A Theory of Authority

3 A Model

We will formalize the concept of legitimacy by introducing it into a single-agent moral-hazard model. The principal, in addition to choosing (i) monetary incentives for the agent (as is standard), will choose (ii) an order θ to give the agent. The agent, in addition to choosing (iii) how much e¤ort to exert (as is standard), will also choose (iv) whether to accept that there is a duty to follow orders.

3.1 The Setup

The principal observes a measure of output q which can be high or low ($q \in \{h, l\}$). The

Time 5: The agent decides whether to accept that there is a duty to follow orders, and chooses effort at tasks 1 and 2.

Time 6: q is realized and the wage is paid.

Later on, we will consider the possibility that, at time 0, the principal can choose to bolster her authority at a cost $k\ b$.

3.1.1 The agent's problem

When the authority maintenance (AM) constraint ($\theta \leq L$) holds, it is optimal for the agent to accept that there is a duty to follow orders. We assume that when the AM constraint holds and the agent (as is optimal) accepts that there is a duty to follow orders, her utility is given by:

$$U^{am} \quad w - -a_1^2 - -a_2{}^2 - d\ a_1, \theta$$

The agent's utility is increasing in the wage w

We will refer to this as IC^{am} (the incentive compatibility constraint of the agent when the authority maintenance constraint holds).

We observe from IC^{am}

We will refer to this constraint as $IC^{¯°am}$.

From $IC^{¯°am}$ we see that as λ increases, we get more task 2 e¤ort relative to task 1 e¤ort. The reason is that, as λ increases, q becomes a worse measure of task 1 e¤ort.

The participation constraint for the agent is:

$$w\ l \quad a_1 \quad \lambda a_2 \ \ w\ h \ ¡\ w\ l \quad ¡\ -a_1^2\ ¡\ -a_2{}^2\ ¸\ U \tag{PC-noAM}$$

Observe that $PC^{¯°am}$ and PC^{am} are identical. Hence, in the future we will simply write PC to refer to both participation constraints.

In fact, the model was constructed so that the participation constraints would be the same. We might imagine settings where the agent derives utility – positive or negative – from being a follower and accepting authority. In assuming $PC^{¯°am} \quad PC^{am}$, we eliminate this e¤ect so that we can focus on the role authority plays as a tool for incentivizing agents.[13]

3.1.2 The principal's problem

The principal's pro…ts are given by:

$$\pi \quad a_1\ ¡\ w$$

Hence, the expected pro…ts of the principal are:

$$E\ \pi \quad a_1\ ¡\ \ w\ l \quad a_1 \quad \lambda a_2 \ \ w\ h \ ¡\ w\ l$$

where the second term is the agent's expected wage.

[13] Interestingly, Fehr, Herz, and Wilkening (2013) have found experimentally that authority is highly valued by principals. There may also be settings in which agents enjoy being followers.

The principal's problem can be stated as follows:

$$\underset{2[\,¸\,(\cdot)[\,¸\,(©)}{E\ \pi}$$

subject to

(1) PC, IC^{am}, AM

or, subject to

(2) PC, $IC^{\bar{\ }\circ am}$

We see that, if the principal meets the AM constraint, the principal faces a better incentive compatibility constraint (…nds it easier to incentivize the agent since the principal can give the agent an order). The principal must decide whether to meet the AM constraint, which is costly if legitimacy L is low, in order to obtain a better IC constraint.

3.2 Solution to the principal's problem

We will now characterize the solution to the principal's problem as a function of the principal's legitimacy (L). This will serve as a baseline for comparison to the case where the principal can bolster her authority. We …nd that there are three regions. When L is large, the principal has "unlimited authority" and can give an order which achieves the …rst-best outcome. The AM constraint is nonbinding in this case. The principal pays a …xed wage since paying the agent a bonus when q is high simply serves to increase e¤ort at task 2 (a_2), which is not desired.

When the principal has a bit less authority ($L^{ua} > L \geq L^{na}$), the principal finds her authority worth maintaining, but is unable to achieve the first-best. The AM constraint is binding in this region. The principal pays a fixed wage as she does when she has unlimited authority. Again, the reason is that paying a bonus increases task 2 effort without affecting task 1 effort.

Finally, when the principal has very little authority ($L^{na} > L$), the principal chooses to give it up and use monetary incentives exclusively. We might wish to think of this as a market relationship. In this region, the authority maintenance (AM) constraint is violated. The principal now does pay a bonus.

The following proposition states this more precisely:

Proposition 1 *The solution to the principal'*

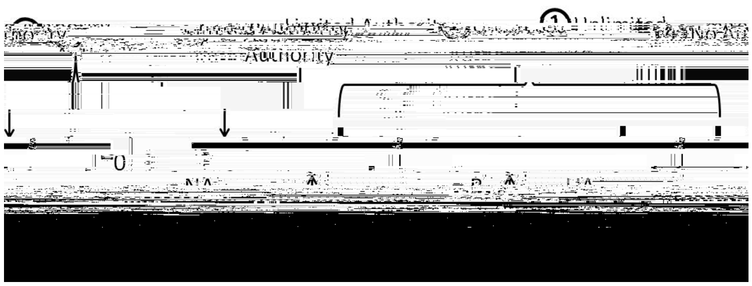
(2) $L^{n\ a}$ ¡ $\mathbf{p}\frac{5}{1+5}$

The value of $L^{n\ a}$ *is decreasing in* λ: $\frac{¥\bar{l}}{¥5} <$.

We will consider what the solution to the principal's problem looks like depending upon the extent of the principal's legitimacy (L_0).

Solution to the principal's problem with bolstering

The solution to the principal's problem depends upon the legitimacy of the principal's authority (L_0). We …nd that there are four regions. The …rst region is an "unlimited authority" region ($L_0 \geq L^{ua}$). In this region, the principal has su¢cient legitimacy to order the agent to exert the …rst-best level of e¤ort without bolstering authority at all (b). AM is nonbinding in this region. The principal pays the agent a …xed wage. As before, we …nd that the principal pays a …xed wage unless she gives up her authority (AM is violated).



A second region is a "limited authority/no bolstering" region. In this region, the principal does not have su¢cient authority to order the agent to exert the …rst-best level of e¤ort without bolstering. Rather than bolster authority in order to give a tougher order, though, she chooses not to bolster (b) and orders less than the …rst-best level of e¤ort. AM is binding in this region.

A third region is a "limited authority/bolstering"

The following proposition characterizes these regions.

Proposition 3 *The solution to the principal's problem when it is possible to bolster authority is as follows.*

(1) Unlimited Authority Region ($L_0 \geq L^{ua}$)

The principal chooses: θ , b , $w\ h$ $w\ l$ $\frac{1}{2}$ U

The agent chooses: a_1 , a_2

The principal's profits are: π $\frac{1}{2} - U$

(2) Limited Authority/No Bolstering Region ($L^{ua} > L_0 \geq L^{b}$)

The principal chooses: θ L_0, b , $w\ h$ $w\ l$ $\frac{1}{2}$ L_0 ^{2} U

The agent chooses: a_1 L_0, a_2

The principal's profits are: π $L_0 - \frac{1}{2}$ L_0 $^2 - U$

¥2/¥l $>$, ¥9/¥l $- L_0 >$

(3) Limited Authority/Bolstering Region ($L^{b} > L_0 \geq L^{na}$)

The principal chooses: θ *and* b *which solve the following two equations:*

(i) $k'\ b$ $-$ L_0 b

(ii) θ L_0 b

The principal chooses: $w\ h$ $w\ l$ $\frac{1}{2}\theta^2$ U

The agent chooses: a_1 θ, a_2

The principal's profits are: π $\theta - \frac{1}{2}\theta^2 - k\ b - U$

Bolstering increases as legitimacy falls: ¥£/¥l $<$

¥2/¥l $>$, ¥9/¥l $- \theta$ ¥2/¥l $>$

(4) No Authority Region ($L^{na} > L_0$)

The principal chooses: θ *which violates AM (no order is given),* b

The principal chooses: $w\ h - w\ l$ $\frac{1}{1+5}$, $w\ l$ $U - \frac{1}{2(1+5\ )}$

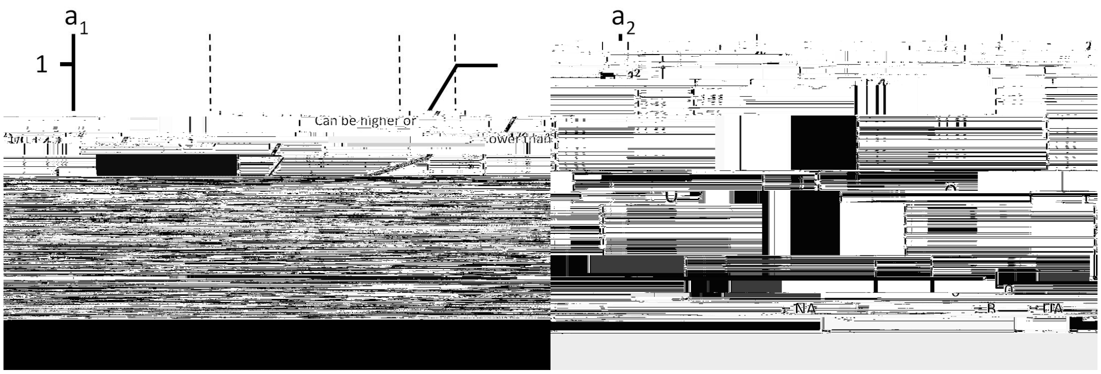
The agent chooses: a_1 $\frac{1}{1+5}$, a_2 $\frac{5}{1+5}$

The principal's profits are: π $\frac{1}{2(1+5\ )} - U$

¥¢/¥5 $\frac{-25}{(1+5\ )} <$, ¥¢/¥5 $\frac{1-5}{(1+5\ )}$ *(which is* $>$ *for* $\lambda <$ *and* $<$ *for* $\lambda >$ *)*

¥9/¥5 $\frac{-5}{(1+5\ )} <$

The following proposition characterizes the cuto¤ points for the four regions (L



3.4 An Alternative Interpretation of the Model

In the introduction, we suggested that there are two reasons that legitimacy matters. A sense that there is a duty to carry out orders (i) motivates compliance, and (ii) motivates people to report on others' infractions or police the disobedient in other ways.

The model we have developed seems to be exclusively about (i). In this section, we will show that the model can be interpreted as being *either* about (i) *or* about (ii). We will suggest a different interpretation of the model in which only (ii) is at work.

Suppose, as before, that the principal only observes q (the noisy measure of output) but the agent has coworkers who observe a_1. Let us suppose, in contrast to before, that the agent does *not* feel a sense of duty to follow orders. However, the coworkers feel the agent has a duty to follow orders when the AM constraint holds. When AM holds, the coworkers get angry when the agent fails to follow orders and notify the principal if $a_1 \leq \theta$, allowing the principal to inflict a punishment p.[15] The agent's utility when AM holds thus changes to the following:

$$U^{am-} \quad w -$$

(a_1 **6** θ).

Time 2: The agent decides whether to accept the o¤er or take an outside option which gives her utility U.

Time 3: The principal gives an order θ.

Time 4: The agent has another opportunity to take her outside option.

Time 5: The agent chooses e¤ort at tasks 1 and 2.

Time 6: Coworkers observe the agent's e¤ort a_1. If they accept that the principal has authority over the agent, which they do if AM holds, they will report if orders were disobeyed (a_1 **6** θ).

Time 7: q is realized, the wage $w\ q$ is paid, punishment p is in‡icted if the coworkers reported disobedience.

Observe that it is clearly optimal for the principal to set p **1**. As a result, p¤ **f**a_1 **6** θ**g** if orders are obeyed and **1** otherwise. Hence, p¤ **f**a_1 **6** θ**g** $d\ a_1, \theta$. As a result, $U^{am-{}^{-}\!\!\mid}$, U^{am} and the solution to the principal's and agent's problems will be exactly the same as before.

4 Applications and Extensions of the Model

In this section, we will consider various appl95.21.6(p)-10.2(ps)2.611(n)33.q F10 11.02.2(o)24.92(e)-382 wage is paid to the agent.

While this case does not initially look like the model with bolstering analyzed in Section 3.3, with some translation, it can be shown to be the same. Rather than thinking of the principal as choosing $\theta, b, w\ s$ to maximize pro…ts, suppose we instead think of the principal as choosing $\theta, b, w\ s$ to maximize pro…ts where $w\ s$ $w\ s$ ¡ EU ¡ U . If the principal's problem is stated in this way, it is equivalent to the principal's problem from section 3 with $k\ b$ $\frac{£}{+}$ and $w\ s$ substituted for $w\ s$. This leads to the following corollary of Proposition 3.

Corollary 1 *Consider the case where the principal's legitimacy is given by:* L L_0 b *where* b $\alpha\ EU$ ¡ U *. In this case, the solution to the principal's problem is as follows.*

(1) Unlimited Authority Region (L_0 ¸ $L^{u\ a}$)

The principal chooses: θ *,* b *,* $w\ h$ $w\ l$ $\frac{1}{2}$ U

The agent chooses: a_1 *,* a_2

The principal's pro…ts are: π $\frac{1}{2}$ ¡ U

(2) Limited Authority/No Bolstering Region ($L^{u\ a} > L_0$ ¸ L^b)

The principal chooses: θ L_0*,* b *,* $w\ h$ $w\ l$ $\frac{1}{2}\ L_0\ ^2$ U

The agent chooses: a_1 L_0*,* a_2

The principal's pro…ts are: π L_0 ¡ $\frac{1}{2}\ L_0\ ^2$ ¡ U

(3) Limited Authority/Bolstering Region ($L^b > L_0$ ¸ $L^{n\ a}$)

This region will exist if α *is su¢ ciently large.* PC *is nonbinding in this region.*

The principal chooses: θ $\frac{+-1}{+}$*,* b $\frac{+-1}{+}$ ¡ L_0*,* $w\ h$ $w\ l$ $\frac{1}{2}\left(\frac{+-1}{+}\right)^2$ U $\frac{1}{+}\left(\frac{+-1}{+}\right.$ ¡ $\left.L_0\right)$

The agent chooses: a_1 $\left(\frac{+-1}{+}\right)$*,* a_2

The principal's pro…ts are: π $\left(\frac{+-1}{+}\right)^2$ ¡ $\frac{l}{+}$ ¡ U

Bolstering increases as legitimacy falls: $\frac{¥£}{¥l}$ $<$

(4) No Authority Region ($L^{n\ a} > L_0$)

The principal chooses: θ *which violates AM (no order is given),* b

The principal chooses: $w\ h$ ¡ $w\ l$ $\frac{1}{1+5}$*,* $w\ l$ U ¡ $\frac{1}{2(1+5\ )}$

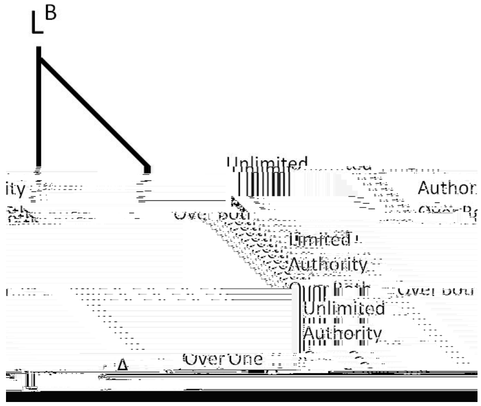
The agent chooses: a_1 $\frac{1}{1+5}$*,* a_2 $\frac{5}{1+5}$

The principal's pro…ts are: π $\frac{1}{2(1+5\ )}$ ¡ U

The proposition shows that, if paying an above-market wage has a substantial e¤ect on legitimacy (α is su¢ciently large), there will be a region in which the principal will choose to bolster authority by paying an above-market wage. The participation constraint will be non-binding in this region.

As mentioned earlier, above-market wages arise in Shapiro and Stiglitz (1984) for a very di¤erent reason. In their model, the optimality of e¢ciency wages relies upon a limited liability assumption: w q ¸ for all q. Above-market wages arise here even without the assumption of limited liability.

Another reason for above-market wages is reciprocity: in these models, a manager gives a worker an above-market wage and the worker reciprocates by putting in more e¤ort.[16]



Proposition 5 states the result more precisely.

Proposition 5 *Suppose the principal's legitimacy with agent A is $L^a \quad b$, the principal's legitimacy with agent B is $L^b - b$, the principal can choose any $b \in$ R, and bolstering is costless ($k\ b \quad$). The solution to the principal's problem is as follows.*

(1) Unlimited Authority Over Both Regions ($L^a \quad L^b > \quad$)

The principal chooses: $\theta^a \quad \theta^b \quad$, $w^a\ h \quad w^a\ l \quad w^b\ h \quad w^b\ l \quad \frac{1}{2} \quad U$, b such that $- L^a \leq b \leq L^b - \quad$.

The agents choose: $a_1^a \quad a_1^b \quad$ and $a_2^a \quad a_2^b \quad$.

The principal's pro…ts are: $\pi \quad - U$

(2) Limited Authority Over Both Regions ($\quad \geq L^a \quad L^b \geq L^{n\ a}$)

The principal chooses: $\theta^a \quad \theta^b \quad \frac{1}{2}\ L^a \quad L^b$, $w^a\ h \quad w^a\ l \quad w^b\ h \quad w^b\ l$ $\frac{1}{8}\ L^a \quad L^{b\ 2} \quad U$, $b \quad \frac{1}{2}\ L^b - L^a$.

The agents chooses: $a_1^a \quad a_1^b \quad \frac{1}{2}\ L^a \quad L^b$ and $a_2^a \quad a_2^b \quad$.

The principal's pro…ts are: $\pi \quad L^a \quad L^b - \frac{1}{4}\ L^a \quad L^{b\ 2} - U$

(3) Unlimited Authority Over One Region ($L^{n\ a} > L^a \quad L^b$)

The principal either chooses $b \geq \quad - L^a$ and maintains authority over just agent A or chooses $b \leq L^b - \quad$ and maintains authority over just agent B. If the principal maintains authority over just agent A, the solution is as follows:

The principal chooses: $\theta^a \quad$, $w^a\ h \quad w^a\ l \quad \frac{1}{2} \quad U$

Agent B chooses: $a_1^b \quad \frac{1}{1+5}$, $a_2^b \quad \frac{5}{1+5}$

The principal's profits are: $\pi \quad \frac{1}{2} \quad \frac{1}{2(1+5\ )} - \ U$

The solution looks identical in the case where the principal maintains authority over just agent B.

$L^{n\ a} \quad \Big(\ - \sqrt{\frac{1}{2}\Big(\ - \frac{1}{\ }}$

While it is hard to give a precise de…nition of bureaucracy, bureaucracy seems to refer to

bureaucratic rule: it is probably easier to achieve compliance when the rule is simple.

In order to capture this idea, consider the same setting as before where $s \in \{-, \}$ and $\pi \quad sa_1 - w \; q$. We will suppose there is just a single principal this time. The principal does not know the state s, but the agent does know the state. Furthermore, we allow the principal to give state-contingent orders to the agent: $\theta \; s$. In other words, the principal can give an order to do θ when s and $\theta \; -$ when $s \; -$.

Clearly, there is a value in giving orders that are tailored to the state ($\theta \; - \neq \theta$). However, we assume that giving a more complicated, tailored order reduces the principal's legitimacy. If a simple order is given ($\theta \; - \quad \theta$), the AM constraint is $\theta \; s \leq L^h$ for all s. If a complicated order is given ($\theta \; - \neq \theta$), the AM constraint is $\theta \; s \leq L^l$ for all s, with $L^l < L^h$.

First, consider the optimal simple order to give. If L^h takes an intermediate value, so that AM is binding, the optimal order is $\theta \; s \quad L^h$. If L^l takes an intermediate value, the optimal complicated order to give will be $\theta \; s \quad sL^l$. Let us compare the principal's expected profits.

The principal's expected profits from giving a simple, bureaucratic order are:

$\pi_b \quad L^h \quad p - \quad - \frac{1}{2} \left(L^h\right)^2 - U$

The principal's expected profits from giving a tailored, non-bureaucratic order are:

$\pi_{nb} \quad L^l - \frac{1}{2} \left(L^l\right)^2 - U$

It makes sense to be bureaucratic ($\pi_b > \pi_{nb}$) if (i) it has a large effect on legitimacy (L^h is

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4.4 Failing to Hire Overqualified Workers

Bewley (1999) has observed that firms typically dislike hiring workers who seem "overqualified" for a job. In interviews Bewley conducted with personnel managers, he has documented their reasoning. One personnel manager said the following: "Overqualification is a problem, just as is underqualification. You cannot fulfill the needs of an overqualified person. They will be unhappy and will be a problem."[19]

It would seem that a large part of what is going on is that it is difficult to manage such workers (AM is tight). Let us make a very small amendment to the model from Section 3 without bolstering to formalize what seems to be going on.[20]

Instead of assuming the principal's profits are given by $\pi = a_1 - w(q)$, suppose $\pi = \rho a_1 - w(q)$ where ρ is assumed to be higher for a more qualified agent. We will also assume that the principal's legitimacy depends upon how qualified the agent is $L(\rho)$, with L decreasing in ρ to reflect the idea that it might be difficult to maintain authority over more qualified agents.[21] With the assumption that $L(\rho)$ takes an intermediate value, so that the AM constraint is binding, the principal's expected profits will be:

$$\pi(\rho) = \rho \cdot L(\rho) - \frac{1}{2}(L(\rho))^2 - U$$

If $L(\rho)$ where constant, $\pi(\rho)$ would be increasing in ρ due to the fact that more qualified workers are more productive. But, since legitimacy falls as ρ increases, profits may actually fall as ρ increases. It is indeed possible, as the personnel manager states, that both overqualification and underqualification pose a problem.

important. Workers who are difficult to manage and fail to respect authority have a bad attitude which may be infectious. Teachers, similarly, always worry when one student is determined to play the role of class clown. They know that, if they are not careful, other students will join the class clown in her tomfoolery.

We might capture this second effect as follows. Suppose there are two agents: A and B. The principal's authority over agent A may depend upon both ρ_a and ρ_b: $L^a(\rho_a, \rho_b)$. Similarly, the principal's authority over agent B may depend upon both ρ_a and ρ_b: $L^b(\rho_a, \rho_b)$. In this event, in choosing to hire an overqualified worker A, a manager needs to think not only about whether worker A will be difficult to manage but also about how this will affect her ability to manage B.

5 Conclusion

This paper has argued that limited legitimacy of authority plays a significant role in determining organizational behavior and organizational structure. We formalized the concept of legitimacy in a single-agent moral hazard model. The model explains numerous organizational phenomena: above-market-clearing wages, merger decisions, bureaucratic organization, and the rejection of overqualified workers.

The paper suggests many topics for further research. The first is exploration of further appli-

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6 Appendix

Proof of Proposition 1. There are three cases to consider: (1) AM holds and is non-binding, (2) AM holds and is binding, and (3) AM does not hold. The PC and IC constraint will always be binding. We will consider each in turn. Each corresponds to one of the three regions.

Case (1): The principal's expected pro…ts are $E\ \pi \quad a_1 - w\ l \quad a_1 \quad \lambda a_2 \ \ w\ h \ - w\ l$. In this case, it is clear that it is optimal to set $w\ h \ - w\ l$ since $w\ h \ - w\ l \ >$ increases a_2 without increasing a_1. A higher a_2 is a pure cost for the principal since it is unproductive and, through the participation constraint, means paying the agent more to compensate the agent for additional e¤ort exertion. If we assume that $w\ h \ - w\ l$, and substitute in IC-AM and PC to the pro…t function, we obtain: $E\ \pi \quad \theta - \frac{1}{2}\theta^2 - U$. The principal chooses θ to maximize pro…ts and hence θ .

Case (2): Again, the principal …nds it optimal to choose $w\ h \ - w\ l$ and maximizes $E\ \pi \quad \theta - \frac{1}{2}\theta^2 - U$, but in this case, subject to a binding AM constraint: $\theta \quad L$.

Case (3): In this case, IC-noAM and PC allow us to write the principal's pro…ts solely in terms of a_1: $E\ \pi \quad a_1 - \frac{1}{2}a_1^2 \quad \lambda^2 \ - U$. The maximizing a_1 is hence $a_1 \quad \frac{1}{1+5}$. The IC-noAM and participation constraints imply that $w\ h \ - w\ l \quad a_1 \quad \frac{1}{1+5}$, $a_2 \quad \lambda\ w\ h \ - w\ l \quad \frac{5}{1+5}$, and $w\ l \quad U - \frac{1}{2}a_1^2 \quad \lambda^2 \quad U - \frac{1}{2(1+5\ )}$. ■

Proof of Proposition 2. The boundary between the unlimited authority region and the limited authority region is given by the value of L for which AM becomes binding, which is clearly L . Hence, $L^{u\ a}$. The boundary between the limited authority region and the no authority region is given by the value of L for which pro…ts are the same with and without authority. $\pi^{¢¶\mu©} \quad L - \frac{1}{2}L^2 - U$ 282 14 4 1 22 ( ) 10 2( ) 21 4( )10 ( ) 2 (1 ( )0 8( ) 2 ( )11 4 1