TI 2004-115/1
Tinbergen Institute Discussion Paper

The Desire for Impact

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December 19, 2006

Abstract

This paper explores the meaning and implications of the desire by workers for impact. We find that this impact motive can make a firm in a competitive labor market act as a monopsonist, lead workers with the same characteristics but at different firms to earn different wages, may alleviate the hold-up problem in firm-specific investment, can make it profitable for an employer to give workers autonomy in effort or task choice, and can propagate shocks to unemployment.

Keywords: impact motive; monopsony-like behavior; wage differentials; hold-up problem; incomplete contracts; autonomy.

JEL-codes: J3, J4, M5.

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*We are grateful for many useful comments and suggestions by the editor, two referees, participants at the 2005 CESifo Area Conference on Employment and Social Protection (particularly our discussant Kjell Erik Lommerud), and seminar participants at Erasmus University. Part of the research was done while the first author was visiting Bocconi University; their generous hospitality is gratefully acknowledged.

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1 Introduction

People's desire for impact is important in many organizations. Job ads sometimes mention a "desire to make an impact" as a qualification of the ideal candidate. For instance, the accounting firm Deloitte UK states on its recruitment website that a common characteristic of their consultants is "a desire to make an impact and create change."[1] Trader Joe's Grocery Stores tries to recruit store workers by offering the chance to "make an impact on people, product, and sales. We're talking about a chance to make a difference, not just be another cog in the wheel."[2] Perry (2001, p. 28) quotes a director of Xerox's research center as saying that: "Our top stars say they want to make an impact—that's the most important thing. Feeling they are contributing and making a difference is highly motivational for them." Similarly, a director of human resources at technology company Corning says: "People come to work here because they want to do world-changing things. If for some reason they think they can't do that, they may look elsewhere." The opportunity to make an impact is also considered as important for workers in the public sector. A report by the British Treasury (Foster et al. (2002), p. 6) quotes a senior manager of a University Hospital as saying that: "...being able to have a real impact on how the patients are treated is key. There are quite phenomenal returns in terms of motivation." In the same report (p. 11), a manager of Stockton Council says: "It is about the public service, but it is also about having the opportunity to make a difference ... It is more than wanting to do good. It is about knowing that you actually do make a real difference."

This paper examines how such a desire for impact by workers affects behavior in the labor market. We will show that workers' desire for impact can parsimoniously explain a wide range of phenomena, including wage dispersion, the prevalence of incomplete contracts, the low return to wages from company training, and monopsony-like behavior in seemingly non-monopsonistic labor markets.

The impact motive we study relates to a worker's intrinsic motivation to produce. Several recent papers study workers who care about output, either for altruistic reasons (Francois (2000, 2006), and Prendergast (2006)), or because they intrinsically value their contribution to the production of

[1] http://graduates.deloitte.co.uk/index.cfm?p_id=242.

[2] http://company.monster.com/trader/

public services (Besley and Ghatak (2005), Delfgaauw and Dur (2004), and Glazer (2004)). Because a person can also make an impact by producing less than someone else would, the impact motive differs from this output motive. Moreover, the impact motive is not limited to the production of public services or to 'doing good.' Note also that the impact motive differs from the desire for independent decision-making, as studied by among others Aghion and Tirole (1997) and Zábojnik (2002). For example, a worker who could be replaced by a person who would behave identically could have independence of action, yet have no impact.

An extensive literature in psychology, both theoretical and empirical, stresses the importance of the impact motive for workers' behavior. Hackman and Oldham (1976) identify task significance (that is, the degree to which the task is seen as important and having impact) as one of the five core job dimensions promoting performance quality and job satisfaction. Relatedly, in Thomas and Velthouse (1990)'s concept of 'worker empowerment,' a sense of impact is one of the four core dimensions fostering intrinsic task motivation (see also Conger and Kanungo, 1988). Spreitzer and Doneson (2005) review extensive empirical evidence showing that employees perform better and show greater satisfaction at work when given more power. Relatedly, much evidence indicates that people intrinsically value freedom of choice, beyond the mere opportunity to match personal preferences with available alternatives (see, for example, Deci (1975), Perlmutter and Monty (1977), and Zuckerman et al. (1978)).[3]

Economic studies also find evidence consistent with an impact motivation.[4] In a survey of U.S. nonprofit workers, 61 percent valued the chance to make a difference more than they valued the salary and benefits (Light (2002)). In a more direct study of the relation between impact and wages, Handel (2000) examines 1,311 responses to the Quality of Employment Survey of 1977. He finds that eighteen percent of respondents were willing to trade a ten percent pay raise in return for "more freedom to decide how to work." Benz and Frey (2003) examine why, though employees earn more than the self-employed, self-employed workers are happier than employees.

[3] Freedom of choice may, however, also cause a psychological burden, in particular when choices are complex, or when people must choose among unwanted outcomes. See Botti and Iyengar (2004), and the papers discussed therein.

[4] We deliberately use the term "consistent with" rather than "supportive of" since most of the evidence in the economic literature is consistent with both a desire for impact and a desire for independent decision-making.

Analyzing survey data from 23 countries and carefully controlling for many different influences, they find that the greater autonomy of self-employed people fully explains the higher job satisfaction (see also Frey and Benz (2006)). Frey and Kucher (1999), using survey data on Swiss managers, find that having more subordinates does not significantly increase a manager's wage.[5] They interpret this finding as evidence that people are willing to pay for power. Frey et al. (2001) find that high-ranked public employees earn more in Swiss cantons having more direct democracy, indicating a compensating wage differential for less discretion. Smith, Masi, and Lemay (1997) find evidence for the impact motive from market data: the greater a worker's autonomy in decision making, the lower his pay.[6]

The following section defines the impact motive studied in this paper. After that we analyze the implications of workers' desire for impact for wages, employment, and a firm's capital stock (Section 3), the effects of demand shocks on the labor market (Section 4), the hold-up problem in firm-specific human capital accumulation (Section 5), and optimal incentive provision within firms (Section 6). Lastly, Section 7 discusses some extensions and some management implications of our analyses.

2 The impact motive

We suppose that a person's utility increases with his impact. Identifying a person's impact can be problematic, because impact can arise from actions taken but also from actions avoided. Moreover, a person's impact depends on how others respond to his actions. To address these problems, we shall assume that a person measures his impact by comparing aggregate output in the current period to what aggregate output would have been had he unexpectedly ceased to exist an instant before. Thus, we define a person's impact as the difference that his current existence makes to output. Note that impact can arise both when a person's actions increase output, and

[5] The results holds *after* controlling for a manager's education, tenure, and several other characteristics.

[6] We note, however, that the evidence on how a worker's wage varies with how closely he is supervised is mixed. (See, for example, Leonard (1987), Groshen and Krueger (1990), Krueger (1991), and Brunello (1995).) Whereas the desire by workers for impact implies a positive relation between wages and supervision, efficiency wage theory suggests a negative relation between wages and supervision. (See, however, Walsh (1999), who shows that the sign of the efficiency-wage effect depends on the shape of the worker's effort supply curve.)

when his actions reduce output.

Our definition of the impact motive is close to Winter (1973)'s and McClelland (1987)'s 'power motive:' a recurrent concern for having impact on others or the world at large. According to these studies, having impact gives people pleasure, as it makes them feel strong and excited. McClelland et al. (1985) and Schultheiss et al. (2005), among others, provide empirical evidence. Related views include de Charms (1968)'s notion of 'personal causation' and Deci's (1975) concept of self-determination. According to de Charms (1968, p. 269), "Man's primary motivational propensity is to be effective in producing change in his environment."

Note that we define impact as the instantaneous effect of a person's existence on output. Clearly, there are other, possibly complementary, concepts. In addition to the 'flow' approach we pursue in this paper, one could think of a person's 'stock' of impact: People may value knowing that the world would be a different place had they never been born. Further, for simplicity, we restrict a person's impact to changes in output. Hence, we ignore people's nonmaterial impact, for example on other people's feelings or emotions. Lastly, we stress that we do not require that people always have perfect information about their impact. We do, however, assume that, when they face uncertainty, they hold rational expectations about their impact.

3 Monopsony-like behavior

For our first application, we will show how the desire for impact by workers can generate an upward-sloping supply curve of labor to a given firm. A firm may therefore behave like a monopsonist, even when many firms compete for the same workers.

Consider a firm producing goods using capital (K) and labor (L) as inputs. For simplicity, let effort by each worker be exogenously given, so that L represents the number of workers hired. Output is $Q = f(K, L)$, with $f_L > 0$ and $f_K > 0$, where throughout the paper subscripts denote partial derivatives. Suppose, as is conventional, that $f_{LL} < 0$ and $f_{KK} < 0$, or that the marginal product of labor declines with the number of workers the firm hires, and similarly for capital. Output is sold at price p; the rental rate of capital is r.

A person's utility, $U(w, I)$, increases with his income w and with his impact I. To avoid corner solutions, we further assume that $U_{ww} \leq 0$, $U_{II} < 0$,

and $U_{wI} = U_{Iw} = 0$. A worker's outside option is unemployment. An unemployed person gets an unemployment benefit b, and engages in household production with monetary value $\overline{q}$, implying income $\overline{w} = b + \overline{q}$. (We could instead assume that the worker's outside option is self-employment, resulting in production $\overline{q}$, and $b = 0$.)

Following our definition of impact, a worker who chooses the outside option has impact $\overline{q}$, since output declines by $\overline{q}$ when the worker vanishes. A worker's impact when working for a firm depends on how quickly the firm can replace a worker. If the firm cannot replace a worker, and its capital stock is fixed, then the worker's impact equals the value of his marginal product, $pf_L(K, L)$. If the firm can immediately replace a worker with an unemployed person, then the firm's output remains the same when a worker vanishes. Since, however, the worker's substitute no longer engages in household production, aggregate output in the economy falls by $\overline{q}$. Hence, a worker who can be replaced immediately has an impact equal to an unemployed person's impact, $\overline{q}$.

More generally, suppose that with probability ϕ a firm can immediately replace a worker. Assume that, because of search frictions in the labor market, $\phi < 1$.[7] An employed worker's impact is then

$$I(K, L) = (1 - \phi)\, pf_L(K, L) + \phi\overline{q}, \tag{1}$$

with first derivatives:

$$\begin{aligned} I_K &= (1 - \phi)\, pf_{LK} \geq 0, \\ I_L &= (1 - \phi)\, pf_{LL} < 0. \end{aligned}$$

When the firm hires more labor, the marginal product of labor declines, and so each worker's impact, I, declines. Unless capital and labor are perfect substitutes ($f_{LK} = 0$), an increase in the capital stock increases each worker's impact.

When hiring labor, the firm must satisfy a worker's participation constraint, $U\left[w, I(K, L)\right] \geqslant U\left(\overline{w}, \overline{q}\right)$. That is, to hire or retain a worker, the

[7] Using data from a survey of 800 managers in twelve industries in the United States, Nicholson et al. (2006) find that only 22 percent of the workers are easy to replace with a worker of similar quality or productivity. A three-day absence has no effect on output for only 29 percent of workers, whereas a two-week absence affects output for 85 percent of the workers. Assuming $\phi < 1$ thus seems to be reasonable for most workers. We stress, however, that several of our results in later sections also hold when $\phi = 1$; see below.

firm must make an offer (consisting of a wage and the job's impact) that is at least as attractive to the worker as his outside option. When the participation constraint binds, it follows that

$$\begin{aligned} w_L &\equiv \frac{\partial w}{\partial L} = -\frac{I_L U_I}{U_w} > 0, \\ w_K &\equiv \frac{\partial w}{\partial K} = -\frac{I_K U_I}{U_w} \leq 0. \end{aligned}$$

Hence, a firm which hires additional labor will find that each worker's utility from impact declines, so that it must compensate with a higher wage. When the firm installs more capital, and $f_{LK} > 0$, each worker's impact increases, and so the firm can offer a lower wage.[8] Note that when utility is concave in income, these effects are larger for workers who earn more (that is, if $U_{ww} < 0$, then w_L and $-w_K$ are larger for given K and L). This makes sense: richer workers are more willing to give up income for a higher impact, because their marginal utility from income is lower.

The firm chooses K, L, and w to maximize profits, $pf(K,L) - rK - wL$, subject to the workers' participation constraint $U\left[w, I(K,L)\right] \geqslant U\left(\overline{w}, \overline{q}\right)$. The first-order condition for profit-maximizing employment is

$$pf_L(K,L) - w - w_L L = 0. \tag{2}$$

Since $w_L > 0$, the firm will hire less labor than at the point where the wage equals the marginal product of labor. For by hiring more labor, it increases the wage it must pay. Thus, the desire by workers for impact has implications similar to monopsony. (See Manning (2003) for an overview of monopsony models of the labor market.)

A standard result in economic theory shows that when firms have monopsony power over heterogeneous workers, the imposition of a minimum wage can increase employment. That result also holds in our model.[9] The result relates to the finding by Card and Krueger (1994) that an increase in the

[8] It is straightforward to verify that this effect does not necessarily imply that more capital-intensive firms pay lower wages. Depending on the exact properties of a firm's production function, a more capital-intensive firm may pay higher or lower wages. In empirical work Abowd, Kramarz, and Margolis (1999) and Hellerstein and Neumark (1999) find that more capital-intensive firms pay higher wages.

[9] As in the standard monopsony model, imposing a minimum wage which is higher than the wage w but lower than $w + w_L L$ increases employment. Imposing a minimum wage higher than $w + w_L L$ reduces employment.

minimum wage in New Jersey in 1992 did not reduce employment in fast-food restaurants. One explanation offered was monopsony. But it is unclear why fast-food restaurants in New Jersey enjoyed any monopsony power. As is clear from the above results, a minimum wage may increase employment even when workers are identical and firms lack monopsony power. All that is necessary is that workers value impact, and cannot be replaced immediately when they quit the firm or vanish.

Our model also implies that workers with the same characteristics but at firms with different production technologies may earn different wages. When workers do not care about impact, the wage w simply equals the reservation wage $\overline{w}$, and is thus independent of the characteristics of the industry or of the firm. When workers do care about impact, the wage depends on worker's impact in the optimum, which differs according to the properties of firms' production functions.

The desire by workers for impact also affects a firm's choice of capital. Given the number of workers, the firm's profit-maximizing capital stock is implicitly described by

$$pf_K(K, L) - r - w_K L = 0. \tag{3}$$

If $f_{LK} > 0$, then $w_K < 0$, and hence the workers' desire for impact increases the firm's profit-maximizing capital stock. A higher capital stock reduces the wage cost, as all workers find their job more meaningful. Hence, the return to capital will be lower than the market interest rate, and the more so in sectors where capital and labor are more complementary; only when capital and labor are perfect substitutes does profit-maximizing investment have the direct return to capital equal the market interest rate.[10]

Our results will continue to hold when the firm has monopoly power in the product market. Then, even for a given physical marginal product of labor, the worker's wage increases with the firm's output: the downward sloping demand curve means that the value of the marginal product declines with output even if physical marginal product does not decline as the firm expands output. Hence, if the firm has some monopoly power in the product market, even when $f_{LL} = 0$ the wage increases with the number of workers hired, .

[10] Stronger substitutability of capital and labor may also reduce in another way a worker's impact. When the firm fails to hire a new worker after the current worker vanishes, it may install additional capital; the increase in production is greater the more closely are capital and labor substitutes.

4 Propagation of demand shocks

Consider an exogenous demand shock which hits some firms in the economy and forces these firms to fire all workers and shut down. The accompanying increase in aggregate unemployment may, coupled with workers' impact motive, put upward pressure on wages and so may generate further increases in unemployment.

To illustrate this effect, consider the same set-up as in the previous section and focus on a firm that is not directly hit by the demand shock. The literature on job search commonly assumes that the probability that a firm fills a vacancy increases with the aggregate unemployment rate (see for instance Pissarides (2000)). In our model, this relation implies that ϕ increases with the economy's unemployment rate. An immediate implication is that, all else equal, at any given firm that is not directly hit by the demand shock, the increased unemployment raises wages:

$$w_\phi \equiv \frac{\partial w}{\partial \phi} = -\frac{I_\phi U_I}{U_w} > 0,$$

where $I_\phi = -\left[pf_L(K,L) - \overline{q}\right] < 0$, as seen from (1). A rise in unemployment makes it easier for a firm to replace a worker, implying a decline in a worker's impact. As the job has become less attractive compared to the outside option of unemployment, the wage must rise. This rise induces the firm to lay off some workers, further increasing unemployment. Worker's desire for impact can thus support high wages during recessions, and may therefore deepen recessions. The opposite holds when the economy booms.[11]

Clearly, in practice and in a more elaborate model, workers may be willing to accept wage cuts during recessions, for instance when employed workers earn a rent and a wage cut reduces the probability of job losses. Then, the impact motive reduces workers' willingness to accept wage cuts, and may therefore contribute to wage stickiness.

[11] The effect we consider is even stronger if productivity is procyclical, as the evidence suggests. Indeed, Baily, Bartelsman, and Haltiwanger (2001) find that plant-level productivity is even more procyclical (that is, falls during recessions) than is aggregate productivity.

5 Investment in worker's skills and hold-up

We saw that if capital complements labor, a firm can reduce the wage by investing in capital. Clearly, the same holds for investment in worker's firm-specific skills, as such investment directly increases a worker's marginal product when working for the firm. The impact motive may thus alleviate the well-known hold-up problem which may arise when wages may be renegotiated after the investment has been made. (See Malcomson (1997) for a survey of the hold-up literature.)

For an example, consider a firm which employs one worker. His productivity is given by $R(S)$, where S is the firm's investment in a worker's firm-specific skills. The firm's profits are $R(S) - w - S$. Hence, for a given wage, the firm's profit-maximizing investment satisfies $R_S(S) = 1$. That is, the firm invests up to the point where the last dollar invested yields a return of a dollar. This level of investment would arise in the absence of both the hold-up problem and the impact motive.

Suppose that after a firm invested, the firm and the worker can renegotiate the wage, resulting in the generalized Nash bargaining solution. The firm's surplus is

$$R(S) - w - \phi \left[R(S_o) - w_o - S_o \right],$$

where, as before, ϕ is the probability of filling a vacancy, S_o is the investment in a new employee's skills, and w_o is the wage paid a new employee. Note that since S is sunk once the investment has been made, it does not appear as a cost. For convenience, let a worker's utility be linear in income and in impact, with γ measuring the weight on impact. A worker's surplus from working rather than taking the outside option is the difference in income, $w - \overline{w}$, plus γ times the difference in impact. A worker's impact when working at the firm is

$$(1 - \phi) R(S) + \phi \left[R(S) - R(S_o) + \overline{q} \right].$$

The only difference from (1) is that a new worker's productivity can differ from the current worker's productivity, since S need not equal S_o.[12] A worker's impact in the outside option is $\overline{q}$, as in Section 3. The worker's surplus is therefore

$$w - \overline{w} + \gamma \left\{ R(S) - \phi R(S_o) - (1 - \phi) \overline{q} \right\}. \tag{4}$$

[12] If the investment in a new worker's skill S_o is also considered as output, the current worker's impact is ϕS_o higher. Including this does not affect the results, except for the equilibrium level of the wage.

The Nash bargaining solution implies that

$$w = \alpha \{R(S) - \phi [R(S_o) - w_o - S_o]\} + \\ (1-\alpha) \{\overline{w} - \gamma [R(S) - \phi R(S_o) - (1-\phi)\overline{q}]\}, \tag{5}$$

where α is the worker's relative bargaining power. The worker's wage resulting from the bargaining clearly depends on the firm's investment S:

$$\frac{\partial w}{\partial S} = \alpha R_S(S) - (1-\alpha)\gamma R_S(S).$$

As in the standard hold-up model, the wage increases with S, the worker capturing part of the return on investment; see the first term. For a given S_o, however, the worker's impact also increases with S, thereby increasing the worker's surplus and lowering his wage; see the second term. If the impact motive is sufficiently strong compared to a worker's bargaining power (that is, if $\gamma > \alpha/(1-\alpha)$), the bargained wage declines with the firm's investment. This result contrasts to the standard hold-up model without the impact motive.

The firm anticipates renegotiation of the wage when deciding how much to invest on the worker. Maximizing profits $R(S) - w - S$ with respect to investment in worker's skills S, where the wage w is given by (5), yields

$$R_S(S) = \frac{1}{(1-\alpha)(1+\gamma)}. \tag{6}$$

As in the standard hold-up model, the worker's ex post bargaining power ($\alpha > 0$) reduces the firm's investment, because the firm anticipates that it does not reap the full return on its investment. But the worker's desire for impact ($\gamma > 0$) increases the firm's investment: an increase in the worker's skills increases the worker's impact, reducing the wage that results from bargaining. When $\gamma = \alpha/(1-\alpha)$, the two effects cancel and profit-maximizing investment satisfies $R_S(S) = 1$. When γ is larger, the firm invests even more.[13]

[13] Empirical studies commonly find a large increase in wages associated with private-sector training, suggesting that the impact motive matters little in investment decisions. A study by Leuven and Oosterbeek (2003), however, shows that a large part of the estimated returns can be attributed to unobserved heterogeneity. Controlling for the selectivity bias reduces the point estimate of the return to training from 12.5 percent to 0.6 percent. Low or zero returns to company training are also found by Goux and Maurin (2000), Leuven and Oosterbeek (2004), and Pischke (2001).

Note from (6) that the effect of the impact motive on the firm's investment is independent of the value of ϕ. So even when the worker can be replaced immediately ($\phi = 1$), a worker's desire for impact promotes firm's investment in the worker's skills. Inspection of the expression for worker's surplus (4) shows why. When the firm increases S, the worker's impact increases for a given value of S_o, independent of the ease with which the worker can be replaced. The higher impact implies a higher surplus to the worker, resulting in a lower negotiated wage. Because the firm's investment in its current worker's skills does not affect the profitability of investing in a new worker's skills were the current worker to vanish, S_o is taken as given. In equilibrium, of course, $S = S_o$ and $w = w_o$. It follows from (5) that in equilibrium the resulting wage is

$$w = \frac{1}{1-\alpha\phi}\left(\alpha\left[(1-\phi)\,R(S) + \phi S\right] + (1-\alpha)\left\{\overline{w} - \gamma\,(1-\phi)\left[R(S) - \overline{q}\right]\right\}\right).$$

As opposed to the firm's incentives to invest, the equilibrium wage does depend on ϕ. The ease with which a worker can be replaced has two effects. First, a higher ϕ improves the outside option of the firm, implying a lower bargained wage. Second, a higher ϕ reduces a worker's impact, implying a higher bargained wage. Only when γ is sufficiently large does the impact effect dominate.

Consider the extreme cases $\phi = 0$ (a worker is never replaced) and $\phi = 1$ (a worker is immediately replaced). When $\phi = 0$ the equilibrium wage is

$$w = \alpha R(S) + (1-\alpha)\left\{\overline{w} - \gamma\left[R(S) - \overline{q}\right]\right\},$$

which increases with S when $\gamma < \alpha/(1-\alpha)$; this condition is identical to the condition for $R_S(S) > 1$ we obtained before. When the worker can be replaced immediately ($\phi = 1$), the equilibrium wage is

$$w = \overline{w} + \frac{\alpha}{1-\alpha}S, \tag{7}$$

which always increases with S, but is independent of the return on investment, and also independent of the worker's desire for impact as measured by γ. The intuition is straightforward. Because, following the departure of a worker, the firm would hire a new worker and incur investment cost S, the equilibrium wage increases with equilibrium investment. The current worker captures part of this quasi-rent. Since a worker can be replaced immediately,

his impact is the same inside and outside the firm, namely $\overline{q}$, as in Section 3. Hence, in equilibrium, the worker derives no utility from impact, and so impact does not affect the wage. Nevertheless, as we saw, the worker's desire for impact raises the firm's investment in worker's skills, independent of the value of ϕ; see (6). Hence, $R_S(S)$ may be less than 1, implying high investment in worker's skills, even when the worker captures much of the (quasi-)rents from the firm's investment. If the firm could commit to investment in future worker's skills, it would commit to little investment, aiming to increase the current worker's impact and hence reduce the wage it pays the current worker.

6 Effort and incentive pay

We so far assumed that a worker's effort is exogenously fixed. We now relax this assumption and examine the implications of the impact motive for optimal incentive contracts and worker's effort. As in the previous section, we consider a firm which employs a single worker whose utility is linear in income and impact. For simplicity, let a worker's cost of effort be $(1/2)\theta e^2$, where e is effort and $\theta > 0$. Effort e generates output e, sold at unit price p. We abstract from household production by setting $\overline{q} = 0$. As before, we assume that workers are homogeneous. We distinguish two cases: noncontractible effort and contractible effort.[14]

6.1 Noncontractible effort

When effort is noncontractible, the firm's only choice variable is the wage offer. The profit-maximizing wage offer makes the worker's participation constraint binding, as in Section 3. The worker chooses effort e, generating impact

$$I(e) = (1-\phi)\, pe + \phi \left| pe - Epe_o \right|,$$

where Ee_o is the expected level of effort by the replacement worker. With probability $(1-\phi)$, the worker is not replaced and his impact equals the value of his production. With the remaining probability, the worker is replaced, and his impact equals the expected absolute difference between his production

[14] Note that, since we take output as deterministic, we assume that under contractibility both effort and output are contractible; under noncontractibility, neither effort nor output is contractible.

and production by the replacing worker. The first-order condition for utility-maximizing effort is

$$\gamma \left[(1-\phi)\, p + \phi p \frac{pe - Epe_o}{|pe - Epe_o|} \right] - \theta e = 0, \tag{8}$$

where $e \neq Ee_o$ if $\phi p > 0$.

We first evaluate utility-maximizing effort in two extreme cases: without replacement of the worker ($\phi = 0$), and with certain replacement ($\phi = 1$). When $\phi = 0$, it follows from (8) that utility-maximizing effort is $e = \frac{\gamma}{\theta} p$. Hence, though the firm does not reward the worker for effort, the worker exerts effort, as it increases his utility from impact.

When $\phi = 1$, it is clear from (8) that in equilibrium not all workers choose the same effort—for if they did, e would equal Ee_o. Intuitively, when a worker knows that once he vanishes he will always be replaced by a worker who exerts the identical effort, no worker would have impact, eliminating the incentive to exert effort. But neither can an equilibrium have no worker exert effort. When a worker believes his replacement would exert no effort, utility-maximizing effort is $e = \frac{\gamma}{\theta} p$, as when $\phi = 0$. Hence, an equilibrium in pure strategies does not exist.

The equilibrium must have a worker adopt a mixed strategy, or have initially identical workers adopt different levels of effort (as in the correlated equilibria described by Aumann (1974)). We can think of such correlated equilibria as inducing a person with some characteristic he observes (but employers do not) to exert high effort, whereas a person with a different characteristic exerts low effort.[15] A third, related, approach is to consider different types of workers, perhaps some with high ability and some with low ability. We conjecture that in such a situation a worker with high ability would exert much effort, in the expectation that he may be replaced by a worker with low ability who would exert little effort, thus implying high impact for both types of workers. Here, we take up the more challenging issue of whether impact can induce effort when all potential workers are essentially identical.

[15] Our approach may then explain some of the empirical association between wages and personal characteristics that one might think irrelevant in the labor market. For example, Bowles et al. (2001) report that beauty, height, obesity, and domestic cleanliness robustly predict earnings. These might be associated with correlated equilibria which affect impact-motivated effort.

To characterize the equilibrium, first note that for any $\phi > 0$, the first-order condition (8) yields two local maxima:

$$e_h^* = \frac{\gamma}{\theta} p \text{ and } e_l^* = \frac{\gamma\left(1-2\phi\right)}{\theta} p.$$

Suppose first that $\phi \leq 1/2$, so that both local maxima imply positive effort. As argued above, utility-maximizing effort cannot be unique. Were one of the effort levels optimal for the current worker, it would also be optimal for the worker replacing him, reducing a worker's impact to zero, and violating the requirement that $e \neq Ee_o$. Instead, workers will choose either e_h^* or e_l^*. Such mixing requires a worker to be indifferent between high effort and low effort. That is,

$$\begin{aligned} &w + \gamma\left[\left(1-\phi\right) pe_h^* + \phi\left(pe_h^* - Epe_o\right)\right] - \frac{1}{2}\theta e_h^{*2} = \\ &w + \gamma\left[\left(1-\phi\right) pe_l^* + \phi\left(Epe_o - pe_l^*\right)\right] - \frac{1}{2}\theta e_l^{*2}. \end{aligned} \tag{9}$$

Let z be the probability with which the replacing worker exerts effort e_h^*. Consequently:

$$Epe_o = \left(1-z\right) pe_l^* + zpe_h^*.$$

Substituting this expression and the values of e_h^* and e_l^* into (9) yields

$$z = 1/2.$$

Hence, workers are equally likely to choose e_h^* as e_l^*. Similarly, it follows that when $\phi > 1/2$, and so e_l^* must be zero, the fraction of workers choosing e_h^* is

$$z = \frac{1}{4\phi},$$

with the remaining fraction exerting no effort.

The wage the firm must offer follows from the worker's participation constraint $U \geq \overline{U}$:

$$\begin{aligned} \text{if } \phi &\leq 1/2 \text{ then } w = \overline{U} - \frac{1}{2}\frac{\left[1-2\phi\left(1-\phi\right)\right] p^2\gamma^2}{\theta} \\ \text{if } \phi &> 1/2 \text{ then } w = \overline{U} - \frac{1}{4}\frac{\gamma^2 p^2}{\theta}. \end{aligned}$$

Clearly, the wage declines with the worker's concern about impact (γ), increases with the cost of effort (θ), and increases with the utility from the outside option ($\overline{U}$). For $0 \leq \phi \leq 1/2$, higher replacement implies less opportunity to make an impact, so the wage increases with the replacement probability (ϕ). A higher price of the product implies greater impact at given effort, and so reduces the wage.

6.2 Contractible effort

When effort is contractible, the firm can avoid inducing workers to mix on high and low effort by offering a contract that fixes effort. Then, however, a worker's utility from impact falls, and so the firm must pay a higher wage. Here we examine this trade-off by comparing expected profits under two alternative contracts: one that fixes effort and one that offers a piece rate.

Consider first the fixed-effort contract. The firm maximizes profits $pe - w$ subject to the worker's participation constraint:

$$w + \gamma (1 - \phi) pe - \frac{1}{2}\theta e^2 \geq \overline{U}. \tag{10}$$

As is clear from (10), when the firm offers a fixed-effort contract, the worker's existence only affects output if the worker is not replaced, which happens with probability $(1 - \phi)$. The profit-maximizing level of effort is

$$e^* = \frac{1 + \gamma (1 - \phi)}{\theta} p, \tag{11}$$

which increases with the weight attached to impact γ and the product's price p, and decreases with cost of effort θ and the replacement probability ϕ. The resulting profits are

$$\pi_{fe} = \frac{1}{2\theta} \left[1 + \gamma (1 - \phi)\right]^2 p^2 - \overline{U}.$$

Consider next a piece-rate contract paying αp per unit of output and a base salary of β.The worker's utility is

$$U = \alpha pe + \beta + \gamma \left[(1 - \phi) pe + \phi \left| pe - Epe_o \right|\right] - \frac{1}{2}\theta e^2.$$

The first-order condition for utility-maximizing effort yields two local maxima:

$$e_h^* = \frac{\alpha + \gamma}{\theta} p \text{ and } e_l^* = \frac{\alpha + \gamma (1 - 2\phi)}{\theta} p. \tag{12}$$

Following the same steps as in the previous subsection, it is easy to verify that, as with noncontractible effort, workers are equally likely to choose e_h^* as e_l^*.[16] Expected profits are

$$E\pi_{pr} = \frac{1}{2}(1-\alpha)\frac{\alpha+\gamma}{\theta}p^2 + \frac{1}{2}(1-\alpha)\frac{\alpha+\gamma(1-2\phi)}{\theta}p^2 - \beta.$$

Maximizing with respect to α and β, subject to the worker's participation constraint $U = \overline{U}$, yields the profit-maximizing $\alpha = 1$. Hence, as in a standard principal-agent model with risk-neutral principals and agents, the firm pays the full marginal product. Note that payment of the full marginal product implies that the expected level of effort is the same under the piece-rate contract as under the fixed-effort contract. (If $\alpha = 1$, then $e^* = \frac{1}{2}e_h^* + \frac{1}{2}e_l^*$, see (11) and (12)). Hence, in terms of expected effort, the firm finds it costless to grant autonomy in effort choice to the worker. The resulting expected profits are

$$E\pi_{pr} = \frac{1}{\theta}\left\{\frac{1}{2}(1+\gamma)^2 - \gamma\phi\left[1+(1-\phi)\gamma\right]\right\}p^2 - \overline{U}.$$

It is easy to verify that if $\gamma > 0$ and $\phi > 0$, then a piece-rate contract always yields higher expected profits than does a fixed-effort contract ($E\pi_{pr} > \pi_{fe}$). Hence, the firm profits from giving the worker some autonomy. This result also holds in the absence of search frictions in the labor market ($\phi = 1$). The intuition follows. Since a worker's successor will exert the same effort as the current worker, a fixed-effort contract limits a worker's opportunity for impact. A piece-rate contract leaves effort choice to the worker. The worker chooses between high and low effort, resulting in the same expected effort. The worker's utility is higher, however, as his expected impact is larger. The firm can therefore offer a lower wage by not specifying effort, but instead giving the worker some autonomy.[17] This benefit of autonomy is consistent with the evidence discussed in the Introduction that workers are willing to accept a lower wage for greater autonomy (Smith et al. (1997), Frey et al. (2001), Benz and Frey (2003), and Frey and Benz (2006)). Desire by

[16] As we will see, if $\gamma < 1$ the restriction that $\alpha + \gamma(1-2\phi) > 0$ for positive e_l^* does not bind. That is, the marginal utility from impact must be smaller than the marginal utility from consumption, which seems reasonable. If $\gamma > 1$, workers mix on exerting effort e_h^* and exerting no effort, as in the previous subsection.

[17] Note the difference with Aghion and Tirole (1997) and Zábojnik (2002), where workers value authority because it allows them to make their preferred choices.

workers for impact may thus explain why firms leave employment contracts deliberately incomplete.[18]

7 Conclusion

We argued that workers' desire for impact can parsimoniously explain several phenomena in labor markets. We conclude by discussing the implications of our work for management practices, some existing experimental findings, and future theoretical and empirical work.

While we mostly aimed to explain observed labor market behavior, our paper can also provide guidance to effective management. As we saw, a firm may find it optimal to increase the opportunities afforded workers to have impact, thereby attracting or retaining workers at lower wages. An employer can increase impact by investing in workers' firm-specific human capital, limiting the size of the work force, and granting autonomy to workers in effort or task choice. Clearly, the grant of autonomy should be used with caution when some people may be attracted to a firm because of the damage they can cause—an illuminating example is firefighter arson.[19] Also, when people differ in work motivations other than the impact motive, granting autonomy to workers may induce sorting of the least motivated workers to the firm. This adverse selection may appear when autonomy enhances workers' opportunities for shirking, which are most valuable to the least motivated workers (see Delfgaauw and Dur (2004)).

Our approach may explain some results in laboratory experiments which find that subjects do not maximize income. For example, some people contribute more to the private provision of a public good than would be called for by profit maximization. (See Ledyard (1995) for a survey of experimental findings on public-good games.) Perhaps one reason is the desire for impact—a person who contributes much when others do not may surprise the researcher (thereby having impact), or may generate more income to other participants than were the subject in question not a participant. A desire for

[18] See, among others, Bernheim and Whinston (1998) and Fehr et al. (2006) for alternative explanations.

[19] The problem is sufficiently serious that the National Volunteer Fire Council issued a report on firefighter arson, and met with a representative of the FBI's National Center for the Analysis of Violent Crime to discuss the issue. See "Firefighter Arson—An NVFC Special Report."

impact may also explain the sometimes erratic behavior of some participants in experiments found by, among others, Blanco, Engelmann, and Normann (2006). As we saw in Section 6, a desire for impact can result in equilibria in mixed strategies in situations where one would normally expect equilibria in pure strategies.

Our theoretical work yields several new testable hypotheses for empirical research. One hypothesis involves the relation between a worker's wage and his impact. As we saw in Section 3, workers' desire for impact can lead to wage differences among observationally identical workers working at different firms. Clearly, one obstacle to test this prediction is the absence of reliable data on workers' impact. The survey data recently collected by Nicholson et al. (2006) on the value of lost output due to a worker's illnesses may be useful in this respect. Interestingly, they find large effects of a worker's absence on output, which much differ between types of job. These data allow for a more direct test of how impact affects wages than do most of the studies discussed in the Introduction.

Our model considered the desire of workers for impact, ignoring the same desire by managers or entrepreneurs. Benz (2006), surveying a broad range of empirical evidence, concludes that entrepreneurship does not generally pay in monetary terms. Rather the rewards appear to come from broader skill utilization, greater autonomy, and the freedom to pursue one's own ideas; the last two motives are consistent with a desire for impact. When applied to entrepreneurs, the impact motive may explain several stylized facts. First, an entrepreneur's desire for impact may imply a bias towards expanding the firm ('empire-building' by the CEO). The bias may arise when, with positive probability, the firm vanishes once the entrepreneur vanishes. The effect may be especially large when impact is a normal good, implying that a wealthy entrepreneur is more willing to increase his impact at the expense of profits than is a lower-income worker willing to forego income for higher impact.[20] Second, when the entrepreneur is replaced with positive probability, he may mix on expanding and contracting the firm. For by doing so, the entrepreneur minimizes the probability that a successor will behave identically, and hence his existence matters for output. Third, entrepreneurs have more opportunities to make an impact the more rigid are labor markets. The reason is that in flexible labor markets laid-off workers easily find a new

[20] We are indebted to a referee for pointing out the potential importance of income effects.

job, and so laying off workers hardly affects aggregate output. So we may expect less volatile and lower unemployment in less rigid labor markets.

Another extension of the model would allow for heterogeneity in the desire for impact. As McClelland (1987, p. 173) notes, "While all children start out enjoying having impact, some parents may strongly discourage this activity, so their child does not develop much pleasure from it or develop a good concept of how to attain pleasure in this way. Other parents may allow or even encourage the activity, so their child develops a more elaborate schematic representation of the many different ways in which he or she can get pleasure from having impact." Allowing for such heterogeneity may raise interesting issues of signaling and sorting by workers and selection by employers; Delfgaauw and Dur (2005) and Prendergast (2006) study that for intrinsically motivated workers.

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