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### The Share Economy: A Symposium

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THE SHARE ECONOMY: A SYMPOSIUM

edited by

William Nordhaus and Andrew John

February, 1986

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### Editors' Introduction

In June 1985, the Yale Economics Department sponsored a half-day conference on Martin Weitzman's striking proposal that sharing should be introduced into compensation arrangements. His suggestions have received wide attention in the popular press and from economists, but the organizers believed that the suggestions were sufficiently novel and promising to warrant careful scrutiny from a wide range of points of view. The conference participants therefore examined the "share economy" from the vantage point of labor economics, capital theory, general equilibrium theory, and macroeconomics.

The discussions were frank and pointed. On review we believe they are of sufficient interest to justify circulation as a "discussion paper." We hope these remarks will contribute to the continuing dialogue on how to improve the performance of our economy.

We would like to thank Carolyn Branchini, Mary Hawley and Elizabeth Dolomont for their efforts in transcribing the conference proceedings, and Cynthia Sclafani for her assistance in the preparation of this manuscript. We have edited the transcript to ensure stylistic and notational consistency. Support for this conference was generously provided by the Sloan Foundation.

## I. Introductory Comments

William Nordhaus: Let me begin by introducing the subject. I will explain the major line of argument that Weitzman puts forth in The Share Economy [1984] and in the associated readings.

The Share Economy certainly makes good reading. It is interesting, witty and comprehensive. The writing is colloquial and avoids the usual impenetrable jargon. If you want to understand the scientific underpinnings of Weitzmanomics, however, you have to go to his article, "Some Macroeconomic Implications of Alternative Compensation Systems" [Weitzman 1983]. There is also background reading in his paper, "Increasing Returns and the Foundations of Unemployment Theory" [Weitzman 1982], but this second article is in fact not terribly relevant for the ideas in The Share Economy. Additional details are found in a paper, "The Simple Macroeconomics of Profit Sharing" [Weitzman 1985c]. Those three pieces are the ones that I will draw upon in my discussion.

What motivates Weitzman? Even though capitalism has been enormously effective in promoting economic progress, it has also been plagued by unemployment since the beginning of recorded statistics. There have been numerous proposals put forth by economists, in this room and elsewhere, on how to combat stagflation or how to lower the natural rate of unemployment. Such proposals include strategies from incomes policies (tax-based or otherwise-based) to employment training and so on. In some sense, The Share Economy is an addition to this long list of proposals that are designed to combat stagflation or, more technically, to lower the natural rate of unemployment.

I would emphasize that the foundation of Weitzman's theory lies in his analysis of the behavior of economies facing profit-sharing schemes. But his justification differs from the usual rationale for profit sharing or revenue sharing. Many of the other proposals are ones that Weitzman calls "soft-boiled" or

"medium-boiled"--where profit sharing is designed to improve worker morale or to make real wages more flexible. Weitzman's "hard-boiled" idea is quite different: by moving to a sharing scheme you will drastically change the incentives of profit-maximizing firms to hire labor. Profit sharing will create a situation in which there is excess demand for labor--a tilt toward vacancies rather than unemployment.

This was called the "best idea since Keynes" by The New York Times (which I presume was a compliment). In Table 1 I have set out eight points which comprise the major assumptions, definitions and propositions of The Share Economy, as well as Weitzman's policy proposal.

Table 1

Outline of Major Propositions for the Share Economy

1. Definition. A share economy is one where the cost per unit of labor falls as employment rises; i.e., it is one where the marginal cost of labor ( $MC_L$ ) is less than the average cost of labor ( $AC_L$ ).
2. Although many institutional arrangements might lead to a share economy, perhaps the most natural arises in alternative compensation packages--that is, ones in which firms share profits or revenues with workers.
3. Revenue sharing will probably produce the greatest divergence between  $MC_L$  and  $AC_L$ , so the present analysis will focus on that type of share economy.

Propositions

4. All compensation systems lead to the same long-run resource allocation.
5. A share system will tend to a long-run equilibrium in which labor is in excess demand.
6. The share economy will produce a lower natural rate of unemployment, and might well display higher productivity and real wages as well.
7. A competitive economy will not gravitate toward the more efficient share economy because of macroeconomic externalities.

Policy Proposal

8. Because market forces naturally push the economy toward a wage system rather than a share system, forceful public policy measures need to be taken to induce firms to adopt share-type compensation systems.



First, it is necessary to understand what a share economy is. The key definition of a share economy has to do with the behavior of labor costs. In particular a share economy is defined as one where a firm's unit labor costs fall as employment rises, i.e., the elasticity of total compensation with respect to employment is less than one. Currently most workers are paid per unit labor (say by the hour, month or year). Such a system displays unit elasticity of total compensation with respect to employment. (By the way, the data bear out this intuition: an equation with a dependent variable of log of total compensation as a function of log of total employment has an estimated coefficient very close to unity.) The purpose of a share economy is to lower that elasticity below one, or to bring the marginal cost of labor below the average cost of labor. That is Weitzman's definition of a share economy.

Next, many institutional arrangements might yield a share economy according to this definition. For example, it might be brought about through the tax system. But perhaps the most natural means is to tie compensation to one of the variables of the firm--this is what Weitzman proposes. He analyzes three different systems: a product wage, where the wage is tied to the price that the firm charges; a revenue-based sharing scheme, where wages are based upon total revenues of the firm; and a profit-sharing scheme, where a fraction (e.g., 25 percent) of the profits of the firm might be distributed to a firm's workers.

For the discussion that follows I will analyze revenue sharing. Why? First, profit sharing would be numerically insignificant given the share of profits. Second, tying wages to product price is infeasible because firms simply do not calculate their own price indexes. The problem of getting firms to calculate their own price indexes has been considered in the context of tax-based income policies and has generally been found extremely burdensome.

Table 2 shows how sharing would affect the average wage paid. This table assumes that there is no change in the macroeconomy other than a move toward sharing of profits, revenues or output. You can see the impact on the growth of average compensation per worker in the recession of 1982 and in the boom of 1984. There would have been some change: in particular, profit sharing in 1982 would have led to somewhat slower wage growth than actually occurred. Otherwise, the difference in wage flexibility brought about by profit sharing would have been extremely small. An important practical problem then is that, if you look at profit sharing at even the substantial level of 25 percent, the share of "share income" in compensation would be minuscule since profits are such a small share of value-added. For non-financial corporations, 25 percent of profits added to wages would add only an average of 2 percent to compensation.

Next, I will briefly go through the propositions that come out of The Share Economy. Points 4 and 5 of Table 1, as we will see today, are key to understanding Weitzman's system. Proposition 4 refers to the long-run behavior of the economy. For this, Weitzman analyzes a profit-maximizing firm which produces output from labor alone (capital could also be included). He then imposes a constraint upon the firm's behavior that it must pay the market compensation, where market compensation is the average compensation per worker. What lies behind this assumption is that, in the long run, workers will migrate from low-compensation-per-worker firms to high-compensation-per-worker firms, independently of whether firms are wage firms or share firms.

Table 2.

Wage Flexibility in Recession and Boom

Rate of Growth of Compensation per Worker  
(U.S. nonfinancial corporations)

	Wages	Wages + 25% of profits	Wages + 10% of output
	-----	-----	-----
1981	9.7	9.5	10.1
1982	6.6	5.8	6.4
1983	3.9	4.0	4.2
1984	5.0	5.2	5.2
Item: Share of "Share Income" in Compensation	0	2%	13%

Put differently, the firm must respect the constraint that it pays at least the market compensation in the long run. He thereby deduces that all compensation systems must have the same long-run resource allocation. This arises because the firm's shadow price of labor is simply the average market compensation per worker.

Point 5 of Table 1 analyzes how firms will behave in the short-run. Note that, when a share economy is at its long-run equilibrium, the marginal cost of labor will be less than the average cost of labor, which in turn is equal to the average compensation per worker. Further, from point 4, you will find that the marginal revenue product of labor is equal to the market compensation per worker. Therefore, at the short-run equilibrium, the marginal revenue product of labor is greater than the marginal cost of labor.

Next comes a key assumption. Weitzman assumes that, in the short run, firms can ignore the market compensation constraint. They will therefore be able to expand their employment up to the point where the marginal revenue product of labor is equal to the marginal cost of labor. This implies that firms will want to expand employment relative to the long-run equilibrium described in point 4. It is absolutely central to this analysis that the market compensation constraint is binding in the long run but can be ignored in the short run.

The analogy Weitzman uses here is that of a Buick dealer: Weitzman is trying to turn the labor market into a Chamberlinean market, and the device to perform this alchemy is the share contract. Why do we want a Chamberlinean labor market? The essence of such a market structure is that, at the going sticker price, Buick dealers are always delighted to sell you another car. Thus if we can somehow turn employers into Buick dealers then firms will always be delighted to hire an additional worker at the going compensation package. Weitzman's argument is that, in a share system, if you walk in the door and say to the

personnel manager, "I'm willing to work at the going compensation package," he will say, "Fine, delighted to have you because your marginal revenue product is equal to your average cost which is above your marginal cost." We would thereby scrap the current labor market, which might be described as biased toward high unemployment, and buy a brand-new share economy, which will be biased towards vacancies or excess demand for labor. Thus spake Marty Weitzman.

Let me conclude with three further points. If you have an economy in which labor is in excess demand in the short run, then this will produce a lower natural rate of unemployment. Firms will act like vacuum cleaners, sucking up labor just as Buick dealers try to draw in suckers who want shiny new cars. As you aggregate over the different firms, with the dispersion that exists in labor markets, the tilt toward vacancies will produce a lower natural rate of unemployment. (If you dislike this term, or think of the natural rate as associated with a Walrasian equilibrium, then substitute "NAIRU"--non-accelerating-inflation rate of unemployment--everywhere "natural rate" appears.)

You might ask, "Well, that all sounds very jolly. But if it is so wondrous, why doesn't a competitive economy naturally gravitate toward a share economy?" It does not, according to Weitzman, because of a "macroeconomic externality" whereby the macroeconomic consequences of firm behavior for unemployment are not captured in the rewards of individual firms and workers. He is vague about the source of the macroeconomic externality, but he is quite clear about its existence.

As a consequence, because market forces do not drive the economy towards the (superior) share economy, Weitzman proposes measures to push us in that direction. His scheme is straightforward: that one-half of share-type compensation of publicly traded firms (say large firms sold on the New York Stock Exchange) should be tax-exempt. What about the consequent budget deficit? There won't be any: after all the purpose of this proposal is to lower the natural rate of unemployment. If in

fact the natural rate of unemployment were lowered by 1 percent, then the scheme would pay for itself. The higher revenue the government would gain from the higher level of economic activity would pay for the revenue loss. This, he concludes, is, "supply side economics par excellence."

Enough of an introduction. We now will move into a discussion and evaluation of The Share Economy. The first session will focus on labor markets.

## II. Labor Market Perspectives

Joseph Tracy: I would like to relate this discussion to the topic of unions. There has been a lot of interest in this in Europe, especially in England, because there you have quite a different picture from the United States with respect to unions. In England unions have a significant impact since many are nationalized. For example, the coal miners (who recently went through a long strike) have 100 percent coverage over that industry, whereas in the United States, at least in manufacturing, unionization has been dropping steadily from around 25 percent. In fact the only area in the United States where unionization has been picking up is the public-service sector. One of the concerns over in Europe is with the increasingly high rates of unemployment and whether or not the blame for this should be placed on the unions. I want to consider whether or not unions in some sense embody certain aspects of a "share system," and the implications of that for unemployment; and then try to relate the "share economy" discussion to the debate that is currently going on in England.

There are two extreme views of the impact of unions. One of them, which is embodied in Freeman and Medoff's book [1984], holds that unions may be a better form of organization of labor, with consequent improvements in productivity. In the extreme case this view says that if you measure union wage differentials (which people like Gregg Lewis [1963] say are about 15 percent), this is really picking up the productivity effect. The other extreme view is to say that unions do not have any measurable impact on productivity but instead force firms to share rents. This view evolves from an assumption that firms have some sort of monopoly rents or quasi-rents coming from specificity in the capital or labor inputs. By forming a collective organization the union can force the firm--through strike threats and the like--to share some of these rents.

The latter view has predominated in the European discussion. The view there is that really much of the increase in wages is not due to a productivity effect, but is instead rent sharing. What is being debated is the way in which unions have increased wages. At issue is whether firms are operating along a demand curve for labor (and one that the unions take as given), or whether the firm and the union are arriving at some sort of efficient division of these rents. The key is how the firms view the wage rate that they are paying in the contract. That is, do firms perceive the contract wage or the opportunity cost of labor as the marginal cost of labor?

The first of these two alternatives is the monopoly theory of unions which has been around for many years. This view holds that firms really do view the contract wage as the marginal cost of labor. Hence once the contract wage is set, firms increase employment unilaterally until they have gone out to the demand curve. According to that particular view, if you break these unions up, forcing the contract wage down, this should generate extra employment. This is the argument put forth by those who would like tougher policies on unions in Britain.

On the other hand, the efficient bargaining view (which says that the union and the firm ought to be on some sort of contract curve for the division of these rents) implies that the true cost that should be used in determining the amount of labor hired is the opportunity cost--an alternative wage in the area or industry. In this latter case, especially if the contract curve is positively sloped, breaking up the union will move you back down to the demand curve at the opportunity cost of labor, and in many cases there will be a reduction in employment. If the contract curve is vertical (so that any dollar the union gains is a dollar less for the firm), there will be no employment effect at all.

There is some evidence in the United States on this because we do have some data at the individual firm level. Unfortunately, the two studies that exist both use the same data



set, which is on the typographical workers. These studies find that there are strong negative effects on employment coming from the contract wage and almost no effect on employment coming from any measure of alternative wages that you can imagine. This suggests that, at least for these typographical workers, the monopoly theory of unions is more relevant than the contract curve theory. (This conclusion will follow unless you believe, as Andrew Oswald [1985] has recently argued, that because of the political nature of unions, the contract curve should be the demand curve. I think there are problems with his argument so I do not want to go too much into that.)

One argument, then, is that unions, through their collective power (say by withdrawing their labor services), can force the firms to share some of the profits or rents that exist. According to the evidence it seems that at least initially they are not bargaining efficiently, in the sense that the firms really are moving up along the demand curve. There may, therefore, be some scope to say that breaking up the unions over in England, or getting tougher on them, might increase employment. In applying this to the United States, you have to keep in mind that there is a very small share of unions, so that the only argument might be that there are spillover effects from the union sector to the non-union sector. In this case, forcing unions to lower wage rates may have a larger impact because of these spillover effects.

There has also been some interest in the recent concessions that have occurred, especially in regulated industries (such as airlines and trucking) that now face some deregulation, and in industries that face increased international competition. Daniel Mitchell has talked about this (see, e.g., Mitchell [1982b]), and makes a couple of important points. One is that there has been very little tendency toward incorporating explicit profit-sharing plans. My comment on that is that, if you believe in the rent-sharing argument, there is implicit profit sharing going on already. That is, the union is forcing the firms to divide up

the monopoly rents with the union workers already, so there is no need for any explicit plans.

Mitchell also points out that unions have traditionally been very averse to wage risk. His interpretation of events in industries where they have incorporated explicit profit-sharing plans is that firms have been able to generate some extra cash flow (because they are currently on the brink of bankruptcy), and in return for that extra risk, unions have been bargaining for more explicit lifetime employment guarantees. In some sense therefore we see a trade-off of some contemporaneous wage fluctuations, due to the explicit profit-sharing plans, for long term guarantees which will reduce fluctuations as workers are not thrown out of their jobs.

To summarize, I think that, for unions, evidence suggests that there may already be profit-sharing. The prevailing view, however, is that this has not led to additional employment, but rather to a restriction of employment. Aside from such implicit profit sharing, I doubt that we will see of a trend toward explicit profit-sharing plans.

Russell Cooper: I am going to talk about Weitzman's work from the viewpoint of a contract theorist, and in addition I will offer some comments on the macrostability issues that he talks about later on in the book.

As you know, there is currently a well-developed theory of contracts for the trade of labor services. This literature considers how compensation and employment schedules should be set by optimizing firms and workers, both to deal with missing insurance markets and to trade labor services in a productively efficient way. In this approach, we can think of situations where there is a vector of random variables affecting firms' profits, along with random variables affecting workers' preferences, and where contracts serve both an insurance and an allocation role.

More explicitly, let  $Y$  index some random variable which affects the production function of a firm. An optimal labor contract would specify two schedules: compensation per worker as a function of  $Y$  and employment as a function of  $Y$ . Denote this contract by  $D^*=[v^*(Y), L^*(Y)]$ . These schedules are chosen to share the risk with respect to  $Y$  efficiently and to allocate labor services in a productively efficient way so that, ex post, marginal rates of substitution between employment and compensation are equalized for the contractants.

Now Weitzman does not explicitly consider a labor contract of this type. Instead he contrasts two special contracts. First, he considers a "wage system," where the compensation paid to workers is independent of the state of nature--i.e.,  $v(Y) = v'$ ; and employment is determined by the firm ex post. This feature of a constant wage is an implication of an optimal labor contract under certain restrictions on preferences of both the workers and the firms. But the other property of the wage system assumed by Weitzman--that employment is determined by the firm ex post--is generally not a feature of an optimal labor contract. The optimal employment schedule  $[L^*(Y)]$  is generally not on either the labor demand or the labor supply schedule of the contractants ex post. Nonetheless, Weitzman takes this as a "straw man system," and contrasts it with a share system.

In a share system, compensation is some share ( $s$ ) of the total revenues from all the workers employed in state  $Y$  divided by the number of workers employed in state  $Y$ . Note that  $s$  could depend on  $Y$ ; we will consider whether or not it does in a moment. Hence compensation is a share of total revenues  $[R(L, Y)]$  generated per worker  $[v(Y) = s(Y)R(L, Y)/L(Y)]$  and employment is determined by the firm ex post.

Now it is certainly possible that a share system could be an optimal labor contract. At least in terms of the share contract itself, I could take any  $v(Y)$  compensation scheme and solve for  $s(Y)$  under the optimal employment rule, so that the two compensation systems are identical. Therefore, in some sense,

talking about a share contract versus an optimal labor contract is just semantics. But there are two distinguishing features of Weitzman's share system. First, he assumes that employment is determined ex post by the firm (I will talk about that more explicitly in a moment). Again that is not a feature of the optimal contract. Second, when Weitzman talks about a share contract,  $s(Y)$  is meant to be a constant. Thus in Weitzman's wage system there is a constant wage and in his share system there is a constant share. In the latter, compensation is determined once you select a constant share and the firm chooses employment ex post knowing  $Y$ .

So in the end, from the viewpoint of the optimal labor contract theory, neither of the two wage systems that Weitzman compares is actually an optimal labor contract. Hence my initial response to his work was: "It looks interesting, but why should we really care about the optimality properties of two contracts which are suboptimal for the private individuals?". It always seemed to me that one of the things that we economists agree upon is that we are interested in the implications of optimizing behavior. So why do we really care about this comparison at all?

Having said this, however, I think that viewpoint goes to an extreme which is not really fair to Weitzman; the argument misses the main point of this exercise which is to focus on the external effects of alternative compensation schemes. In the presence of externalities we should look beyond the optimal arrangements between workers and firms and consider the social welfare properties of these individual contracts. Hence Weitzman needs to do two things: first, to consider an optimal labor contract instead of this wage system and argue that the former has undesirable social optimality qualities; and, second, to argue that a share system (which might not be a privately optimal contract--you can use taxes and guns and other schemes to enforce it) has better optimality properties in terms of getting rid of this macro externality.

The second half of my comments is thus concerned with the question that I find the most intriguing: what is the macroeconomic externality that lies behind all this? I am therefore going to go a little bit beyond labor contracts and talk about this briefly, and then I want to come back to these contracts and discuss why I think that a share system can minimize this macro externality relative to the straw man wage system. Therefore, I am going to play Weitzman's game by comparing these systems, although I really think we should be comparing the share system with a privately optimal labor contract.

Weitzman is somewhat vague on the source and the type of this macro externality. As Bill Nordhaus mentioned, Weitzman has a paper on increasing returns to scale (which Don Brown and Truman Bewley will tell us about), which highlighted the demand externalities in a multisector economy [Weitzman 1982]. This externality has the property that it magnifies shocks in one sector and transmits them to another. In the equilibrium that Weitzman considers, wages and prices fluctuate very little and quantities fluctuate a lot. (See also Cooper and John [1985].)

If I might just quote briefly from The Share Economy:

For when a contractionary impulse hits, not only is the initial response of a wage economy to throw people out of work [so quantities vary a lot], but a wage system can deepen a recession, multiplying its adverse consequences until the economy is trapped in a vicious circle of persistent involuntary underutilization of the major factors of production. This public cost of the wage system--its 'macroeconomic externality' of misbegotten unemployment spawning further unemployment--is a pollution-like consequence that private agents have little incentive to consider. (Weitzman [1984], p.46).

There is this demand externality across the sectors of the economy; the quantity fluctuations sustained under a fixed-wage system tend to magnify it, while a share system is supposed to remove the extreme nature of these quantity fluctuations and

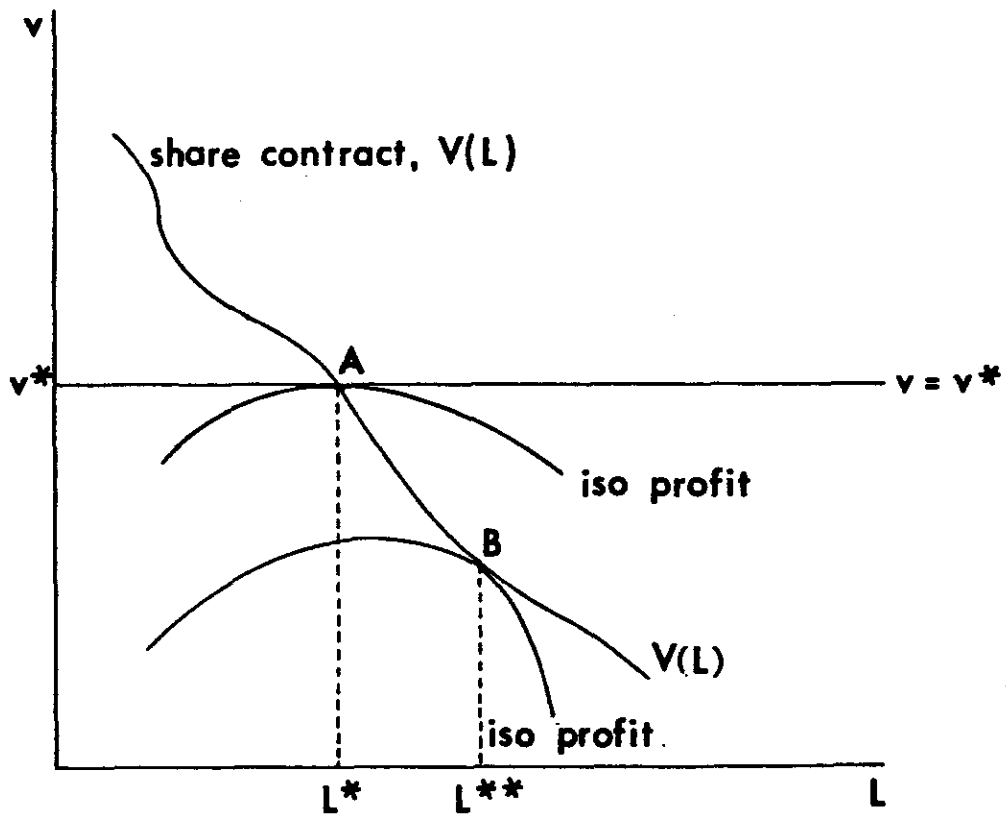
substitute a little more wage and price flexibility. The question then is: how does the share system do this?

I thought Bill Nordhaus was going to present Figure 1, but I will have to do so instead! On the horizontal axis we have the number of workers at a given firm ( $L$ ), and on the vertical axis we have compensation per worker ( $v$ ). In general,  $v$  could depend on  $L$ . Going back to Bill's observations on Weitzman's first proposition with regard to different compensation schemes, suppose we have a pure wage system (and no uncertainty) with an equilibrium wage  $v^*$ . Point A, where an isoprofit line is tangent to the (horizontal) line ( $v=v^*$ ), lies along a labor demand curve.  $L^*$  would then be the equilibrium quantity of workers hired by the firm; let us suppose that  $L^*$  clears the labor market in aggregate. What does a share system look like? In a share system, compensation per worker decreases as the number of workers increases:  $V(L)$  is a candidate share system which passes through point A.

Weitzman's first proposition is as follows: Suppose all firms except for one offer wages, and the last firm comes in with the share contract  $V(L)$ . This firm will want to hire as many workers as it can, subject to its offering compensation of at least  $v^*$ . Given this constraint, the firm can hire at most  $L^*$ ; if it hired more, the compensation per worker would fall beneath  $v^*$ , and the firm could not hire any workers. This is essentially Proposition 1 (or Bill Nordhaus' point 4), which says that the long-run properties of two compensation systems in a world of certainty will be identical. You can go further and add in more and more share firms without disturbing this equilibrium.

The reason Weitzman claims that there is excess demand for labor here is the following. Consider a firm optimizing against the  $V(L)$  schedule. The firm would like to move to point B and hire  $L^{**}$ . In this long-run equilibrium the firm cannot hire  $L^{**}$  because compensation falls below  $v^*$ . In the short run, where Weitzman apparently assumes workers are not mobile (and so the constraint of offering compensation of at least  $v^*$  is relaxed), a

FIGURE 1  
 THE DEMAND FOR LABOR IN THE SHARE ECONOMY (I)



THE FIRM MAXIMIZES PROFITS SUBJECT TO A COMPENSATION CONSTRAINT ( $v \geq v^*$ ) IN THE LONG RUN, AND SUBJECT TO THE SHARE CONTRACT [V(L)] IN THE SHORT RUN.

firm could hire more workers if it could find them. This is the sense in which a share economy is always in a state of excess demand for labor. It is important in understanding these macroeconomic fluctuations for reasons I will explain shortly.

Before analyzing the comparative statics, however, consider the source of uncertainty in this system. Note that Weitzman is restricting attention to a wage system where compensation is constant and to a share system where the share is constant. From the contracting viewpoint, we might ask why contracts do not reflect the current state of the world. Weitzman responds to that by saying shocks "are caused by unanticipated, unforeseen, unstable, non-recurring, non-stationary disturbances" (Weitzman [1983], p. 775). That is, they are tough to predict and hence are excluded from the contract. Hence these contracts are totally non-indexed in terms of compensation or the share, although in the share economy compensation per worker does vary with the state of the world.

The last thing I want to talk about is why a share system reacts better to shocks than a wage system. The first experiment Weitzman considers (which is really a partial equilibrium experiment in a supposedly general equilibrium model) is that of assuming that additional workers are dropped on to this sector of the economy. What would happen to them? To quote Weitzman again: "A share system looks very much like a labor shortage economy. Share firms every hungry for labor are always on the prowl--cruising around like vacuum cleaners on wheels, searching in nooks and crannies for extra workers to pull in at existing compensation parameter values" (Weitzman [1984], pp. 98-99). Put formally, if another worker was dropped onto this market, the firm would wish to travel down the  $V(L)$  schedule and employ that worker. So if there were extra workers floating in, either from other sectors or because of a labor force participation decision, they would be brought into this firm immediately.

There are other comparative statics that we might consider. Suppose that there was some change in the revenue function of



this individual firm. That would, of course, shift the isoprofit schedules around and thus move the labor demand schedule around. For small perturbations in the state of the world, the isoprofit schedule moves just a little bit. But in the short run the firm is optimizing against the  $V(L)$  schedule, so a small perturbation would still leave the firm wishing to hire more than  $L^*$ . Hence, in the presence of small shocks to the revenue function, the response of a firm in the share economy is to stay at point A (since that is the best point on the  $V(L)$  schedule against which the firm is optimizing). Short-run fluctuations in the revenue functions of these firms generate no fluctuations in employment; firms do not move out of the region of excess demand for workers. Thus since workers are always gobbled up if they are unemployed and small changes in the revenue function do not lead to changes in employment, Weitzman concludes that the vicious circle that I talked about before--the demand externality--is minimized in the share economy relative to a wage system.

So what is my evaluation of all this? As I see it, it is a good story without a detailed, explicit model--a good starting point, but nowhere near complete. We need an explicit model of these macroeconomic externalities and of the interaction of the type of labor contract with the magnitude of those fluctuations. We need to contrast the share system with an optimal labor contract, not with a privately sub-optimal one like his wage system. I would also like to see a model which is more explicit about the nature of the constraints and of these contracts. There are some open issues about labor mobility, in the short run versus the long run, and there are questions about the treatment of uncertainty. In the long run we are in a perfectly certain world, while in the short run there are these shocks which cannot be forecast in any way; it is not clear how to put the short run and the long run together. Also, even if the share system is shown to be better in terms of macro stabilization, we have to remember that workers would be exposed to considerable risk relative to the optimal labor contract; we need to take this into

account in a full-fledged cost-benefit analysis of the Weitzman proposal. So before these and other questions are answered, I remain an intrigued but unconvinced observer. And, despite all of my social consciousness, I will continue to request compensation which is independent of the number of other faculty members in my department.

Merton J. Peck: I will discuss the relationship between Weitzman's theory and the Japanese economy. The one empirical piece in Weitzman's book is the Japanese experience, which he characterizes as follows: "Japan offers a living laboratory for many of the ideas in this book" (Weitzman [1984], p. 73). He focuses on the distinctive features of the Japanese wage payment system. It is different, I think, from most O.E.C.D. countries in the following way: regular employees, who can be at any rank from janitor to company president, receive a monthly salary plus a semi-annual bonus. The bonuses, as Weitzman points out, are on average about a quarter of the annual earnings from labor, but vary from occupation to occupation and from firm to firm. All the regular employees, from janitor to president, get the bonus. It is expressed as so many months' salary (like "4.8 months' salary"), but the exact amount is not known until bonuses are given. For managerial employees, the amounts vary according to performance; for production and clerical workers, the usual practice is to pay all employees the same percentage of their regular salary. All regular employees receive a bonus, unlike an American bonus system which is usually limited to top management. Regular employees account for 97 percent of male non-agricultural employment. The other 3 percent are daily workers (who get paid by the day) and are really the casual labor force. About 20 percent of female non-agricultural workers are daily employees. Hence, most Japanese workers, apart from the self-employed and agricultural workers, are paid semi-annual bonuses.

Weitzman focuses on the semi-annual bonus as a feature of a share economy. There is substantial dispute among scholars of

the Japanese economy, however, as to whether the bonus is a form of profit sharing or simply a different timing of wage payments. Weitzman recognizes this dispute by saying "Skeptical observers question whether bonus payments actually vary with profitability" (Weitzman [1984], p.75). He does not address the question empirically but rather asserts that the Japanese bonus is not a form of disguised wage payment. To consider the question, I have looked at the data published by the Japanese Economic Planning Agency, which, on the basis of household surveys, distinguishes between regular and temporary wage income (see Table 3). Temporary income is in turn made up of several elements, and I was able to find a separate data set which indicates that the bonus is about three quarters of temporary labor income; the other items are overtime and what the Japanese call "side jobs," or what we call moonlighting. Table 3 also gives temporary income as a percentage of total labor income of wage-earning heads of household in the non-agricultural sector.

Table 3

A. Bonuses as a Percentage of Total Temporary Income

1973	75.3%
1974	75.2%
1975	79.3%

B. Temporary Income as Percentage of the Total  
Labor Income of Non-Agricultural Wage Earning  
Heads of Households

1974	26.4%
1975	24.1%
1976	23.8%
1977	23.1%
1978	22.5%
1979	22.7%
1980	22.6%
1981	22.2%
1982	22.1%

Computed from data in White Paper on National Life  
(Economic Planning Agency, Government of Japan)  
Various Annual Issues.

After 1976, the bonus (or more precisely temporary income) is a relatively constant fraction of total wage income, which suggests that Weitzman may have put his argument too strongly in claiming that Japanese bonuses are not a disguised wage payment. (Tsueno Ishikawa and Kazuo Ueda [1984] have shown that the growth rates of bonuses fluctuate more than that of regular wages, though major differences occur in the years prior to 1965 and in 1974 and 1975, years of high inflation.)

A share economy should display a greater fluctuation of temporary income than we observe here. The bonus was a higher percentage of total income in 1974-75, years in which the cost of living (not profitability) rose very substantially. It appears that the firms responded initially by increasing bonuses more than the regular salaries. But in years closer to equilibrium, the bonus is fairly steady as a percentage of income, though it should be noted that profits have not fluctuated greatly after 1976. That is consistent with some anecdotal evidence that, first, even if firms are very profitable, it is unusual to pay more than 6 months' bonus (apart from trading and financial companies) and, second, in some industries like steel, bonuses were maintained throughout a wide range of profitability. Weitzman modifies his views a little some sentences later, saying that "the degree of bonus flexibility is perhaps not as great as is sometime supposed, [but] neither is it negligible." Then he undercuts me by saying, "[b]onuses, like dividends, do respond to corporate earnings, but with a complicated lag structure not easy to quantify by any rigidly prescribed rule" (Weitzman [1984], p. 75).

In order to investigate this question, Chris Erickson--a Yale student--and I ran a simple regression explaining temporary income as a function of corporate profits and wages (see Table 4). The dependent variable was the annual percentage rate of change in temporary income, which is a function of the annual percentage rate of change in profits per worker for all industries and the percentage rate of change in the annual wage

rate (all in nominal terms). This was for the period 1974-1982, for which data were easily available. Looking at the first equation, wage changes explain most of changes in bonuses. This is confirmed by the second equation, in which changes in bonuses are explained just by using wages; the profit variable does not add much. Hence the data, it seems to me, support the wage hypothesis more than the profit sharing hypothesis. Here again Weitzman has an answer to my work without being present: that it is the worker's perception that the bonus depends on corporate profits which counts. That response is impossible to test empirically.

I showed these results to David Weiman, who said, "There is yet another possibility: that the whole wage system is a share system. If the bonuses are a function of wages, and wages are operating as in a share economy, then perhaps Weitzman is right."

Table 4  
Regression Results

TEMPY = % Change in Temporary Income (percent per annum)  
 PROF = % Change in Profits per worker (percent per annum)  
 WAGE = % Change in Wage Rate (percent per annum)

$$1. \text{ TEMPY} = -4.6713 + 0.1698 \text{ PROF} + 1.2221 \text{ WAGE}$$

(1.5617)                      (1.8626)                      (4.7490)

$$R^2 = 0.772303 \quad DW = 1.3176$$

$$2. \text{ TEMPY} = -3.2496 + 1.1427 \text{ WAGE}$$

(-0.9822)                      (3.9359)

$$R^2 = 0.658450 \quad DW = 2.2037$$

$$3. \text{ TEMPY} = 7.5057 + 0.0980 \text{ PROF}$$

(2.5356)                      (0.5675)

$$R^2 = 0.038699 \quad DW = 1.1697$$

Data source as in Table 3. Figures in parentheses are t-statistics.

Table 5 shows the Economic Planning Agency's wage equation for the Japanese economy. We used it to divide the wage increase in the spring of each year among the three factors in the wage equation. (I will explain in a minute why spring is important.) Employers' ability to pay is essentially profits; prices are the rise in consumer price index; and supply-demand is the ratio of job openings to job seekers. The equation suggests wage payments behave like those in a more conventional market economy. Consider first the years 1967-1973, often called a period of labor shortage, reflecting demographic factors and a fast-growing economy. As expected, supply-demand has the greatest weight. Then, beginning with 1974, there was--for the Japanese--a massive inflation of 20 percent, and wage changes responded to price increases. Later in the 1970's, there was a more stable situation and the three factors have about the same weight.

I think it is still the case, however, that the Japanese labor market behaves quite differently from those in other O.E.C.D. countries. The most important feature is the difference in Okun's Law. The Okun coefficient is 2.5 - 3 for the United States (a 3 percent fall in output relative to trend will lead to about a 1 percent rise in unemployment). By contrast, the Japanese number as calculated by Hamada and Yoshio [1984] is 28, and the hypothesis that, for some sub-periods, changes in output have no effect on unemployment cannot be rejected. Hence, labor supply in Japan behaves dramatically differently than elsewhere, which I think would have macroeconomic consequences; it is a built-in stabilization device. It may also have microeconomic consequences. If a firm cannot reduce employment with short-run output fluctuations, employment is a fixed factor and the marginal cost of output is very low. Japanese firms are considered prone to price-cutting both abroad and at home, when there is a macroeconomic downturn. It may then be the labor arrangements that yield a share economy rather than the bonuses. That is a hypothesis that Weitzman does not focus on, but I think is a possibility.



Table 5

## Percentage Breakdown of Factors Determining Wage Increases

Year	Employers' Ability to Pay	Prices	Supply Demand
1959	55.6%	5.6%	38.9%
1960	42.9	14.3	42.9
1961	43.8	12.5	43.8
1962	38.9	22.2	38.9
1963	33.3	26.7	40.0
1964	40.0	13.3	46.7
1965	34.4	28.1	37.5
1966	32.1	25.0	42.9
1967	24.2	21.2	54.5
1968	27.5	17.5	55.0
1969	27.5	12.5	60.0
1970	22.0	20.0	58.0
1971	23.8	16.7	59.5
1972	20.0	13.3	66.7
1973	20.0	20.0	60.0
1974	11.4	45.7	42.9
1975	10.0	50.0	40.0
1976	16.7	41.7	41.7
1977	23.1	38.5	38.5
1978	25.0	25.0	50.0
1979	36.4	18.2	45.5

Estimation is Based on the Following Equation:

$$RBV = -5.15 + 11.67 DS + 0.62 P + 1.46 R$$

(2.70)    (7.48)        (6.14)    (2.84)

$$R^2 = 0.951 \qquad S = 1.864323 \qquad D.W. = 2.56$$

RBV: SPRING-TIME WAGE INCREASE RATE

DS: ACTIVE JOB OPENING-SEEKER RATIO IN JANUARY-MARCH

P: CONSUMER PRICES IN JANUARY-MARCH

R: CURRENT PROFIT RATIO FOR LAST HALF OF PREVIOUS FISCAL YEAR

Source: Calculated From the Wage Equation in The Economic Survey of Japan (1978-1979) (Economic Planning Agency) p. 179.

The third long-term consequence of employment stability is that there are union contract provisions--covering 25 percent of the labor force and another 10 percent in the public sector--which make it extremely difficult to fire workers; there is also some degree of a tradition against it. A firm then is stuck with the workers it has. In a situation where workers are guaranteed lifetime employment, the firm wants its workers to be highly committed to the firm. It is my impression that Japanese firms are like the pre-WWII U.S. Marine Corps. People are with the firm until age 55 or 60 and hence the firm wants to engage them in activities that ensure that they are not alienated. (Sometimes, though, regular employees--particularly middle management--are asked to move to subsidiaries or encouraged to take early retirement.)

One easily observable example of the efforts to have workers identify with the firm is uniforms; in some plants everyone wears a uniform. Another interesting feature is that--unlike the Marine Corps--the uniforms are differentiated by function rather than rank. That may have consequences for labor relations that are greater than economists normally think. Weitzman points out that firms in Japan maintain a wide variety of recreational and social activities, just like the Marine Corps.

One final point is that the Japanese have a quite flexible wage system in the small business sector, where wages are about 20 percent lower than in the large firm sector. Hence, because wages are so much lower, large firms contract out many functions (janitorial services, cafeterias, and so on). That may enable the Japanese economy to suck up labor (the vacuum cleaner as Weitzman suggests) not through sharing arrangements, but through very flexible wage arrangements. It is interesting to observe that the highest official Japanese postwar unemployment rate was only 2.6 percent. That can be adjusted upward by about one percentage point to make it comparable to the U.S. unemployment rates, but even then Japanese unemployment rates are low relative

to other O.E.C.D. countries. I think the U.S. would be very pleased with an economy where a recession means 3.6 percent unemployment.

### General Discussion

William Nordhaus: That ends the prepared presentations. We now have open discussion time, and I welcome comments and questions from the floor.

Ray Fair: My question is for Russ Cooper. Is it to one firm's disadvantage to move to the share system if nobody else does? I do not see the externality problem.

Russell Cooper: In a world of certainty as depicted here, if the deviating firm was offering this  $V(L)$  compensation schedule and choosing the same number of workers ( $L^*$ ), everybody would be indifferent between working for that firm or working for any other; there would be no loss. The difference comes in a world of uncertainty. I think part of the problem is that Weitzman does not consider the ex ante equilibrium in the labor market where individuals recognize that they are in an environment of uncertainty and take account of that. In that case, I think your point comes out. Suppose you had the structure of preferences, etc., such that you end up with a constant wage being part of an optimal labor contract. Then this deviating firm is offering a contract where compensation might vary with the state of nature. That has poor risk-sharing properties, and therefore the firms would find it costly to try to attract workers with a suboptimal contract. In that case, it would be tough to force a firms to deviate in this way, and that is where the taxes and other incentives to get firms to offer these contracts come into play.

Gregory Dow: I would like to point out that there is a potentially non-trivial enforcement problem with the share system at a micro level. It seems to me that Weitzman is turning the employment decision into a zero-sum game between labor and management. Consider his GM-UAW example for instance, where GM is \$8.00 better off under the share scheme by hiring an additional worker; the reason is simply that the existing work force is \$8.00 worse off. To make the system work, you have to be absolutely sure that the UAW has no voice whatsoever in the marginal hiring decision. How do you go about making sure that that is the case? In fact the UAW plainly has a willingness to pay \$8.00 to prevent this from happening, and it may very well be that there will be some implicit bribes flowing back and forth between the UAW and General Motors in the area of hiring decisions.

The problem is not just one of unions receiving wages above the competitive level, either. Even in a competitive world with zero union power, the willingness of the existing workforce to bribe management not to expand employment will exist in a share system. It is not at all clear to me how, at the intra-firm level, one can enforce a prohibition on that sort of side payment or bribe. If you cannot enforce a ban on these intra-firm transfers, then the incentives for additional hiring simply will not be operative. Weitzman recognizes this, but waves a wand toward the end and says that under existing labor law, the UAW would not be involved in preventing new workers from coming in anyway, so it is not a big issue.

Joseph Tracy: I think you are right there. The current view is that unions apparently do not tend to build much control into contracts over the actual amount of hiring. Rather, they focus more on what happens to workers once they are hired. There are always union security provisions; these address whether workers have to join the union or not; what the probationary period is; what the stipulations are which allow a firm to lay

off workers, cut their hours or permanent work, or cut them off the payrolls, etc. But that is given the way that bargaining goes right now, and there is no reason to assume that would not change if you moved toward a share system. I think that unions would have an incentive to try to ration jobs.

Brian Wright: This problem is even more serious when you think that the change to a share system will involve giving workers what looks like a "Chrysler" share in the profits, but no "Chrysler" representation on the board.

Gregory Dow: I would think that, under the current regime, unions do not get particularly involved in the decision about new hires because they do not have much incentive to do so. The marginal worker does not directly affect the compensation of infra-marginal workers one way or the other. Under the share scheme, they clearly do have an incentive to be involved, first, because the existing work force loses, and, second, because workers are turning into residual income claimants. If the share system were implemented, it might do a lot to revive efforts to achieve greater unionization of the U.S. work force, in part for that reason.

Joseph Tracy A similar argument was made in the context of the argument that unions raise productivity, which is reflected in the wage rates they bargain for. One of the ways which people originally thought this might be happening is as follows. By raising the wage rate, unions create an excess supply of labor, and firms have a larger pool of workers to choose from. Hence, if they can choose the most talented workers, then they have raised average productivity. The retort to this was: why would unions ever permit this, because the firm is basically undoing what the union was trying to accomplish in bargaining? I think a similar reaction would take place on the union's part in this particular situation.

Brian Wright: In the two-tier wage system recently developed, you already have very heavy opposition by the employed unionized workers to increasing employment at lower second-tier wages, which is a milder form of what is being suggested here.

Joseph Tracy: One of the things that unions have always pushed for in the past is uniformity of wages, to eliminate discretionary promotions by making them strongly tied to seniority; they felt that this had some important implications for labor relations. But now, because of the massive unemployment in certain industries, we have developed a two-tiered wage structure. Hence, they "grandfather" the wages for the existing members, who have the jobs and may be protected by seniority rules from losing them, and let in new workers at drastically reduced rates.

William Nordhaus: I have a question for you, Russ. In your discussion you said that you thought that the wage system was a "straw man" that Weitzman used. He actually has a reply. He calls the optimal-labor-contract view "a fallacious generalization of the tenured worker's experience in a partial equilibrium setting." I would think that the "straw man" wage system is a reasonable description of the kind of contract that many workers labor under today outside of universities. I therefore think Weitzman is right that the relevant comparison would be between today's wage system and the proposed share system.

Russell Cooper: My response to that would be that you should set up a model of an economy which has the implication that the optimal contract takes the form of a wage system, and then use that as the basis for the welfare comparison.

William Lang: There is another argument for the wage system's being efficient. If the senior workers have power to make decisions for the union, then you might have an efficient contract, along the labor demand curve, which sets a given wage. There is a similar constraint to be taken into account in moving from a wage economy to a share economy. In the case of unions (and, perhaps, in non-union firms as well), the people who would lose out in a share economy are the existing employees who are receiving some type of monopoly rent.

William Nordhaus: This is an important point because Weitzman describes the voting system in unions as the source of the "macroeconomic externality." I am not sure it is an externality; it may instead be a feature of non-representative decision making. He views the senior workers as holding the political power in labor contracting. Since they are not often laid off--they are not the marginal workers--they are personally little concerned about employment stability or lay off stability. They are going to be working anyway so their main interests are high and stable wages. In part, Weitzman's point is that by pushing the system towards a share economy, everybody, including senior workers, would share in the lower total compensation that occurs in recession.

Robert Shiller: This is the first time I have actually heard about the government intervention proposal. Did you say that Weitzman proposes giving a tax break to share income?

William Nordhaus: Right, there would be a certain class of labor incomes that are designated "share-type income." Profits and revenues are in that class; there might be others as well. In addition, he wants to disqualify certain classes of economic organization. For example, partnerships already have a share system and do not need a tax preference. Weitzman proposes restricting the tax preference to situations where owners are not

employees. He designates publicly-traded corporations as being that kind of entity. Those are the ones for which one-half of share-type income would be tax exempt.

Robert Shiller: Could not a firm decide to buy a lot of some commodity and sell it immediately? It could stabilize its revenue or increase its revenues a great deal without changing profits at all.

James Tobin: Weitzman was not very explicit about what he means by "revenue" and "sharing," but it stands to reason that he means value added. He did mention value added in one place as the proper thing to be shared. It could not be gross revenue; just for the reason Bob Shiller gave. It must be value added excluding indirect taxes.

Ray Fair: If you enact Weitzman's proposal, do you not then create an incentive for a lot of partnerships to become publicly traded companies?

William Nordhaus: Yes, there would be such an incentive. The main effect, however, is that you would create enormous incentives for firms to pay their workers in share-type income. In firms where revenues are very stable, such as utilities, this would be a pure tax preference. Whether or not you find this a good idea depends primarily on whether or not you think it is going to have the macroeconomic implications that Weitzman claims. If it really lowered the natural rate of unemployment by 2 or 3 percentage points, then you might be willing to tolerate introducing a whole new set of tax preferences.

Alvin Klevorick: Is not part of Ray's point that there is yet another consideration? The same organizational structure is not optimal for the production of all goods and services. So if in fact Weitzman's policy measure were to create an incentive for



organizations to change their legal forms, that might also lead to a reduction in output, and the consequent output reduction has to be balanced against the increase in output he claims for the move to the share system.

David Weiman: This is for Joe Peck. I have one question about the Japanese analogy. As Weitzman describes his system, firms are operating at full capacity and, regardless of demand, will cut prices to clear markets. But it was my impression that although Japanese firms promise lifetime employment, they do not always continue producing at full capacity during periods of recessions. Rather, they cut back on production, and divert the excess labor to maintenance of the factory, etc. So, as a further criticism of that analogy, it does not seem to me that Japanese firms actually function as Weitzman describes.

Merton J. Peck: The only argument is made on the micro level--that they maintain output and cut prices more than U.S. firms. But you are right in the sense that during recessions the shift to activities that are not immediately productive is common.

David Weiman: Then we could say that the Japanese labor market resembles an unemployment-compensation scheme that has been privatized in the sense that it operates within the confines of these firms. They really have a form of built-in stabilizer that operates under a different institutional structure than we have here, because ours is organized through the government.

Merton J. Peck: I think that is right. In fact, one of the reasons for the output stability is that in Japan union contracts provide that the employer has to pay a high percentage of the regular wage of a laid-off worker. Hence there is no point in laying workers off, and no unemployment compensation is paid

because unemployment compensation is not received until workers are actually fired.

James Tobin: You are talking about output stability, but Hamada and Yoshio said that the Okun coefficient in Japan is at least 13, maybe 25, while in the U.S. it is 2.5 or 3. That means 1 point of unemployment in Japan is equivalent in output terms to 5 to 10 points of unemployment in the United States. Therefore, if Japan has changed (as they have in recent years) from 1.5 percent to 2.5 percent unemployment, that implies output variability at least as great as in the United States. They therefore do not have output stability.

William Nordhaus: Some time ago, I looked at the volatility of GNP around its trend; Japan was actually rather high relative to other major industrial countries. The implication of Joe Peck's comment was that, given the output instability, Japan has somehow developed institutions that reduce the unemployment instability. Weitzman claims that it is the share system which is generating the stability of unemployment.

James Tobin: But Weitzman is alleging that the share system would generate stability of production as well.

Gregory Dow: I understood Joe Peck to say that Weitzman had the right analogy for the wrong reason. It is not that the bonus system is equivalent to a share economy, but that there is a high fixed cost component in labor costs, with very low marginal labor cost. That part of it sounded as if you were coming back around to saying that there is a share component.

Merton J. Peck: There is a share effect. I argued first that this implied employment stability because Japanese firms do not lay off workers. And second, it has some microeconomic consequences because these Japanese firms cut prices rather than

output (which is one of the complaints before the U.S. International Trade Commission); this is because they have the stability of employment. The problem with the share theory is that they do cut output, which has been pointed out.

Russell Cooper: There are really two classes of workers in Japanese firms, regular workers and temporary workers. The employment status of the latter fluctuates a great deal--in fact that is where most of the variation comes from. This point has been made very clearly in a Yale senior essay [Spier 1985].

Merton J. Peck: That is what people say. But I am dubious of that because Hamada and Yoshio's results concern overall employment. It is true that there are two categories of workers, but I am not sure that the differentiation is quite as sharp as you make out. I would add that one reason for the low unemployment rate in Japan is that two groups enter and leave the labor market depending on the level of demand: middle-aged women and older, semi-retired men.

William Nordhaus: Joe Peck pointed out that total compensation in Japan is sensitive to profits. Back when people estimated wage equations in the United States (for example, George Perry's dissertation (see Perry [1966])), they found that nominal wages in the U.S. responded to profits; the same phenomenon is also found in Western Europe. So the correlation between wages and profits is not unique to the Japanese.

Guy Orcutt: Is it not true that Weitzman, to make his proposed system work, has to have not simply a share system, but also one in which the sharing is implemented relatively rapidly. As Colin Clark [1979] has pointed out, the U.S. system looks very much like a share system if you average over cycles. There are variations in the share so that profits show more fluctuation than wages. But Colin Clark takes a long period and claims, on

an empirical basis without any underlying model of the type presented here, that the United States has been and is (up until the 1970's at least) a share economy already. Thus, it seems to me that Weitzman needs to show, not that having sharing is better than some other theoretical model which maybe does not fit that historical experience, but instead that his share system would be better than the slowly-responding share economy indicated by our historical experience.

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### III. Capital and Price Theory

Matthew Shapiro: Since we are engaging in more hermeneutics than we usually do in economics, I thought I would start by reading the paragraph on capital in Weitzman's book.

The theoretical isomorphism between wage and share systems is not only limited to static situations where the stock of capital is given. Essentially the same logic applies to establishing the stock of capital itself over longer periods across which it can be treated as variable. It is true that, if pay parameters were permanently frozen, then capitalists in a share system would underinvest relative to a wage system because any incremental output would have to be shared with labor. But this is strictly a short-term effect, which does not hold over a longer time frame when compensation coefficients can be flexible and are basically determined by competitive forces. (Weitzman [1984a], p. 91)

Weitzman's conclusion is correct: a share system, as he defines it, and a wage system lead to the same capital stock. (This is essentially an extension of Proposition 1 of Weitzman [1983] and is shown as point 4 in Table 1 on page 4 above. In a stationary environment, it does not matter for allocations how factor payments are labelled.) In this paragraph, however, he gives the wrong reasons. He claims that adjustment of the parameters of the pay schedule will cause firms to choose the competitive capital stock in the long run. Such reasoning is inconsistent with the argument behind Weitzman's Proposition 1. That is, in Proposition 1 Weitzman argues that long-run allocations are invariant to the labelling of the factor payments, but he now wants to argue that they can adjust to lead to the competitive level of capital. Instead, as I will demonstrate graphically, the compensation constraint in a share economy causes firms to choose the competitive capital stock.

If unit compensation is given by  $v = w + sf(K,L)/L$  (that is, there is a wage component and a share component), then the

constraint is that the firm has to choose a capital and labor input which satisfies  $v = v^*$  in the long run, where  $v^*$  is the marginal disutility of work. It is the requirement that this constraint must be satisfied which leads to the identity between the wage system and the share system, not any adjustment of the compensation schedule. The barrier to underinvestment in the share economy is just the flip side of the barrier to hiring too much labor. The firm does not underinvest because if it did choose a lower capital stock, as it would apparently like to do, it would not get any workers; their compensation would be too low.

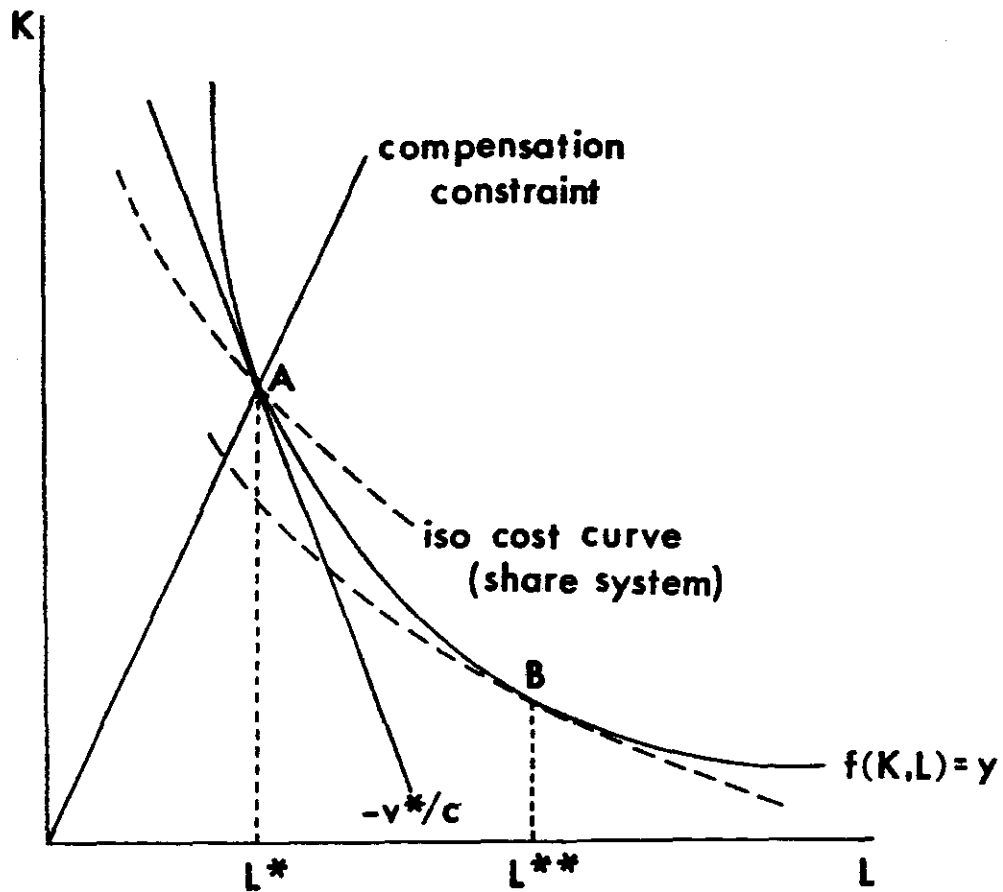
This analysis is for a closed economy, which is the most favorable case for Weitzman. In an open economy, where agents have the opportunity to earn a full return on capital, capital would move abroad. As far as the capitalist is concerned, the share contract is just like a value-added tax. The tax can be avoided on foreign investment.

Let me move from Russell Cooper's diagram to Figure 2. The latter is couched in terms of cost minimization in order to get both capital and labor in the same figure.

Labor and capital are on the horizontal and vertical axes respectively. An isoquant is given by  $f(K,L) = y$ . The wage system solution would lie on some isocost line with a slope of  $-v^*/c$ , where  $c$  is the cost of capital. Weitzman identifies this  $v^*$  with the competitive wage. That is the substance of Proposition 1: since every compensation system has to yield the same wage,  $v^*$  must equal the competitive wage. As I argued above, and as Russ demonstrated, this result will hold in a stationary world. For the purposes of this diagram, however, we need only assume that there is some  $v^*$  which can be viewed as a wage economy equivalent.

When compensation is a function of the level of output, the isocost curve will differ from that in a wage system. It will not be a straight line because of the curvature of the production function: whether it curves in or out depends on the

FIGURE 2  
 THE DEMAND FOR LABOR IN THE SHARE ECONOMY (2)



THE WAGE-SYSTEM ISO-COST LINE HAS SLOPE  $-v^*/c$ , WHICH IS GREATER THAN THE SLOPE OF THE ISO-COST CURVE IN THE SHARE SYSTEM.

substitutability between capital and labor. We do know, however, that it is less steep in absolute value at point A because of the diminishing marginal cost of hiring labor. Finally, we introduce the compensation constraint, which will be upward-sloping. For a constant returns to scale technology, it can be shown to be a straight line. It is, equivalently, the expansion path of the wage economy.

The fact that this compensation constraint intersects at the point of tangency (A) is precisely Weitzman's Proposition 1; the constraint is satisfied at this optimal capital stock. Proposition 2 is that if the firm did not have to lie on (or above) this constraint, it would want to move to a lower isocost curve. Hence the firm employs  $L^*$ , but would like to hire  $L^{**}$  at point B. However, it cannot because that implies lowering its capital stock, and no worker will work for a company with this capital-labor ratio because compensation would be too low. Therefore, the flip side of always having excess demand for labor is that the firm will always have more capital than it would in the absence of this constraint.

This characterizes Weitzman's "long run." His use of "long run" and "short run" is odd. In Weitzman's terms there is a constraint to satisfy in the long run, while in the short run you can be off the constraint. Usually we think of these the other way around: agents are not constrained in the long run but are in the short run. Hence, contrary to claims made in the book, the long-run equilibrium is not a short-run equilibrium. In Weitzman's short run, firms would want to move off the constraint. I think this is the fundamental problem that Bill Nordhaus will deal with in the next section. Perhaps the disjunction between the short run and long run in the share system is not as unreasonable as it first might seem. Frictions in the wage economy (such as mobility cost or gift exchange) prevent competitive mechanisms from clearing the labor market as if it were a spot market. Likewise, in a share system, workers



may tolerate short-run outcomes inconsistent with the long-run constraint.

It is interesting to analyze the motive for holding capital in a share economy versus a wage economy. In a wage economy, the reason to add a unit of capital is to economize on labor or some other input. The motive for adding a unit of capital in a share economy is exactly the opposite: it is to hang on to workers, since if the firm did not add the last unit of capital, compensation would be too low, and it would not attract workers. This might be an attractive feature of a share economy because it reduces the tension between labor and management on installing new capital. Labor is happy to have new capital installed because it will raise workers' compensation, rather than reduce marginal product and lower their compensation.

Finally, think of a recession as an adverse productivity shock. Weitzman's share contract allows the firm to move to point B. The demand for capital would be greatly reduced because firms would be relieved of the burden of maintaining the capital stock in order to attract workers. Even though full employment is maintained, the fluctuations in output could be much more dramatic, because of lower demand for capital goods. Hence, although the share economy might stabilize employment, it could increase variability of output by creating a new channel for the accelerator.

James Tobin: Where does  $v^*$  come from in the long run?

Matthew Shapiro:  $v^*$  is the competitive compensation of labor in a stationary environment. It is the marginal disutility of work at full employment, which is the same regardless of the labelling of the compensation. A small firm adjusting its capital stock is not going to affect  $v^*$ . In turn,  $v^*$  will depend on the aggregate capital stock. But if his Proposition 1 is correct (which I believe it is, and abstracting from uncertainty), then  $v^*$  is identified with the competitive wage.

Sidney Winter: How can you be sure that Proposition 1 is correct without a theory about  $v^*$ ?

Matthew Shapiro: One way to think about Proposition 1 is to consider the central planning problem instead of the competitive equilibrium. In the central planning problem, it is obvious that the labeling of the compensation schedule is irrelevant for the outcome. There may be other equilibria, but I think it is certainly true that, given the right capital stock and the competitive wage, you can choose a schedule that would sustain the competitive equilibrium. This is true even if, as usual, we do not have a satisfactory account of the dynamics of adjustment to equilibrium.

Joseph Tracy: Your compensation constraint reflects, I think, an underlying assumption that workers can move costlessly between whatever sector provides  $v^*$  and the share sector. Is that assumption true in both the short run and the long run?

Matthew Shapiro: Bill Nordhaus will have more to say about this. I think it may be reasonable to say that this is a long-run constraint, but not a short-run constraint. In the short run, labor is not mobile; the constraint, therefore, does not bind. In the long run, labor will adjust, so the constraint will bind. Another way to think about it is that workers might allow short run fluctuations in their implicit wage as part of an insurance scheme as long as their wages averaged out to the long-run level.

Gregory Dow: In the theory on labor-managed firms (which, say, maximize dividends per worker), the long-run analysis closely resembles what Weitzman is doing in his long-run analysis. The story there is that in the short run you can have a wide range of perverse behavioral responses from labor-managed

firms, but in the long run, as long as there is free entry and exit of firms, workers can move between firms. This leads to a zero-rent condition which yields all of the standard allocative properties you would expect for a normal economy. That is essentially the story he is telling here for the long run.

Sidney Winter: Except that he elsewhere emphasizes imperfect competition, which undercuts that line of argument.

Matthew Shapiro: I was also supposed to say a few things about risk-bearing. This system makes the laborers joint venturers with the capitalists, so whenever a unit of capital is added, some fraction of value added will be shared with the workers. In a world of uncertainty, laborers would have to be compensated for taking on part of the capital risk. Hence, a move to a share system should reduce the risk premium on risky investments and increase  $v^*$  to compensate workers for bearing the risk. Given that we know from optimal contract theory that compensation should be stabilized, you would expect the increase in  $v^*$  to be quite large. Given also that workers presumably have more imperfect access to capital markets, insurance markets or option markets than do capitalists, so workers would demand a very high premium. Moreover, workers' portfolios contain a large component of human capital that may be specific to their current firm. Hence, investment in their firms' capital has, from their point of view, very high beta.

Finally, a point about saving: Weitzman seems to imply that the level of saving would be increased, because workers would have fluctuating incomes. He says at the end of the book that workers would have to learn to save, and that the level of saving would thus increase. This reasoning is flawed. The level of saving would be higher at some points but lower at others. But averaged across agents and across time, saving should be governed by life-cycle and bequest considerations. One might therefore expect to see more variability of savings, but the level of

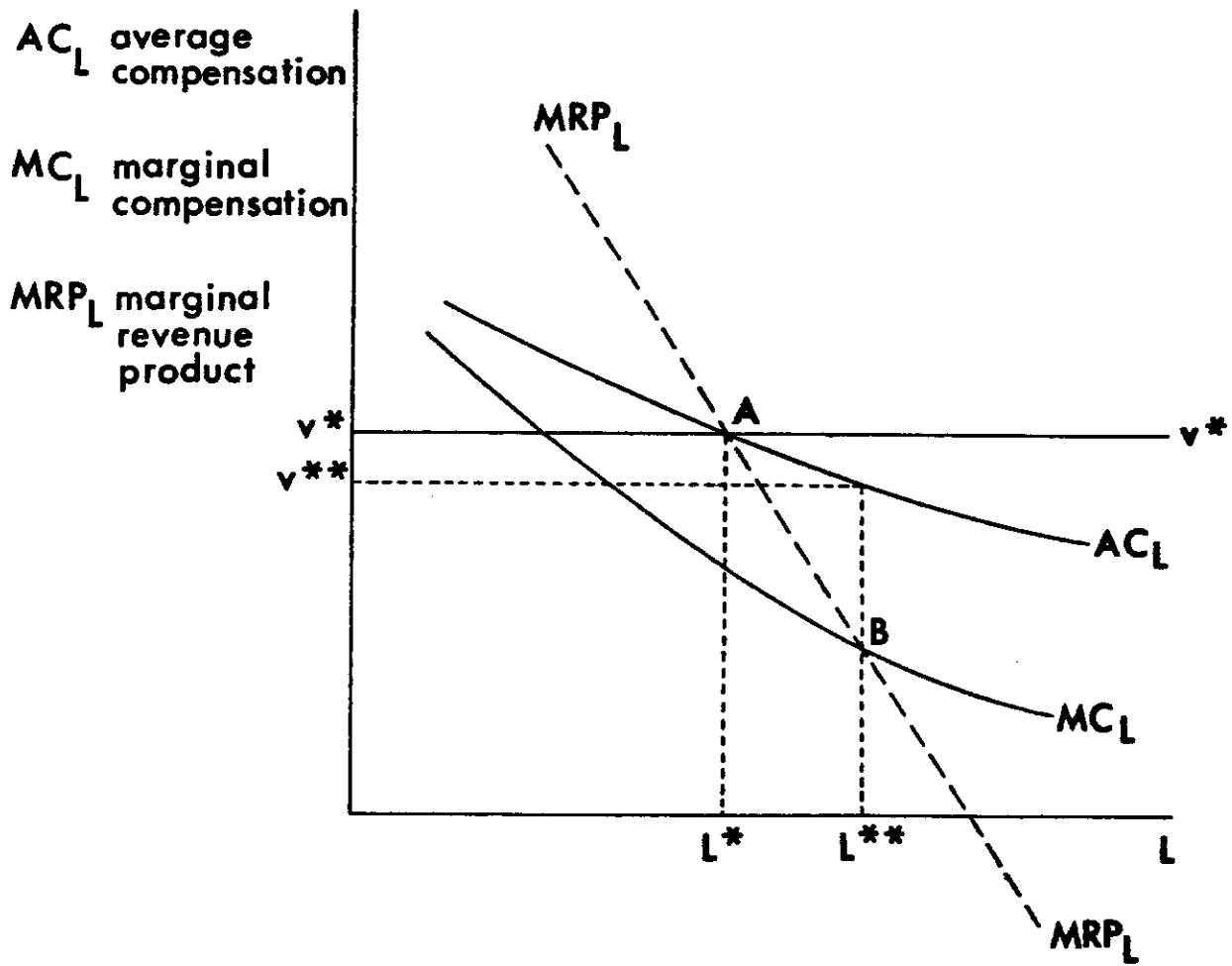
savings should be approximately the same. For that reason, I think his assertion that the bonus system in Japan leads to more savings is incorrect. Moreover, the share system would eliminate the worst transitory income shocks (unemployment). Hence, one might expect precautionary saving to fall in a share system.

William Nordhaus: My original assignment was to talk about innovation, but I fell into a pothole on the way to this forum. I was analyzing the share system with capital and labor and then was going to introduce innovation, but I fell in a pothole because I discovered what I thought was a serious flaw in the analysis. I am therefore going to talk about the pothole rather than innovation.

My basic conclusion is that a share system is a wage system. I can think of no analysis, in a certainty-equivalent case, where you would get a substantial difference between the behavior of the Weitzman-style share economy and a conventional wage economy. Let me go back and talk about Weitzman's major propositions. (See my Table 1, p. 4 above.) Basically, there is a tension between point 4 and point 5 in that table.

The first problem arises because--striking fact to an amateur microeconomist who is used to envelope theorems--we have a system in which the long-run behavior does not envelop the short-run behavior, in which you reach a long-run equilibrium and then suddenly find yourself wanting to be somewhere else in the short run. This bizarre situation describes Weitzman's argument. I have a diagram, which is closely related to Russ Cooper's diagram, shown as Figure 3. I can use this to illustrate Propositions 4 and 5 in Table 1. We have labor inputs on the horizontal axis and compensation per worker ( $v$ ) on the vertical axis. Strictly speaking, this should be  $v_k$ , where the  $k$  subscript indicates that this is firm  $k$ .  $v_k$  is the compensation per worker in firm  $k$ , which is equal to the wage element (which is, say, \$6 per hour or \$12,000 per year) plus a share parameter ( $s$ ) multiplied by output (or, strictly speaking, revenues),

FIGURE 3  
 THE DEMAND FOR LABOR IN THE SHARE ECONOMY (3)



IN THE LONG RUN THE FIRM IS CONSTRAINED BY THE MARKET COMPENSATION RATE ( $v^*$ ); IN THE SHORT RUN THE MARGINAL COST OF LABOR DECREASES AS EMPLOYMENT INCREASES.

divided by the number of workers. Hence  $v_k$  is total compensation per worker. In a standard wage system  $s$  would be zero, and in a sharecropping or share-type system  $s$  would in general be positive. For simplicity, I suppress the  $k$  subscript in Figure 3. Finally, let  $v^*$  be the market compensation rate per worker.

The first point to emphasize is that Weitzman assumes that the labor market behaves competitively in the long run; i.e., firms have to pay at least the competitive compensation rate ( $v^*$ ). Otherwise workers will migrate to other firms, and the firm will have to go out of business. Hence we find an implicit assumption about perfect competition in labor markets, which implies that compensation levels are equalized across all firms. Now, in a wage system  $v^*$  would be the marginal cost of labor, equal to the average cost of labor. But in a share economy the average cost of labor falls with employment. Hence let the long run contract (or average cost of labor schedule) go through point A, where the firm employs  $L^*$  workers, and let us also show the marginal cost of labor in the share system as  $MC_L$  (again, suppressing all the  $k$  subscripts).

Next look at points 4 and 5 of Table 1 to understand Weitzman's argument. He says that in the long run firms are going to have to pay at least the average compensation ( $v^*$ ), so the profit-maximizing point will be at point A: at A the marginal revenue product of labor equals the wage. Surprisingly, this is also true for a share-type system: the firm might like to expand its employment beyond A, but the minute it did so, the average compensation per worker would fall below  $v^*$ , and therefore all the workers would migrate to other firms. A is therefore the long-run equilibrium for the firm.

Let us go on and ask what happens in the short run, which is our point 5 (his Proposition 2). The key point is that Weitzman assumes that the firms can ignore the competitive compensation constraint in the short run. He just asserts this--there is no defense for such an assumption, nor does he present a model of labor-market dynamics that would lead to such a result. But

assuming that the firm can ignore the long-run competitive compensation constraint, it will clearly want to move to point B, where the marginal cost of labor equals the marginal revenue product of labor; in our notation that arises at point B with employment  $L^{**}$ .

So at the long-run equilibrium the firm reached a contract with the workers and everybody was happy. Then suddenly the firm is magically freed from the competitive compensation constraint and wants to move to point B, where it will get higher profits than at A; hence it wants to employ  $L^{**}$  rather than  $L^*$  workers; and at the long-run equilibrium there is excess demand for labor. This is the argument behind Proposition 2 or my point 5.

I am puzzled at this point. What kind of labor-supply dynamics would allow this kind of behavior--imposing a constraint on the firm in the long run but allowing the firm to violate this constraint and to move down to point B in the short run? To alleviate my confusion I constructed a number of different models of labor-supply dynamics to see what would happen.

Let us first assume that there is perfect competition and perfect mobility. In that case the competitive compensation constraint would be binding in the short run as well as the long run. If the firm indeed started to hire more workers, it would find that its average compensation would fall, all of the workers would immediately abandon the firm to go to work elsewhere, and the firm would have to shut down. So in the case of perfect mobility it is clear that Weitzman's argument is incorrect because the firm is constrained to be at or above  $v^*$  at all of times. Therefore the firm would not want to move to B in Figure 3, since in trying to hire additional workers it would immediately lose all its existing workers. That is a very simple case to think about.

A second and more interesting case, which seems more in the spirit of Weitzman's analysis, is what I call a delayed reaction model. This is the following: workers sign a contract and then are glued to their employer for the life of the contract (a year,

or a day, or whatever). Workers know what the contract is, but do not learn the level of employment until the end of the period and so only learn their compensation at the end of the period. If in fact their compensation was below the competitive level ( $v^*$ ), they leave at the end of the period; otherwise they stay. So the labor supply for firm  $k$  in period  $t$  is some function of compensation in firm  $k$  in period  $t-1$  [ $L_{k,t} = S(v_{k,t-1})$ , where  $S(v) = 0$  for  $v < v^*$ ]. I assume also that once the workers leave, the firm is out of business. This is a very simple dynamic structure.

If you analyze this system you find that there are two kinds of firms: those that want to stay in business and those that want to go out of business. The firms that want to stay in business stay at A, and firms that want to go out of business move down to B for the last period. (Notice that this is a case of irrational expectations, because this behavior is completely naive and backward-looking.) When would a firm want to go out of business? It would want to go out of business when its profits were very low. If profits are zero, firms could make a little extra profit by surprising their workers, lowering their wage, and moving to B; firms thereby squeeze out a little profit and say goodbye. You thereby have some firms at A and some at B.

In a stationary environment all firms would always be at A, because if they wanted to go out of business they would already be out of business. But the key question now is: does there exist excess demand for labor in this system? The surprise is, there is not. High-profit firms are at point A and will not accept an additional worker if he walks in the door; low-profit firms are at B with  $L^{**}$  workers, and also will not accept an additional worker if she comes in the door. As a result there is no excess demand in this system.

Incidentally, in the case of rational expectations, where information is completely symmetric, then of course firms could not go to B in the last period. Workers would know that firms were in poor profit positions and would know that they were going



to be exploited; therefore workers would not even show up at the door. So irrational expectations is the best case for Weitzman's argument.

More briefly, consider a couple of other cases. Let us take the case of imperfect competition in labor markets. Suppose firms are facing upward-sloping labor-supply schedules because of segmented labor markets, so the marginal cost of labor schedule in a wage system is not constant but is an increasing function of employment. This modifies the analysis but just yields a monopsonistic equilibrium with no excess demand for labor.

I also tried to think of an incentive-compatible case. Consider a situation where for some reason firms could violate the competitive compensation constraint in the short run so that firms could bargain for point A but then move to point B. An incentive-compatible equilibrium would settle where firms and workers bargain such that point B was at the competitive wage  $v^*$ . They might pretend to be bargaining for some higher compensation  $v^{**}$ , but firms and workers would know that they were going to end up at B, and indeed they would end up at B. At B, workers would receive the competitive compensation and firms would be at the point where the marginal cost of labor equals the marginal revenue product of labor. If you insert Weitzman's approach into the standard contracting model, you find an equilibrium at point A of Figure 3 in which there is no excess demand for labor. Why so? Because the workers anticipated that firms would set  $MRP_L = MC_L$  and therefore would have settled for a contract where  $MRP_L = MC_L$  at  $v^*$ .

These are the only four cases of labor supply that I was able to work out easily. They all lead to the following conclusions. First, there are all kinds of different outcomes, but in general (with the exception of these firms that are going out of business) firms would be at an equilibrium that is identical to the wage-system equilibrium (i.e., at point A). At that point employment is such that the marginal revenue product of labor is equal to the competitive compensation rate. Firms

are at that point in the long run and the short run almost all the time, with the exception of firms going out of business. Secondly, there is no example where there is excess demand for labor in the short run.

Finally, let me tell you what I think is wrong with the Buick analogy, which Weitzman uses very heavily. Weitzman thinks that, by having these downward sloping cost curves, you can create a Chamberlinean situation where firms will be sucking up labor like a vacuum cleaner. The problem with the Buick analogy is as follows. In the Chamberlinean situation, you have cost curves and average revenue curves as functions of output, giving the Chamberlinean equilibrium price ( $p^*$ ). The true marginal cost and marginal revenue schedules--that is, those schedules for variable prices--intersect at a lower price. But the sticker price for your Buick is  $p^*$ , and the firm is willing to sell at this going sticker price or fixed administered price to any naif who wanders in. Once the firm has fixed its price, its marginal revenue schedule is horizontal at  $p^*$ , and marginal revenue is above marginal cost. So naturally the firm would be very eager to sell you a new Buick at the sticker price.

That is, however, an inapt analogy to the share system, because in Weitzman's case you do not have an administered wage; instead you have a situation where compensation is variable, changing along with the level of employment. It is as if, in the Chamberlinean situation, the Buick dealer moves down the demand schedule whenever a new customer comes in. That is, when a customer bargains with the dealer and offers to pay \$100 under the sticker price, it is as if the dealer must also send a rebate of \$100 to all previous customers. Hence, the analogy with the car dealer does not fit because in the car dealer's case you do have an administered price at a fixed level, while in a share system the whole point is that you do not have a fixed wage.

James Tobin: You do have an administered system. You have

set that and will take anybody who will work and accept that system.

William Nordhaus: Yes, that is right. But if an additional worker comes in, you lower the wage to all workers. Not only that worker gets less than  $v^*$ , but all previous workers do also; whereas in the Buick case, when you go and bargain for \$100 under the sticker price, there is no need for the dealer to send a \$100 rebate to all previous Buick purchasers.

So, again, I conclude that the fundamental point 5 (that there is excess demand for labor in a share system) seems unproven.

Move finally on to analyze Weitzman's views about the macroeconomy. You find that the excess demand for labor proposition is central to his conclusions. I think Russ Cooper went through an example, so I will just remind you of what he said. If you are at point B of Figure 3 where you have demand  $L^{**}$  and an actual number of workers  $L^*$ , then you have excess demand which is the difference between these two. For any small changes in any of the schedules you will continue to have excess demand after a shock. That is Weitzman's Proposition 3 in the 1983 paper on alternative compensation systems: after small shocks the system will continue to have excess demand for labor. You can see, then, how the excess-demand-for-labor proposition is central to Weitzmanomics. Because firms are eager to hire more workers in the short run, they will prefer not to lay off workers after a contractionary shock. Such an economy, were it to exist, would indeed be recession-proof (but not depression-proof).

Alas, the microeconomic foundations of the analysis seem infirm. If in fact a share system behaves virtually identically to a wage system, then firms will not have excess demand for labor; firms will want to lay off workers after a contractionary shock; a share system will not be recession-proof. There might well turn out to be effects of a share economy, but at present I take the case for the share system to be unproven.

#### IV. General Equilibrium Issues

Donald Brown: Truman Bewley and I divided the material in the following way--I read the book, and he read the book and the papers. So I would like just to provide an introduction to Truman, and talk about Weitzman's model as it appears if one only reads the book. I may be in a minority, but I like the book. It very much is Weitzman; it sounds as if he is sitting there in the room making Weitzman-like statements and examples.

There are really three chapters where he has an analytical model. In the first part of the book, he looks at the firm as an imperfect competitor which is maximizing profits. I took my assignment to be: what role, if any, does increasing returns to scale play in his analysis? This is something that has puzzled me and Russ Cooper for at least a couple of years since Weitzman's first paper on increasing returns appeared (Weitzman [1982]).

As everyone in this room knows, if a firm maximizes profits, there are two ways of writing down the profit function. One is to express the profit function in terms of output, so  $V(Q) = R(Q) - C(Q)$ ; then when you write out the first-order condition you get marginal revenue equal to marginal cost at the optimum. Weitzman says, "Let us look at two situations; first consider the situation where we have a perfectly competitive environment, and then we know that price equals marginal cost." But he actually means more than that. He wants also to assume constant returns to scale; he wants to be able to say that in this instance the firm is indifferent about selling another unit of output.

We then set that observation aside and consider the imperfectly competitive case. In that situation Weitzman assumes that price depends on output, and we have a downward sloping demand curve. And then he says, "There are lots of mark-up rules in the world; is this not yet another instance of a mark-up rule?" In response, he writes down, from the first-order conditions, that  $p = MC [E/(E - 1)]$ ; where  $p$  = price,  $E$  = the

price-elasticity of demand, and MC - marginal cost. Hence, there is a mark-up because the demand elasticity is greater than one, and price exceeds marginal cost. If the firm in its myopic attempt to maximize profits takes this into account, it would like, if it could (even though it has now specified its price), to sell an additional unit at that price. Weitzman makes a big point of this in the book, saying that economists misconstrue what is meant by supply curves and demand curves. A supply curve is what the firm would like to sell at the prevailing price, not what it can sell. And of course the demand curve has the analogous interpretation. Therefore, given that the firm at that price would like to sell an additional unit (although it cannot because it is constrained by the demand curve), he asserts that we have excess supply. So what he means by excess supply is an instance where the prevailing market price exceeds the marginal cost of production.

All of us can imagine situations where the firm would like to sell more at the prevailing price than it can; and I do not know if we would characterize those situations as being imperfectly competitive markets. The point about the firm wishing to sell more than it can and thereby identifying "wishing" with the supply curve is that it allows him to say there is excess supply. Once this point is established, there are many stories one can tell about firms in the real world working very hard to get that additional demand; Weitzman's favorite example is a car dealership.

Weitzman then has what I actually think is really a clever idea. He has an analysis of the wage system in a perfectly-competitive, full-employment situation, and makes the observation that you do not see the same sort of incentives in the labor market. How could we change the world so that the firm would have the incentive to want to hire an additional worker, even if it could not? In effect what he then does is to take the profit function and write it down again in terms of labor. We have

$f(L) - vL$  (choosing output as numeraire). Then he notes that typically we choose  $v$  to be a constant, because we assume competitive markets, but we are free in fact to let  $v$  be something other than constant. Let us make  $v$  a function of  $L$ . Formally, he intends to replicate in the cost function the same properties that we have in the revenue function when we assume imperfect competition. So he writes down  $C(L) = v(L)L$ , and then assumes that this wage function  $v(L)$  is decreasing with  $L$ . Of course, this leads to the same kind of story that we just told for the product market; that is, we will get marginal cost of labor as being less than the average cost of labor. In the way Weitzman talks about these things, the firm would like to buy an additional unit of labor at the equilibrium value that it gets out of solving its maximization problem.

Weitzman then goes on to ask: what are some reasonable forms of  $v(L)$  which would have the desired properties? He gives two prototypical examples. One is the notion of a wage fund, where the firm has a fixed number of dollars ( $F$ ) to buy labor, so each worker will get  $F/L$ ; this certainly has the desired property. Then--and this is where increasing returns to scale comes in--he notes that out in the real world there are many firms paying their workers in some profit-sharing fashion. He asks: when is it the case that revenue per worker  $[f(L)/L]$  decreases with  $L$ ? One example is  $f(L) = a + bL$ , so you have a fixed cost. In that case it would be true that if the firm paid its workers at  $v(L) = sf(L)/L = s(a+bL)/L = s(a/L + b)$ , it would have his desired property of marginal cost of labor less than average cost.

Finally, let us think of a case where, if the firm remunerated the worker in these terms, it would not have the desired properties. Consider constant returns to scale. Suppose  $f(L) = aL$ ; then it would not be true that the revenue per worker would be decreasing with  $L$ ; it would just be constant. It is in this sense that Weitzman brings increasing returns to scale into the analysis in a fashion which strikes me as legitimate. What he really has in mind is constant marginal cost and a fixed cost,

hence when he talks about increasing returns, he is really talking about fixed costs. (You can check for yourself that an increasing-returns-to-scale Cobb-Douglas production function will not give rise to a wage function with the desired properties.)

Can all of this be formulated as a general equilibrium model? God only knows. The literature is really quite flawed in terms of having suitable existence theorems for general models of monopolistic competition. There is no general equilibrium model in which we can show the existence of monopolistic competitive equilibrium. And nobody has devised a model in which, not only the price of output varies with quantity, but also the price of labor varies with quantity. So, if he succeeded in his papers to present a general equilibrium model, other than as an example, that would be a major contribution even if it did not have any macroeconomic implications.

Truman Bewley: I will talk mostly about the 1982 paper, and try to interpret what Weitzman does in terms of general equilibrium theory.

General equilibrium may be represented as a system of equations expressing the equality of supply and demand in each market. We have, say, the demand for labor,  $D_L(w,p)$ , as a function of the wage,  $w$ , and the vector of prices of other goods,  $p = (p_1, \dots, p_N)$ . One equation is  $D_L(w,p) = S_L(w,p)$ , where  $S_L(w,p)$  is the supply of labor. Similarly, we have demand equals supply for each other commodity:  $D_k(w,p) = S_k(w,p)$ , for  $k = 1, \dots, N$ . We know that demand and supply satisfy Walras' law. That is,  $wD_L + \sum p_k D_k = wS_L + \sum p_k S_k$ . Because of this equation, one of the equations  $D_L = S_L$  and  $S_k = D_k$ ,  $k = 1, \dots, N$ , is superfluous. We have  $N+1$  unknowns and  $N$  independent equations. But all the demand and supply functions are homogeneous of degree zero, so we may fix one of the variables. Thus, the equation system is in a sense determined. All this is standard elementary equilibrium theory.

What happens when we attempt to count equations and unknowns in a Keynesian system? The distinguishing feature of a Keynesian model is what is loosely called the Clower constraint. That is, consumer demand depends on the quantities consumers actually sell as well as on prices. This dependence on actual sales arises because consumers may not be able to sell all they would like to sell; markets are not necessarily in equilibrium. Because of the Clower constraint, Walras' law does not hold. Since the demand and supply functions remain homogeneous of degree zero in prices, the system of equations defining equilibrium seems to be overdetermined. There is one more equation than unknown. However, one new variable has been left out, that is, the aggregate amount of labor sold by consumers; call it  $D^*$ . Consumers' demand for goods and supply of labor should depend on  $D^*$ . A Keynesian equilibrium is, then, a vector  $(D^*, w, p)$  such that  $D_L(w, p) = D^* \leq S_L(D^*, w, p)$  and  $D_k(D^*, w, p) = S_k(w, p)$ , for  $k = 1, \dots, N$ . An additional equation may be added, such as  $w = 1$ , which normalizes prices. The difference  $S_L(D^*, w, p) - D^*$  may be interpreted as unemployment. Walras' law now applies with  $S_L$  replaced by  $D^*$ , so that one equation is again redundant. Hence, there is a one-parameter family of equilibria, the parameter being  $D^*$ .

The mathematics of Keynesian equilibrium is much like that of Walrasian equilibrium. In order to make sense of Keynesian equilibrium we need explanations of why the unemployed labor is not used and why excess labor supply does not cause wages to fall.

As I understand Weitzman's 1982 paper, the mathematical description of equilibrium is along the lines just described. The monopolistic competition among firms and their fixed costs explain why unemployed labor is not used. Weitzman provides no explanation of why nominal wages do not fall in response to unemployment. He has not addressed the most vexing question in the microeconomics of macroeconomics.



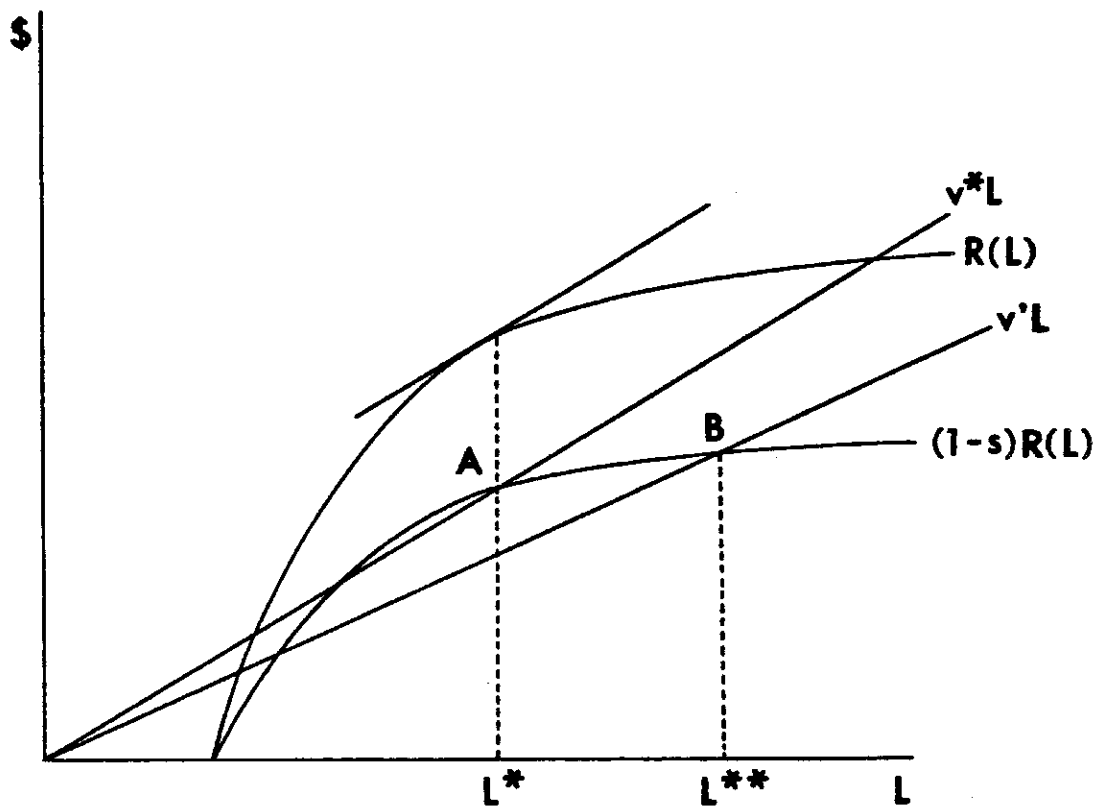
In the 1983 paper, Weitzman introduces profit sharing. He apparently believes that he has a convincing model with unemployment equilibria. He claims that in a model such as this, unemployment would automatically be eliminated by an equilibrating process if the compensation scheme he proposes were adopted. I will now more or less repeat what other people have been saying about how this scheme works. I use a diagram (Figure 4), which is equivalent to the one used by Bill Nordhaus.

Think of a simple sharing scheme where the compensation ( $v$ ) paid by a firm times the number of laborers ( $L$ ) equals some parameter ( $s$ ) times the revenue ( $R$ ) of the firm:  $vL = sR(L)$ . The long-run problem of the firm is to maximize, over  $s$  and  $L$ , the profits of the firm  $[(1-s)R(L)]$ . The short-run problem is to maximize profits, over  $L$ , with  $s$  fixed. Put  $L$  on the horizontal axis and dollars (not dollars per worker) on the vertical axis. With Weitzman's assumptions of a fixed cost and constant marginal product, together with monopolistic competition, you would think the revenue function would be as I have drawn it. And then you have some shadow price of labor, which is  $v^*$ . So let us represent the shadow price of labor times  $L$ . We know that profit is the distance between these two if the firm has to pay the shadow price, so the firm will choose  $L^*$ . Hence, with a share compensation scheme, it chooses  $s$  and  $L$  so that  $(1-s)R(L)$  goes through point A. That is the long-run position of the firm. It is the same as the profit maximizing position of the firm if it paid labor a wage of  $v^*$  rather than a share.

Imagine what happens in a Walrasian system if for some reason new laborers came on the market. The actual wage paid would fall, increasing the demand for labor. Weitzman asserts that in the real world, wages are fixed, at least in the short run. An influx of new workers would increase unemployment and reduce the shadow wage, but would trigger no action by firms to absorb the additional labor. But if firms operated according to a share system and shares were fixed, the drop in the shadow wage would cause firms to expand their workforces. In the diagram, if

FIGURE 4

THE DEMAND FOR LABOR IN THE SHARE ECONOMY (4)



IF THE SHADOW WAGE FALLS (FROM  $v^*$  TO  $v'$ ), A FIRM PAYING FIXED SHARES WILL WISH TO HIRE MORE LABOR, WHILE A FIRM PAYING A FIXED WAGE WILL NOT,

the shadow wage drops to  $v'$ , the firm's employment will increase to  $L^{**}$  (point B). Shares are fixed only in the short run. In the long-run, firms would adjust shares, and the economy would move to the same position as in Walrasian equilibrium.

I find this system very objectionable for two reasons. First of all, it gives an enormous amount of power to the firm, since the firm may choose  $s$  as well as  $L$ . Why not just assume that the firm can choose its wage to be the shadow price of labor? Then the system adjusts as in the Walrasian setup.

My second objection is that I do not see why it is reasonable to assume that  $s$  adjusts more slowly than  $L$ . This assumption is apparently made because  $s$  is thought of as being analogous to wages, and wages are thought of as adjusting slowly. But if firms could set wages as they wished, they might adjust them very quickly. Such quick adjustment of shares would not make Weitzman's scheme ineffective. It would simply make firms behave in the Walrasian manner.

Weitzman sometimes speaks not as if the firm were unilaterally determining  $s$  and  $L$ , but as if they were the outcome of competitive forces or bargaining. But the only way competitive forces impose themselves is through the shadow price of labor. If  $s$  is the outcome of bargaining--well bargaining is bargaining, and you bargain over what you actually earn. It is not clear why bargaining would lead to a contract specifying a fixed share, unless workers and firms were legally obliged to use only such contracts.

## V. Inflation and Unemployment

William Nordhaus: We will now turn to a discussion of the effect of the share economy on inflation and on the "natural rate of unemployment."

James Tobin: I have little to say on that because I do not understand what happens to the natural rate under Weitzman's system. I did not think he actually claims that the share economy produces a lower natural rate. That is, if you assume that what we mean by the natural rate is the Walrasian equilibrium, then that is the long run, which he says is the same under his system as under any other system. So there would not be any effect on that. If the vacuum cleaner analogy is supposed to imply a reduction in the natural rate, I would interpret that as follows.

As Bill Nordhaus and others have already pointed out, Weitzman makes a lot of the monopolistic competition implication that sellers always desire to have another customer come into the showroom and buy the car at the sticker price. Another part of the Chamberlinean story is that, because of that incentive, monopolistically competitive firms engage in advertising and other selling costs; and they also try, by differentiating their product in various ways, to create a loyal coterie of customers and to shift their demand curves out. So they balance production costs at the margin against selling costs at the margin. (That can be found in the Theory of Monopolistic Competition [Chamberlin 1933], if economists ever read that book any more.) The analogy would be that firms would be willing to engage in some resource costs to find employees who would accept their compensation package, whereas they do not have so much incentive to do that under the present system. If that were the case then there would be less frictional unemployment, I suppose; there would be less mismatching of people who would like to take jobs

but cannot find them or do not come together with the jobs that are available. But that may not be a big effect.

I think the interpretation of what Weitzman means by saying that there is always excess demand for labor is very important in trying to understand what he is talking about. I found what Bill Nordhaus said about that, and about the difference from the analogy with the product market, illuminating. I think we are left, then, with the assumption that, if a compensation contract has been agreed to or accepted implicitly by workers taking jobs with a firm, then they have already accepted the fact their wage will go down if new workers are employed. Given that they have accepted that possible outcome by taking the job, then if the employer can find someone who, like the customer coming into the showroom, will come and work for the same compensation package, the employer will be glad to take that person. I think that is the analogy that should be looked at. However, as Bill pointed out, that will not work in the long run if you think that the attraction of the job would be diminished so that people leave to go somewhere else.

Now it is certainly not true that the existence of excess demand (in the sense of the margin of marginal revenue product against marginal cost of labor, which Bill Nordhaus showed in Figure 3) provides any incentive for the employer to change his compensation package. It is not excess demand in that sense. We are used to thinking of excess demand in a market as being a signal to change the price in the market. That is not true of Weitzman's excess demand; it is not a signal to either side of the market that they should or could change the compensation package. Excess demand in that sense does not give the employees any bargaining power to ask for a higher  $v$ , or an increase in  $s$  (the share coefficient). They do not have any bargaining power to do that from the fact that there is excess demand (in the sense that we have been talking about) and neither does the employer. Even though the employer would like to get additional workers if they came in off the street (and assuming that the

existing workers are going to be quiescent about that), he does not have any incentive to offer higher wages or a higher share to get additional workers because that will lose him money. Weitzman actually shows that to be true in his well-worked-over General Motors example in the book. I think this has to do with the way you interpret a Phillips curve in this model; it is not the case that this excess demand is going to lead to pressure for higher wages or a higher share.

Now, it is true that the system has characteristics with respect to various shocks, including macroeconomic shocks, that differ from those of the fixed wage system that we have. By the way, I disagree with Russ Cooper about the relevance of the comparison with the fixed wage system with the employer determining the amount of employment, because I agree with Weitzman that the wage system is a good description of the actual system. Whether or not the wage system is optimal in the sense of contract theory is another question. That is the way the world works to a good approximation, so it is correct to compare any new system with the wage system. In comparison to the wage system, if Weitzman's system were to be adopted, it would have different characteristics with respect to certain shocks.

He talks about these soft-boiled, medium-boiled and hard-boiled motivations for a share system; the medium-boiled one is the common macro one. That is, the rigidity or stickiness of money wage rates in the face of macroeconomic spending shocks is a reason for cyclical movements in unemployment (which we have certainly seen in recent years). It is necessary to have unemployment to force the wage down, and to reduce the rate of inflation to what is regarded as tolerable, whereas under Weitzman's system the wage does down automatically. That is, value added goes down and the wage does down, so there is no lag in that adjustment in the complete system. In practice, the adjustment would depend on how big a share of labor income the share component is compared to the wage component, but a share

system certainly has improved characteristics with respect to that kind of shock.

I think it also has improved characteristics with respect to supply shocks, like the oil shocks of the last decade. If you have a share system in which worker compensation is based on value added, then oil prices are not in it at all, so there would be a quick adjustment rather than a slow adjustment to the terms of trade shock or the increased cost of imported materials. We went through a lot of turmoil in the last decade to get that eventual real wage adjustment, but if Weitzman's system had existed it would have come quickly.

Now, there has been a considerable absence this morning of discussion of the distinction between nominal and real variables; I suppose the meaning of macro is to bring that back into the discussion. Indeed, Weitzman also does not make much of this distinction as far as I can see; when he talks about wages, he focusses on real wages. He says that the system he is proposing is better, in the respects that I just mentioned, than systems in which real wages were specified in contracts. The latter would be an indexed wage system or a product wage system. We know that an indexed wage system that has the price of oil in the index has very bad macroeconomic consequences in the face of supply shocks. A product wage system would be better in that respect, but it would be subject to macro problems from shocks to productivity, as well as from shocks to aggregate real demand, and his system would have better characteristics than those.

Does it have characteristics that are preferable to those of a money-wage system? We all know that any system in which wages are set in real or relative terms, rather than in money terms, poses serious difficulties; in some sense all the Keynesian problems are not there (at least the ones that Keynes originally talked about). Keynes was very clear about that: he said the reason for the problems he was talking about was that wages were set in money terms, and the implication is that the system would be very different if wages were indexed or set in real terms.

That is also true with respect to Weitzman's discussion, because the shares are real, not nominal. So the idea that came from Keynes and the Phillips curve was that there is some short-run adjustment possibility of changes in real wages through price changes when money wages are relatively fixed, or where there is inertia in the path of money wages. That would be lost in Weitzman's system to the extent that it exists.

One idea in the past about wage and price behavior in a wage system has been that there are some asymmetries between money wage increases and money wage reductions, so there is some kind of bias towards inflation when there is micro dispersion among sectors; money wages decline more slowly in the excess-supply sectors than they rise in the excess-demand sectors. You could imagine that to be true also across sectors in bargaining about  $s$ , the share coefficient; it would be hard to get shares down in the declining sectors and easier to get them up in the expanding sectors. However, it is not clear what that would result in, except labor strife, because unemployment and reduction of output are not going to be any solution to that problem. Reducing production and reducing employment just lower everybody's real income; they do not change the share problem. To a first approximation, the shares are going to be the same and everybody is going to be worse off.

In some sense you can say that one of the problems of which inflation has been a symptom in some countries (maybe not in our own, but maybe in Britain, as was discussed earlier by Joe Tracy) is a fundamental lack of harmony about the division of the national pie--or lack of agreement even about the process by which it is to be determined. That basic disharmony is not resolved either by reducing the size of the pie or by increasing it. You get inflation as a result, but inflation is not necessarily corrected very soon or very fundamentally by depression, by reductions in employment and output. If there is that lack of harmony, it would show up very clearly in fights about  $s$ . Some kinds of fights that are disguised in a wage



system could be naked struggles in the Weitzman system in a country like Britain. Maybe that is good because it means that you have to face the problem of resolving these conflicts outright; maybe it is not good--I do not know.

#### General Discussion

William Nordhaus: We now will have a free for all.

Sidney Winter: Bill, in your quest for a dynamics that would make the system make sense, it seems to me you were very close but just did not accept it. That is, take your adjustment rules but remove the all-or-none response in one period and instead have people trickle away from given situations toward more favorable situations. Then, under the share system, when there are shocks which change the supply and demand situation at a particular firm (which, say, involve an increase in the amount of labor there), workers previously there are worse off than they were before, workers who would otherwise be unemployed under a wage system are better off, and the firm is better off in the adjustment to that shock. Presumably it also has the desirable macroeconomic properties that Jim Tobin was referring to. Is that a sufficient answer to the question?

William Nordhaus: It seems to me that the key to Weitzman's macroeconomics is that firms always have many vacancies at the going compensation package. Every building you walk past would have a "Help Wanted" sign on the window. Why? For the simple reason that, at these long-run compensation packages that the firms have negotiated, their marginal cost is less than the marginal revenue product at any point of time. Hence, for small or medium shocks, a firm would always respond by retaining its existing workers. For medium or small shocks, a firm would always want to hang onto its existing workers and indeed would be

glad to hire a few additional workers. I think that is the key to the macroeconomics in the Weitzman paper.

In the situation you describe, where you have more continuous response, I suspect that firms would still not be in a position of excess demand for labor. But the excess-demand for-labor theorem is absolutely central to the argument.

Sidney Winter: As Jim has observed and other people have noted, the excess-supply/excess-demand terminology may be obfuscating here; Weitzman may have made a mistake in introducing that terminology into the discussion. But you can set that terminology aside and simply ask the question: if labor supply in individual firms or markets (or an otherwise segmented system of markets) is fixed in some short-run sense, and if you shock labor supply so more people show up in a particular labor market, what is the character of the response to that shock? Under that interpretation it seems to me that the story basically works, whether or not you think the excess-supply/excess-demand terminology is appropriate to it.

William Nordhaus: But if there is a shock to the marginal revenue product, and you impose a long-run compensation constraint, the behavior of the wage firm and the share firm would be identical. If, on the other hand, there is a shock to the  $v^*$ , then because firms are constrained by different contracts in the short run the response might well be different between the two systems.

Joseph Tracy: All along we have assumed the homogeneity of workers, and I thought it would be interesting to speculate on the following. I am not clear in the discussion up to this point what the competitive packages are that firms offer in the share market, but assume they have a wage component and some share component. Then suppose firms have the opportunity to invest in workers to increase their productivity, and assume this is

firm-specific. Now these shares have to be based on actual numbers of workers, not on efficiency units of workers, which may introduce a problem because firms do not have the incentive to improve their work force through these investments. The latter would raise revenues without the increase in  $L$  in the denominator.

Guy Orcutt: I just want to ask Jim Tobin a question about his remarks. It seemed to me you were saying that if this plan were adopted, it would not make any difference to the bargaining strength, or position, or demands of the workers and the employers. It seems to me that if in fact a plan like this was introduced and if the level of unemployment moved down from 7 percent to 2 percent or 3 percent, as is hoped for, then people who are out of work (and who will be back at work faster than they otherwise would) would have higher reservation wage rates. That is, firms are competing for them and so I do not understand why it would not make some difference in terms of the outcome.

James Tobin: What I said was that I think the bargaining power is essentially the same as it would be for the same amount of employment and unemployment under the two systems.

Guy Orcutt: But the whole point of the system is to lower it.

James Tobin: Well, if unemployment is lowered by whatever means, then certainly the bargaining power of labor is increased. We have other ways of lowering unemployment but they might not be acceptable because they involve more risk of inflation, so, in that sense, it might be more likely that unemployment is lowered in a Weitzman world than in the world we have at present. But you should not believe that, because they individually have an incentive to hire new employees (assuming that their existing employees have agreed to the compensation package and to the

possibility that it will result in such hiring), employers also have an incentive to improve their compensation package. Nor is it the case that the already-employed workers have bargaining power which would be effective in getting the employer to improve the compensation package.

William Nordhaus: I have a comment on what Jim Tobin said. When I asked Jim to reflect on the impact of the share system on the natural rate, it was not in the sense of a Walrasian equilibrium but in the sense of that pattern of unemployment and vacancies which would lead to a stable rate of inflation. I presume the analog of that in a pure share system would be the unemployment rate at which shares tend neither to rise nor to fall. If Weitzman's microeconomics were correct, my interpretation of why the natural rate might fall would be the following. In a wage system you tend to get aggregate inflation stabilizing when, in some sense, the balance of unemployment and vacancies across different sectors, weighted by the pressure of each of those on wages, was equal. That is, the economic weight of vacancies driving up wage inflation was balanced by the pressure of unemployment driving wage inflation down. Now, if you accept the idea that a share system would be one where firms always have "Help Wanted" signs on the window, it seems to me that the point where the aggregate share tends to stabilize--neither to rise nor to fall--would be one where the balance would be towards much greater levels of vacancies and much lower levels of unemployment. And, in that sense, the balance would be toward a significantly lower natural rate in the sense that I used the word.

James Tobin: Those vacancies are different kinds of vacancies from the ones that are measured in terms of having wage pressure. They are not vacancies in that sense, so I think that is a misleading indicator in comparing the two systems.

William Nordhaus: In what sense are they not wage-type vacancies?

James Tobin: They are not wage-increasing vacancies.

William Nordhaus: That was my point. They are vacancies in the sense that they are "Help Wanted" signs which do not increase shares. That seems to me the macroeconomic argument implicit in Weitzman.

James Tobin: But that does not tell us whether or not there is a different level of employment or unemployment. The fact that there are more "Help Wanted" signs does not tell us the answer to the question.

Brian Wright: It seems to me that this program, if it were ever implemented, would stand or fall on its political rather than its economic content. I think that the crucial question is really whether it is more acceptable to workers to enter into one of these contracts, where, when you hire more workers, everybody's wage goes down, or to have, say, the nominal wage reduced in the current system. It is not at all clear to me that the former is more acceptable. If that were true, it might make it very attractive. We know the realities of the current system, but Jim has alluded to possible struggles under the alternative system; it is not clear that they would work out as well as under the current system.

Adrian Pagan; I had two comments. First, I wondered whether one should really concentrate not on the type of equilibrium considerations that Bill was giving us but rather on system design; whether in fact the whole point of this proposal is that it is a better way to ride out shocks, as Jim was talking about. Essentially you end up in the same position as you would have with a perfectly competitive system but you achieve it by a

different route. And we regard it as a better route in the sense that we have less labor-supply response and more wage response. The second problem I had was the following. We have got a big government sector out there which employs an awful lot of people, so if we are going to devise a share system for the private sector, what are we going to do about all the public sector people out there? One of the difficulties with this proposal is that, if there is someone who is not paying the share but is essentially just paying a fixed wage, then the firms who are paying the shares will have great difficulties retaining their employees when they start reducing their compensation. This means that the government is going to have to be extremely benevolent and farsighted in figuring out what exactly the public wage should be when faced with this sort of response from the private sector.

Andrew John: I have two points. First, I would agree with Adrian Pagan that Weitzman is more concerned about the disequilibrium properties of the system than the equilibrium properties. But I think we have to be very wary of his proposition that the long-run equilibria of wage and share systems would look the same. Weitzman in his less-guarded moments mentions ways in which the equilibrium of the share system would actually be superior to that of the wage system. My second point is a response to something Bill Nordhaus said earlier. Suppose for the moment the world is not as Weitzman seems to believe it to be, but is in fact competitive; and suppose also that there is this constraint on firms that they have to pay a given compensation in the short run. In this case it seems to me that shocks to the revenue product function could lead to perverse results--that is, to greater employment fluctuations under a share system than under a wage system. If there is, say, a negative shock to the revenue product function, then, ceteris paribus, that will lower workers' compensation, so firms will have to lay off workers in order to bring the level of

compensation back up to the short-run constraint. That could cause a greater fall in employment than would occur in a wage system.

James Tobin: I think the early speakers this morning pointed out that one way of interpreting Weitzman's proposal is to give unemployed workers or junior workers more say in what goes on, and to reduce the monopoly and self-interested protective powers of senior employed workers, who are relatively sure not to be laid off except in deep recessions. So the question is whether or not there are other and better ways of doing that, either by reforming basic labor law or the governance of trade unions, or by stiffening the backbones of employers so that they respond more to the availability of outside workers than to the pressures from their senior employees. One thing I have thought of is using the unemployment insurance contribution system as a way of penalizing, by higher unemployment taxes, employers who raise wages during periods of high employment, or at times when they themselves are reducing employment, or at times when the area in which they are located is experiencing increases in unemployment. They should not be raising wages in those times. This penalty would enhance the incentive for the firm's and union's wage decisions to take account of the existence of these unemployed workers.

William Nordhaus: It is now time to adjourn. I would like to thank everyone who made this discussion so enlightening. We are indebted to the speakers for their careful and thoughtful remarks; to the kibitzers, for their sparkling and uninhibited interventions; to Andrew John, for his skillful coordination of the arrangements; and to Alfred Sloan, who not only served up General Motors for Weitzman to analyze, but also, through his legacy in the Sloan Foundation, provided the funding for this conference.

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