

# On the Performance of Piece-Rate Incentive Schemes: Some Explicit Solutions beyond the Uniform Distribution

Masahiro Watabe\*

Rissho University

Department of Economics

April 17, 2017

Very Preliminary

Abstract

This paper examines the performance of piece-rate incentive scheme relative to the fully optimal contract in a principal-agent problem under moral hazard and adverse selection. A firm compensates heterogeneous workers based on uncertain outcomes of the worker's skill (private information) and effort.

The aim of this paper is twofold. Firstly, the paper considers the question of the shape of the fully optimal compensation scheme when workers are heterogeneous in terms of skills. I provide a version of the taxation principle that converts the full optimal contract as a direct revelation mechanism into a nonlinear wage schedule as an indirect mechanism. The theorem also establishes a necessary and sufficient condition for the optimality of piece-wise linear compensation scheme, and it is shown that any incentive scheme involving a linear part never optimal.

Secondly, I argue the performance of the optimal piece-rate incentive scheme. I employ the incremental gain relative to the optimal fixed wage. I provide two primary observations. Firstly, a possibility of bunching influences the performance of piece-rate incentive scheme drastically. The optimal piece-rate incentive scheme can secure "more than" three-fourths (75 percent) of the maximized expected profit under the fully optimal contract if there is no bunching in the fully optimal contract under the uniform distribution. On the other hand, if there is a bunching and private information is distributed uniformly, the piece-rate incentive scheme can secure "at most" 75 percent of the profit secured by the fully optimal contract. Under a non-uniform distribution, the performance of the optimal piece-rate incentive scheme can secure substantially "more than" 75 percent of the expected profit secured by the fully optimal contract. The sufficient condition for that is fully characterized by the first-order stochastic dominance shift parameter.

Keywords: incentive contracts, piece-rate, fixed wage, private information, non-uniform heterogeneity

---

\*This work was supported by JSPS KAKENHI Grant Number 15K03363.