evidence of this perceived deficit of learned behavior around 'hard work.' This same manager argued the piece rate was a 'human right' because it afforded workers the opportunity to earn more based on their own effort. Another manager noted that piece rate work was the norm before apparel arrived in Cambodia, so it was already in the worker mindset. Along this line of reasoning, multiple managers noted that wage incentives were a critical component to productivity within their factories. There was a general sentiment among managers that workers have gradually become complacent under the minimum wage system, resulting in direct declines in worker productivity and work effort. To complicate matters, declining productivity is happening simultaneously with increased time to delivery pressure from buyers.

Another manager pointed to potential differences in the developed and developing world context as related to the learning curve, worker substitution, and high rates of absenteeism. This manager suggested that it takes workers longer to develop the skills needed to do the work due to the generally low levels of education present in the Cambodian workforce. When workers are absent and substitutions in the line are made to accommodate the missing worker, additional learning has to take place on the spot before the line can function properly without the absent worker. The manager suggested that the higher rates of absenteeism make this learning and substitution more challenging in the Cambodian context, thereby impacting the ability of other workers in the line to earn based on their own skill. Another manager also emphasized the point that the low-skilled workforce and the learning curve present a challenge to properly implementing a piece rate and incentivizing workers to be more productive. In general, managers suggested that the low-education level of the Cambodian workforce also made it more challenging to motivate them.

Yet another manager suggested that the piece rate works better in contexts such as Cambodia and the developing world where wages are generally low and the cost of living is low relative to the developed world. In these cases, the piece rate incentive is more impactful because workers can purchase more with the additional wage premium, including necessities. However, it is important to note that in low-income countries where the cost of living and general necessities are high, this stronger piece rate incentive may not hold.

Overall, the managers surveyed believed incentives tied directly to worker effort and output boost productivity. All factories regardless of whether they paid an explicit piece rate pursued incentive strategies that included both team and individual bonuses for effort to incentivize work effort to various extents. However, tying compensation to group and team effort through collective bonuses was seen as less effective than individual incentives, because they required more learning and intrinsic work effort on the part of workers.

Perceived worker preferences

When asked whether they thought workers would prefer to be compensated using the piece rate or daily wage, half of the managers felt that workers prefer piece rate because of the ability to earn more money, while the other half differentiated worker sentiment into two groups – skilled and motivated, and unskilled and unmotivated. The skilled and motivated workers respond to piece rate incentives by working harder and being more productive, utilizing their skills to the mutual benefit of themselves and factories. However, there was agreement among this half of managers that another group of workers prefer a stable pay that does not require additional strenuous effort on their part. ‘They want to work, earn a steady wage, and go home with less stress.’ One manager also noted that it depended on the proportional difference of the piece rate compared to minimum wage. If it wasn’t sufficiently greater, workers prefer to just earn less for less effort. As noted previously, the piece rate differential has steadily eroded over time with increases in the minimum wage floor. Additionally, new workers that have not acquired skills on the job were thought to be more likely to prefer daily wage, while their preferences evolve to piece rate as they become more adept at their work.

In response to whether managers thought the union would prefer piece rate or daily wage, the responses were similarly mixed. Half of managers thought the union would definitely prefer piece rate based on the ability of workers under that system to earn more than the minimum wage. The other half thought the union response was more mixed in favor of a daily dependable wage. Regardless, unions were perceived as pushing simultaneously for both higher wages *and* less pressure on workers.

Despite manager suggestions that productive workers favor piece rate, the extent to which worker feedback is valued in the piece rate setting process is questionable. As noted in the previous section, managers suggest that worker *complaints* about poorly set piece rate appear to be taken into consideration. However, there is no evidence to suggest that worker input through internal bargaining, worker committees, union leadership, etc., are incorporated into the initial decisions around compensation type or the setting of targets.

Importance of other incentives and worker benefits to compensation strategy

Regardless of whether factories compensated workers based on a piece rate or daily wage, all managers suggested that incentives, benefits, and bonuses represented a critical management strategy to recruit, retain, and motivate skilled workers. Factories compete with each other on benefits to differentiate their work environments and attract skilled labor. According to one manager, the only thing that works to motivate workers is money (‘money talks’), and as such,

most of the benefits to workers are financial. Another manager went so far as to tie low rates of absenteeism to a happier workforce as a result of the good benefits workers receive in that factory. Although the benefit strategies were similar across factories, there were differences in the extent to which particular benefits were afforded to workers. Table 5 below provides a count of the various benefits cited by managers as present in their factory that *exceeded* the Cambodian labor law requirements. Where possible, these assertions of additional worker benefits were verified in the most recent BFC compliance report (BFC 2018).

With respect to the group incentives, only two of the managers mentioned that they were being used in a significant way, and both of these factories paid salary. Group incentives were described as a weak substitute to the individual piece rate incentive in cases where the factories lacked one.

Table 5: Count of Benefit Categories Exceeding Labor Law Requirements (n=8)

Additional benefit/bonus description	Count of factories
Lunch allowance	8
Prenatal leave	5
Individual production bonus (worker)	4
Transportation allowance	3
Attendance bonus	3
Childcare support	2
Seniority bonus	2
Group/team-based collective bonus	2
Individual production bonus (supervisor)	2
Probationary pay	2
Skill bonus	2
Higher factory imposed minimum wage standard	1
Marriage leave	1
Health-related benefits	1
Night shift premium	1

Piece rate and worker turnover

The managers expressed varied concerns related to worker turnover, particularly across the piece rate versus daily wage divide. The primary reasons cited for worker turnover related to work-life balance, including marriage, children, and the care of sick relatives. It is difficult to compare turnover directly across factories because some managers expressed turnover as length of time on the job while others expressed it as an annual percentage loss. Of the managers who discussed turnover as tenure on the job, responses were quite variable – workers tended to stay on the job two to 10 years depending on the factory. Alternatively, an average of 5% of workers were lost annually to turnover. However, one of the managers noted that although 5% was their standard rate of annual employee losses, more recently that rate increased to 10-12%. The

manager blamed higher turnover on competition from other domestic factories for skilled labor, and in particular from those supplying branded products. According to this manager, factories serving branded apparel products had higher profit margins and were able to pay workers more without having to become more efficient in other production areas.

During peak season, turnover challenges differed across daily wage versus piece rate factories. Peak season represents an opportunity for skilled and efficient workers to earn more under the piece rate system, and as such, turnover was reportedly lower in piece rate factories during periods of high buyer demand. Managers noted that piece rate workers demand more overtime hours during peak seasons, and turnover would be higher if they weren't provided these overtime hours. In contrast, managers in the daily wage factories expressed higher rates of turnover during peak demand, because workers are working harder but the reward remains the same. In general, turnover of skilled labor was a more salient challenge for factories paying daily wage compared to piece rate because the latter form of compensation presented efficient workers the opportunity to earn more. That said, competition for labor, particularly skilled labor, was a challenge for all factories regardless of pay type. When asked why they did not provide competing offers and higher salary to avoid the loss of high skilled workers, one manager noted that worker salaries are public information among factory workers, and higher salaries based on skill would be perceived as unfair and would be demanded across the board by all workers regardless of skill.

Piece rate impact to accidents, illnesses, absenteeism, and work breaks

There were no major concerns expressed by managers around the topic of workers accidents. All managers thought that accidents were both rare and minor in their factories, including the incidence of finger pricks. However, these factories did not collect the data necessary to identify causes and risk factors, including those that might be related to compensation type. Six of the eight factories were cited by BFC as having both an inadequate accident reporting system as well as inadequate OSH investigation procedure. Although notably unreliable for comparison purposes, the number of accidents reported to Cambodian social security and recorded in the individual factory compliance reports ranged from 0.2% to 3.7% (average 1.4%) for piece rate factories, and 0.5% to 2.8% (average 1.3%) for daily wage factories. Although the average reported accident rate is slightly higher for piece rate factories, there is no way to determine whether that difference is statistically meaningful given the available data.

The managers did not express concern over worker illnesses, other than the general pattern of illness and absenteeism on Mondays and after holidays. They noted that a greater number of sick days resulted not from worker illness but a family (child or parent) illness in which the worker served as the primary caregiver. One manager thought that while common sense might dictate a higher rate of illness among piece rate workers due to the intensity of their work, this particular manager felt that it also depended on work ethic and life satisfaction. In other words, piece rate workers that work very hard see this return in greater financial success and life satisfaction. Unfortunately, none of the factories maintained a database of worker illnesses that

could provide evidence of a discernable pattern comparing illness patterns across daily wage versus piece rate.

The reported rate of absenteeism varied across factories, ranging from a low of 2-3% per day in two of the piece rate factories, to a high of 6-8% in a third piece rate factory. The available information on reported absenteeism in daily wage factories ranged from 3-5% per day, putting it in the middle of the two piece rate extremes. Although there is no clear discernable pattern in absenteeism across compensation type based on the available data, it provides suggestive evidence that the *variability* in absenteeism may be higher among piece rate compared to daily wage factories. Although multiple managers noted that absenteeism would tend to be higher among daily wage workers who may not be as motivated as those on piece rate (particularly during peak season as noted previously), this is not born out in the limited reported information.

Although all factories had a similar break structure for lunch, multiple managers noted that additional individual breaks were higher among daily wage compared to piece rate workers. In other words, those workers whose earnings were not directly impacted by work effort were more likely to take additional breaks beyond the standard lunch time.

Piece rate and quality control

Managers discussed their concerns related to quality control, noting that product quality is essential regardless of compensation type. Although the need for quality control was identified as a consistent challenge, the intensity of oversight varied based on seasonal demand, the skill level of the worker, and the difficulty of the style of garment being produced. Three of the managers made explicit note of the importance of a well-designed and automated quality control system based on industrial engineering standards that bring poor quality garments back to the original worker. This appeared even more essential for piece rate workers, where quality has a greater potential to decline as workers are incentivized to increase the pace of their work. With such an advanced system in place, the managers did not cite additional concerns related to quality control and piece rate compensation.

Piece rate and international competition

Multiple managers characterized competition within the developing world, comparing Cambodia to what they referred to as 'bottom' countries where the labor protections are weak to non-existent. As buyers search for the cheapest production cost of their product, Cambodian managers feared an exodus of factories to countries where labor protections were weak, resulting in comparatively low labor costs. In general, managers thought that they were at an increasing disadvantage with respect to international competition with each annual increase in the Cambodian minimum wage. Countries identified as among those which Cambodia risked or were already steadily losing market share to included Laos, Burma, Tunisia, Myanmar, Pakistan, and Bangladesh.

One manager also thought that concerns over worker well-being, turnover, illness, accidents, etc. could be a problem in these 'bottom' countries, but not in more highly functioning

places like Cambodia. While one manager noted that factories are staying in Cambodia for now, this is due to the high fixed startup costs of apparel that make it hard to pick up and move, arguing that it takes three years after starting up before a factory begins to make money. Overall, the high fixed startup costs balanced against annually increasing variable costs of labor make staying competitive in Cambodia a challenge. Managers argued that at some point, high labor costs will result in a tipping point where incurring the fixed costs of moving to one of the bottom countries will be justified as a cost saving approach. This concern was further emphasized when managers spoke of the impending trade renegotiations with the European Union, and the devastating impact a loss of trade preferences with the Block would have on business operations in Cambodia.

One manager described piece rate as a general strategy to promote workers to work hard in the developing world. In countries with low-levels of education (argued this manager) they primarily understand – work harder, make more money, i.e. punishment and reward. As such, when you reward all workers the same, you lose this incentive. However, this same manager recognized that there are some countries where workers ‘die for money,’ citing Bangladesh as an example of a country where wages are low and the managerial practices and OSH protections are poor. To this manager, the mutually beneficial incentive value of the piece rate depended on management, laws, structure of operations, and the owners.

In addition to competition from countries with lower wages and worker protections on labor costs, managers also noted that competition from countries with better developed infrastructure (like Malaysia) and better educated and skilled workforces are also a challenge. One manager noted that average salaries for Cambodian garment workers (cited by this manager as \$330-350) were 20% higher than average wages in Vietnam. Although highly skilled workers in Vietnam make a relatively high minimum wage, the low skilled wage is lower than Cambodia, and there are no unions. Vietnam has the additional cost advantage of trade agreements with the United States, which keep it on balance a ‘low cost’ apparel supplier. Managers pointed to Cambodia’s fast-growing wage rate as a major challenge in light of the comparatively poor infrastructure and low education and skill level of the Cambodian workforce compared to other countries with either more skilled and/or cheaper labor.

Summary of management interviews – common themes and conclusions

A number of common themes emerged about manager sentiment around issues of compensation and productivity that are worthy of re-emphasizing here.

- Piece rate and productivity: Managers unanimously agreed that a well-designed piece rate system improves worker productivity. Factories that don’t have piece rate expressed a strict preference for that compensation type, under different labor law standards.
- Piece rate and worker preference: Managers believed that high-skilled and motivated workers prefer piece rate, and the opportunity it affords to earn substantially more than the minimum wage. Low-skilled, new, or otherwise less motivated workers prefer daily wage, because their ability to achieve higher compensation under piece rate is comparatively lower. However, direct data from workers are not available in this study to confirm manager beliefs.

- Minimum wage and productivity: The piece rate incentive as a motivator has failed to keep up with increases in the minimum wage. Managers believed that annual increases in the minimum wage are responsible for declining productivity overall, regardless of compensation type.
- Low-skill and low education population: The piece rate financial incentive was perceived as the most effective means of promoting a hard work ethic in the absence of a high skilled and educated workforce.
- Low-wage and low cost of living setting: The piece rate incentive was seen as a more impactful motivator when the incentive had a greater relative impact on daily living standards.
- Human labor vs. technology: The piece rate incentive was less important in more automated and technologically advanced work environments, where efficiency gains could be made in non-labor cost areas.
- Individual vs. group effort: Workers are less inclined towards teamwork and group effort, but they understand the individual contribution. Therefore, the individual piece rate was the preferred managerial approach to motivating workers and improving productivity.
- Recruitment and retention of high skilled workers: Piece rate and other non-wage financial benefits were critical to maintaining an internal supply of labor in a tight labor market where the demand for skilled labor far exceeds domestic labor supply. Daily wage factories were at a disadvantage against piece rate factories with respect to skilled labor.
- Higher minimum wage and efficiency: To remain competitive with the higher labor costs, factories are focused on increasing efficiency in non-labor-intensive cost areas, such as technology and automation.

DISCUSSION AND POLICY IMPLICATIONS

The quantitative analyses of self-reported health outcomes in Cambodian garment workers presented relatively mixed results, with both positive and negative piece rate and quota associations observed for worker health outcomes. For example, workers subject to quota experienced significantly lower odds of hunger (OR=0.70) and stomachache (OR=0.58), but higher odds of dizziness (OR=1.97) and job satisfaction (OR=1.48) when controlling for other factors compared to workers not under a quota system. With respect to the piece rate, the most striking evidence of a potentially detrimental effect related to occupational injuries. Controlling for other factors, the odds of being injured on the job were 5.87 times higher for piece rate workers compared to non-piece rate workers. Not surprisingly, this strong and negative effect on workplace injury is corroborated in the developed world context, where recent and consistent evidence points to a significant impact of piece rate on accidents and injury (Artz and Heywood 2015; Bender et al 2012).

Conversations with factory managers provide a more nuanced picture of incentives, suggesting that piece rate as a compensation strategy may be mutually beneficial to both workers and factories. More specifically, they describe piece rate as an opportunity for developing world workers to earn higher wages based on their skills and effort, while providing factories greater

productivity and higher returns. From the managerial perspective, Cambodia faces fierce competition for labor both inside and outside its borders, as well as challenges around productivity and motivation of its workforce. ***However, from a worker health perspective, the potential for a ‘mutually beneficial’ piece rate strategy may only be possible in cases where appropriate safety laws and standards are in place to reduce workplace hazards and injury risk.***

Characteristics of a Mutually Beneficial Piece Rate

- ***Minimal occupational health and safety hazards***
- Growing economy, robust competition for skilled labor across sectors
- Minimum wage floor and basic wage protections
- Basic benefit structure afforded to workers
- Well organized and technologically advanced quality control systems
- Basic health and education standards afforded to the general population
- Stable government to support and enforce labor law standards

In countries and sectors where these characteristics are present, the piece rate may represent an opportunity for workers to earn more based on their effort, while also incentivizing worker productivity and increasing the competitiveness of factories with respect to international low-wage competitors. By the same token, in countries and sectors where these conditions are not met, the piece rate may be exploitative of workers and should be avoided.

Characteristics of an Exploitative Piece Rate

- ***High occupational health and safety hazards***
- No wage protections, or very low minimum wage
- Reliance on contract workers that fall outside standard wage and benefit protections
- Inefficient and ineffective quality control systems, lack of adequate technology
- Unstable government where support and enforcement of labor laws are lacking

LIMITATIONS

Critical to understanding the balance of benefits and costs is the extent to which piece rate compensation increases the risk of occupational accident and injury risk. At present, there is very little reliable data available on occupational accidents and injury in Cambodia, either at the factory or government level. The limited evidence on reported accidents to the government is suggestive of no significant difference, while the worker survey data alternatively point to large differences in self-reported injuries across compensation type. It is impossible to know without better and more consistent data collection the extent to which piece rate elevates occupational risk in Cambodia, and whether those risks outweigh the additional benefit to workers of increased potential earnings.

The support for mutually beneficial piece rate described in this paper is based on manager perceptions and not a direct survey of worker preferences. More information on the worker perspective is critical to understanding the potential for a mutually beneficial piece rate in this setting. A better understanding of the piece rate setting process in terms of opportunities for employee input, internal bargaining, and social dialogue are also important missing pieces in this research. Additionally, the quantitative data that is available from worker surveys and reported in this discussion paper, such as compensation, hours worked, and health outcomes, are subject to self-report and recall bias.

Finally, the conclusions cited in this discussion paper are based on a limited number of management interviews from a single country context. The generalizability of the Cambodia results to other developing world countries may be limited, and additional country cases and contexts are needed to review whether the criteria outlined for mutually beneficially and exploitative piece rate cases play out in other countries.

FUTURE RESEARCH

As noted above, additional research in other countries and contexts are needed before reliable recommendations can be developed beyond the Cambodia case. Data from other countries will help determine if the proposed framework accurately identifies the broad scenarios and conditions in which the benefits of piece rate might outweigh the costs. Context from other countries is especially critical given the strong link observed between piece rate and occupational injury self-reported by Cambodian workers in the BFC survey.

Additional research on the worker perspective is necessary to understand worker preferences around piece rate. The current study relies on manager reports of worker sentiment, as the available worker survey data does not provide additional perspective on their preferences for various compensation types. It would be useful to better understand the opportunities available to workers to provide input in the wage setting process, including internal committees, union representation, social dialogue, as well as identify the role played by buyer-supplier pressures in compensation strategy.

Future research should explore the impact of piece rate on other indicators of worker health and well-being, including the likelihood of verbal and sexual abuse, number of hours worked, and take-home pay. The indirect impact on verbal and sexual abuse is particularly relevant in the context of the mutually beneficial piece rate, as previous Better Work studies have found a relationship between compensation incentives and the likelihood that a worker reports harassment on the job (Truskinovsky et al. 2014; Babbitt et al. 2020).

Finally, given the timing of the Cambodian study immediately prior to the global disruptions related to COVID-19, it would be useful to conduct a follow-up in that country to explore the extent to which manager sentiment around compensation strategies and labor practices have changed as a result of the pandemic.

CONCLUSIONS

Existing evidence on the effects of piece rate, both intended and unintended, are largely from developed world sectors in Europe and the U.S. Despite significant differences in labor standards, wage levels, and business practices in the developing world that might exacerbate the negative effects piece rate, relatively little information is available to understand how the observed relationships generalize to this context. This paper adds to the literature by exploring the relationship between piece rate, worker health, and business strategy in a developing world case, the Cambodian garment sector. Using a mixed method study design, the evidence identifies a strong association between piece rate and self-reported occupational injuries, while the impacts to other reported health outcomes are mixed. Managerial interviews highlight a potentially important role for piece rate to simultaneously improve worker outcomes with higher wages and strengthen the business bottom line.

Based on this initial evidence, two hypothetical scenarios are identified to characterize cases where piece rate compensation might represent an overall beneficial strategy versus conditions where it is more likely to be exploitative of workers and should be avoided. Additional research in different country contexts is needed to test the hypothesis around beneficial vs exploitative piece rate before developing recommendations on best practices in compensation. If these results are shown to generalize to additional country contexts, governments and labor organizations such as Better Work might support piece rate practices in cases where these critical building blocks are present. Supporting best practices where the piece rate is mutually beneficial could potentially avoid a race to the bottom in the developing world, where high labor costs and reduced productivity drive manufacturing towards countries with less labor protections.

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