

***Piecework: Theory and Applications
to the Motor Carrier Industry***

Brenda Lantz

Upper Great Plains Transportation Institute
North Dakota State University
Fargo, North Dakota

October 1992

ABSTRACT

In the motor carrier industry, many drivers are paid based on the number of miles they drive. Because of this, they can be said to be on a piecework system of payment. This paper explores some ideas and theory about piecework and applies these to drivers. The theories discussed are those pertaining to (1) setting the piece rates, (2) changing the rates, (3) the seeming lack of employee loyalty, (4) the seeming importance of quantity over quality, and (5) equity theory.

Each of these areas has specific implications for the motor carrier industry and it is believed that employers in this industry can benefit from the discussion and recommendations that are made through a better understanding of this method of payment and the implications for their drivers.

TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
Theories Pertaining to:	
(1) Setting the Piece Rates	1
(2) Changing the Wage Rates	3
(3) Employees Have No Loyalty	8
(4) Quantity Must Matter More Than Quality	9
(5) Equity	10
Summary and Conclusions	12
References	15

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1 Effect on Price After Increase in Supply	5
2 Backward-Bending Supply of Labor Curve for an Individual Worker	7

INTRODUCTION

Piecework can be defined as attaching a wage value to a unit of output such as an article which is produced or an operation performed. Pay is the product of the number of output units produced, or operations performed, and the wage value. Piecework seems to go as far back as the first person to have ever worked for someone else. A cave man may have told a friend that for every animal he kills for him he will give him two arrowheads. Of course, piecework has evolved since then, but the basic principle remains the same. In fact, piecework appears to be the oldest incentive plan. One author mentions that "recent excavations of a temple in Ur have shown a system for paying for the labor of temple women engaged in spinning and weaving. Each woman was paid in food depending upon the amount which she produced" (Alford, p.37). Another author states that piecework seems to have had its origin in the ancient craft trades where the worker was paid for each unit they produced, but only if it met strict quality inspections (Dunn, p.246).

The purpose of this paper is to examine some of the theory and ideas associated with piecework and apply these ideas to the motor carrier industry. This is done to try to gain a better understanding of the majority of drivers who are paid this way. Specifically, according to one study (Griffin, p.19), approximately 87% of drivers are paid on a per mile, or piecework, basis and thus most of the following ideas will apply directly to them. This paper should also aid employers in making decisions about their employees, such as hiring, wages, or hours worked. Of the following theories, some can be thought of as advantages, some disadvantages, and some simply ideas. Each helps to gain a better insight into piecework.

The theories to be discussed are those pertaining to (1) setting the piece rates, (2) changing the rates, (3) the seeming lack of employee loyalty, (4) the seeming importance of quantity over quality, and (5) equity theory.

(1) Setting the Piece Rates

Although the actual setting of piece rates may not apply to most motor carrier firms, a brief explanation of the process is presented in order to clarify later ideas. Employees should be able to easily

determine what they have earned in wages otherwise they will not have confidence in the company's plan and there will be complaints (Carroll, p.98). Piece rates are liked for this reason because they are easily understood by employees and are simple to calculate.

The following describes an optimum procedure for how piece rates should be determined. First, a job evaluation and careful work measurement studies should be done to ascertain a fair rate for the price paid per unit produced. This may be adjusted later depending on management strategies, but it's important for a base rate to be determined using job evaluation methods as it is from this base rate that all pay ranges are developed and it should facilitate a fair comparison of the worth of jobs in the company (Dunn, p.246).

A common way to determine a base or standard rate is by a time study. A time study, as typically defined, is "used to find the amount of time that will be necessary to accomplish a unit of work, using a given method, under given conditions, by a worker possessing sufficient skill to do the job properly, as physically fit for the job, after adjustment to it, as the average person who can be expected to be put on the job and working at a pace 30 per cent below the maximum pace that can be maintained, day after day, without harmful physical effects" (Mundel, p.131). The time that is measured under these conditions is referred to as the "standard time" for the job. As an example of how a rate is set after determining the standard time for the job, consider a company that may believe that an average employee should earn a base salary of \$10.00 an hour. If according to time studies, an average person can drive 50 miles in an hour then the pay rate should be set around \$0.20 per mile driven. If a driver can safely drive more miles in an hour on average, he/she will earn more. Many firms guarantee a base rate even to employees who produce less than standard, but usually this rate is one set low enough to motivate the employee to produce at or above standard (Dunn, p.246).

Although the aforementioned procedure is an ideal way to determine a fair piece rate, there are a variety of ways which are actually used. One method is simply to have a supervisor determine a rate. He/she usually does this by giving their opinion of what they feel the job is worth at the moment - subjectively arriving at a value (Carroll, p.14). Another way is to conduct a time study as mentioned before. Unfortunately, these usually involve little more than timing a few cycles and setting a rate from that one study. This method doesn't account for whether or not the researcher timed the "best" worker

and so came up with an artificially high number of units that could be produced in a time period. Also, this average may not include waiting time, variations in production materials, or even management errors that wouldn't be the fault of the employee (Carroll, p.6). Also, if the employee realizes that he/she is being timed, they may purposely work at a slower than normal pace in order to try and increase the piece rate (Ehrenberg, p.412).

All of the above aspects must be taken into consideration when setting a wage rate as it will save many problems later on. Time studies should be conducted several times and at random intervals to ensure that a correct rate is arrived at that will maximize the benefit to both the company and the employee.

(2) Changing the Wage Rates

Piecework provides an advantage to employers as it only pays employees for what they produce. This leads to an interesting theory proposed by one author that since "incentive systems pay more to more productive workers, workers who are 'inherently' more productive will therefore tend to sort themselves toward incentive-using firms" (Blinder, p.48). Consequently, according to this theory, those companies using a piecework form of payment, for example, will get the best workers. *Only those people who are productive employees will want to work for a company that pays for how much one produces.*

This may produce a conflict in the trucking industry as drivers may be attracted to that business because they are independent, self-motivated, productive people and they enjoy being paid for their production. However, management tends to define drivers' jobs as simple as possible and may not include them in important company decisions. Drivers may start to resent this after a time and search for a different company that may listen to their ideas and suggestions. Therefore, it would be a smart idea for companies to ask drivers for their input and try to include them in the decision-making process whenever possible.

In terms of efficiency, a more efficient worker can offer more productivity than a less efficient one and therefore receives more wages (Hicks, p.89). Piecework enables changes in an individual's productivity to be reflected directly and immediately in their wages earned. A worker may change his/her production because of a new technique, a change in working conditions, such as the number of hours

he/she is allowed to work, or because of a conscious or even unconscious reaction to a change in wages offered per product (Hicks, p.93).

From an economic point of view, wages are the price of labor and so are determined to a degree by supply and demand (Hicks, p.1). As the supply of labor increases, wages will tend to decrease and if the supply of labor decreases the wages offered will show an increase. This must be modified slightly, however, when one is dealing with humans as opposed to products. If wage rates rise too high (from a decline in the labor supply), an employer may have to hire a less qualified worker. Conversely, if wages fall below a certain point (due to an increase in the labor supply), the employee may seek alternative work elsewhere, perhaps in a different field (Hicks, p.32). In addition, there are other variables that effect labor supply and demand such as training time, mobility, or company rules.

A serious problem with piecework appears when a company needs to change its wage rate, perhaps due to a requirement to reduce costs. In order to do this, the company needs to either increase efficiency, and thus increase production for the same amount of time, or it needs to reduce the price of the inputs, the wages of the drivers. There is a large amount of work involved in changing the wage rates under a piecework system. This is especially true for those companies that never took the time to develop an accurate base rate as explained earlier because each job will now have to be reevaluated. Not only is it a huge task from the viewpoint of changing all the piece rates in the company, but also the company must make sure no errors occur in calculating the new rates. Then there is still the problem of making sure all the workers understand the new rates and aren't confused - this also can be very time consuming (Louden, p.17).

If the rate needs to be changed downward, it is referred to as rate cutting and usually happens when workers start producing more than a certain level and so management decides to lower the rate paid per piece (Dobb, p.64). *Rate cutting does not have to be an actual drop in the absolute rate paid. If the rate does not keep pace with inflation or with the wages paid in other industries, this is the same as rate cutting.* Sometimes this is necessary. However, it is usually viewed negatively by employees who may feel punished for increasing their output. For example, consider Figure 1. If output has increased substantially, perhaps by new technology, this would tend to lower the selling price of the product at the same demand. So, if there is a change in the market price, there must either be a change in

the wage rates or the number of employees working (Dobb, p.64). Many employers (and perhaps employees) would probably rather see a decline in wage rates than a decline in employees.

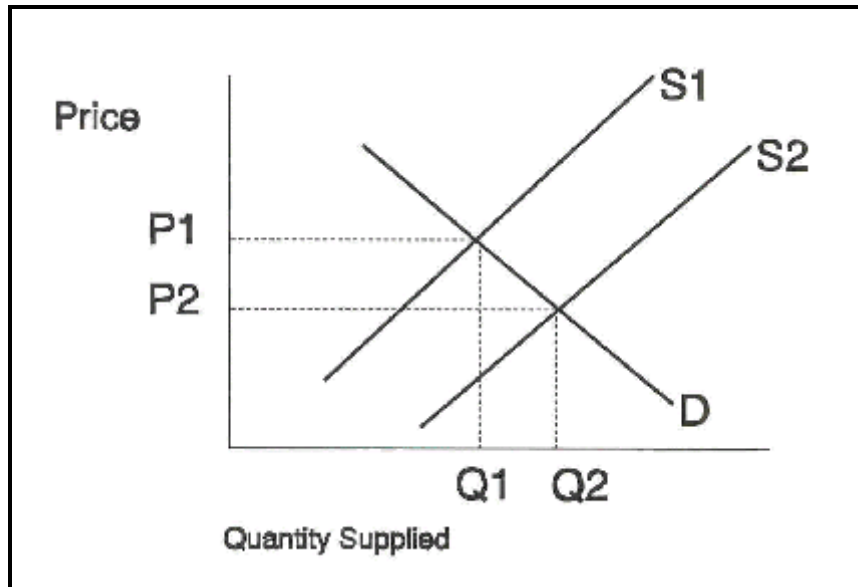


Figure 1. Effect on Price After Increase in Supply

Several negative impacts can result when rate cutting occurs and each seems to have consequences for either the company (usually in the form of turnover costs) or the worker. First, the worker could decide to quit and look for other work. This means the company will now have to find a replacement. They not only will lose productivity until they find someone, but they also lose time and money training in a new person. Also, the new person will take time to become as productive as the old one who had learned to be more efficient. The worker also loses time and money searching for new work and trying to become efficient once again in their new job. As one author states, it is beneficial to both the employer and the employee for the employee to remain in their job. Therefore, once a wage is established it is likely to stay at that level unless it is absolutely necessary to change it (Hicks, p.71).

Second, if quitting is not an option, the worker could simply resign themselves to working even harder to earn the money they need. This is what the company might hope for. However, although the worker may produce more, they are going to experience more fatigue and health problems and may end up spending more money on food and doctors than they normally would (Dobb, p.61). Also, they may take more sick days, or worse, have an accident due to their fatigue. The implications of this are varied, but could include lost productivity, increased insurance and workmen's compensation costs, liability/law

suits as well as the other general costs associated with turnover. Whenever there is a fall in piece rates one can expect an immediate expansion of output, but it is very uncertain if it will, or even can be, maintained (Hicks, p.98).

A third negative manifestation of rate cutting is that it may teach the worker that increasing their productivity isn't beneficial and so they may continue to make the same amount in an hour even if they could be earning more. The company loses the possible extra productivity and the worker loses the challenge of trying to come up with better methods of producing and their job may become boring and monotonous.

The previous examples illustrate that rate cutting isn't a good practice. Besides the effects mentioned above, when a company decreases its wage rate, it has a reduced chance of attracting qualified employees and so the company will also eventually suffer from having less skilled workers (Hicks, p.46). Rate cutting rarely will have a desirable outcome and, therefore, it would be wise to use only as a last resort after carefully considering all options.

Conversely, there are several views on increasing piece rates. When piece rates are raised, employees may be motivated to produce more at the increased wage rate. Consequently, since piece rates reward in direct relation to output, the employer benefits from increased production through a decrease in unit costs (Dobb, p.63). The more an employee can produce in a given amount of time, the less the overall cost per unit will be (taking in to account overhead costs). Thus, even if an employer increases pay to increase output, it may be more than offset by the economy of the plant and machinery.

Another aspect to consider is that if the wages of a large group are increased, there will be a favorable reaction in production, but the higher the wage increase, the smaller the reaction will be (Hicks, p.97). This means that production will increase up to a point if wages are increased, but past that point any additional increase won't effect productivity. This is due to the fact that the amount of work done by an employee is determined not only by his/her ability, but by the relative demand he/she has for income and leisure (Hicks, p.94). If the employee works harder, they may have more income to pay for leisure activities or may be able to retire sooner. Conversely, if they work less they will have more time for leisure, but maybe can not afford it unless the wage rate is raised. For example, examining Figure 2, the worker is willing to provide less hours of work at the higher wage, W_1 , because the amount he/she can

earn from the reduced number of hours of work is still enough for a comfortable living, so he/she chooses to have more leisure time (Solmon, p.583). An implication of this for the company is that if equipment is assigned to an individual driver and they decide they want more leisure time, that equipment may lie idle and thus be underutilized. So, increased pay may only work up to a point to increase production or efficiency.

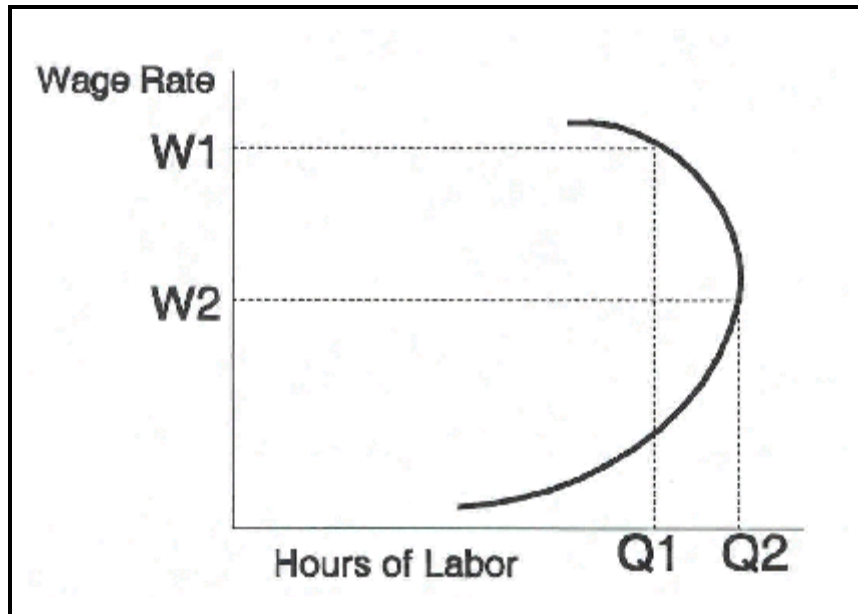


Figure 2. Backward-Bending Supply of Labor Curve for an Individual Worker.

It also seems to be advantageous for a company to simply maintain its wage rate even if competitors are lowering theirs. By doing this, the company maintains its efficiency, production, and employee morale while the competitors do not (because of lowering their wages) and this, therefore, will make up for the extra cost and put the company at an advantage when the trade recovers (Hicks, p.102). For the same reason, there are also advantages from decreasing the number of hours that an employee works at a time. This will lower output at first, but it is theorized that it will ultimately be offset as the extra rest and recreation that the employee gets improves their strength and alertness and therefore improves their efficiency and attitude (Hicks, p.104). The bottom line is for the company to do that which will increase its employees' efficiency and morale the most as this benefits both the company and the employees.

(3) Employees Have No Loyalty

There is concern that under a piecework system of payment employees seem to have little or no loyalty to their company. As one author states, "piecework systems represent a situation where individuals act as fractional sub-markets within an organization and use their bargaining power to sell their effort for the highest price without regard to the effect on the organization as a whole" (Int'l Seminars, p.116). There appears to be no real integration into the company. If an employee can make a higher wage elsewhere, and the switching costs are low, they will go. *There can be no loyalty or pride in a company which simply pays for production without regard to the producer.*

This problem of employees having no loyalty is of particular concern in the motor carrier industry where the turnover rates are very high. Drivers really seem to "go where the money is". For example, if they hear in a truck stop that one company is paying more than the one they are currently working for, many may have no problems with trying to get a job there and quitting their present one. They simply don't have as many of the switching costs as other occupations do. Many can still continue to drive all over the country and their home can stay in the same place, they are just driving for a different company. So, in the trucking industry, the companies must really try to promote loyalty in their employees even more so than in other occupations. They need to show that they care about their employees and not just about what they can do for the company.

Lack of loyalty can also come from the fact that piece rates are strongly associated with bad practices in the past in incentive systems, such as those mentioned before of rate cutting or establishing standards based on a supervisor's estimate. Because of this, it leads some workers to distrust and be suspicious of any piecework system (Louden, p.17). It makes it very difficult to manage a productive company under these conditions. It simply takes a lot of work for a piece rate plan to be successful. As with any plan, for it to be effective, it must be very carefully planned, installed, and administered with the employees kept informed of every move and able to express questions, problems, or concerns.

(4) Quantity Must Matter More Than Quality

An unnerving fact is that it appears that only in trades where quantity matters more than quality that piecework is possible. If the quality of the product suffers because of speeding up the process to

make the product then paying for speed is bad economy (Hicks, p.40). Unfortunately, that is exactly what piecework seems to do. The worker knows that if they produce more, they will make more money and, therefore, they may not be concerned with the actual quality of the product - the worker simply focuses on increasing their income by increasing their output. This is certainly true in the trucking industry. Drivers seem to be most concerned about the number of miles they can cover in a given time period and dislike company speed limits, loading and unloading freight, and other procedures which hinder their output and thus, their income (Griffin, p.1). This can also lead to misuse of the company equipment. Since the workers are motivated to work quickly, they may have little regard for the correct procedures for using the equipment (Ehrenberg, p.412).

A similar concern with piece rates is that time and money are determined in one "rate" (Carroll, p.16). A worker is paid the same amount per unit produced no matter how much time it takes them. If a worker makes a certain number of products they are paid a certain amount of money regardless of how many hours it took. This relates to the problem of workers not really caring about the quality of the product - they just want to produce as much as they can in the time they are allowed to work. This can cause a certain amount of anxiety in workers as their production could be remarkably variable over time due to the normal differences in thought and energy one can bring to the job from day to day. Because of this, their income will also fluctuate, perhaps causing worry over meeting financial obligations. Consequently, employers may have to pay a higher wage over time than they would on a time-based system in order to get their employees to accept the more variable pay under the piece rate system (Ehrenberg, p.409). This can really be a problem in trucking. If a driver knows they can only drive a certain number of hours each day, they may try to cover as many miles in that time period as possible perhaps without regard to speed limits or safety. They may also drive more than their allotted time in order to increase their number of miles, and this could cause more fatigue or health problems as was discussed previously.

Another point to consider is that the quality of production between workers may vary significantly. For example, one worker could be very reliable while another may miss days of work, have a bad relationship with management or other workers, or just generally not be content. This could effect their producing ability and/or the quality of their product and cause expensive temporary adjustments. For

example, one truck driver may really enjoy his/her job and have a good attitude and loyalty to the company and drive safely following all procedures while another may not have or do any of these things, but they are both paid the same and the latter may end up being paid more. Piece rates take no account for this and make it almost impossible to take account for it (Hicks, p.40). The workers are simply paid the same per piece/job even if their quality of production is much different.

Because of this variability in production and/or quality of products from day to day, piece rates also seem to make a poor measure for planning production (Carroll, p.100). As an example, suppose an average driver covers 500 miles a day and the company bases the amount it can haul and the time it takes to haul it on that figure and the number of drivers they have. Because of the aforementioned variability in production from day to day and the lack of loyalty to the company, drivers may not be able to, or be as devoted to, making sure the shipment arrives safely and on schedule as the company would like and this could seriously effect the estimate.

(5) Equity

An additional theory that applies to piecework is that of Equity Theory. This theory states that one perceives the ratio of their outcomes to their inputs to be equal (or unequal) to the ratio of a "comparable other". Outcomes may be such items as pay, benefits, status, or even the intrinsic interest of, or the value derived from, the job. Inputs may be how hard one has to work, their educational level, their specific qualifications, or seniority. If there is felt to be an inequity, there is pressure to correct the perceived imbalance. This may be done in a cognitive fashion by changing the "comparable other" or making excuses for the difference, or it may be done with more concrete action such as decreasing inputs (how hard one works) or applying pressure to increase outcomes (pay). If the perceived imbalance is not corrected, job attractiveness declines, and workers may seek alternative employment, have a lower morale or commitment to the company, be absent more, or simply perform worse (Int'l Labour Office, p.34). Companies should make sure that they are paying comparable wages, benefits, and recognition to jobs which are similar in nature so as not to cause this feeling of inequity between workers.

Equity theory seems to be particularly applicable to drivers. There appears to be evidence that truck drivers have more opportunity and are more prone to comparing their situations with other drivers

than what may occur in other occupations. When they make this comparison and find that their inputs (the amount they work) are equal, but their outcomes (pay or benefits) are different, there is pressure to correct this. Unfortunately, the most popular way seems to be by leaving their job and going to work for where the comparable driver was working. Companies must make sure they are at least paying a competitive wage, but it would help if they tried to offer extra incentives that perhaps the other companies don't. These could be, for example, more recognition, benefits, or status. This would help ensure that when an employee makes a comparison with another driver that the outputs he/she receives are at least equal to, and may be even better than, the comparison person's.

One needs to remember that the motives which determine working behavior are multiple, overlapping, and complex. Additional financial rewards may not make an employee work harder or better (Int'l Labour Office, p.30). In other words, more income only works up to a point to make an employee more loyal or work harder, then something else must be tried, such as recognition, promotion, or extra benefits. Employees must feel that an exertion of extra effort will lead to better performance which will lead to attractive outcomes. Employers need to make sure that the outcomes an employee receives for better work are something the employee wants. Companies shouldn't believe that the only way to make employees more loyal or more productive is to pay them more. Sometimes new or innovative ideas end up with much better results. For example, Gene Griffin and Julie Rodriguez of the Upper Great Plains Transportation Institute have found that career advancement is important to many drivers, but seems to be lacking in the trucking industry. They have suggested that "one method of providing this would be the development of a classification system of career advancement for drivers designated as (1) apprentice, (2) certified, (3) advanced, (4) senior, and (5) master driver. Such a system would allow for advancement as skills and job performance improved and as additional responsibilities were added. In return, this could be rewarded with additional pay, benefits, or recognition." This is the type of idea companies need to consider implementing in order to achieve more productive and/or loyal employees.

Summary and Conclusions

In summary, theories have been discussed in five major areas. First, in setting the piece rates, the ideal procedure of time study was outlined and it was demonstrated how the results could be used in

setting a wage rate for a product or job. It was also mentioned that companies do not always use a suitable method, but may use one that gives inaccurate results. If this is the case, either the company or the employees will suffer from a wage rate that is either too high or too low. It is beneficial for the company to take the time to develop an appropriate base piece rate.

Second, in the area of changing the wage rates, it was submitted that companies operating under a piecework system may obtain the most productive workers since piecework motivates employees to produce more in order to receive a higher wage. This also encourages employees to become as efficient as possible in order to produce the most in the least amount of time. An economic view of wages as the price of labor (determined by supply and demand) was considered as well as implications of what may happen when a company changes its wage rate. Not only does this involve an immense amount of work, but if the rate needs to be adjusted down (rate cutting), several negative consequences that could occur were discussed.

However, if rates are increased, the employer may benefit through a decrease in unit costs due to increased production in a shorter span of time. As discussed, this only works up to a point. Advantages from maintaining rates (even if other companies are lowering theirs) and decreasing work hours were also examined with the conclusion that it benefits both the company and the employee to increase, or at least maintain, efficiency and morale.

In the third area (employees have no loyalty) it was observed that, in piecework, workers search for the highest wage for their production and so there is little integration into one company and, therefore, little loyalty. Many workers are also distrustful of any piecework system because of former unacceptable practices. Employees should be kept informed of any changes the company is planning that influence them.

Fourth, under the idea that quantity must matter more than quality in piecework, the fact that piecework seems to pay for speed with little regard to quality was addressed. The workers are simply paid for how much they produce, which can lead to poor quality and misuse of equipment. Paying for production can also lead to anxiety among the workers as their production may normally vary from day to day and thus their wages will also vary. Variations between workers' producing ability and/or quality of

production was also mentioned which led to the problem of piece rates making a poor measure for planning production.

In the final area, equity theory was described and applied to workers under a piece rate system. The point was made that employers may need to do more than simply offer a comparable wage in order for their workers to continue to stay with their company.

All of the aforementioned ideas were applied to the specific field of the motor carrier industry where most employees are paid on a piecework, per mile, basis. Suggestions were made to employers in this particular area because of the problems this field has with turnover and loyalty. Employers need to remember that there can be no loyalty or pride in a company which simply pays for production without regard to the producer. Hopefully, the above discussion has lent some insight to employers in this industry to assist them in making important decisions concerning their drivers.

Although it was beyond the scope of this paper to analyze any other form of compensation, a few comments about time-based pay are mentioned for comparison. Under this form of payment, employees are paid for a certain time period (i.e, per hour, week, month, or year). Many employees tend to prefer this over a per unit based system as earnings don't vary as much from day-to-day. However, employers must now deal with the variations in productivity and, thus, profits. They are usually less anxious about this than employees as they are more likely to have adequate assets and also to have more than one employee, so the likelihood is low that they will all have the same swings in productivity at the same time. Employers should consider that worker productivity will probably be lower under a time-based system than a piecework one because the incentive to work hard isn't as great (Ehrenberg, p.411).

There are also other forms of incentive pay, such as commissions, bonuses, or group incentives, which can give the desired outcome of increased productivity or efficiency, but again, these are beyond the scope of this paper. I would suggest further research in these areas if one has an interest in them.

REFERENCES

- Alford, L.P. "Laws of Management." 1928. The Ronald Press Company: New York
- Blinder, Alan. "Paying for Productivity." 1990. Brookings Institution: Washington, D.C.
- Carroll, Phil. "Better Wage Incentives." 1957. McGraw-Hill Book Company, Inc.: New York
- Dobb, Maurice. "Wages." 1946. Nisbet & Co., Ltd.: London
- Dunn, J.D. and Rachel, Frank M. "Wage and Salary Administration: Total Compensation Systems." 1971. McGraw-Hill, Inc.: New York
- Ehrenberg, Ronald G. and Smith, Robert S. "Modern Labor Economics." 1988. Scott, Foresman and Company: Glenview, Illinois
- Griffin, Gene and Rodriguez, Julie. "A Survey of Commercial Drivers' Opinions of What They Consider Important in Their Job." 1990. Upper Great Plains Transportation Institute: Fargo, North Dakota
- Hicks, J.R. "The Theory of Wages." 1963. MacMillan & Co., Ltd.: London
- International Labour Office, Geneva. "Payment by Results." 1984.
- International Seminars. "Forms of Wage & Salary Payment for High Productivity." 1967.
- Louden, J.K. and Deegan, J. Wayne. "Wage Incentives." 1959. John Wiley & Sons, Inc.: New York
- Mundel, Marvin E. "Systematic Motion and Time Study." 1947. Prentice-Hall, Inc.: New York
- Solmon, Lewis C. "Economics." 1980. Addison-Wesley Publishing Company, Inc.: Reading, Massachusetts