

## Chapter Nine

# LITERATURE ON WORKPLACE AND GOVERNMENT EXCHANGE



James E. Annable

## CHAPTER NINE

# LITERATURE ON WORKPLACE AND GOVERNMENT EXCHANGE

---

The book's introduction to the use of the formal economic method to explicate the generalization of exchange is almost complete. This chapter acknowledges antecedent work on the broad research agenda, reviewing the existing economic literature on rational exchange in the workplace and government venues. The attention paid to the former is much more fulsome. The second part of the chapter provides little more than a outline of the substantial economic literature on optimizing government exchange.

### I. CRITICAL REVIEW OF WORKPLACE MODELING

The analysis so far has focused on the objective functions, mechanisms of exchange, and constraints that rationally govern price-mediated transactions in two-venue general equilibrium. Despite a longstanding informal literature and readily observable management practices that have evolved over the past century, the workplace venue of self-interested behavior has attracted relatively little interest from mainstream macro theorists. Hopefully, that will change now that a consequential dynamic general workplace equilibrium has been derived from proper axioms.<sup>1</sup> Much of importance of the generalization of exchange results from its unique capacity to microfound a continuous-equilibrium monetary theory of production that accommodates meaningful wage rigidities and involuntary job loss. Such joblessness has been shown to be a rational response to adverse disturbances in total nominal spending. The MWR Channel is both essential to coherent, stabilization-relevant macroeconomics and unavailable in coherent SVGE modeling.

---

<sup>1</sup> Proper axioms are so broadly accepted to be true as to require no derivation – a stern test that serious theorists must return to taking seriously. For a start, practitioner behavior and beliefs cannot be ignored.

### **BOX 9.1: THREE FUNDAMENTAL VENUES OF ECONOMIC EXCHANGE**

Modern, specialized economies can be usefully divided into three distinct venues of economic exchange. Most familiar to economists is the marketplace, where the lion's share of price-mediated exchange occurs. That complex and powerful venue has occupied analytical attention since before Adam Smith. Less familiar, still critically important, is the class of price-mediated exchange occurring in the information-constrained workplace, originating in the Chandler's "new corporate forms". Large bureaucratic firms began to be organized in the late 19<sup>th</sup> century and have come to dominate global production. The second venue unique microfoundations the MWR Channel necessary for macroeconomics to be stabilization relevant and has been closely examined in this book

In the third venue, exchange is arranged and implemented by government and is typically not price-mediated. Its objective functions, mechanisms of exchange, and constraints (including the government's monopoly on coercion) differ substantially from the other two venues. Economic thinking on government exchange, captured by public-goods, public-choice, incentive, and externality theories, is briefly outlined toward the end of this chapter. The relatively slight attention paid to the third venue of exchange does not, of course, reflect its importance. In the United States, government expenditures exceed 30% of total GDP, up from less than 20% after World War II. Other Western democracies typically have even higher public-expenditure ratios.

The problematic unavailability plays a featured role in this chapter's critical review of the small antecedent literature on formal workplace modeling. The analysis will reinforce readers' understanding of what SVGE versus TVGE modeling can and cannot do. Modern economists' grasp of the workplace model class is surprisingly spotty, with a many inexplicably believing that the relatively crude efficiency-wage analysis of the early 1980s (most notably, Shapiro and Stiglitz (1984)) has already adequately motivated rational workplace labor pricing. This review demonstrates that neither Shapiro-Stiglitz nor any of the other theories in the existing SVGE literature produce endogeneity for MWR or involuntary job loss.<sup>2</sup> Previous to the recent completion of original efficiency wage theory, workplace models universally relied on free parameters to make their analysis stabilization-relevant.

---

<sup>2</sup> Recall that downward labor-price rigidities are meaningful if they are sufficient to suppress wage recontracting and support involuntary job loss. If rational labor pricing is wholly determined in the marketplace, there is little macrodynamic need to model workplace behavior.

In the two sections that immediately follow, the analytic framework (explicitly or implicitly) used by theorists to model economic behavior in the workplace is reviewed. The next several sections summarize and assess the most significant of the available theories. Reflecting the literature, two broad model classes are emphasized, i.e., the shirking approach, which is best known to economists, and the human-resource approach, inspired by equity-based personnel practices ubiquitously found in large establishments. Some thoughts on the design of a productive research agenda are also offered.

### Common Characteristics

*Assumptions.* The various formal theories of workplace exchange share an analytic framework that is rooted in the fundamental definition of employee on-the-job behavior:

$$(9.1) \quad \dot{Z}_j(t) = \mathcal{E}_j(t)/H_j(t).^3$$

In addition, rigorous OJB theories almost always (at least implicitly) posit that labor is market homogeneous; that workers cannot borrow or save; and that employees and employers are risk-neutral. Firms maximize profits; workers maximize utility; and both form expectations rationally. Technology is fixed, with input specificities and production scale generating workplace information cost and asymmetries.<sup>4</sup>

*Endogenous OJB.* If  $\mathbf{X}_j$  and  $\mathbf{H}_j$  are not in 1-1 technical correspondence, worker behavior is broadly understood to be contingent on the nature of the workplace. Given perfect workplace information, the firm wholly controls and must optimize  $\dot{Z}_j$ , confronting a choice set largely involving working conditions, which were (as has already been noted) the original interest of

---

<sup>3</sup> Recall Chapter 2, where  $E$  denotes labor cooperative effort,  $H$  is labor hours paid for,  $i$  is the individual employee,  $j$  is the work establishment, and  $t$  is the unit of time. In particular, a subset  $\mathbf{K}_j$  of the Cartesian product of the sets to which  $E_j$  and  $X_j$  (production) belong is posited such that every element  $E_j$  and every element  $X_j$  appear once and only once in a pair in  $\mathbf{K}_j$ . It follows that  $\mathbf{X}_j$  and  $\mathcal{E}_j$  are in 1-1 correspondence ( $\mathbf{X}_j \sim \mathcal{E}_j$ ). A necessary condition for interesting endogenous workplace exchange is that  $\mathbf{X}_j$  and  $\mathbf{H}_j$  cannot also be in a 1-1 technical correspondence.

<sup>4</sup> In the literature, establishments' production functions are (implicitly) posited to generate maximum real output ( $X_j$ ) for each available combination of the typically two (labor and physical capital) inputs. Output is increasing in both worker cooperative effort ( $E$ ) and capital; no resources imply no production; and  $\mathbf{X}_j$  is a closed set. Other typical, but not universal, restrictions on the technology space are the exclusion of prices from the input domain and  $0 \in \mathbf{X}_j$  (the establishment can be idle). TVGE production substitutes capital services ( $K$ ) for the capital stock ( $K$ ).

Hawthorne researchers in the early 20<sup>th</sup> century. More interesting workplace exchange occurs in establishments characterized by costly, asymmetric information, typically resulting from input specialization and scale. Agency problems associated with nonsupervisory, production workers in large establishments shift a degree of  $\dot{Z}_j$  control from employers to employees. Optimal workplace exchange becomes much more complex, as hidden actions resulting in variable cooperative labor input invite management methods of indirect control, including wage incentives, into the profit-seeking problem set.

The relationship between employee economic behavior ( $\dot{Z}_j$ ) and the hourly wage ( $W_j$ ) has been named the *workplace-exchange relation* (WER). It is viewed from the aggregating perspective of management but motivated by employee optimization on the job, subject to firm and market constraints.<sup>5</sup> If provided the latitude, rational workers may vary cooperative input in response to the wage received, a process that plays a central role in any formal, price-focused model of on-the-job behavior.<sup>6</sup> Establishment WERs are defined over the range of feasible labor pricing, restricting  $\dot{Z}_j$  to be positive, continuous, and non-decreasing in compensation paid.

*Profit maximization.* In the more complex production environment mandated by self-interested workers, agency problems, and the absence of a 1-1 correspondence between  $\mathbf{X}_j$  and  $\mathbf{H}_j$ , management must sufficiently identify its WER to enable payment of the unit-cost minimizing labor price (named the *efficiency wage*):

$$(9.2) \quad W_j^n = \max_w (\dot{Z}_j / W_j).$$

If the firm's choice set permits the establishment to be idle, the rational payment of the efficiency wage additionally requires that its expected revenues be at least equal to its expected variable costs (more on this below). The firm's profit-seeking labor-pricing critically accommodates wage rents, *sine qua non* in formal workplace modeling. A necessary condition for the optimizing payment of a wage ( $W_j$ ) that is greater than employees' market opportunity

---

<sup>5</sup> In large, specialized establishments, imperfect workplace information limits management knowledge of individual employee OJB. The employer, however, is reasonably assumed to know its average labor productivity ( $\dot{Z}_j$ ), using that knowledge to design optimal wage incentives. The worker-homogeneity assumption, of course, eliminates both OJB dispersion and management's need to play the averages.

<sup>6</sup> The relationship notably receives in-depth examination in the management literature, suggestive of its practical importance.

cost ( $W^m$ ) is that the labor price ( $W_j$ ) produces lower unit labor costs:  $(W^m H_j^m)/X_j > (W_j H_j)/X_j$ . An optimal, firm-specific wage incentive ( $W_j > W^m$ ) exists iff:

$$(9.3) \quad \dot{Z}_j/W_j > \dot{Z}_j^m/W^m,$$

where  $\dot{Z}_j^m$  is the on-the-job labor input associated with cost-effective workplace monitoring (usually assumed to be technologically given) and  $W^m$  denotes employees' market opportunity cost, i.e., the expected best alternative wage upon separation from firm  $j$ . The WER class that is consistent with the payment of wage incentives is *unbundled* (i.e.,  $\dot{Z}_j/\dot{Z}_j^m > W_j/W^m$ ), while WERs mandating payment of market-opportunity costs are *bundled* (i.e.,  $W_j/W^m > \dot{Z}_j/\dot{Z}_j^m$ ).<sup>7</sup> The Holy Grail of formal OJB modeling is the derivation of unbundled workplace exchange from axiomatic model primitives. Absent that derivation, rational labor pricing and use default to their market solutions, permitting economists to ignore workplace behavior.

### Unique Characteristics

Formal workplace theories differ largely as a result of their specifications of, agency problems, the nature of jobs, and firm revenue distribution, and most significantly worker preferences. Those categories are useful in organizing the existing literature.

*Firm size.* Some workplace models explicitly use differences in establishment size to motivate heterogeneous agency problems. Large establishments have relatively high ratios of specific to total (human and physical) capital, with specificity and scale implying team production, information asymmetries, and imperfect employee monitoring. By contrast, in small firms, worker OJB is effectively controlled by either monitoring (often a by-product of the owner-manager's other duties) or contingent wage contracting.

---

<sup>7</sup> It follows that unbundled WERs are characterized by  $(\Delta \dot{Z}_j/\dot{Z}_j)/(\Delta W_j/W_j) > 0$ , while bundled WERs are consistent with  $(\Delta \dot{Z}_j/\dot{Z}_j)/(\Delta W_j/W_j) < 0$ . The third class of WER bundling,  $(\Delta \dot{Z}_j/\dot{Z}_j)/(\Delta W_j/W_j) = 1$ , microfounds ideal piece-rate compensation systems.

*The nature of jobs.* The nature of workplace exchange cannot be independent of the nature of jobs held. In the literature, one model class explicitly uses a bimodal separation to accommodate employment heterogeneities. Input specialization imposes, from the perspective of employees, two restrictions with respect to the nonmarket exchange of outcomes for inputs: (i) wages are important relative to nonpecuniary benefits ( $O^N$ ), and (ii) fixed-input characteristics ( $I^f$ ), such as seniority, are important relative to variable cooperative input on the job. The formal definition of such routinized jobs, named *class-I* employment, is:

$$(9.4) \quad \dot{O}^N/\dot{O} < \dot{I}^f/\dot{I}.$$

The remainder of the employed workforce holds *class-II* jobs:

$$(9.5) \quad \dot{O}^N/\dot{O} \geq \dot{I}^f/\dot{I}.$$

Frequently, in this class, the work itself contributes substantially to job satisfaction, restricting the relative utility provided by wages. Such employment is characterized by creative tasks in diverse fields such as the arts, research, some skilled crafts, and policymaking. Most formal OJB models implicitly posit class-I employment.

*Profits.* Time-varying wage rents introduce a significant nonmarket influence into the rational distribution of factor incomes and the return on capital ownership. Some OJB models that pay attention to distribution employ a Jensen-class residual-rent framework to accommodate that and other complications.<sup>8</sup> In this survey, firm-specific residual rents claimed by equity owners are defined as  $j$ th revenue in excess of the cost of labor hours and financial-capital input:  $\Pi_j(t) = P_j(t)X_j(t) - (G_j(t)+1)W^m(t)H_j(t) - \dot{r}^m(t)K_j^r(t)$ , where  $G_j$  equals  $W_j/W^m - 1$ ,  $P_j$  is the product price,  $\dot{r}^m$  is the market price of financial capital, and  $K_j^r$  denotes the resale value of the establishment's capital stock. Given  $\Delta P_j/\Delta G_j < 1$ , it follows that  $\Delta \Pi_j/\Delta G_j < 0$ .<sup>9</sup> Other workplace theories continue to

<sup>8</sup> See Jensen (2000) and Chapter 3. The dynamic residual-rent model also facilitates the useful introduction, into formal OJB analysis, of the classic "hold-up problem". Again, see Chapter 3.

<sup>9</sup> Expected real residual rents are  $\Pi_j(0) = E_{oj} \sum (1+r(t)+p(t))^{-t} \Pi_j(t)$ .  $E_{oj}$  denotes expectations based on the information available to management at the beginning of the current period ( $t=0$ );  $r$  and  $p$  are, respectively, the discount and general inflation rates; and the series are summed from  $t=0$  to  $t=\eta$ , the expected life of the sunk capital investment. The residual-rent definitions imply a stretch variation on Tobin's  $q$ :  $q_j(0) = (1+\Delta \Pi_j(0))/(1+\Delta K_j^s(0))$ , where  $K_j^s$  is sunk capital and  $\Delta q_j/\Delta G_j < 0$ .

rely on the Wicksell-Wicksteed textbook distribution model featuring perfect market competition and first-degree homogeneous production that eliminates increasing returns and pure profit.

*Worker preferences.*<sup>10</sup> An important class of OJB models relies on *arbitrary preferences*, parsimoniously building on the standard two-argument (consumption and leisure) description of worker utility. The taste for leisure is conveniently expanded to include loafing on the job; and the pursuit of that preference is constrained by workplace monitoring as well as labor-market conditions. Despite being universally rejected by human-resource professionals, the arbitrarily-imposed preference to shirk motivates employees in mainstream economic theory.

The *axiomatic-preference* approach, by contrast, adds an argument to the employee's utility function that reflects his or her relative position. This general model class is broadly accepted by practitioners and was pioneered in macroeconomics by Duesenberry (1949) and Modigliani (1949) and has more recently been featured by a number of theorists, notably including Becker (1996), Bewley (1999a, 2007) and Akerlof (2007).<sup>11</sup> From de la Croix (2001, p.262): "The preferences under which the [mainstream] utility function is derived are, by definition, independent of past choices and others' choices. This simplification is quite useful to address many economic issues, but it is fair to recognize that most economic models have adopted a very naïve approach to the determination of utility and that a large number of choices depend very much on past actions and inter-individual relationships."

---

<sup>10</sup> In all the OJB models surveyed, worker utility is strictly increasing in both consumption and away-from-the-workplace leisure.

<sup>11</sup> For a review of the use of extended preferences in macroeconomic modeling, see de la Croix (2001). In general, care must be taken in the search for topological transformations of preferences that make one's model more consistent with the data. Misuse of the practice results in hidden free parameters. Such transformations are admissible in model building only if the reformulated preferences are both intuitively plausible and strongly supported by the evidence; in other words, they must satisfy the frequently ignored standard criteria for the construction and use of axioms. See Jensen and Meckling (1998) for a general critique of the axioms used by economic theorists to motivate preferences.

Arbitrary Preferences: Shapiro-Stiglitz Shirking

Market-constrained shirking behavior, rooted in the assumption that workers prefer to loaf on the job, is the most familiar economist description of OJB. It has been modeled by Calvo (1979), formalized by Shapiro and Stiglitz (1984), and explored by a number of others, notably including Bulow and Summers (1986) who endowed shirking theory with technology heterogeneities in order to construct and test an interesting disaggregated model of wage determination and structure. Macroeconomists, engaged in the infrequent act of thinking about what goes on in the workplace, almost always default to the Shapiro-Stiglitz model.

Phelps (1994, p.12) summarized shirking theory's idea of optimizing behavior: "Continuous monitoring of every employee would be prohibitively expensive for the firm. The suggested solution is to motivate employees to shirk with reduced frequency by the same means that it motivates employees to quit with reduced frequency: by offering the employee incentive pay. By giving the employee more to lose in the event of dismissal, the firm will reason, the threat (certain or uncertain) of dismissal in the event the employee is caught shirking is made a stronger deterrent for the employee. Up to a point, then, raising the wage will generally gain more in output per man-hour than it will lose in wages per man-hour, with the result that the wage cost of producing a given output is decreased on balance." Phelps explicitly posits unbundled  $\dot{Z}_j$ , calling attention to the general problem with shirking-class workplace modeling. Absent nonintuitive constraints, worker utility that is simply decreasing in  $\dot{Z}_j$  restricts workplace behavior insufficiently to support the derivation of unbundled  $\dot{Z}_j$ , and the existence of meaningful wage rigidities, from employer-employee optimization. (See below.) As a result, any interesting results from the shirking-model class are always assumed.<sup>12</sup>

The central distinguishing elements of any formal economic model of worker OJB are found in its employee-utility and workplace-exchange functions. With respect to the former, shirking theory expands the leisure argument in von Neumann-Morgenstern expected utility:

---

<sup>12</sup> Phelps's important *Structural Slumps: The Modern Equilibrium Theory of Unemployment, Interest, and Assets*, from which the passage is drawn, is the most ambitious use of the shirking variant of efficiency-wage theory to rework macro theory. See also Layard, *et al.* (2005).

$$(9.6) \quad E_{oi} \sum_t \tau^t \dot{U}(C_i(t), L_{ij}^H(t), L_{ij}^W(t)),$$

such that  $\Delta \dot{U}_i / \Delta L_i^W > 0$ ,  $\Delta L_{ij}^W / \Delta \dot{Z}_{ij} < 0$ ,

where  $C$  represents consumption at time  $t$ ;  $L^H$  and  $L^W$  denote, respectively, leisure away from and on the job;  $E_o$  denotes the expectation of future values of the function's arguments based on the information available at the beginning of the current period ( $t=0$ );  $\tau$  is the subjective discount factor ( $\tau \in (0,1)$ );  $\Delta$  is the change operator; and the series are summed from  $t=0$  to  $t=\kappa$ , the employee's desired future tenure at firm  $j$ .<sup>13</sup>

The Shapiro-Stiglitz (S-S) model's capacity to derive wage rigidity from employer-employee optimizing behavior further requires arbitrary constraints imposed on workplace exchange:

$$(9.7) \quad \dot{Z}_j = (E/H)_j = \dot{Z}_j(W_j, \hat{W}_j, W^{\hat{a}}, \check{g}_j),$$

such that a particular wage ( $\hat{W}_j$ ) is posited to satisfy two conditions,  $(\dot{Z}_j | (W_j/W^{\hat{a}}) < (\hat{W}_j/W^{\hat{a}})) = 0$  and  $(\dot{Z}_j | (W_j/W^{\hat{a}}) \geq (\hat{W}_j/W^{\hat{a}})) = \bar{e}$ , with  $\bar{e}$  defined by S-S as "some fixed positive level" of labor effort.<sup>14</sup> Workers' market opportunity cost is  $W^{\hat{a}}$ , which in the S-S model equals their best alternative compensation, adjusted for the expected duration of unemployment and associated jobless benefits, after separation from firm  $j$  (introducing labor-market conditions into the optimization process). Workplace-monitoring intensity, denoted by  $\check{g}$ , is assumed to be constant.

Given  $H_j > 0$ , profit-seeking mandates that the firm must pay  $\hat{W}_j$ :<sup>15</sup>

$$(9.8) \quad \text{If } W^{\hat{a}} \leq W_j < \hat{W}_j, \text{ then } (\dot{Z}_j / \hat{W}_j | \dot{Z}_j = \bar{e}) > (\dot{Z}_j / W_j | \dot{Z}_j = 0); \text{ and}$$

<sup>13</sup> Other restrictions with respect to lazy-worker utility are common to all formal OJB models:  $\Delta \dot{U}_i / \Delta C_i > 0$ ,  $\Delta \dot{U}_i / \Delta L_i^H > 0$ ,  $\Delta L_i^H / \Delta H_i < 0$ ,  $W_{ij} \geq W^m$ , where  $H$  is hours at work. With respect to variables  $L^H$  and  $L^W$ , the former can be best thought of as otiose free time, characterized by ease and relaxation, as opposed to the latter, which is less satisfactory free time that must be spent on the job and is further degraded by the constant need to avoid detection. It should be noted that, in constructing their model, Shapiro-Stiglitz sharply simplify employee instantaneous utility, i.e.,  $\dot{U}_{ij} = W_{ij} - \dot{Z}_{ij}$ , such that  $\Delta \dot{U}_{ij} / \Delta W_{ij} > 0$  and  $\Delta \dot{U}_{ij} / \Delta \dot{Z}_{ij} < 0$ . Their other assumptions include worker and firm homogeneity, risk neutrality, perfect information about alternative jobs, no vacancies, and exogenous workplace monitoring intensity; class-I jobs are implicitly assumed.

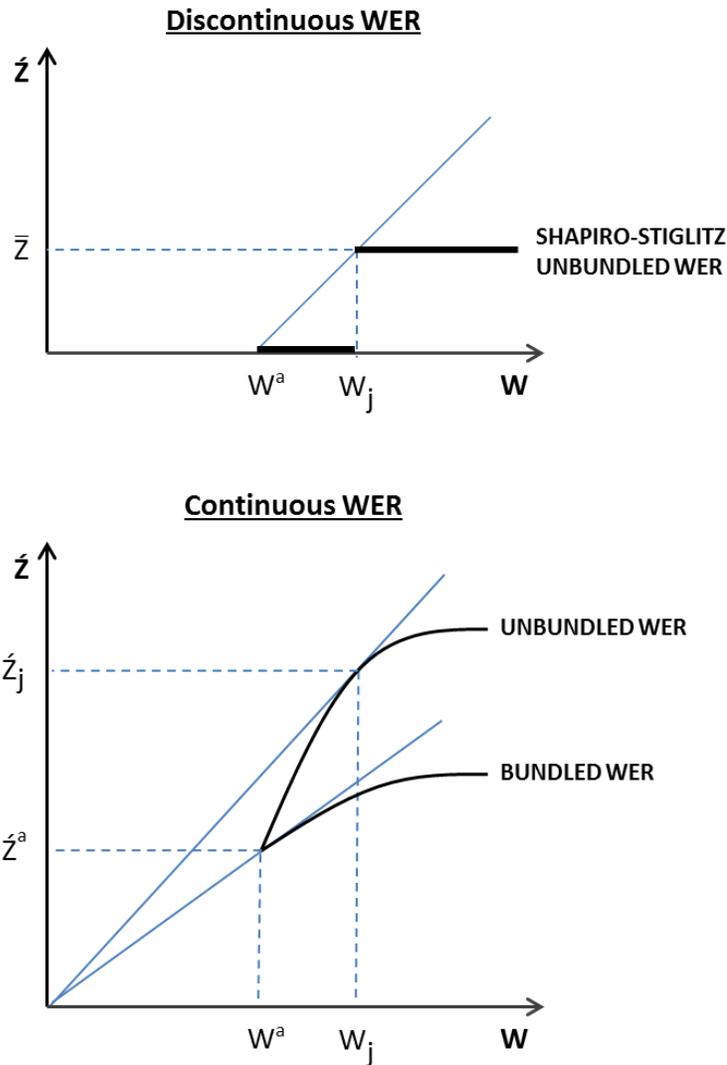
<sup>14</sup> Shapiro and Stiglitz (1984), p. 435.

<sup>15</sup> The wage ratio  $\hat{W}_j / W^{\hat{a}}$ , reflecting the constant wage rent consistent with homogeneous worker preferences (given constant workplace monitoring  $\check{g}_j$ ), causes  $\hat{W}_j$  to move inversely with market unemployment.

(9.9) If  $W_j > \hat{W}_j$ , then  $(\dot{Z}_j / \hat{W}_j \mid \dot{Z}_j = \bar{e}) > (\dot{Z}_j / W_j \mid \dot{Z}_j = \bar{e})$ .

Figure 9.1 illustrates the optimization condition. In the Shapiro-Stiglitz WER, unit labor costs at  $\hat{W}_j$  must always be lower than unit costs in the range of all other feasible wages ( $W^a \leq W_j$ ). Shirking theory's bimodal workplace exchange ( $\dot{Z}_j = 0$  or  $\dot{Z}_j = \bar{e}$ ) is, therefore, much more than an analytical convenience. It critically motivates the unbundled  $\dot{Z}_j$  required for the rational payment of labor rents.

**FIGURE 9.1. SHIRKING THEORY: WORKPLACE-EXCHANGE RELATION**



The restrictions that enable nonmarket wages to exist in Shapiro-Stiglitz are, at best, non-intuitive. Most significantly, in the technological space of the shirking model, homogeneous firm conduct is constrained by  $0 \notin X_j$ , rejecting the typical characteristic of the firm's choice set that permits the refusal to hire variable inputs, i.e., to remain idle.<sup>16</sup> As a result, in the labor-price range  $W^a \leq W_j < \hat{W}_j$ , management is required to pay opportunity costs to a workforce that produces nothing, making profit maximization conditional on that arbitrary employment policy. To avoid paying labor out of nonexistent revenue, the firm always chooses to pay the wage incentive ( $\hat{W}_j$ ) that transforms  $\dot{Z}_j=0$  into  $\dot{Z}_j=\bar{e}>0$ .<sup>17</sup> That zero-based discontinuous transformation of  $H_j$  into  $E_j$  permits Shapiro-Stiglitz to derive interesting results from optimizing workplace behavior.<sup>18</sup>

If endowed with (less problematic) continuous, positive  $\dot{Z}_j$ , also illustrated in Figure 9.1, shirking theory exchanges one problem for another. Now, because of insufficiently restricted behavior, shirking theory cannot derive Phelps's condition for the existence of rational wage rents (an unbundled WER) from employee-employer optimization. To reiterate, interesting results for the shirking-model class cannot be derived from model primitives; they must always be assumed.<sup>19</sup>

---

<sup>16</sup> Worker homogeneity is used to motivate a universal insistence on  $\hat{W}_j$  as a condition of  $\dot{Z}_j>0$ .

<sup>17</sup> The peculiar nature of the Shapiro-Stiglitz theory is no secret. For example, David Romer (2001) devotes nine pages to summarizing their shirking model, concluding: "The firm must pay [labor rent  $\hat{W}$ ]; otherwise, its workers exert no effort and produce nothing." (p.425)

<sup>18</sup> There is a noteworthy caveat here. The impetus for the 1984 shirking theory was the authors' desire to explain unemployment in the marketplace, not activity in the workplace. The bimodal separation of  $\dot{Z}_j$  to be either zero or a positive constant (with its attendant restrictions on firm profit-seeking) was likely never meant to be, nor can it be, a serious model of worker behavior on the job. The remainder of the Shapiro-Stiglitz story, having little to do with modeling rational OJB, assumes a SVGE economy populated with firms restricted by costly, asymmetric workplace information and posits two characteristics for the  $j$ th establishment's equilibrium wage: (a) equality with the rate paid by the other homogeneous firms and (b) a premium over the homogeneous workers' opportunity costs, in order to increase the cost of shirking. (Farmer (2010) similarly restricts wages in his interesting reworking of Keynesian theory.) It is readily apparent that positive market unemployment is needed to reconcile the two conditions.

<sup>19</sup> Moreover, shirking theory cannot prevent wage recontracting in response to adverse disturbances to aggregate nominal demand and, therefore, can neither support the existence of high-frequency involuntary job- and income-loss nor explain the cyclical behavior of unemployment.

### Arbitrary Preferences: Principal-Agent Problems

Principal-agent analysis formally models the existence and distribution of information rents arising from task delegation in organizations. (The literature is usefully summarized in Laffont and Martimort (2002) and Prendergast (1999).) Positing private information and conflicting employer-employee objectives, researchers have associated moral hazard with variable worker cooperative input. In large, specialized production environments, employees know more about how to do, and how well they are doing, their jobs than does their employer. Workers, exploiting that information asymmetry, can take hidden actions to alter their terms of trade with management. With sufficient production scale and specialization, moral hazard is an inherent feature of optimizing, price-mediated workplace exchange.

Incentive theorists have, in particular, studied the design of compensation contracts and the circumstances in which payment methods can mitigate workplace information problems. Given that the construction of optimal wage incentives requires prior understanding of the employee behavior to be motivated, the principal-agent literature is relevant to this review. Workplace modeling used to illuminate agency problems typically combines the default lazy-worker utility function and a simple workplace-exchange relation, producing a generic economic model of on-the-job behavior:<sup>20</sup>

$$(9.10) \quad E_{oi} \sum \Gamma^t \dot{U}(C_i(t), L_{ij}^H(t), L_{ij}^W(t)),$$

such that  $\Delta \dot{U}_i / \Delta L_i^W > 0$ ,  $\Delta L_{ij}^W / \Delta \dot{Z}_{ij} < 0$ ; and

$$(9.11) \quad \dot{Z}_{ij} = \dot{Z}_j(W_{ij}, W^m, \dot{Z}_j^m),$$

such that  $W_j \geq W^m$ ,  $\dot{Z}_{ij} \geq \dot{Z}_j^m$ ,  $\Delta \dot{Z}_{ij} / \Delta (W_j / W^m) > 0$ .

The fundamental idea is that, if employees are sufficiently willing to substitute on-the-job leisure for consumption, making labor pricing contingent on productivity induces a voluntary unbundling of workplace exchange ( $(\Delta \dot{Z}_{ij} / \dot{Z}_j^m) / (\Delta W_j / W^m) > 1$ ). For nonsupervisory, production

---

<sup>20</sup> The path-breaking principal-agent analysis of Alchian and Demsetz (1972) motivated discretionary employee behavior with an inherent distaste for work; and that model-building choice has been generally followed by incentive theorists. Other restrictions on worker utility are common to all formal OJB models:  $\Delta \dot{U}_i / \Delta C_i > 0$ ,  $\Delta \dot{U}_i / \Delta L_i^H > 0$ ,  $\Delta L_i^H / \Delta H_i < 0$ ,  $W_{ij} \geq W^m$ .

workers, whose workplace is characterized by costly, asymmetric information, agency theorists identify piece rates and profit-sharing as the principal classes of contingent payments used by management to induce employees to better align their behavior with employer goals.

*Piece rates.* The most significant macroanalytical shortcoming with the agency analysis of piece rates is that it cannot support the derivation, from optimizing behavior, of the existence of rational labor rents, let alone involuntary job loss. Either outcome must be assumed, a problem that is (as has been emphasized in this review) intrinsic to the shirking-model class.<sup>21</sup>

It is interesting that the most consequential implications of incomplete contracts in the principal-agent literature follow from microfounding limitations on the rational use of piece rates. Workplace-information asymmetries motivate problems that include imperfect measurement of output (especially when quality is less observable than quantity) and the difficulty detecting free riders in team production.<sup>22</sup> When the quantity and quality of output is both measurable and attributable to individual employees, a relatively unusual occurrence in large establishments, some version of piece rates is frequently employed.

*Profit-sharing.* Profit-sharing given inherently lazy employees is also not supported by modeling optimizing behavior. The rational use of gain-sharing compensation plans, implemented in order to motivate better alignment of OJB with firm goals, is fundamentally limited by workplace-information problems that are particularly aggravated by the use of aggregate measures of performance. (See Chapter 8.) For the employee, the connection between his or her behavior on the job and the firm's reported profits is typically muddled into incoherence by firm size and specialization, multiple product lines, capital-investment decisions, accounting practices, and external economic forces. Asymmetric information with respect to the

---

<sup>21</sup> No intuitive analysis relying on the simple lazy-worker specification of employee utility is capable of deriving, and must instead posit, the WER unbundling needed for the optimal payment of meaningful wage rigidities. The default, arbitrary description of inherently lazy employees is inconsistent formal policy-relevant macroeconomics. It is a happy characteristic of the real world that human-resource professions reject the shirking convenience.

<sup>22</sup> Related problems include worker gamesmanship in management's calibration of wage incentives and the dysfunctional OJB that occurs when multi-tasking employees rationally concentrate only on those aspects of their jobs that are explicitly rewarded in their compensation contracts, inducing an inefficient reallocation of activities to the subset of the job functions that are directly linked to wages.

several, often obscure, influences on total profits combines with management's inability to identify free riders in team production to thoroughly compromise the capacity of company-wide profit-sharing to effectively motivate employee OJB.<sup>23</sup>

### Arbitrary Preferences: Tournaments

Edward Lazear and Sherwin Rosen (1981) constructed tournament theory, one of the earliest formal models of employee on-the-job behavior, during a remarkably productive period for innovative analysis of labor pricing.<sup>24</sup> Although Lazear-Rosen did not emphasize the role of shirking, their theory is consistent with positing  $\Delta L_{ij}^w / \Delta \dot{Z}_{ij} < 0$  and fits best in the expanded-preference class of workplace models. Like other formal workplace analyses, the identifying features of the tournament approach are captured in its utility and workplace-exchange functions:

$$(9.12) \quad E_{oi} \sum_t r^t \dot{U}(C_i(t), L_{ij}^H(t), L_{ij}^W(t)),$$

such that  $\Delta \dot{U}_i / \Delta L_{ij}^W > 0$ ,  $\Delta L_{ij}^W / \Delta \dot{Z}_{ij} < 0$ ;<sup>25</sup> and

$$(9.13) \quad \dot{Z}_{ij} = Z_j(W_{ij}, W_j^P, \dot{Z}_j^k),$$

such that  $W_{ij} \leq W_j^P$ ,  $\Delta \dot{Z}_{ij} / \Delta(W_{ij} / W_j^P) < 0$ ,  $\Delta \dot{Z}_{ij} / \Delta \dot{Z}_j^k > 0$ ,

<sup>23</sup> If gain-sharing pay programs do not help align worker behavior with management goals, why is the compensation practice found in so many firms? Recall that Chapter 8 uses GWET to provide an interesting explanation. To the extent that efficiency wages make claims on firm revenue that are independent of market conditions, the residual share going to the owners of sunk capital absorbs most of the revenue volatility associated with changing economic circumstances. Management, therefore, will likely be on the lookout for cost-effective wage-setting arrangements that allow some risk-sharing with their employees. The wage-policy-making problem is to design payment methods that partially link total compensation to profits without triggering adverse worker feedback. A solution to that problem is to invest in convincing workers to adopt an additional equity-based reference standard, building on the intrinsic employee preference for a fair distribution of residual rents between the workers and the owners of capital. In practice, that additional reference standard is then used to justify partitioning total money compensation, which includes labor rents, into the wage paid and a periodic bonus. The latter is assumed to be an increasing in the profit share and restricted to be non-negative. Profit-based bonus payments introduce simultaneity in the determination of labor and capital factor-income shares, making employee compensation more flexibly responsive to changing product-market conditions. Note the asymmetry. If employees' preference for equitable treatment is effectively extended to the division of residual rents, then some degree of downward flexibility in labor compensation can occur absent adverse OJB reactions. Meanwhile, given the perceived weak link between individual behavior and overall profits, rational workers do not increase their cooperative effort on the job in the hopes of pushing up residual rents and, as a result, their annual bonuses. In organization analysis, this general class of behavior is named "procedure justice". See Brockner and Wiesenfeld (1996).

<sup>24</sup> Other notable contributions of that period include Solow (1979), Wood (1978), Annable (1977, 1980, 1984), Calvo (1979), Akerlof (1982, 1984), and Shapiro-Stiglitz (1984).

<sup>25</sup> Other restrictions are common to all formal OJB models:  $\Delta \dot{U}_i / \Delta C_i > 0$ ,  $\Delta \dot{U}_i / \Delta L_i^H > 0$ ,  $\Delta L_i^H / \Delta H_i < 0$ ,  $W_{ij} \geq W^m$ .

where  $W^p$  is wage (the “prize”) received by the worker if promoted and  $Z^k$  is the relevant productivity of other employees in competition for the promotion. The compensation structure associated with the firm’s leadership hierarchy provides the incentive that influences employee productivity. From Lazear and Shaw (2007, p.94): “Tournament theory begins with the notion that prizes are fixed in advance.... Winning that salary depends on relative performance. Individuals are promoted not because they are good, but because they are better than others in the relevant group.”

Tournament theory combines the payment of wage rents and effective labor monitoring. Strong requirements with respect to the symmetry and cost of relevant workplace information are sensible in the Lazear-Rosen approach, which is largely limited to the OJB of employees who reasonably aspire to higher-paid management positions.<sup>26</sup> Those employees want to demonstrate superior performance; and their productivity, given the nature of supervisory positions, is relatively easy to monitor. By contrast, most workplace theories focus on the optimizing behavior of nonsupervisory, production workers who perform structurally different work tasks with different ports of entry to the firm than management employees in large establishments.<sup>27</sup>

Most wage earners learn relatively quickly learn that they are unlikely to move significantly up the firm’s leadership hierarchy. They understand, correctly, that they are not contenders for the big paydays “won” by promoted managers. Rational wage-earner behavior on the job is motivated by different objectives, and specialized-workplace information asymmetries produce monitoring limitations that provide the latitude to pursue those objectives. As a result, the conduct and pricing of that largest class of employees is neither explained nor predicted by tournament modeling.

---

<sup>26</sup> Tournament theory also applies, less interestingly, to employees who derive relatively high utility from the nonpecuniary benefits of their rationed class-II jobs. The oft-cited example is junior faculty at research universities who are thought to expend substantial effort (the productivity of which, given the goals of their employer, is easily monitored) in their attempt to win tenure tournaments. As someone who has held faculty positions in research universities and executive positions financial-service firms, I can attest that the intense competition for tenure has remarkably little to do with pecuniary rewards. More generally, my experience in large, for-profit firms (as a member of management committees of large banks and chairman of the compensation committee for a large insurance company) has been especially useful in understanding the unique nature of labor pricing in specialized economies.

<sup>27</sup> More than 80 percent of U.S. private, nonfarm jobs are held by nonsupervisory or production workers.

Lazear-Rosen, of course, were not attempting to explain the OJB of nonsupervisory, production workers. Instead, they were focused on incentives that influence the behavior of employees attempting to move up the firm's management ladder, rationally responding to the compensation prize attached to climbing higher rungs as well as the productivity of their competitors for that advancement. As a result, tournament theory usefully augments the more typical emphasis of OJB analyses that, given workplace-information asymmetries, describe the rational conduct of workers with restricted upward mobility.

### Axiomatic Preferences: Morale-Centric Efficiency Wages

The axiomatic-preference approach to modeling workplace exchange is more familiar to practitioners than economic theorists. But increasing economist attention is being paid, most notably by the school of economic behaviorists who are using findings from theoretical and experimental psychology, neuroscience, and evolutionary biology to rewrite the textbook primitives of economic theory.<sup>28</sup>

The morale-centric version of efficiency wages, originally modeled by Solow (1979, 1990) and Annable (1977, 1980, 1984, 1988), draws from human-resource management to extend employee tastes to include a stable preference for fair treatment by his or her employer.<sup>29</sup> The worker desire for equity is asserted to have sufficiently broad acceptance among practitioners to require no derivation.

The ubiquitous von Neumann-Morgenstern expected-utility framework is adapted to the extended preference of worker  $i$ :

---

<sup>28</sup> See, for example, Camerer *et al.* (2004).

<sup>29</sup> While less explicitly in the formal neoclassical maximizing tradition, Wood (1978) anticipated much of what is useful in efficiency-wage theory and is broadly compatible with Annable (1977, 1980). More generally, employee feedback was not discovered by efficiency-wage theorists. As noted in the previous chapter, Gary Becker (1962) hinted at the existence of nonlinear worker-response functions. Earlier antecedents can be found, to cite four examples, in Rowe (1928), Stanley Mathewson (1931), Richard Lester (1941), and E. Wright Bakke (1946). A notable more recent example of efficiency-wage thinking, but again outside the neoclassical framework, is Piore (1972).

$$(9.14) \quad E_{oi} \sum (1+r)^t \dot{U}_i(C_i(t), L_i^H(t), W_j(t)/W_j^n(t)),$$

such that  $(\Delta \dot{U}_i / \Delta (W_j / W_j^n) \mid W_j \leq W_j^n) > 0$ .<sup>30</sup>

The innovation here is the definition and behavior of  $W^n$ , named the *reference wage*. Three classes of reference standards calibrate the worker's stable preference for fair treatment:  $W^a$  (his or her best alternative wage),  $W^b$  (the interpersonal reference standard), and  $W^c$  (the intertemporal reference standard), implying a set of labor prices  $\mathbf{K}_{ij} = \{W_{ij}^a, W_{ij}^b, W_{ij}^c\}$ .<sup>31</sup> The worker's preference for equity is satisfied by the set's least upper bound:  $W_j^n = \sup \mathbf{K}_{ij}$ . Instantaneous utility is strictly increasing in  $W_j / W_{ij}^n$  up to unity and unchanged thereafter.

Axiomatic preferences provided the intuition motivating the assumption of unbundled workplace exchange from optimizing employer and employee behavior in large establishments offering class-I jobs. Unbundled WERs imply that the payment of wage rents ( $W_j = W_j^n > W^m$ ) is consistent with profit maximization.<sup>32</sup> By contrast, for small firms or those offering class-II jobs, workplace exchange is bundled, making labor pricing greater than market opportunity costs inconsistent with profit seeking. WERs for large and small establishments respectively are posited to be (see Annable (1980)):

---

<sup>30</sup> Other restrictions are  $\Delta \dot{U}_i / \Delta C_i > 0$ ,  $\Delta \dot{U}_i / \Delta L_i^H > 0$ ,  $\Delta L_i^H / \Delta H_i < 0$ ,  $(\Delta \dot{U}_i / \Delta (W_j / W_j^n) \mid W_j > W_j^n) = 0$ . See Annable (1977).

<sup>31</sup> In the academic literature, the three-part calibration of the reference wage was established by a loose school of labor economists, based on their numerous on-site studies of workplace exchange, in the middle-20<sup>th</sup> century. As has already been noted, they found that employees preferred wages that were consistent with interpersonal and intertemporal reference standards that had become ingrained (via repeated application) over time and that had, therefore, been incorporated into workplace standards of acceptable treatment. More generally, the literary workplace analysis of Clark Kerr, John Dunlop, Richard Lester, Lloyd Reynolds, Arthur Ross, Frederick Harbison, Charles Myers, and others motivates the formal human-relations analysis of workplace exchange. (For insightful overviews, see Kerr (1977 and 1987) and Kaufman (1988 and 1994).)

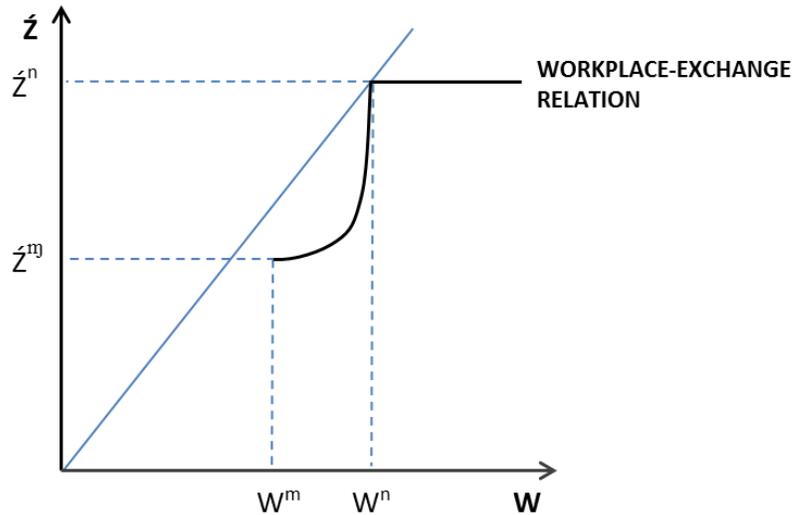
<sup>32</sup> Large-establishment  $\mathbf{K}_j$  is exogenous and consistent with the payment of wage rents ( $W_j^n > W_j^a$ ). Such rents constrain worker optimization. High-wage jobs are rationed, and employment by a rent-paying firm implies being pushed off one's labor-supply schedule, suppressing work-leisure choice and making the workweek a management prerogative. For workers receiving rents, hours on the job are exogenously determined, limiting the pursuit of utility maximization to adjusting OJB:  $\max \dot{U}_i(C_{ij}, L_{ij}^o, W_j / W_{ij}^n)$  with respect to  $Z$ . Also in the static analysis, the reference wage is given, implying fixed consumption ( $C^o$ ) unless the firm attempts to reduce labor rents by cutting compensation from  $W_{ij}^n$ . Worker dissatisfaction with the inequitable change would then be reinforced by their preference for more to less consumption. Constrained by large firm profit-seeking, employees maximize instantaneous utility at  $W_j / W_{ij}^n = 1$ . By contrast, the absence of agency problems in small firms implies the workers' inability to establish  $W^b$  and  $W^c$ :  $W_j^n = \sup \mathbf{K}_j = W_j^a$ . See Annable (2007).

(9.15a)  $\dot{Z}_j = f(W_j, W_j^n, \dot{Z}_j^m, W^m)$ , such that  
 if  $W_j \in [W_j^n, W^m]$ ,  $(\Delta \dot{Z}_j / \dot{Z}_j^n) / (\Delta W_j / W_j^n) > 1$ ;<sup>33</sup>

(9.15b)  $\dot{Z}_k = \dot{Z}_k^m$ , such that  
 if  $W_k > W^m$ ,  $(\Delta \dot{Z}_k / \dot{Z}_k^m) / (\Delta W_k / W^m) < 1$ .

Figure 9.2 illustrates the unbundled WER class, capturing a critical model asymmetry. A positive compensation shock (i.e., the wage paid moving to the right along the WER from  $W_j = W_j^n$ ) does not disturb workplace equilibrium. Unchanged  $\dot{Z}_j$  implies no gift-exchange, usefully restricting the role of reciprocity to its negative variant. Indeed, the interesting action is wholly confined to  $W_j$  reductions from  $W^m$ , falling increasingly below the reference rate. Wage cutting causes dissatisfaction, and employees restore equilibrium by altering their on-the-job behavior, a response that is consistent with the evidence. In large establishments offering class-I jobs, unchanged  $\mathbb{K}_j$  implies that labor-price reductions are inconsistent with profit maximization, usefully microfounding  $W_j = W_j^n > W^m$ .

**FIGURE 9.2. RATIONAL WORKER THEORY: UNBUNDLED WER  
 (LARGE ESTABLISHMENTS OFFERING CLASS-I JOBS)**



<sup>33</sup> If  $W_j > W_j^n$ ,  $(\Delta \dot{Z}_j / \dot{Z}_j^n) / (\Delta W_j / W_j^n) = 0$ . Ideal piece-rate compensation systems  $((\Delta \dot{Z}_j / \dot{Z}_j) / (\Delta W_j / W_j^n) = 1)$  are ignored.

*Model dynamics.* Employees' intertemporal substitution of expected consumption for fair treatment (represented by  $W_j^n$ ), modeled and simulated in GWET as a dynamic programming/Bellman problem, motivates rational  $K_j$  recalibrations, making the time path of optimal labor pricing and use endogenous. (Recall Chapter 3.) The analysis demonstrates the existence of a level of expected nonstationary residual rents that precludes the rational substitution of expected consumption for fair treatment, restricting the inter-temporal flexibility of  $W_j^n$  in response to changing market conditions.

The dynamic modeling assigns a critical role to the establishment's revenue-adequacy problem that was noted above. It identifies multiple interrelated sources of residual rents ( $I_j(0) > 0$ ) that can fund  $K_j$  (and  $W_j^n$ ) durability, including optimal investment in sunk capital under uncertainty, endogenous product pricing (featuring monopolistic competition), increasing returns, and government intervention, broadly defined to include actions that reduce industry product-demand elasticities as well as those that restrict management latitude to optimize labor costs.

Completing the picture, inadequate expected residual rents ( $q_j(t) < 1$ ) induce firm-specific job destruction, modestly at first but eventually threatening worker rents (and the consumption path they support) sufficiently to produce  $K_j$  recalibrations and reference-wage reductions.<sup>34</sup> Given sufficient incidence in the overall population of firms, such  $K_j$  revisions reduce the natural rate of unemployment.

#### Axiomatic Preferences: Gift-Exchange

*Original modeling.* George Akerlof's 1982 theory, despite appearing somewhat after Solow and Annable, is the best-known example of the extended-preference model class.<sup>35</sup> His approach is motivated by an employer-employee "gift exchange" of higher wages for higher productivity. "On the worker's side, the 'gift' given is work in excess of the minimum work standard; and on

---

<sup>34</sup> The nonrandom workplace incidence of permanent job loss by employees combined with moral hazard rooted in workplace information asymmetries contributes to the lagged worker response to job destruction.

<sup>35</sup> Akerlof's gift-exchange model shows up in some textbooks but has not approached the acceptance of the Shapiro-Stiglitz shirking theory. See, for example, Cahuc and Zylberberg (2004).

the firm's side, the 'gift' given is wages in excess of what these [workers] could receive if they left their current jobs." (Akerlof (1982), p.543) A worker-response function is arbitrarily specified to produce unitary elasticity at  $W_r$ :<sup>36</sup>

$$(9.16) \quad \dot{Z}_j = \dot{Z}_j^\eta = -a + b(W_j/W_r)^\gamma \text{ such that } 0 < \gamma < 1,$$

where  $\dot{Z}_j^\eta$  denotes the "effort norm",  $W_j$  the offer wage, and  $W_r$  the "reference wage". In order to introduce contemporaneous labor-market conditions into the model, the reference wage is defined as:

$$(9.17) \quad W_r = W_o^{1-\hat{U}} B_U^{\hat{U}},$$

where  $W_o$  is the wage paid by other firms,  $\hat{U}$  denotes the rate of market unemployment, and  $B_U$  is the level of jobless benefits.<sup>37</sup>

Similarly to Annable, gift-exchange (implicitly) builds on the neoclassical, albeit literary, framework of Kerr, Dunlop, Harbison, Myers, Ross, and other mid-century labor economists: profit maximization, variable worker behavior on the job, workplace norms, labor-pricing (interpersonal and intertemporal) reference standards, and the importance of perceived fair wages in employee utility. But, and here's the rub, Akerlof (along with Annable, Solow, Wood, and the other morale-centric efficiency-wage theorists in the late 1970s and 1980s) failed to combine the ingredients drawn from Kerr *et al.* (and emergent human-resource management) into a model of optimal worker behavior that restricts WERs sufficiently to liberate nonmarket efficiency wages

---

<sup>36</sup> The notation is Akerlof's. The negative intercept term ( $a$ ) is the assumption that restricts the WER sufficiently to motivate unbundled OJB.

<sup>37</sup> Note that, if unemployment exists ( $\hat{U} > 0$ ) and the  $j$ th establishment pays a competitive wage ( $W_j = W_r = W_o$ ), the labor price paid by other firms must equal unemployment benefits ( $W_o = B_U$ ). Akerlof (1984) presents "... a more sophisticated version of gift exchange than in my earlier article", which implies a more general model of worker behavior on the job:  $E_{ij} = E(W_{ij}^R; W_{oj}^R, U)$ , where  $W^R$  is the real wage received,  $W_o^R$  is the real wage paid to other workers, and  $U$  is the market unemployment rate. He describes the equation as "... the key ingredient in an efficiency-wage model of unemployment." (p. 82) He recognizes that using only real explanatory variables means that the unemployment in question is the natural rate. The more sophisticated version still does not solve the fundamental problem with the gift-exchange approach. Free parameters continue to be necessary to make the workplace-exchange relation consistent with unbundled employee conduct.

from reliance on free parameters.<sup>38</sup> Exogenous labor-price rigidities, however dressed up, will always provide unwelcome microfoundations for formal macro theory.

It is also noteworthy that experimental work has had difficulty finding evidence of gift-exchange's positive reciprocity, especially beyond transient transactions.<sup>39</sup> The same experiments, however, find substantial negative reciprocity. From one recent study: "We find that wage cuts have severe implications on workers' effort. Moreover, during the observed period, there is no significant indication that the workers adapted to the lower wage over time. On the contrary, the detrimental effect is so strong that it cannot be compensated for by setting the wages back to their original level. While these results are broadly supportive for the notion of negative reciprocity in labor markets, the evidence for positive reciprocity is less conclusive.... we do not find a significant positive relationship between higher wages and effort, not even in the short run" (Kube, Maréchal, and Puppe (2006), p. 9).

*Identity Modeling.* Akerlof, collaborating with Rachel Kranton, has more recently has focused on Herbert Simon's mid-century analysis of employee acceptance of employer goals. (See Akerlof and Kranton (2005).) In his seminal work on organizations, especially as a market-alternative venue of rational exchange, Simon argued, persuasively, that such acceptance is a necessary condition for high performance in large, information-limited establishments. The idea was first introduced into formal economics by morale-centric efficiency-wage theorists. (See Annable (1977, 1984)).

Akerlof and Kranton's elaboration on firm investment in worker acceptance of organizational goals provides an interesting alternative specification of the employee's utility function and clearly contributes to the extended-preference class of OJB modeling. Their variant, however, features changing preferences, distancing (perhaps unnecessary) their exploration of the sociological concept of worker identity (rooted in acceptance or rejection of employer's goals)

---

<sup>38</sup> De la Croix *et al.* (2000) strengthened gift-exchange analysis by formally introducing, in their numerical experiments, intertemporal comparisons into the determination of the workers' perceived fair wage. However, de la Croix *et al.*, in order to square the payment of nonmarket wage incentives with employer profit maximization, must continue the general efficiency-wage practice of assuming that  $\dot{Z}_j$  is unbundled.

<sup>39</sup> See Kube, Maréchal, and Puppe (2006) for a review of the recent literature.

from the earlier work on morale-centric efficiency wages and, more consequentially, the formal economic method of optimizing, general equilibrium derived from stable (axiomatic) preferences. Their model-building strategy is important. In both early efficiency-wage thinking and modern workplace-equilibrium modeling, causation runs from a stable, universal preference for equitable treatment (ultimately rooted, as noted in Chapter 2, in tens of thousands of years of natural selection that facilitated human cooperation and increased species-survival odds) to the choice concerning acceptance of management goals. In Akerlof and Kranton, causation is reversed; employer investment in employee identity fosters perceptions of fair treatment.

Identity-model causation, not surprisingly, finds little support in the management literature. Practitioners recognize the futility of direct investment in changing worker “identity” if their employees broadly perceive management to be arbitrary with respect to compensation, work rules, layoffs, promotion, etc. The ability to effectively manage a large, complex workplace begins with worker perceptions of fair treatment.

#### Axiomatic Preferences: Bargaining Models

Formal OJB theories typically model spontaneous workplace behavior, motivated by employee pursuit of stable preferences in the context of costly, asymmetric information, economic rents, and exclusion-principle limitations on collective activities. The development and maintenance of workplace reference standards ( $\mathbf{K}_j$ ), however, need not be spontaneous. Most notably, workplaces can be intentionally organized by labor unions. In those circumstances, the economic modeling of collective bargaining is usefully microfounded by the optimizing, price-focused analysis of workplace exchange organized around continuous equilibrium.

*Nash bargaining.* As noted in Chapter 7, wage negotiations in modern formal theory are almost always represented as an exercise in Nash bargaining. The familiar generalized solution for the Nash model is  $\max [(\check{Y} - \check{Y}_0)^\pi (W - W_0)^{1-\pi}]$ , where  $\check{Y}$  denotes firm profit,  $\check{Y}_0$  is the firm’s reservation profit (implying a reservation wage),  $W$  represents the wage paid,  $W_0$  is the worker’s reservation wage (usually assumed to equal market-opportunity costs), and  $\pi$  captures the firm’s relative bargaining power.

The mainstream status of the Nash model among economists is puzzling. It is a little more than a black box that relies on free parameters (most critically informing  $\pi$ ) to produce a determinate wage.<sup>40</sup> For a union, bargaining power, usefully defined as the ability to impose cost on the other side for disagreeing with your position, is rooted in its capacity to organize workplace behavior, notably including work stoppages, that damages employer profits. Exogenous  $\pi$  eliminates the need for endogenous worker OJB in the modeling of collective bargaining.

*The California school.* Chapter 7 usefully emphasized Arthur Ross's California-school approach to collective bargaining, informing Nash bargaining with intuitive restrictions on both the range of feasible wages and the calibration of relative bargaining power. Ross informally modeled worker utility (emphasizing interpersonal and intertemporal wage comparisons and job security), union institutional goals, determinants of the negotiators' capacities to impose costs on each other, and reservation wages and profits. Developed in the mid-twentieth century, the Ross literary model is an important antecedent to formal workplace-equilibrium theory and, therefore, merits inclusion in this review.<sup>41</sup>

The utility and workplace-exchange functions implicitly used by Ross and the California school are virtually identical to intertemporal workplace equilibrium theory:

$$(9.18) \quad E_{oi} \sum (1+r)^t \dot{U}_i(C_i(t), L_i^H(t), W_{ij}(t)/W_j^n(t)),$$

such that  $(\Delta \dot{U}_i / \Delta (W_{ij}/W_j^n) \mid W_j \leq W_j^n) > 0$ ;<sup>42</sup>

$$(9.19) \quad \dot{Z}_j = \dot{Z}_j(W_j, W_j^n, W^m, \dot{Z}_j^m),$$

such that if  $W_j \in [W_j^n, W^m]$ ,  $(\Delta \dot{Z}_j / \dot{Z}_j) / (\Delta W_j / W_j^n) > 1$ .

---

<sup>40</sup> Many economic theorists have been content to follow Nash's suggestion that  $\pi$  be set equal to 0.5. Labor-management negotiators would be surprised that anyone would take such an arbitrarily calibrated model seriously; it clearly cannot be an acceptable axiom for economic models of labor pricing and use.

<sup>41</sup> The modest literature on the formal economic modeling of collective bargaining typically ignores union institutional goals, simply motivating labor organizations to maximize the total utility of their (employed and unemployed) membership. See, for example, McDonald and Solow (1981).

<sup>42</sup> Other restrictions are common to all formal OJB models:  $\Delta \dot{U}_i / \Delta C_i > 0$ ,  $\Delta \dot{U}_i / \Delta L_i^H > 0$ ,  $\Delta L_i^H / \Delta H_i < 0$ ,  $W_{ij} \geq W^m$ .

The reference wage ( $W_j^n$ ) is also governed by the same three-argument workplace reference standards ( $\mathbf{K}_j$ , such that  $W_j^n = \sup \mathbf{K}_j$ ) as in GWET. Indeed, the California School provided economists early identification of the importance of fair treatment in the specification of worker preferences.

The bargaining model is rooted in the same fundamental workplace analysis as a the GWET's spontaneous workplace organization, differing in three interrelated ways. Formal organization reduces free-rider limitations on collective employee actions, restricts the expected incidence of job loss from worker monitoring, and introduces a third set of objectives, i.e., those pursued by the rational union, into the labor-pricing process. Formal organization most notably expands the range of OJB responses to firm violations of  $W_j^n$  to include overt actions, especially work stoppages. Given sufficient firm-specific human capital, formal workplace organization broadens the range of discretionary OJB (for legal strikes,  $\dot{Z}_j - \dot{Z}_j^m = \dot{Z}_j$ ), enhances employees' capacity to impose costs on their employer, and increases  $\mathbf{K}_j$  durability.<sup>43</sup>

*Rubinstein's bargaining model.* The modest literature on formal economic modeling of union-management bargaining ignores the work of the California school, concentrating instead on the task of more deeply burying the black-box nature of the Nash model. The major contribution to the mainstream research agenda, so far, is Rubinstein (1982).

In his model, as described in Chapter 7, both sides to the negotiations are endowed an impatience quotient ( $\delta$ ) that discounts the future benefits of a completed bargain, implicitly assuming that the willingness to compromise is increasing in the time spent negotiating. Time pressures in the context of deteriorating outcomes replace bargaining power as the repository of the free parameters that motivate determinate wages. Rubinstein's game has a unique sub-game perfect equilibrium producing  $\Pi = 1/(1+\delta)$  and  $W = \delta/(1+\delta)$ , defining bargaining power wholly in terms of the time pressure to compromise:  $\pi = (1-\delta)^{-1}$ .

---

<sup>43</sup> There is a pleasing feature of the translation of Ross's literary unionism into an axiomatic model of optimizing worker behavior. Union-management negotiations are now con-strained by unbundled workplace exchange, providing the static bargaining process with a determinate wage ( $W_j = W_j^n$ ) that is both consistent with rationality and helps explain the low incidence of work stoppages in mature relationships.

In addition to a continuing reliance on free parameters, the model’s assertion that time pressure alone forces a bargaining solution would surprise practitioners. Absent some additional force or forces compelling compromise, profit-seeking firms (already paying small wage premiums to discourage turnover and the loss of specific human capital) would almost always be willing to negotiate forever with employees insisting on higher rents. More precisely, firm optimizing behavior mandates a comparison of the direct costs of negotiating, likely to be relatively small, and the costs of compromise.<sup>44</sup>

Axiomatic Preferences: Insiders-Outsiders Model

An interesting variant of insiders-outsiders theory is motivated by price-sensitive, optimizing behavior on the job. (See Lindbeck and Snower (1988, 2001).) From Lindbeck (1993): “... insiders can refuse to cooperate with outsiders who try to get jobs by underbidding the prevailing wages of the insiders. For instance, suppose that an unemployed worker approaches a firm and offers to work for a lower wage than the prevailing insider wage. Insiders may prevent such an attempt at underbidding by threatening not to cooperate with an under-bidder in the production process. As a result, the latter’s productivity may become so low that it is not in the firm’s interest to hire him or her. Insiders may also push up the reservation wage of outsiders by threatening to harass those who try to break into the firm through wage underbidding.” (p. 38)

More formally, the hypothesized uncooperative behavior of veteran employees in defense of their established wage ( $W_j^e$ ) would reduce productivity, implying a particular version of the workplace-exchange relation:

$$(9.20) \quad \begin{aligned} \dot{Z}_j &= \dot{Z}_j(W_j^e, W_{oj}, \dot{Z}_j^m, W_j^m), \text{ such that } \dot{Z}_j \in [\dot{Z}_j^e, \dot{Z}_j^m], \\ (\dot{Z}_j \mid W_{oj} = W_j^e) &= \dot{Z}_j^e, \Delta \dot{Z}_j / \Delta (W_{oj} / W_j^e) > 0, \end{aligned}$$

---

<sup>44</sup> The methodological message here deserves reiteration. When applied to union-firm negotiations, Nash bargaining must remain a black box, with solutions motivated by free parameters, unless it is endowed with endogenous worker behavior. (The absence of government imposition of wages and working conditions is assumed.) Only workplace organization provides labor leaders with the power to impose costs on managements that are sufficient to influence workplace terms of trade. The Rubinstein model cannot intuitively motivate bargaining power (e.g., work stoppages) because it has no embedded OJB description to microfound the necessary employee conduct. See John Straka (1989) for an analysis of bargaining models in the context of endogenous worker behavior.

where  $W_o$  is the offer wage to new hires and  $\hat{Z}_j$  is equilibrium OJB if undisturbed by underbidding. Given that the insider-outsider literature does not derive the uncooperative employee behavior from optimizing workplace exchange, the existence of rational nonmarket wages still must be assumed.

### Axiomatic Preferences: Flat-Top Model

Harvey Leibenstein (1976) constructed one of the earliest formal models of variable worker behavior on the job. Implicitly positing class-II jobs, he extends standard instantaneous utility by directly including an argument representing employee satisfaction derived from work effort itself:

$$(9.21) \quad \max \dot{U}(\dot{C}_{ij}(t), \dot{L}_{ij}(t), \dot{Z}_{ij}(t), \dot{Z}^6), \\ \text{such that } (\Delta \dot{U}_i / \Delta \dot{Z}_{ij} \mid \dot{Z}_{ij} \leq \dot{Z}^6) \geq 0,$$

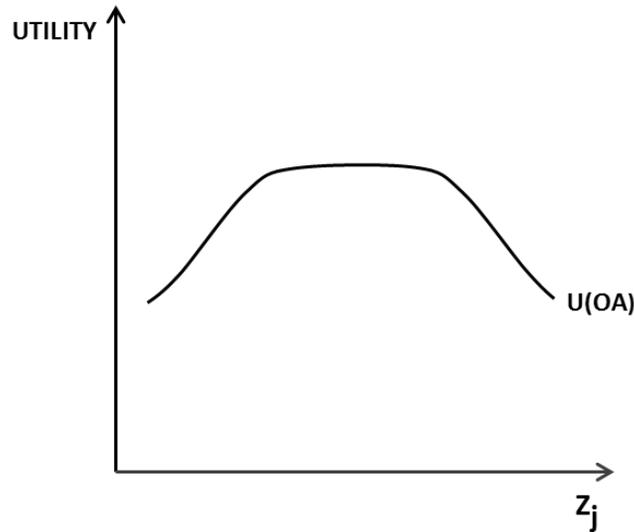
where  $\dot{Z}^6$  denotes the exogenous level of OJB effort beyond which exertion becomes unpleasant. The model design is a mirror-image of shirking theory, which also posits a direct (albeit strictly decreasing) relationship between utility and  $\dot{Z}$ .

From Leibenstein (1976): “A typical utility-effort index relation  $U(OA)$  is shown in the Figure [Figure 9.3]. Two major shapes seem likely. In the figure it is assumed that up to a point the individual prefers more effort to less effort, that is, all things being equal, he is not happiest when he is not working. Beyond some point it is assumed that he prefers less effort to more. This suggests that there is a limit to which effort is enjoyed for its own sake and beyond some point it becomes onerous. The utility curve  $U(OA)$  of Figure [9.3] has a relatively flat top. A ‘comfort effort range’ exists, within which people do not mind working somewhat harder or less hard, hence, total utility does not change markedly. We assume that this is true for most employees.” (pp. 107-8)

The principal virtue of the “flat-top” model is that it draws attention to the nonintuitive nature of the lazy-worker assumption that motivates shirking theory. Practitioners believe that workers prefer being elsewhere than on the job but, once at work, they prefer OJB in a comfort zone; it

makes the time go faster. Beyond challenging the broad acceptance of lazy workers by economic theorists and Leibenstein's pioneering role in the history of economic modeling of rational employee behavior, the flat-top model has little contemporary interest.

**FIGURE 9.3. LIEBENSTEIN'S "FLAT-TOP" MODEL**



### Assessing the Literature

The mainstream SVGE model class cannot, but the TVGE model class can, reconcile the powerful rigor of the optimizing-exchange, continuous-equilibrium economic method and the stabilization-policy relevance required if macroeconomists are to maintain (and enhance) their enviable advisory status in government and business. Readers satisfied with that one-sentence assessment can skip the remainder of this section.

*Endogenous MWR.* In modern economic theory, formal workplace modeling comes down to a choice between its non-axiomatic and axiomatic versions.<sup>45</sup> The former has emphasized the

<sup>45</sup> Strict constructionists may argue that truly formal theory must be derived from proper axioms, making the posited choice moot. But economic theorists, in practice, tend to be more flexible. For example, Grossman and Hart (1981) replace shirking workers with OJB that is a random variable observable by the firm but not by employees, in order to derive an optimal long-term (implicit) contract that, given moral hazard, leads to underemployment. Another notable exception to the purely formal treatment of preferences is the recent work of a group of theorists who have been (implicitly) synthesizing new-institutional analysis and the ideas of the mid-century labor economists outlined above. Incomplete contracts and information asymmetries are being combined with agent preferences extended to

shirking behavior of the entrenched Shapiro-Stiglitz (1984) theory, while the earlier original efficiency-wage theory (notably Annable (1977, 1980)) pioneered the latter class.

Shirking theory ignores critical on-site, best-practices, and behavioral-economist findings in its specification of employee preferences. As a result, it cannot derive unbundled workplace exchange, and consequent rational MWR and involuntary job loss, from optimizing employee-employer exchange. Moreover, it cannot even derive the less challenging Shapiro-Stiglitz wage rent (demonstrating downward flexible labor pricing over the business cycle) absent nonintuitive restrictions on profit seeking. By contrast, with its broadly accepted preferences combined with axiomatic technological constraints on both workplace information and the nature of jobs, TVGE modeling easily derives unbundled workplace exchange, the endogenous MWR channel, and involuntary job loss from utility- and profit-maximization organized around continuous general equilibrium, rescuing formal macroeconomics from stabilization-policy irrelevancy.

*Other differences.* Other characteristics particular to the shirking approach are also problematic. First, the scope of practitioner rejection of the lazy-worker keystone of SVGE utility ( $(\Delta \dot{U}_i / \Delta \dot{Z}_{ij}) < 0$ ) cannot be ignored. Given the importance of cooperation and acceptance of management's goals in the circumstances of unbundled workplace behavior, discretionary  $\dot{Z}_{ij}$  typically is not principally motivated by physical effort on the job. Unless work is restricted to unpleasant physical exertion, a misleading assumption to which economists are unhappily attached, there is no justification for generally restricting utility, once on the job, to be strictly decreasing in  $\dot{Z}_{ij}$ . The arbitrary work-equals-unpleasant-exertion assumption is ubiquitous not because it reasonably describes the nature of OJB in specialized, large establishments but because, in its absence, the market-hegemonic approach to labor pricing, and macroeconomics, is irreparably damaged.<sup>46</sup>

---

include fair treatment and “tit-for-tat” reciprocity, making the modeling of how nonmarket institutions evolve a central goal of economic analysis. (See Samuel Bowles (2004).) This “new microeconomics”, especially once it discovers antecedent original efficiency wage theory, may help provide a larger analytical framework for serious attempts to construct a modern neoclassical theory of behavior on the job.

<sup>46</sup> The more general epistemological point should be reiterated. Practitioners of the axiomatic economic method powerfully argue that rigorous modeling is needed to bring clarity, consistency, compactness, and persuasive power to economic analysis. But, with respect to labor pricing and use, they almost always doom their own analyses to special-case status by ignoring the essential nature of axioms, i.e., that they are so generally accepted to be true as to require no derivation. A dominating preference to loaf on the job is rejected, not accepted, by practitioners.

### **BOX 9.2: WHAT ABOUT POST-KEYNESIAN MACROECONOMICS?**

*Macro theorists ostensibly begin doing what they do by choosing a promising methodology within which to work. Jespersion (2009, p.xii) has provided a thoughtful division of mainstream methodologies that emphasizes the analytic merit of the formal economic method: “It can be substantiated that two entirely different methodological traditions within macroeconomic theory have developed. The first of these, a neoclassical-inspired line of theory, utilizes general equilibrium models as its analytical method, and the model of the ideal market equilibrium is central. The tradition includes both the new-classical and new-Keynesian schools. Second, the post-Keynesian tradition employs path-dependent causal analyses, where uncertainty, incomplete information, societal power structures and institutional relationships are of greater interest.” Post-Keynesians believe that the explanatory power of their model class is inherently rooted in freeing their analysis from the formal economic method.*

This book has focused on an even more fundamental bimodal division of macro methodologies. In the first, optimizing exchange is conducted wholly in the marketplace. In the second, rational exchange occurs in one of two (marketplace and workplace) venues that demonstrate core heterogeneities in their decision rules, constraints, and transaction mechanisms. Both model classes are motivated by optimizing exchange organized by continuous general equilibrium.

Innovative workplace exchange is confined to large establishments, axiomatically restricted by asymmetric, costly information and routinized jobs. The two-venue methodology uniquely informs a monetary theory of production in which fluctuations in aggregate demand rationally induce same-direction movements in employment and wage recontracting is sufficiently suppressed to microfound involuntary job loss (both temporary layoffs and permanent downsizing). The TVGE model class notably uses the formal economic method to identify and accommodate path-dependencies, uncertainty, incomplete information, power structures, and institutional relationships that are most critical to macrodynamic stability in specialized economies. Despite marketplace behavior, constrained by dominant LEV labor pricing and use, always being in continuous decision-rule equilibrium, “ideal market equilibrium” no longer plays a significant role. Macro market failure, featuring adverse shifts in total spending, occurs episodically with varying intensity. The associated welfare loss justifies the discretionary management of aggregate demand.

This book suggests that many central themes of post-Keynesian analysis, including the rejection of the natural-rate hypothesis and accounting for much of its admired capacity to explain macro instability, are accommodated by the TVGE model class. If so, it is important that the robust explanatory power of generalized-exchange methodology has been achieved without abandoning the analytic anchor provided by the formal economic method. As argued in Chapter 1, the preservation of FEM coherence, clarity, and persuasive power is closely aligned with the preservation of the unique power of economic theory among the social sciences.

Consistency with the evidence is also at the heart of the second problem. In the shirking theory, the optimal wage responds symmetrically to market joblessness and is, therefore, equally accommodative of labor-price increases or decreases.<sup>47</sup> The generalized-exchange model class, by contrast, derives asymmetric on-the-job behavior, with worker reaction restricted to reductions from the reference wage. As a result, the human-resources approach is consistent with the low incidence of nominal wage cuts in large establishments, and none wholly in response to the business cycle, while shirking theory counterfactually predicts symmetric wage flexibility as labor-market conditions change.

Third, while both theories relocate, to some degree, wage determination to inside the firm, they imply very different workplace mechanisms of exchange. Large-firm personnel practices consistent with shirking theory would emphasize OJB monitoring and worker punishment. Personnel departments would exist to identify and discharge a sufficient number of loafing employees to send a message to the entire workforce, making wage incentives effective by generally instilling fear and uncertainty.<sup>48</sup> Meanwhile, TVGE personnel practices are both more complex and more familiar, producing workplace rules designed to promote perceptions of equitable treatment in compensation, promotion, layoffs, and other elements of job outcomes. Monitoring plays a subsidiary role; discharge for cause is a rare, near-judicial process; and employers generally orchestrate ongoing efforts to convince employees to trust management and, therefore, adopt the firm's objectives as their own. Actual practice is thoroughly consistent with TVGE mechanisms of workplace exchange, while the mechanisms of shirking theory are typically confined to a heuristic existence, appearing in the management literature as a straw-man representing badly flawed personnel policy.<sup>49</sup>

---

<sup>47</sup> Downward nominal wage flexibility, an unfortunate characteristic of shirking theory, is also predicted by Akerlof's gift-exchange model.

<sup>48</sup> The involuntary job loss in the shirking model is wholly discharge for cause; employees caught shirking are fired. Unemployment induced by for-cause job separation is a tiny part of overall joblessness and has no stabilization-policy relevancy. Attempting to model the phenomenon is a waste of time. Such modeling certainly has little to do with the motivation claimed by Shapiro and Stiglitz (1985, p.1217): "To us, involuntary unemployment is a real and important phenomenon with grave social consequences that needs to be explained and understood."

<sup>49</sup> Note that shirking theory also incorporates a troubling inconsistency in its treatment of employee preferences that is aggravated as labor rents increase. Management strategy is to provide wage incentives sufficient to suppress the natural aversion to effort by workers. For optimal incentives to exist, however, the wage premium (relative to opportunity costs) must induce a proportionately larger increase in  $\dot{Z}_j$  (relative to  $\dot{Z}_{mj}$ ), which is a suspiciously eager

*Microfounding good macro theories.* The generalized-exchange model class has derived intuitive explanations for (a) the existence, incidence, and particular characteristics of job loss and (b) why some categories of employment are more affected by nominal-demand disturbances than others. Moreover, TVGE axioms that inform worker preferences and restrict technological homogeneity are the most robust, with respect to direct testing, behavioral assumptions used in the formal economic modeling of labor pricing and use. Alternative approaches, including shirking theory, do not come close. The generalized-exchange theory is not wrong, not unimportant, and (as demonstrated in this chapter) not unoriginal. Given the unsatisfactory state of modern formal SVGE macroeconomics, especially with respect to its inability to adequately model labor behavior and satisfy the needs of stabilization policymakers, the existence of alternative, powerful microfoundations is surely good news.

### Much More to Do

One of the obvious conclusions from this chapter's review of the workplace literature is that, except for Akerlof's continuing work on reference standards and my recent completion of the original EWT, the field has long been moribund. An important goal of this book is to revive interest in the once vibrant nonmarket branch of economic exchange, encouraging careful work on workplace equilibrium and its integration with the existing corpus of market-centric theory.

Economists' interest should be piqued by the fundamental, stabilization-relevant reconfiguring of macroeconomics induced by the intuitive generalization of rational exchange. Indicative of the power and importance of the continuous-equilibrium Workplace-Marketplace Synthesis is that the book, limited in size and tasked to introduce the second venue of economic exchange to macroeconomists, necessarily leaves a great deal of interesting work undone.

---

response for inherently lazy agents. In the richer, extended-preference environment of TVGE theory, the wage direction is reversed. Its unbundled cooperative-effort reaction is motivated by a *reduction* from the reference wage that violates established standards of fair treatment. Practitioners have no difficulty believing that angry workers, given the latitude provided by costly, asymmetric information, can and will substantially affect productivity.

Some examples of the low-hanging fruit that remain for research by industrious readers, especially those burdened by future dissertations, follow:

- Extend the TVGE model to open economies, reworking critical SVGE trade theorems;
- Design and execute numerical simulation exercises for active- $\mathbf{K}_j$  dynamics;
- Enrich and test the briefly sketched TVGE model of stagnation dynamics;
- Enrich and test the briefly sketched TVGE model of depression dynamics;
- Formally model the rational trade-offs among the  $\mathbf{K}_j$  component reference standards;
- Further document the validity and implications of the rational-arrangements labor pricing that established the relative importance of inflation catch-up in wage determination;
- Formally integrate the TVGE and the Search/Matching/Bargaining models, delivering macro labor analysis from its protracted period of wandering in the wilderness;
- Carefully integrate TVGE modeling, with special attention to Lewis transfer and global trends in living standards, into modern growth theory;
- Explicitly introduce, via the TVGE framework, increasing returns into coherent macro theory and work through the many implications;
- Carefully investigate the broad range of implications resulting from introducing residual rent (pure profit) into formal macro theory as well as the more general substitution of Jensen's factor-income distribution for Wicksteed's;
- Enrich Edgeworth, Nash, Pigou, and the remaining bargaining literature by close application of TVGE axiomatic preferences and technology constraints to the formal modeling of unions and collective bargaining with both passive and active government participation, beyond that presented in Chapter 7;
- Enrich and test the compact TVGE analysis of the nature and implications of the axiomatic substitution of the preference for fair treatment for the discredited assumption that employees inherently prefer to shirk on the job;
- Use the generalized-exchange framework to generally rework consumption analysis;

- Use the generalized-exchange framework to generally rework investment analysis, with special attention to the hold-up problem, uncertainty, and the independent role of investor and lender confidence;
- Use the generalized-exchange framework to rework fiscal analysis, with special attention to Ricardian equivalence;
- Use the generalized-exchange framework to carefully recalibrate the role of rational expectations and the Lucas critique
- Use the generalized-exchange framework to rework the analysis of monetary rules – i.e., rule specification and rules versus discretion
- Use the generalized-exchange framework to formally rework central-bank single objective monetary policymaking.
- Use the generalized-exchange framework to enrich the analysis of central-bank credibility and, more particularly, to rethink the Fed’s narrative in support of that credibility.
- Use the generalized-exchange framework to enrich the analysis and tools of central-bank management of aggregate nominal demand.
- Introduce the generalized-exchange analysis into business-school best practices literature.

## **II. BRIEF REVIEW OF THE GOVERNMENT-EXCHANGE LITERATURE**

Modern, specialized economies have three distinct venues of economic exchange. The marketplace and workplace venues of price-mediated exchange have been considered in detail. Almost no attention has been paid to government exchange, in part because agent interaction here is typically not price-mediated. Its objective functions, mechanisms of exchange that frequently feature coercion, and constraints including the government’s monopoly on coercion differ greatly from the other two venues. Formal economic thinking on government exchange, as captured by public-goods and public-choice theories, is very briefly summarized in the remainder of this chapter. The minimal attention paid to the third venue does not, of course, imply lack of importance. The size of government has long been one among the most debated of

economic questions. The large and growing scale of the public sector alone attests to its worthiness of close study. In the United States, government expenditures exceed 30% of total GDP, up from less than 20% after World War II. Other Western democracies typically have even higher public-expenditure ratios.

### Public-Goods Theory

*Samuelson.* Paul Samuelson pioneered the rigorous analysis of public goods, which he defined as “collective consumption goods”. Public goods critically demonstrate *nonrivalness* in consumption, i.e., each individual’s consumption of such goods results in no reduction of any other person’s consumption. Goods that are nonrival also tend to demonstrate “nonexcludability in supply”. It is not cost-effective to block nonpayers from consuming the good once it is offered. Freeloading is, of course, a rational self-interest strategy.

Samuelson and Nordhaus (1989, 13<sup>th</sup> edition, p.45): “... private provision of these public goods will not occur because the benefits of the goods are so widely dispersed across the population that no single firm or consumer has an economic incentive to produce them. Because private provision of public goods will generally be insufficient, government must step in to provide public goods.” The implication is the welfare-enhancing necessity of compulsion.

A central issue in the analysis of pure public goods, which are nonrivalrous positive and for which there is no cost-effective means to prevent free-riders, is whether the first characteristic alone is sufficient to compel compulsory funding of production. If some potential consumers of the collective consumption good are only willing to pay amounts less than private-cost pricing rooted in some imperfect exclusion technology, zero marginal costs imply that unexploited welfare gains from the market exchange must exist. From White (2012, p.342): “If a nonrival good is excludable..., then it can be withdrawn from nonpayers, allowing a producer to induce payment from those who want it and thereby to finance its provision. But any positive price, Samuelson argued, means that *too little* is consumed. Where the social marginal cost of adding

another beneficiary is zero because of nonrivalness, any positive price blocks potential net social benefits. The benefits to additional users will be all gravy.”<sup>50</sup>

That interesting issue will not be considered in this brief overview of the economic modeling government exchange. Suffice it to note that pure public goods, their identification, production, financing, and distribution, are at the core of a significant public-policy problem for which use of homogeneity simplifications in associated modeling is particularly problematic. The assumption obscures the critical “demand-revelation” issue that occupies center stage in any government attempt to calibrate taxes (or other forms of compulsion) to individual willingness to cooperate.

*Musgrave.* Richard Musgrave (1959) became the father of public economics as a result of his comprehensive effort, building on Samuelson, to provide a blueprint for the government’s role in market economies. Musgrave pioneered the integrated analysis of both the spending and taxation sides of public budgets. More generally, he identified three economic functions of the state: managing externalities that arise from rational price-mediated exchange, improving resource allocation; influencing the distribution of income and wealth, balancing incentives and social cohesion; and intervening in total demand, using spending and tax policies, in pursuit of macroeconomic stabilization.

In order to simplify his ambitious model, Musgrave posited universally efficient design and execution of fiscal policy as well as universally selfless motivation of fiscal policymakers. Those simplifications opened the door for the more realistic modeling of government policymaker preferences and constraints by Buchanan and Tullock.

### Public-Choice Theory

The most intrepid economic analysis of government behavior has come from public-choice theorists, who have played by the formal rules of rational exchange (anchored by continuous equilibrium) in their modeling of the public venue’s objective functions, exchange mechanisms,

---

<sup>50</sup>The general idea is broadly familiar to economists, akin to the class of positive (negative) externalities that occur when an individual’s consumption of a particular good generates benefits (costs) to free-riders (victims).

and constraints. Public-choice theory is most closely associated with the work of James Buchanan (for which he was awarded the 1986 Nobel) and Gordon Tullock.

PC theorists work with the same basic analytic tools as their counterparts who model optimizing price-mediated exchange (in the marketplace and workplace): objective functions that feature the general pursuit of self-interest informed by axiomatic preferences for consumption, leisure, and fair treatment; mechanisms of exchange, the specifications of which tend to be particular to the venue being studied; and constraints assigning a central role to costly, asymmetric information.<sup>51</sup>

In public-choice theory, rational self-interested behavior centrally motivates *rent-seeking*, which characterizes rational exchange in marketplace- and workplace-venues as well. However, given particular structure and nature of government exchange, the substantial latitude thought to be provided for rent-seeking makes it an especially important characteristic of the public sector. Self-interested firms or groups of individuals exchange with self-interested government agents, seeking special market privileges that generate rents. The outcome is a negative externality, generally reducing the efficiency of the economy. Overall, the ubiquitous pressures that rent-seeking exerts on politicians and bureaucrats are broadly understood to be pervasive and for which any model of government exchange must account.<sup>52</sup>

The particular features of rent-seeking government exchange are concentrated in the mechanisms of exchange and the constraints on the overall process, producing, in public-choice theory, a prototypical class of government exchange between politicians who seek election victories and groups that seek special benefits:

Special-interest programs that use government's monopoly on coercion to transfer benefits to a particular group at the expense of those outside the group are exchanged for the group's support in mobilizing votes, either directly or indirectly (mainly campaign funds), that help secure a successful election outcome.

---

<sup>51</sup> From Kalt (in White, 2012, p.355): "If individuals can get away without paying for something, either by free-riding when the market system tries to provide a public good or by forcing other to pay through governmental coercion, they can generally expected to do so."

<sup>52</sup> Rent-seeking is broader than public choice in that it applies to autocracies as well as democracies and, therefore, is not directly concerned with collective decision making.

Characteristics of exchange mechanisms that are particular to the public venue notably include:

- Mechanisms of exchange that facilitate the prototypical government exchange typically designed to obfuscate the transaction as much as possible;<sup>53</sup>
- Majority votes in the legislature, imposing majority preferences on the minority;
- Exploiting costly, asymmetric information, majority votes that transfer resources from the majority to special interests engaged in the prototypical government exchange.

The latter mechanism, using majority votes to transfer resources away from the majority to special-interest groups receives substantial attention from PC theorists. From White (2012, p.356): “On an issue where the taxpaying majority is poorly organized, a well-paid special interest group may use plausible arguments (and campaign contributions) to persuade legislators to grant it monopolistic privileges or to tax the general public for the group’s benefit. This is especially likely where the benefits are concentrated, while the burden is so diffused over the general public that it is hardly felt.”

Constraints that are particular to the government venue notably include:

- Success in political campaigns is strongly increasing in the money that the candidate effectively spends.
- Self-evident knowledge that no single vote will decide a significant election deprives the voter of rational incentive to invest in gathering unbiased information about relevant government programs and their effects.
- Rational self-interested voters attempt to free-ride on the information-discovery of others, who must be engaged in rent-seeking to make their investment rational, and therefore are especially vulnerable to among those who lose in the prototypical government exchange.
- Rent-seeking government exchange is itself, in part because of the need to obfuscate, a very costly endeavor. (Tullock (1967, in White, p.356) has argued that the cost of

---

<sup>53</sup> Transparency is a problem, not a solution.

competing for monopoly privileges in government exchange exceeds the cost of the misallocated resources that result from the rent-seeking transfer.<sup>54</sup>

Public-choice theorists are typically, and probably excessively, skeptical of government's capacity to promote general welfare. There are, of course, exceptions, including Mancur Olson whose insightful rent-seeking macrodynamic model was identified in Chapter 3 as an integral contribution to the evolution of generalized-exchange growth theory. Olson opposed special-interest group lobbying but otherwise advocated an activist state. Moreover, this book has constructed a broad expansion of the reach of optimizing exchange to the modeling of the workplace, motivated by self-interest and organized by general equilibrium, that has demonstrated the welfare-enhancing importance of discretionary public management of aggregate demand.

Systematically working through implications of rational, self-interested exchange is a powerful, useful research methodology that has supported generally reliable policymaker advice. Public-choice theory clearly has much work to do if it is to match the success of the formal method in explicating behavior in the marketplace and workplace. Perhaps heterogeneities, altruism, or some other intractable limitation on the specification of self-interest, exchange mechanisms, or relevant constraints will turn out to fundamentally constrain the capacity of PC theorists to adequately model government exchange.<sup>55</sup> But what has been accomplished so far, despite the heavy dose of skepticism, is sufficient to justify applying the formal method to the public venue.

---

<sup>54</sup> Another major claim is that much of political activity is a form of rent-seeking which wastes resources. Gordon Tullock, Jagdish Bhagwati, and Anne Osborn Krueger have argued that rent-seeking has caused considerable waste. In a parallel line of research Fred McChesney claims that rent extraction causes considerable waste, especially in the developing world. As the term implies, rent extraction happens when officials use threats to extort payments from private parties.

<sup>55</sup> Buchanan and Tullock (1962, p.30) outline methodological limitations of public-choice modeling of government exchange: "... even if the model [with its rational self-interest assumptions] proves to be useful in explaining an important element of politics, it does not imply that all individuals act in accordance with the behavioral assumption made or that any one individual acts in this way at all times... the theory of collective choice can explain only some undetermined fraction of collective action. However, so long as some part of all individual behavior... is, in fact, motivated by utility maximization, and so long as the identification of the individual with the group does not extend to the point of making all individual utility functions identical, an economic-individualist model of political activity should be of some positive worth."

Public-choice modeling should be required in any economics curriculum that aspires to inform students about the societies in which they live.

Perhaps Buchanan perhaps best captured the spirit of public-choice theory by describing it as "politics without romance". Along those lines, he and his colleagues have constructed a useful counterweight to the once-pervasive textbook view of idealized politics that provided an unflattering contrast with the market failure associated with public goods.<sup>56</sup>

### III. CONCLUSION

*Workplace exchange.* Once Early Keynesians constructed their Neoclassical Synthesis (with its keystone assumption of wage stickiness) within the consensus SVGE model class, the die was cast. The resulting incoherency, subsequently and forcefully captured in the Barro critique, was obvious for all to see. It is not surprising that, over time, an increasing number of rigorously trained macro theorists concluded that such a fundamental incoherency was unacceptable. Only two research strategies are available to deal with the elemental methodological breakdown. Either consensus Early-Keynesian macroeconomics must be changed to be compatible with consensus market-centric microeconomics, or textbook general-equilibrium theory must be altered in order to coherently accommodate Early-Keynesian restrictions on wage recontracting.

Keynesian researchers still had the overwhelming weight of the evidence on their side (e.g., involuntary job loss clearly exists and is always the principal engine of unemployment fluctuations over the business cycle). But, to their surprise, that advantage mattered less and less with their continuing failure to root wage rigidity in rational behavior. The problem was made especially difficult by the non-incremental nature of the analysis that turned out to be necessary for its solution, i.e., the generalization of optimizing exchange from the marketplace to the workplace. Non-incremental modeling is almost always rejected, at least initially, by the mainstream in any field. As shown in this chapter's literature review, some researchers interested

---

<sup>56</sup> The great Swedish economist Knut Wicksell notably argued that politicians will always, as a class, respond to their own self-interests. As a result, effective efforts to improve political outcomes are best invested in improving the rules and structure of government exchange.

in a modern theory of labor pricing did look at the workplace; but that look was typically through the lens of the consensus SVGE framework and accomplished little.<sup>57</sup> Few theorists published models featuring rational employee-employer exchange in a rigorously constructed workplace venue. And none were able, until recently, to make meaningful wage rigidity consistent with continuous general equilibrium.

In the interim, the default strategy for dealing with the crisis of macro incoherency, especially weighing on those who teach economics, was to reject Early-Keynesian modeling. Macro theory was reconfigured to conform to textbook microeconomics, accompanied by a broad effort to limit attention to the subset of macro evidence that is consistent with the new consensus theory. Effective stabilization analysis was the main casualty of the failure to improve, taking account of the Second Industrial Revolution's "new corporate forms" (with their costly, asymmetrical workplace information and routinized jobs), upon the 19<sup>th</sup> century treatment of labor pricing and use. It required more than generation for postwar macro theorists to derive a recognizable non-convex Workplace Exchange Relation, microfounding meaningful wage rigidity. Once located in the new corporate forms, optimizing WER must be substituted for neoclassical labor supply featuring the equality of the wage paid and workers' marginal disutility of labor.

*Government exchange.* Meanwhile, the existing literature on the formal modeling of government exchange has fared somewhat better with respect to Occam-razor and policy-relevancy tests. Models of public goods and public choice have been powerfully developed. Beyond the need to more effectively establish lines of demarcation between the two approaches, the most significant deficiency in the existing literature is the absence of an effective strategy for the integration of

---

<sup>57</sup> Despite the unhappy record, for some good theorists the promise of efficiency wages was strong, as illustrated by Edmund Phelps's response when asked which of his ideas is he most proud: "I would have to say that the incentive wage idea is the most important. The reason is that this laid the foundation for thinking about unemployment as an involuntary phenomenon, rather than just the result of having to be on the boat between one island and another before you could get into the labor market in that new place. I thought that was a very important breakthrough, and it became even more important when Steven Salop, who had been an undergraduate student of mine at Penn, pointed out that I could have written that paper without money. He proceeded to set out a nonmonetary theory of the incentive wage and involuntary unemployment (Salop, 1979). This was followed by the paper by Shapiro and Stiglitz (1984) which was a shirking model of a nonmonetary type to get a nonmonetary theory of involuntary unemployment."<sup>57</sup> (Vane and Mulhearn (2009), p.116.) The summary of the Shapiro-Stiglitz model provided above indicates how far it is from being a stabilization-relevant, coherent explanation of involuntary joblessness.

government coercion-mediated exchange with the price-mediated exchange that dominates economic teaching and research.

Integration will be facilitated by a growing recognition about the evolving state of economic theory. To be adequate to describing modern societies, to supporting economic policymakers, and to motivating textbooks and lecture notes used in instruction, rigorous thinking must push economists outside their market-centric comfort zone. I imagine future introductory textbooks coherently focused on optimizing exchange and divided into the analysis of marketplace, workplace, and government venues that organize that exchange. Surely such an approach would provide students a more useful grounding in economic thinking than the market-centric focus that has long dominated the profession.

### **BOX 9.3: BIG VICTORY FOR THE CHICAGO SCHOOL'S IMPERIAL AGENDA**

*At the close of this chapter's literature review, it is useful to emphasize this book's allegiance in a fundamental methodological debate that has long divided economists. (Recall Box 9.2.) Generalizing price-mediated exchange from the marketplace to the workplace is the most significant extension of the reach of the rational modeling of human behavior in more than a century. As such, it greatly advances the self-described "imperialist agenda" of the Chicago School, already famous for the analytic conquest of a variety of venues of human endeavor previously thought to be noneconomic.*

Perhaps the most surprising difference between the SVGE and TVGE model classes is the latter's greater consistency with the Chicago-School credo that people are best understood as acting efficiently in their own interests. From George Stigler (1982, pp.11-12): "The basis of the credo is simply the fact that an economic actor knows better the environment in which he is acting and the probable consequences of his actions than an outsider, no matter how clever the outsider may be." Generalized-exchange modeling extends Stigler's simple fact to the workplace and, in so doing, turns out to be a champion of the Chicago School's core message. The credo advocates the aggressive expansion of the reach of rationality analysis to a broad range of human activity, and the large, specialized workplace becomes its most substantial acquisition since the Walrasian revolution. The acceptance of original efficiency-wage theory within the corpus of Chicago-school thinking has been long-delayed by theorists' failure to derive the rational shape, needed to make the exercise interesting, of the Workplace-Exchange Relationship from axiomatic model primitives. (Recall Figures 1.1 and 2.1.) Now that the sufficiently nonconvex WER has been properly derived, the integration of marketplace and workplace exchange, making coherent macro theory stabilization-relevant, can move forward.

Moreover, TVGE modeling better satisfies the other Chicago-School characteristic emphasized by Milton Friedman (1974, p.11): "In discussions of economic science, 'Chicago' stands for an approach that takes seriously the use of economic theory as a tool for analyzing a startlingly wide range of concrete problems, rather than as an abstract mathematical structure of great beauty and little power; for an approach that insists on empirical testing of theoretical generalizations and rejects alike facts without theory and theory without facts." Coherent SVGE modeling must ignore too many (frequently labor-related) facts to be stabilization relevant. Meanwhile, perhaps the most pleasing feature of the Workplace-Marketplace Synthesis is its explanation of a remarkably broad array of facts that uniquely captures the richness of macro behavior in modern economies.