JOINT PRODUCTION AT THE WORKPLACE:

EVIDENCE FROM NORWEGIAN ESTABLISHMENT DATA

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Abstract:

The emergence of worker-firm matched data sets over the last decade has provided an opportunity to implement and test ever richer models of wage and employment outcomes (e.g. Abowd and Kramarz 1998 and Mortensen 1999). Two basic approaches have developed to understand matched data. One approach explains the variation within firms and between firms and workers using large and sparse (fixed effect) wage regressions. The other approach focuses on variation in firms in their mean wages as explained by models of matching and turnover. With few exceptions most analysis of matched data sets presumes that the output of workers is additively separable. By linking data on workers not just with their employers but also their co-workers, matched data shed light on joint production in the workplace. Under joint production the marginal product of a worker is not additively separable from their co-workers' inputs.

This paper studies the implications of co-worker interactions by developing a model of joint production and estimating it using Norwegian administrative data. The model of joint production is inspired by the literature on task assignments within firms. As the early literature surveyed by Sattinger (1993) showed, endogenous assignment of tasks has important implications for our understanding of earnings. Some recent contributions suggest that assignment and joint production can help explain stylized facts about development (Kremer, Kremer and Maskin).

We combine a technology with joint production and endogenous task assignment with earnings determined by multi-lateral Nash bargaining within workplaces. We can calculate consistent estimates of our model using matched data in two steps. In the first step technology parameters are estimated using worker characteristics and average (or total) earnings paid by workplace. The technology parameters include coefficients of a Mincer-like equation relating worker characteristics to the talent they contribute to their workplace. In the second step the coefficients on worker characteristics in their outside options are estimated in order to explain the distribution of earnings within firms. That is, individual earnings are given by the outside value plus and an equal share of the workplace surplus. The value of outside options must satisfy the condition that observed workplaces generate non-negative surpluses as well to fit the ordering (distribution) of wages within workplaces according to worker characteristics.

Parameters of the model are estimated using data on the adult population of Norway in 1997. A workplace is a given physical location with a unique plant or establishment identification number. Besides wages and regular work hours, detailed information on education, actual labor market experience, and tenure at the current workplace are available through information from various public registries.

Our analysis quantifies a number of important elements of the labor market that are typically assumed to be zero or to be treated as exogenous. The first is, of course, joint production itself as most empirical models assume linearity across co-workers. Our tightly-parameterized model of joint production and task assignment includes as special extreme cases linear technologies. In this cases the workplace surplus would, in equilibrium, be zero. Thus we can counter-factually estimate the contribution of joint production to explain both inter- and intra-workplace earnings distributions. This contribution depends on both estimated technology and the observed distribution of co-worker characteristics. Some workplaces have a larger per-worker surplus than others. This surplus is properly interpreted as a workplace 'fixed-effect' conditional on both the estimated technology and the distribution of worker characteristics. In addition the outside options of some workers will be farther from their internal contributions than that of other workers. Thus we can quantify the implications of counter-factual matchings of workers inside workplaces.

In our analysis the distribution of co-worker characteristics is exogenous. Extensions can incorporate endogenous matching of workers to their workplaces through search. This links the value of inside-the-workplace contributions to the value of outside-the-workplace options. Endogenous task assignment within workplaces upsets supermodularity in production. Workers of different ability can be matched in equilibrium within workplaces which then allows for a full distribution of wages within and between workplaces. The administrative data are available as a fifteen year panel, enabling an extended model to explore how turnover and labor market dynamics are related to joint production.