

***Missing Market in Labor Quality: The Role of Quality
Markets in Transition***

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Missing Market in Labor Quality:
The Role of Quality Markets in Transition¹

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Abstract

This paper characterizes a key feature of the classic socialist economy and state-owned enterprise, namely that of missing markets in labor quality. Under the socialist regime in which students and workers were assigned to work units, the rights of managers to monitor and reward workers were limited. The exchange of labor services was based more on measures of quantity rather than quality. Workers who performed functions broadly consistent with that of their assigned occupations for the duration of the designated workweek received the standard wage. With the reassignment of property rights, this situation has changed. Students and workers have resumed control over the accumulation of their human capital the trade of skill and effort. Managers have acquired greater authority to monitor labor – to discriminate in setting wages and bonuses and to hire and fire – as well as stronger incentives to use this authority to raise efficiency and profits. The result is an emerging market in labor quality.

A 1995 cross section of enterprise data spanning 10 ownership types is used to test the hypothesis of an emerging labor quality market. The results show that certain non-state forms of ownership, in which the rights of managers to monitor and reward skill and effort are presumed to be relatively well developed, encourage labor quality, most notably training, which raises productivity. The relative inability of state enterprises to monitor and reward high quality labor is likely to create an adverse selection problem in which the most skilled and motivated workers exit from the state sector, so as to cause a “hollowing” of skilled workers and weakened enterprise performance.

The theoretical contribution of this paper is to generalize Coase’s analysis of the critical role of property rights in creating resource markets to the creation and exchange of quality in all goods. Analytically, the conditions for a missing market in labor quality are equivalent to those for a missing market in pollution abatement and water quality. The analysis underscores the importance of property rights in creating the conditions for the accumulation and efficient exchange of human capital.

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Introduction

This paper argues that the critical distinction between socialist and market systems is the inability of the former to assign the property rights that are needed to establish markets in quality. From this perspective, the paper has two purposes. The first is to characterize the market in labor quality and demonstrate its relevance to economies in transition from planned socialism to market capitalism. The paper uses Chinese enterprise data to test the quality markets hypothesis. The paper's second purpose is more ambitious. It is to demonstrate the broad, if not universal, applicability of the Coase Theorem to the analysis of quality markets and economic efficiency.

This paper illustrates the distinction between markets in the quantity of labor and the quality of labor. The absence of the assignment of a specific bundle of rights - the right of workers to accumulate and trade on human capital and effort and the right of managers to monitor and reward labor quality - creates a missing market in labor quality. This missing market has profound implications for efficiency, accumulation and growth, and income distribution in socialist economies. The assignment of certain rights to workers and managers creates markets in labor quality and raises economic efficiency. This is the quality markets hypothesis.

The paper is organized into five sections. The first characterizes labor markets in socialist economies. Section two describes the market in labor quality as an extension of the Coase Theorem. Section three uses Chinese enterprise data to mount an empirical test of the quality markets hypothesis. Section four examines certain implications of the quality markets hypothesis for the performance of state-owned enterprise, including the

problem of adverse selection. Finally, the concluding section of the paper explores certain theoretical implication of the quality markets hypothesis.

Labor markets in socialist economies

A dominant feature of the classic socialist economy is that property rights are embodied in the state or "all of the people". The state confers only limited rights to individuals and non-governmental entities (World Bank, 1996). This concentration of rights within the state affects the labor market and enterprise efficiency in two important ways. First, by retaining the right to allocate labor to work, the state exercises substantial control over the matching of human and physical capital to the individual. Secondary school and college graduates are generally assigned to work units - factories or communes - to which their lifetime labor services are tied. While these restrictions go beyond the tax on labor income and occasional military conscription found in capitalist societies, it would be incorrect to characterize the retention of labor rights by the state as involuntary slavery or indentured servitude. Workers receive a basic wage, a range of subsidized services, and a substantial degree of security. In exchange for security in which the main requirement has been to show up for work and satisfy a common minimal standard of effort, workers face restrictions on their rights to accumulate and trade their labor services. In China, the erosion or outright abolition of elements of this system of labor allocation, dubbed the "iron rice bowl" (*tiefanwan*), has met with considerable resistance, even though it infringes on the rights of workers to control their accumulation of human capital and the intensity of its use.

The second key feature of this model of missing markets in labor quality arises from the condition that within the socialist economy the state owns all or most of the

industrial assets. For the purpose of carrying out production plans and monitoring the use of state-owned industrial assets, the state assigns certain rights to managers and party secretaries. A key right of managers and party secretaries is to supervise the workforce to ensure that it responsibly combines the services of labor assigned to the firm with the services of the state's fixed assets. In practice, however, the rights of managers to monitor, reward and discipline workers are severely circumscribed. Under central planning, labor bureaus set wages for various categories of work; bonuses do not exist or are uniformly distributed. Firings are extremely infrequent. A consequence of this limited assignment of rights to individual managers in which rewards and sanctions cannot be used to motivate quality is that monitoring is conducted along the dimension of the quantity of work rather than its quality.

Since the authority to monitor and the incentive to monitor are complementary rights, it should not be surprising that weak monitoring authority should be accompanied by weak incentives to monitor. In capitalist economies where the effective monitoring of inputs is expected to raise profit, the manager's compensation includes the right to capture a share of the residual. In short, the inability of the socialist system to assign to an agent within the enterprise the right to monitor, reward, and, in turn, receive rewards for efficient monitoring results in the absence of the effective central contracting agent envisaged by Alchian and Demsetz (1972) and Jensen and Meckling (1976).

The result of this weak assignment of property rights to workers to accrue skill and exercise effort and managers to monitor and reward that same skill and effort is the absence of a market in the quality of labor services. The socialist labor market is largely limited to the quantity of labor services - compensation for being on the job daily for

eight hours. Because managers have the authority to monitor and reward on quantity but not on quality, workers trade on quantity but not on quality. The fact that workers themselves exercise limited control over the use and exchange of the quality of their labor services might be vexing but for the fact that nowhere within the system is there a market for quality labor services. The opportunity cost of diminished skill and effort is unobservable. From this vantage, the introduction of a sector that is granted the rights required to create a market for labor quality threatens the stability of the state sector.

Several results follow from the missing market in labor quality. These are:

- (i) Workers are employed, monitored, and rewarded for the quantity of work, not skill and effort. Workers, particularly more skilled and energetic workers, are not efficiently employed.
- (ii) As complements to labor, plant, equipment, and other inputs are not efficiently employed.
- (iii) Production targets are met by adding to the quantity of workers and machinery, not by using inputs more efficiently.
- (iv) Because inputs are not used efficiently or rewarded for quality, the incentive to accumulate embodied technical change through investment in human capital and innovation is missing.

The argument of this essay is that the essential distinction between a socialist system and a capitalist system is the nature of rights that are allocated to individual workers and managers in the workplace. By circumscribing these rights, socialist economies focus on quantities, physical targets, and the central plan. Because the system creates only weak incentives to improve the quality of labor or capital, the result is a relatively stable set of technical production relationships that facilitates central planning. Hence the reliance on input-output tables defined by a matrix of fixed technical coefficients. With monitoring and rewards on quantity rather than quality, high rates of labor force participation and savings become an important avenue to expanding

production. Increasing quantities of output by increasing quantities of inputs does not disrupt the structure of the input-output table. Changing the quality of inputs, however, fundamentally alters and disrupts the exercise of central planning. In this view, extensive, rather than intensive, growth results from the absence of quality markets.

An extension of Coase

This section extends the analytical framework of the Coase Theorem to examine how the assignment of property rights create markets.

Figure 1 reviews a standard application of the Coase Theorem in which a clear assignment of property rights and zero transaction costs result in an efficient level of pollution shown at P^* . Whenever the marginal cost (marginal benefit) of pollution for the downstream (upstream) firm exceeds the MB (MC) of the upstream (downstream) firm, the firm with the right to pollution or to limit pollution will receive compensation from the other to obtain the efficient level of pollution, P^* . Regardless of whether the upstream firm or downstream firm receives the right, the equilibrium settles at P^* .²

The basic logic of the Coase Theorem can be extended to markets in labor quality. In the absence of the right of workers to accumulate and trade the services from their human capital, workers will remain relatively unskilled and unmotivated. Managers will be unable to acquire the skills and motivation required to employ other factors of production efficiently. The result will be low labor and total factor productivity.

This situation is analogous to that of a missing market in pollution abatement described above. The missing market can be viewed from an alternative perspective, which is not described in the Coase model. This envisages a regime in which managers do not possess the right to monitor or reward workers for skill and effort. In this

situation, workers cannot receive compensation for accumulating and utilizing their human capital and therefore remain relatively unproductive and poor. This condition does not arise in the Coase model, because it is assumed that each party has the right to compensate the other party for various levels of water quality. In the spirit of a model that focuses on how assignments of rights shape markets this assumption should be made explicit.

Absent a complete assignment of property rights to *either* the worker or the manager, a market in labor quality will not function. Workers will not provide nor will managers demand quality. Like the upstream polluter who voluntarily reduces pollution without compensation, workers who provide quality services - effort that exceeds their reward - create externalities that they cannot capture. As in the conventional Coase model in which the creation of a property rights market internalizes the pollution externality, the creation of the usual set of rights in a capitalist labor market internalizes the externalities created by the exercise of skill and hard work. The assignment of rights thereby motivates a higher quality labor force and greater social efficiency.

This result is shown in Figure 2. Absent the assignment of rights to trade on quality (skill and effort), workers provide E_0 of effort. With the enlargement of rights to workers to accumulate and trade labor quality within and across firms and the provision of rights to managers to meter, reward, and be rewarded for successfully trading on labor quality, the equilibrium moves to E^* .

Note several contrasts with the Coase model of missing pollution rights. First, the absence of a market in pollution rights causes the upstream firm to overpollute; the equilibrium lies to the right of the socially optimal level of pollution, P^* . In the absence

² This result requires the further assumption that redistribution does not affect marginal values.

of a market in labor quality, the equilibrium lies to the left of the socially optimal level of labor quality, E^* . By redefining the market in pollution as a market for pollution abatement (i.e. water quality), the graphics of the two cases can be made entirely symmetric.

In Figure 1, the assignment of pollution rights to either the upstream or downstream firm leads to P^* . This is a key result of the Coase Theorem. In principle, the worker's right to exchange freely skill and effort could be assigned to the employer, but such an assignment implies a state of slavery, which is generally unlawful. Moreover, while employers that held these rights might be able to induce labor services along quantity dimensions, as slave holders they would likely achieve little success along quality dimensions.³

Another difference between the analysis of the missing pollution market and the missing market in labor quality is that the market in pollution rights entails the assignment of rights to one side of the market only. Either the upstream or downstream firm receives the right to pollute or to abate pollution. The results of the Coase Theorem follow. As presented, however, creation of the market in labor quality entails the assignment of rights to both parties, i.e. the right to one's human capital to the worker and the right to monitor and reward effort and skill to the manager. Why the difference?

A key assumption of the Coase Theorem is no transaction costs. The model assumes that both sides have the rights and capabilities to costlessly monitor the level of pollution. If the downstream firm sells (buys) the right to pollute (abate), it can monitor

³ The inability to effectively force quality from involuntarily labor may help to explain why slavery is absent from industrial societies and the relative absence of slavery in the North of the United States prior to the Civil War.

the pollution generated by the upstream firm. The assumption of costless transactions implicitly assumes an assignment of the right to monitor and reward.

For trade in labor effort and skill, the assumption of no monitoring costs seems excessively optimistic, particularly against the backdrop of well-established theories of asymmetric information and screening costs (Tirole, 1990). By interpreting the assumption of zero transaction costs to assume costless monitoring of labor quality, as well as pollution, we could simplify the labor quality model to a single assignment of rights, i.e. the right of the worker to control the effort and quality of his work. The unambiguous assignment of this right to the worker along with either Coase's assumption of no transaction costs or the assignment of the right to monitor and reward yields an efficient outcome. For the purpose of modeling the effect of a missing model in labor quality, the central role of effective monitoring argues for an explicit acknowledgement of the assignment of the authority and incentive to monitor.

Creating a market in labor quality carries important implications with respect to efficiency, accumulation and growth, and distribution. These are:

(i) **Efficiency.** By increasing the potential rewards to workers and managers, these parties bargain until the trading in labor quality has exhausted potential gains to all parties. The allocation of work effort and skill will be efficient. Moreover, if workers are compensated for their productivity, they will want to use complements to production, including equipment, efficiently. By linking the compensation of managers to the residual, they will also want to employ other inputs to production efficiently.

(ii) **Accumulation and growth.** When individuals acquire the right to trade on skill and effort and managers exercise the right to compensate workers for such skill and effort, the incentive to accumulate human capital increases. Rewards to complementing skilled labor with new vintages of capital rises, the incentive to innovate rises, and rates of growth of productivity and output rise.

(iii) **Distribution.** All individuals suffer under the constraint of 24 hours in the day. Moreover, most workers more or less adhere to the convention of an 8-hour

day. In an economy in which labor's performance is measured and rewarded principally in terms of number of hours worked, incomes are relatively uniform. Given an unequal distribution of individual skill and effort, the creation of a market in labor quality will give rise to more greater inequality.

The model predicts the key stylized features of a socialist economy - allocative inefficiency, labor shirking, patterns of extensive growth, and relative income equality.

The model also predicts key features of capitalist economies - comparative allocative efficiency, discipline in the labor force, intensive growth, and a relative skewed distribution of income.

Markets in labor quality in China's enterprise sector: an empirical test

In this section a cross section of Chinese enterprises of various ownership forms is used to test the quality markets hypothesis. The test employs a recursive two-equation model. The first equation examines the relationship between various assignments of property rights and measures of labor quality within the enterprise. The second equation investigates the impact of labor quality on labor productivity. The model can be summarized as follows:

$$H/L = f_1(PR; X)\varepsilon_1, \quad (1)$$

$$Q/L = f_2(H/L; K/L; Z)\varepsilon_2, \quad (2)$$

where H/L is a measure of labor quality, Q/L is a measure of labor productivity, K/L is the capital-labor ratio, X and Z are vectors of control variables, and the ε_i are random variables with the usual iid properties. The more conventional approach to investigating the relationship between property rights and efficiency is to estimate the reduced form version of equations (1) and (2). Because the focus of this paper is on conditions

required to create a market in labor quality, this model examines the explicit role of labor quality, both as the outcome of an assignment of property rights and as a determinant of labor productivity.⁴

The production technology embodied in equation (2), i.e. f_2 , is assumed to be Cobb-Douglas of the following intensive form:

$$Q/L = A(K/L)^\alpha(M/L)^\beta(H/L)^\gamma \epsilon, \quad (3)$$

where Q is gross industrial output, K is net value of fixed assets, L is the year-end number of workers, M is intermediate inputs, and A is the productivity parameter. H/L , the labor quality variable, can also be interpreted as a human capital variable where H spans various dimensions of labor quality. In this specification, the sum of α , β , γ , and ϕ , the weight on labor, is unity, i.e. the technology assumes constant returns to scale.

Productivity is generated by the process:

$$A = A_0 e^{\sum_i Z_i \nu_i}, \quad (2)$$

where A_0 is the average level of productivity within the sample and Z is a vector of individual industry branches.

Note that, in principle, the property rights variable H/L includes measures of property rights that are assigned to both workers and managers. In practice, by the 1990s, Chinese students and workers had received a complete set of rights to make educational choices and, upon graduation, to choose their place of work. Beginning in 1987, graduating students were given the right to search for their own employment rather than

⁴ Equation (1) can, in turn, be interpreted as the reduced form of a labor supply and demand system in

be assigned by the state. By the end of the decade, young Chinese regularly organized and conducted job searches upon graduating. . Therefore, the property rights vector is limited to measures of managerial control.

By the mid-1990s, China's industrial economy had established an extraordinarily heterogeneous mix of enterprise forms. The State Statistics Bureau, which collects and reports data on ownership in 1995 reported statistical profiles for 13 ownership types, including state-owned enterprise, collective-owned enterprise, a variety of foreign and overseas-invested enterprise, individually-owned enterprise, and other forms of ownership. Each of these ownership forms represents a different form of governance and, potentially, different assignments of managerial control rights bearing on the right to monitor and reward labor for skill and effort. In principle, the greater the degree of state ownership, the more constrained or ambiguous is the assignment of control rights to a managerial entity; the more ownership is concentrated in the hands of individuals, the more clearly assigned are the relevant control rights. These principles and the body of literature on the relative performance of China's industrial enterprise types suggest a set of priors in which the ability to monitor and reward labor quality, from the most to least constrained rights, is SOE, COE, and various forms of overseas and foreign ownership (i.e. *sanze*).⁵ It is difficult to anticipate how shareholding enterprises, which include a substantial measure of state ownership, fit into the ranking.

Measures of labor quality include the proportion of the workforce that has received a college education and training expenditures per capita. These may either be

which the worker and manager optimize along certain dimensions of labor quality.

⁵ See, for example, Jefferson, Mai, and Zhao (1998), who compare the distribution of managerial control rights in SOEs and township and village enterprises (COEs). Also see Perkins (1998), who makes similar comparisons between SOEs and foreign joint ventures.

substitutes or complements. Firms may hire in fewer expensive college graduates but compensate by providing more training; alternatively, high quality labor may require both a college education and subsequent on-the-job training. The model does not test whether a college education and training are substitutes or complements; it does assume that both enhance labor quality. Within the context of the specification of the production function shown above, both create human capital, H , and raise the average level of labor quality, H/L . The control variables, X and Z , both are vectors of industry branches.

The cross-section of 1995 enterprise data is a sample of approximately 1100 enterprises representing various ownership types (shown in Table 1) and a range of sizes drawn from Beijing. About half of these enterprises are industrial; the others are non-industrial enterprises.

The estimation results are shown in Tables 1-3. According to the results shown in Table 1, management control rights as determined by ownership appears to have relatively limited affect on the proportion of the college-educated workforce. Shareholding and foreign-wholly owned enterprises show weak evidence in support of the quality hypothesis. Collective enterprises may have a lower proportion of college educated workers than state-owned workers,

The apparent absence of significant disparities in educational levels across ownership types may reflect the fact that the share of college educated workers is a stock variable that adjusts only slowly over time. During the period when China's labor allocation system remained in force, many college graduates were assigned to state enterprise. Although during the 1990s relatively few college students may have joined the ranks of the state sector, in 1995 the stock of college graduates in the state sector may

have persisted above the long-run equilibrium that was consistent with the limited labor quality market found in most state-owned enterprises.

By comparison, the results shown in the right-hand side column of Table 1 indicate that ownership has substantial affect on training expenditure per capita. Moreover, the relative ranking of the importance of ownership is highly consistent with the usual set of priors in which collectives dedicate more to training than do state-owned enterprises and overseas and foreign joint ventures train more than COEs and SOEs. Since training expenditure is a flow variable that should respond to differential managerial control rights, this finding is reassuring.

In conclusion, tests of the labor quality market hypothesis indicate that management control rights, as summarized by the form of ownership, does not appear to significantly affect the propensity to recruit and retain college educated labor. It does, however, appear to substantially affect the willingness of managers to invest in training the workforce.

Table 2 reports on the results of tests of the impact of labor quality on productivity. The results show a robust relationship between labor quality, measured in terms of college education and training expenditure, and labor productivity. The combined value of the estimated output elasticities for college education and training expenditure is 0.28; while the estimate of the contribution of college education exceeds that of training, its statistical significance is less.

Finally, Table 3 shows the results of estimates of the reduced form equation in which Equation (1) is substituted into Equation (2). The reduced form shows the impact of managerial control rights, as shaped by ownership, on enterprise productivity. The

results indicate that foreign joint ventures, which also in Table 1 demonstrated the greatest commitment to training, exhibit the highest level of productivity. No other ownership form exhibits a distinct productivity advantage over state-ownership.

A possible explanation of this finding is, as suggested above, that the stock of college graduates that remained in state-owned enterprise in 1995 was larger than warranted by the character of the market in labor quality in that sector. As the proportion of college graduates in the state sector falls relative to that in the non-state sector, the predicted productivity differentials will become more apparent.

Asymmetric rights: the problem of adverse selection

Imperfect labor quality markets are vulnerable to problems of adverse selection. Specifically, the adverse selection problem arises from an asymmetric assignment of control rights between workers and managers. An asymmetric assignment of property rights is most characteristic of state-owned enterprise.

In the early stages of China's economic reform, elimination of the labor allocation system established for students and workers the right to accumulate human capital and to trade on skill and effort. The gradual reform of state-owned enterprises has not created a complete assignment of rights for managers to monitor and reward labor quality. The results in Table 1 show, for example, that non-state enterprises provide their workers with significantly more training opportunities than does state enterprise: an incentive for more ambitious workers to migrate from the state to non-state sectors.

If the most skilled and able workers leave the state sector and managers continue to compensate on the basis of the quantity of labor rather than the quality of labor, then efficiency will decline. A shrinking surplus eventually requires a reduction in or slower

growth of compensation, which in turn motivates the departure of the next tier of skilled and energetic workers. This process of adverse selection in which workers are paid the average productivity of the work force rather than compensated on the basis of their individual productivities creates a continuous deterioration in firm productivity, with falling profit or mounting losses.

Other than imposing a Pigovian tax or subsidy or creating a Coasian market, the third solution to resolving the efficiency problem is to integrate ownership. Integration of the downstream and upstream firms internalizes the pollution problem, so that a single owner optimizes the level of pollution as would an ideal Pigouvian tax or subsidy or a Coasian market. Integration provides an analogous remedy for the problem of a missing market in labor quality.

For the labor market, upstream-downstream integration entails the worker becoming his own manager. As with the integration of the upstream and downstream firms, the integration of worker and manager allows the worker to avoid the transaction costs of negotiating in a setting in which managers exercise poorly specified control rights. By internalizing the labor quality market, labor acquires management and the right to meter and reward its own services. Alternatively, management acquires labor and the right to control its own level of skill and effort.

Viewed from either perspective, the absence of a clear assignment of rights that motivates an optimal level of skill, effort, and compensation will encourage higher quality workers to transfer to a regime in which labor quality can be exchanged and rewarded. In China, while managers in state-owned enterprises are being assigned greater rights to monitor and reward, these rights continue to be circumscribed relative to

those enjoyed by managers outside the state sector. It is not surprising, therefore, to see generally the most talented workers "jumping into the sea" (*xiahai*), leaving state sector jobs for non-state jobs including self-employment. Hundreds of thousands of workers have been drawn from the state sector to newly established firms in the foreign invested sector. Nearly 6 million of China's nearly 8 million industrial enterprises are "individual" (*geti*) enterprises with 7 or fewer workers. Defective markets in labor quality in the state and collective sectors that cause adverse selection is one way to explain the huge proliferation of small individual enterprise throughout China.

. State-owned firms that are increasingly motivated by profit considerations can purchase inputs to production more cheaply from outside the state sector where markets for labor quality exist than they can produce them within the firm. As more efficient markets in labor quality develop in the non-state sector, state-owned firms can shed labor that it cannot efficiently monitor in favor of lower unit cost inputs from competitive suppliers. From this Coasian perspective (1937), it is not surprising that in 1985 there were no non-state enterprises among China's largest 15,000 large and medium-size enterprises. Now with the grant of capitalist-style rights to monitor and reward labor quality well established outside state industry, nearly one-third of China's large and medium-size enterprises belongs to an ownership category outside state industry. By creating the rights needed for a market in labor quality outside the state sector, reformers are motivating a downsizing that is shrinking the boundaries of state industry

So long as state-owned enterprise is unable to resolve the adverse selection problem in labor quality that arises from its inability to effectively monitor and reward

labor quality, the most productive of the remaining workers will continue to leave until the ranks of the SOE are depleted of able workers.

Conclusion

This essay argues that the essential difference between a socialist system and a capitalist system is the right to accumulate and trade on labor quality. By devolving these property rights from the state to individual workers, firms, and managers, socialist economies in transition are creating incentives for an efficient allocation, a greater accumulation of human capital and wealth, and more inequality. An initial empirical investigation suggests that by reassigning control rights to managers, the proliferation of non-state forms of ownership is creating an emerging market in labor quality. Unless state enterprise is able to match the ability of the non-state sector to monitor and reward labor quality, China's state-owned enterprise will suffer from a process of adverse selection in which the most skilled and motivated workers will exit the state sector. The result is a cascading process that hollows out human capital and effort among the ranks of workers in the state sector, causing its declining relative performance.

In the lecture he delivered when he received the Nobel Prize, Coase predicted that "recognition (of the role of the institutional structure of production) will lead to a change in the way we analyze the working of the economic system...." (1992, p. 713). This paper attempts to extend Coase's analysis of the role of property rights in creating efficient resource use to the realm of markets in quality generally. Viewed from Coase's perspective, we see that motivation for the creation and exchange of the quality of labor, and in principle all other goods and services, depends critically on the assignment of property rights.

Table 1
Impact of Managerial Control (Ownership) on Labor Quality

	% of college grads in the workforce [natural log (NL)]	Training expenditure Per capita (NL)
Constant	-0.472 (17.210)	-0.036 (0.318)
Collective	-0.067 (1.696)	0.457 (2.896)
Overseas cooperative	0.147 (0.508)	1.178 (1.273)
Overseas joint venture	-0.018 (0.229)	0.832 (2.848)
Overseas wholly- owned	0.132 (0.983)	1.031 (2.019)
Foreign cooperative	-0.046 (0.658)	-0.130 (0.470)
Foreign joint venture	0.007 (0.059)	0.962 (4.103)
Foreign wholly owned	0.011 (1.064)	1.380 (3.675)
Private enterprise	0.167 (0.751)	0.534 (0.583)
Shareholding enterprise	0.079 (1.523)	0.285 (1.244)
Industry dummies (statistically significant)	13 of 17	1 of 17
R ²	0.130	0.083
Adj R ²	0.102	0.044
Observations	1029	649

*The references intercepts are state-owned enterprise; figures in parentheses are t-statistics.

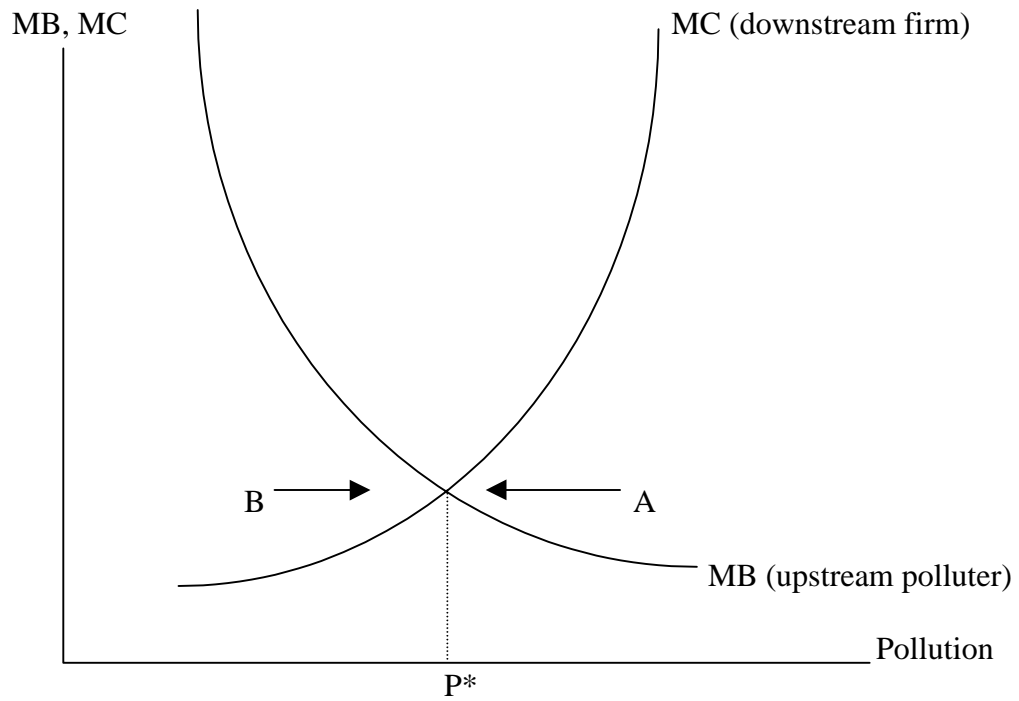
Table 2
Impact of Labor Quality on Productivity
(dependent variable = natural log of gross value of industrial output/labor)

Constant	2.438 (21.586)
Capital/labor (NL)	0.034 (1.254)
Intermediate/labor (NL)	0.447 (18.964)
College educated per capita (NL)	0.197 (2.157)
Training expenditure per capita (NL)	0.085 (3.055)
Industry dummies	6 of 17 stat. signif.
R ²	0.442
Adjusted R ²	0.423
Observations	647

Table 3
 Reduced form: Impact of Managerial Control (Ownership) on Productivity
 (dependent variable = natural log of GVIO/labor)

Constant	2.323 (26.302)
Capital-labor ratio (NL)	0.034 (1.590)
Intermediate-labor ratio (NL)	0.464 (26.709)
Ownership:	
Collective	-0.012 (0.566)
Overseas cooperative	1.009 (1.531)
Overseas joint venture	0.100 (0.566)
Overseas wholly owned	0.303 (0.982)
Foreign cooperative	-0.170 (1.081)
Foreign joint venture	0.418 (3.111)
Foreign wholly owned	0.140 (0.588)
Private	-0.284 (0.559)
Shareholding	0.002 (0.015)
Industry dummies	5 of 17 are stat. signif.
R ²	0.461
Adjusted R ²	0.446
Observations	1034

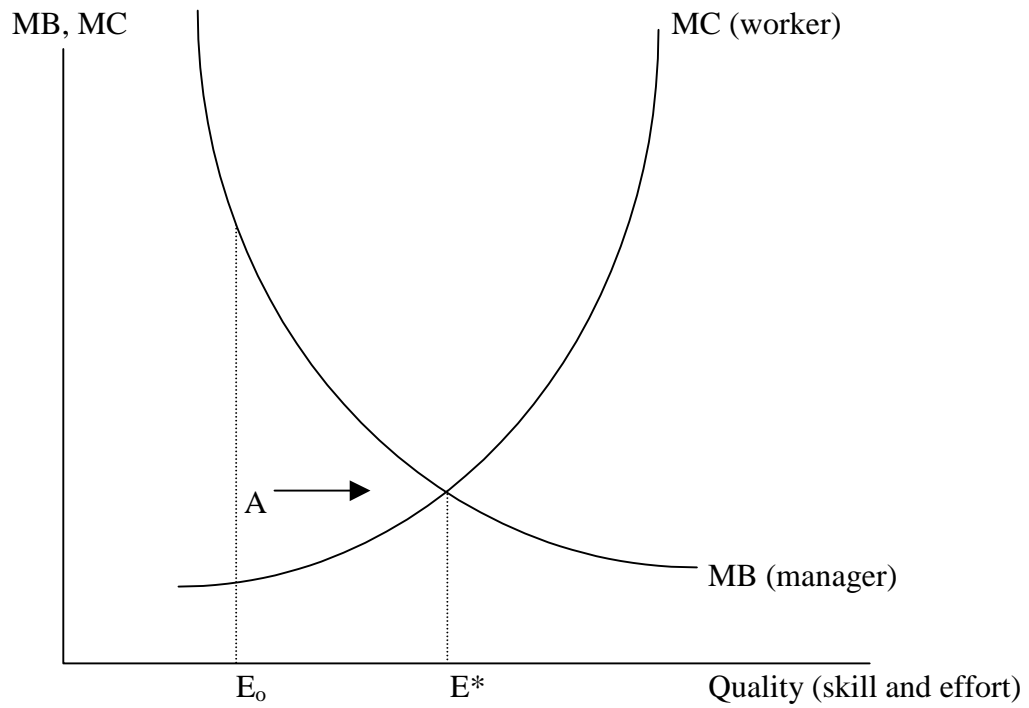
Figure 1: Market for Pollution Rights



A: Rights are assigned to the upstream polluter; the downstream firm compensates the polluter to reduce pollution to P^* .

B: Rights are assigned to the downstream firm; the upstream polluter compensates the downstream firm to allow for more pollution to P^* .

Figure 2: Market for Labor Quality



A: Rights to accumulate and negotiate the exchange of labor quality are assigned to workers; rights to monitor and reward labor quality are assigned to managers.

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