CAN GROWTH EASE CLASS CONFLICT?

E. SOMANATHAN*

This paper proposes a theory that links labor supply to wage growth and economic growth, and the conflict of interest between capital and labor. During the early stages of industrialization of a country, "surplus" labor drawn from the traditional sector of the economy is available to the modern capitalist sector at a constant or only slowly rising wage. As industrialization proceeds, this labor surplus vanishes, leading to wages rising in tandem with the growth of output. As long as there is surplus labor, workers in the modern capitalist sector, who are organized, have little interest in growth as it does not raise wages. The effect of growth is external to them, simply drawing more workers into the capitalist sector and enabling the entrants to receive rents. So capitalist-sector workers would like to redistribute income regardless of the adverse effect on growth. Once the economy grows enough for the subsistence sector to vanish, further growth raises wages. Hence, this change in the structure of the economy leads to a reduction in the intensity of the labor–capital conflict.

The dual economy model implies that growth rates rise over time and fall after the exhaustion of the labor surplus which is consistent with the stylized fact of economic growth.

1. LABOR SUPPLY AND CLASS CONFLICT

THE ORGANIZATION of work in industrial capitalism is such that it is relatively easy for the working class, unlike the peasantry, to overcome the problems that beset collective action (Olson, 1965) and organize itself. If workers are able to obtain a share of political power, they engage in redistributive measures to the detriment of capitalists. This paper makes the point that workers' incentives to redistribute are, however, different in rich and poor economies. When workers obtain a share of power and redistribute, they thereby reduce capital accumulation. This can be because they save a smaller proportion of their income than do capitalists (as assumed in the model below), or because redistribution reduces the incentive of capitalists to invest. The reduction in the

*I am especially grateful to my Ph.D. thesis advisers at Harvard University, Alberto Alesina and Eric Maskin, and to Kenneth Shepsle. I received very useful comments from Peter Aranson, John Leahy, Stephen Marglin, Debraj Ray, Eric Reinhardt, Rajiv Sethi, Rohini Somanathan, E. Sridharan, Barry Weingast, participants of several seminars, and the editor and two anonymous referees of this journal. Financial support was provided by the Research Training Group in Positive Political Economy at Harvard/MIT. Eric Hallerberg provided excellent research assistance. Contact address: Indian Statistical Institute, 7 Shaheed Jeet Singh Marg, New Delhi 110016, India. E-mail: som@isid.ac.in

rate of capital accumulation slows the growth of wages. Labor, as well as capital, has an interest in economic growth. But this has not always been true. In the early stages of industrialization (at least in the old world), more labor, drawn from the peasantry, was always available at a constant or very slowly rising wage. This meant that capital accumulation could take place without significantly bidding up wages.

This paper shows that organized labor in such poor "labor-surplus" economies (that is, economies in which labor supply was perfectly elastic or nearly so) had less of a stake in economic growth.[1] The conflict of interest between capital and labor was sharper in such economies.[2] Therefore, if workers had obtained a share of political power, they would have been much more aggressive about redistribution. Indeed, in the rare cases in which labor did get a share of political power in a capitalist country before labor surpluses were exhausted, as in India, considerable redistribution directed mainly to the small industrial working class did take place. The paper has implications for theories of transition to democracy, which are briefly discussed in the concluding section.

A dual-economy model is presented with a capitalist (capital- and labor-using) sector, and a subsistence sector with labor as the only input. As capital accumulates, labor is drawn out of the subsistence sector and into the capitalist sector. This carries the implication that the growth rate of output rises over time as long as the subsistence sector persists, and falls thereafter. This is consistent with the stylized fact that low-income and high-income countries grow more slowly than middle-income countries. Neither the exogenous nor the endogenous growth models that are common in the literature carry this implication.

The model enables us to examine how robust the argument is to the introduction of dynamic considerations. What if workers in a surplus-labor economy anticipate the future growth of wages following the exhaustion of the labor surplus? Would this make them willing to refrain from redistribution? Moreover, even if wages do not rise with capital accumulation, total output does, and this would mean a larger pie from which to redistribute. Again, this could give organized labor in a labor-surplus economy a stake in economic growth. The model examines these effects, and shows that the basic argument is robust to them.

This suggests that in a democracy with surplus labor, such as India, since the organized workers are likely to wield considerable political influence, they will succeed in directing redistributive transfers to themselves. Moreover, since a large part of the labor force will be peasants or unorganized labor in agriculture, who will not get the transfers, it will be politic to conceal the extent of the transfers to

[1] Originally, in development economics, the term "surplus labor" meant that the marginal product of labor in the subsistence sector was near zero. This paper does *not* assume that labor has a zero or near-zero marginal product in the subsistence sector, only that labor is available at a constant wage.

[2] The labor–capital conflict may become less sharp for another reason. As workers grow richer and save, they acquire financial assets, and with them a stake in capital. The distinction between the classes declines and inequality is reduced. However, since even in the United States, three-fourths of the national income is labor income, it is not clear how large the effect of this has been.

organized workers.[3] The need for concealment is likely to lead to very inefficient and distortionary redistribution (Shleifer and Vishny, 1993). Thus the economy will tend to grow slowly. The exhaustion of labor surpluses is likely to moderate class conflict and lead to a reduction of redistribution, and perhaps also to less distortionary means of redistribution. This can, therefore, create greater incentives to invest and (other things equal), faster growth. It is instructive to contrast India's political economy with that of the United States, in which rising labor productivity from capital accumulation has always brought with it rising wages. Labor is aware of this and will not attempt to tax capital as much for fear of jeopardizing the "American dream" of continuously rising standards of living.

2. THE MODEL

This section examines how much redistribution capitalist-sector workers would choose if they wielded political power. It is assumed that while workers do have political power, this is not unlimited, so that outright expropriation is either impossible or too costly for workers to attempt.

Many poor countries have surplus labor, meaning that growth can take place via capital accumulation with little effect on the wage for a significant period of time. This was the world of the classical economists: Smith, Ricardo, Malthus, and Marx. Surplus labor may arise for several reasons. Productivity in agriculture can be enhanced by the introduction of technology that permits greater use of capital. As long as enough capital has not been accumulated, old technologies will co-exist with their modern replacements, thus keeping wages constant or nearly so. In addition, when labor is drawn out of agriculture, those left on the land may put in more labor, thus keeping the marginal product of labor from rising significantly (Sen, 1966). Moreover, the process of technological change during capital accumulation may itself displace labor, thus keeping wages from rising.[4] Finally, population growth can be a contributing factor.

Consider a society with two classes – capitalists and workers. In period t capitalists start with wealth B_t (measured in terms of the single good in the economy) inherited from the previous period. They consume c_t and save the rest, earning a return r_t. They pay a tax τ_t on interest plus principal and are left with wealth B_{t+1} at the end of the period. They maximize the sum of discounted utilities from consumption:

$$\max_{\{c_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \rho^t U(c_t)$$

subject to

[3] The idea that industrial workers are better able to organize than the peasantry was made famous by Marx. Bates and Rogerson (1980) provide an alternative theory to explain why the peasantry tends to wield less political influence than industrial labor in poor countries.

[4] Hicks (1969) suggests that this, in combination with population growth, was what kept real wages roughly constant in Britain during the 60-odd years of the Industrial Revolution.

$$B_0 \text{ given}, \ B_{t+1} = (1-\tau_t)(1+r_t)(B_t - c_t), \ \ t = 0, 1, 2, \ldots \tag{1}$$

We assume $U(\cdot) = \log(\cdot)$, and ρ is a constant discount factor between zero and one.

Solving the capitalists' problem (1) gives saving in period t:

$$S(B_t) \equiv B_t - c_t = \rho B_t. \tag{2}$$

To see this, note that the log utility function is a monotonic transform of the Cobb–Douglas utility function, for which the expenditure share c_t/B_t of the first good is constant and equals $1-\rho$. The logarithmic form of the utility function that is assumed thus has the convenient property that saving is independent of the after-tax rate of return. This enables us to sidestep the problem of multiple equilibria that commonly arises in analyses of dynamic games and focus on the issue of interest: the different incentives facing organized labor in economies with scarce and surplus labor. This point will be discussed further below.

The production side of the economy consists of a capitalist sector and a subsistence sector, as in Lewis (1954). The former has competitive firms employing a constant returns-to-scale technology given by the production function $Y_t = F(K_t, L_t) = AK_t^{\alpha}L_t^{1-\alpha}$ where Y_t is output plus undepreciated capital left over at the end of period t, and K_t and L_t denote capital and labor employed in period t respectively.[5] Zero population growth is assumed for convenience and the labor supply is normalized to one.

Taxes collected by the government are paid to workers in the capitalist sector as transfers. Capitalist-sector workers' income thus consists of a wage plus a transfer, while subsistence-sector workers get only a wage. This assumption is in accordance with the idea that capitalist-sector workers are better organized than subsistence-sector workers and so have a greater say in the distribution of government subsidies. The purpose of the model is to determine the tax rate *desired* by capitalist-sector workers. The political process that determines the realized tax rate in a capitalist democracy is not modeled, but it would presumably be influenced by both the power of organized labor and its optimal tax rate.

The subsistence sector uses no capital, only labor. Output in period t is given by $s(1-L_t)$ where s is the constant marginal and average product of labor. It is assumed there is a legal minimum wage in the capitalist sector which is at least s. This ensures that capitalist-sector workers' rents are not dissipated by subsistence-sector workers bidding down the capitalist-sector wage below s. For expositional convenience, suppose this minimum equals s. So a subsistence-sector worker's income is s. Let W_t be the wage (in both sectors). It follows that

$$W_t \geqslant s, \quad W_t > s \Rightarrow L_t = 1. \tag{3}$$

In the capitalist sector, firms maximize profits:

$$\max_{K_t, L_t} AK_t^{\alpha}L_t^{1-\alpha} - (1+r_t)K_t - W_tL_t. \tag{4}$$

[5] This formulation follows Stokey and Lucas (1989).

The first-order conditions imply that marginal products of capital and labor are equal to the rate of return and the wage, respectively:

$$A\alpha K_t^{\alpha-1}L_t^{1-\alpha} = 1 + r_t \tag{5}$$

and

$$A(1-\alpha)K_t^{\alpha}L_t^{-\alpha} = W_t. \tag{6}$$

Finally, assume that workers have no capital and do not save.[6] This assumption is made in order to model the distributive conflict that is central to the theory in the simplest possible way. As long as the distribution of capital is not uniform, the conflict remains and is lessened only in degree.

Now capital market equilibrium implies

$$K_t = S(B_t). \tag{7}$$

Using (1), (2) and (7), the evolution of the capital stock is given by

$$K_{t+1} = \rho(1-\tau_t)(1+r_t)K_t. \tag{8}$$

This equation says that total investible capital in the economy increases by a factor equal to the rate of return $1+r_t$. This is reduced by taxation by a factor of τ_t, which is transferred to capitalist-sector workers and consumed. Capitalist consumption further reduces what is left until the actually invested capital in the next period is given by the right-hand side of (8).

If the marginal product of labor in the capitalist sector when it employs the entire labor force is at least s, that is, if

$$K_t \geqslant \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha}, \tag{9}$$

then the subsistence sector will vanish. Those periods in which this holds will be referred to as the phase of *scarce labor*. Further capital accumulation will result in a rise in the wage. The right-hand side of (9) will be called the *turning point* (known in the development economics literature as the Lewis turning point). Those time periods in which K_t is less than or equal to the turning point will be called the phase of *surplus labor*. In this phase, marginal capital accumulation will *not* raise the wage (except at the turning point). Instead, it will expand employment in the capitalist sector. Of course, continued growth would eventually eliminate the labor surplus and bid up wages (see Figure 1).

When the economy is in the surplus labor phase it will be called a *dual economy*. When it is in the scarce labor phase, it will be called a *neoclassical economy*.

[6] This is a common assumption in models of labor–capital conflicts. See, for example, Lancaster (1973), Przeworski and Wallerstein (1982), and Alesina and Rodrik (1994). That richer people save a larger proportion of their incomes is well established in the literature on household saving in developing countries (Deaton, 1989, and references therein). Gersovitz (1983) provides a utility-maximizing model that gives conditions under which this will be true.

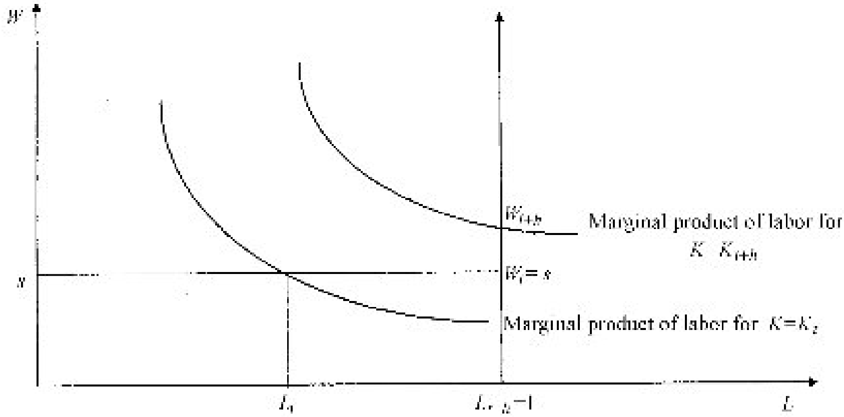

Figure 1.

In a dual economy, the marginal product of labor, which equals the wage W_t, is constant (and equal to s). But because the production function has constant returns to scale, the marginal product of labor depends only on the capital–labor ratio K_t/L_t, so the latter is constant as well. Similarly, the marginal product of capital depends only on K_t/L_t, and therefore is also constant. Consequently, the rate of return on capital $1 + r_t$ (which equals the marginal product of capital), is constant and will be denoted by $1 + r$.

Assume that the parameter values ρ, α, A, and s are such that capitalists are sufficiently patient and that the capitalist sector is sufficiently productive relative to the subsistence sector, i.e. A is large enough relative to s, so that

$$\rho(1 + r) > 1. \tag{10}$$

By (8), this ensures that the growth rate of capital, which will be denoted by $g_t(K)$, is positive for low enough tax rates.

Notice that from the capital evolution equation (8), the growth rate of capital in the surplus labor phase depends entirely on the tax rate.[7] In the scarce labor phase, by standard neoclassical theory, the growth rate of capital and output will decline as capital accumulates, raising the capital–labor ratio and lowering the marginal product of capital.[8]

[7] It follows that with a zero or positive and low enough constant tax rate, the growth rate of output will increase with capital accumulation in the surplus labor phase. This reverses the standard result of neoclassical theory, that the growth rate of output declines with capital accumulation because of diminishing returns to capital. The reason for this result (the algebra is straightforward) is that capitalist-sector output grows at a constant rate, because capital and labor grow at the same constant rate, and there are constant returns to scale. However, subsistence sector output shrinks as labor is absorbed into the capitalist sector. Since the subsistence sector accounts for less and less of total output as capital grows, the effect of its shrinkage on the growth rate of total output gets smaller. So the growth rate of total output increases.

[8] This is assuming a constant tax rate low enough for growth to be positive.

With the framework now complete, we are ready to examine what tax rate capitalist-sector workers would choose in a dual economy as opposed to a neoclassical economy, if they had their way.

As with capitalists, suppose workers' utility is logarithmic in consumption with the same discount factor. They solve

$$\max_{\{\tau_t \in [0,\bar{\tau}]\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \rho^t \log\left(W_t + \frac{\tau_t(1+r_t)K_t}{L_t}\right) \tag{11}$$

subject to

$$K_{t+1} = \rho(1-\tau_t)(1+r_t)K_t, \quad t = 0, 1, 2, \ldots,$$

and K_0 given.[9] Here, $\bar{\tau} < 1$ is the maximum possible tax rate that workers can choose. As mentioned at the beginning of this section, it will be assumed that workers have the power to set a tax on capital and transfer income to themselves, but that this power is constrained. $\bar{\tau}$ represents the constraint on workers' power.

Some explanation is in order here. Capitalist-sector workers choose a sequence of tax rates, one for each period, in order to maximize the discounted sum of utilities from consumption in each period. By assumption, a worker's consumption in any period equals his or her income in that period. A worker's income in period t is the wage plus the total tax revenue per worker in the capitalist sector. Notice that an increase in τ_t raises workers' current income but lowers the next period's capital stock.

It is assumed, for simplicity, that $\bar{\tau}$ is small enough that growth is never negative. Specifically, let

$$\rho(1+r)(1-\bar{\tau}) = 1. \tag{12}$$

Notice that if the capitalist technology is sufficiently productive, then $(1+r)$ can be large, which means that even high tax rates (close to one) would not induce negative growth.

When labor is scarce, both the wage and transfer components of income are increasing in K_t, by (6) and (5). So an increase in τ_t lowers K_{t+1} and, therefore, workers' income in period $t+1$. But in the surplus labor phase, W_t, $1+r_t$, and K_t/L_t are all invariant with time, as was noted above. So the cost to workers of raising the tax rate in period t is not felt in period $t+1$, but only via a postponement of the period in which the turning point is reached.

This addresses one of the issues raised in the introduction: in a dual economy, although a lower tax rate allows capital to accumulate faster so that the size of the pie from which redistribution is possible expands, the number of workers in the organized sector expands proportionately. So each worker in the organized

[9] The capital accumulation constraint follows from (8), which is a consequence of the capitalists' savings decision. Since capitalist saving is a function of only the end-of-period wealth, and unaffected by future tax rates (itself a consequence of log utility), it does not matter whether the workers' optimization is done under commitment or discretion. This is discussed further below.

sector gains nothing next period by reducing taxation today. This phenomenon is important. When there is surplus labor, part of the gains from capital accumulation go to workers outside the capitalist sector. This is because they are drawn into the capitalist sector as it expands and start to enjoy a share of the rents. Workers already in the capitalist sector do not internalize all the gains from growth. This externality makes them less interested in growth. On the other hand, once the subsistence sector has vanished, there is no longer any external effect of growth.

This can be thought of as an important special case of an argument made by Olson (1982, pp. 47–53). He argues that when interest groups in a society are encompassing, that is, when they constitute most of, or a large part of, the society, they will be more concerned with the expansion of the economic pie than with its redistribution in their favor. This is because the scope for such redistribution is limited and they internalize a large part of the efficiency losses from redistribution. Workers in the capitalist sector constitute a very powerful interest group in democratic societies since they are well-placed to organize if they are given the freedom to do so. But when they constitute only a fraction of the labor force, which is the case as long as a significant subsistence sector exists, they are not encompassing, so less interested in growth.[10]

Of course, a democratic political system would also give some power to workers outside the organized sector, particularly when the unorganized sector is large. Workers in the subsistence sector, like their counterparts in the capitalist sector, will not substantially benefit from growth via an increase in wage incomes. However, unlike organized-sector workers, they will benefit from growth in the surplus labor phase because it enlarges the economic pie from which redistribution can take place. Thus, to the extent that their role as voters in a democracy gives them power, they may exercise a moderating influence on redistribution that tends to choke off growth.

Now let us suppose for a moment that (capitalist-sector) workers in a dual economy believe that surplus labor will persist for ever. This is quite reasonable, since they would never have experienced an economy with labor scarcity. It is evident from the discussion above that they would then choose the highest possible tax rate, that is: $\bar{\tau}$. They have no reason for restraint.

Now suppose workers have been informed and persuaded that the labor surplus will eventually vanish. This could lead to some restraint on their part. Specifically, if they do not choose $\bar{\tau}$ in period t, then they will tax at lower and lower rates as time passes and the economy approaches the turning point. The reason for this is the following.

Suppose $\tau_t^* < \bar{\tau}$ is the optimal (for capitalist-sector workers) tax rate in period t. Then $\tau_{t+1}^* < \tau_t^*$. For if $\tau_{t+1}^* \geqslant \tau_t^*$, then consumption in period t will be no higher than in period $t+1$. Therefore, the marginal utility of consumption in period t

[10] The theorem is essentially unaffected if some fraction of the tax is paid to all workers, with the remaining fraction being paid only to capitalist-sector workers.

will be at least as great as the marginal utility of consumption in period $t+1$. Since the future is discounted, this means workers would be better off if they shifted some consumption from period $t+1$ to period t by taxing more in period t and less in period $t+1$. This contradicts the optimality of $\tau^*_{t+1} \geqslant \tau^*_t$. So τ^*_{t+1} must be less than τ^*_t.

It can be shown that once the economy reaches the turning point, the optimal tax rate for the workers is constant from then on. Thus, if the economy ever reaches the turning point (rather than stagnating for ever), it must do so with a declining sequence of tax rates, which then level off. This is the sense in which workers in a labor-surplus economy will always prefer to tax more than those in a labor-scarce economy. This discussion is summarized in the following theorem.

Theorem 1. Assume that (12) holds and

$$\bar{\tau} > \frac{1+\alpha\rho-\rho}{1+\alpha\rho}. \tag{13}$$

Then, (1) The optimal tax rate chosen by capitalist-sector workers [that solves (11)] will be higher when there is surplus labor than when labor is scarce. In the surplus labor phase if it ever becomes less than $\bar{\tau}$, it will then decrease monotonically to $[1+\alpha\rho-\rho]/[1+\alpha\rho]$ at the turning point. It will remain constant at $[1+\alpha\rho-\rho]/[1+\alpha\rho]$ throughout the phase of scarce labor. (2) The growth rate of capital will either be zero, or positive and increasing till the turning point is reached, after which it will decline monotonically towards zero. (3) The growth rate of output will either be zero, or positive and increasing till the turning point is reached, after which it will decrease monotonically towards zero.

The proof of the theorem is in the Appendix. The assumption (13) essentially says that the capitalist-sector technology is sufficiently productive that the workers' optimal tax rate does not induce negative growth.

Relaxing the assumption that workers cannot save is unlikely to overturn the conclusions of the theorem. In fact, the effects may be accentuated since workers in a richer economy would be able to save more and would own more capital. They would, therefore, have less reason to tax capital than workers in a poorer economy.

I now discuss the role of the assumption of log utility. The model sets up a dynamic game between two parties: capitalists, who decide how much to save, and capitalist-sector workers, who decide how much to tax capitalists. In general, such dynamic games have multiple equilibria because each party's optimal strategy depends on what they expect the other to do. If capitalists think that workers will set a low tax rate, it may be more worthwhile for them to save, since they will get to keep more of the benefits of thrift. In a neoclassical economy, if capitalists are going save a lot of their profits, it pays the workers to exercise restraint in taxation, since the pie (both wages and future profits from which they can redistribute) can be expected to grow fast. On the other hand, there can be an equilibrium in which workers tax a lot since they think capitalists will consume rather than save, and capitalists consume a lot since they expect to be taxed heavily. Przeworski and Wallerstein (1982) examine the conditions under which these different kinds of equilibria are likely to occur. Labor is implicitly assumed scarce in their model.

The log utility assumption used in this paper implies that capitalists' savings decision is independent of what workers do. Thus we can examine a single equilibrium and see how it changes depending on whether or not labor is scarce.

The model above is one of a closed economy in which capital is immobile. There has always been at least some capital mobility, although even in the modern world, this remains quite limited. Increased capital mobility would tend to limit worker demands for redistribution due to its adverse effects on capital accumulation. Thus, even in a dual economy the possibility of capital inflows raises the potential growth rate and thus brings the turning point nearer in time. Conversely, the possibility of capital flight raises the cost of taxation due to a postponement of the time when the turning point will be reached. Nevertheless, this would probably not affect the qualitative conclusions of the theorem. The costs of taxation due to capital mobility would be felt even more keenly by workers in a labor-scarce economy because the effects are felt right away. For workers in a dual economy, on the other hand, the costs are felt only in the future, via a postponement of the turning point, and the future, since it is discounted, matters less than the present.

3. DISCUSSION AND AN EXAMPLE

In the dual-economy model presented, the growth rate of output rises until the subsistence sector has vanished, and falls thereafter. This is in accordance with the observation that the poorest and richest countries do not grow as fast as middle-income countries. It has been shown that the conflict between capital and organized labor is sharpest in poor labor-surplus economies and declines as the labor surplus gets exhausted. The reason for this is that organized labor benefits from growth only after surplus labor is exhausted. This is because neither of the two ways in which growth benefits labor is operational when there is surplus labor. Growth can be good for labor because it raises wages or because it expands the pie from which redistribution is carried out. When there is surplus labor, wages will not rise, and the per capita pie does not expand for workers in the capitalist sector since new labor is drawn into the sector in proportion to the accumulation of capital and expansion of output.

In all democracies, labor in the capitalist sector has acquired considerable political influence. In those rare cases, such as India, in which democracy has coincided with surplus labor, there has been considerable redistribution to workers in the capitalist sector. The subsistence sector in rural India consists of small family farms. Its urban component, usually referred to as the urban informal sector, consists of those engaged in petty production and service occupations in the towns. At the time of the last census, the urban formal sector employed about 10 percent of the total labor force of which more than two-thirds was in the public sector (Planning Commission, 1999, section D.V). The labor force in agriculture is not organized and has little political influence. Between 1950 and 1978, real wages in agriculture rose at an average annual rate of 0.4 percent (Lal, 1988), while the real per capita net national product grew at the rate of 1.5 percent. In other words, wages increased by only 12 percent while per capita income grew by 53 percent over this period. Wages in this sector therefore grew much more slowly than output unlike the case in the advanced countries.

Labor in the urban formal sector in India is well organized and unionized. All the major political parties have trade union wings which constitute powerful lobbies. In this sector, labor regulations result in an implicit tax-and-transfer scheme from capital to labor. Perhaps the most important of these is the need to obtain government permission to fire or lay off workers. Such permission has almost never been granted. When combined with the minimum wage law, there is an effective mark-up on the legal minimum wage that workers have to be paid to induce them to work. About 5 percent of GDP, that is about one-sixth of the government budget, was spent on subsidizing the public sector (Mundle and Govinda Rao, 1991). This has helped private-sector workers as well, since the government established a tradition of taking over loss-making private firms that would otherwise shut down, so as to preserve workers' jobs and wages. The public distribution system for food, operational mainly in the urban areas, has been another source of transfer income for the capitalist sector. Public spending on health and educational facilities is also much greater in the urban areas.

It is notable that direct transfers to workers in the organized sector in India have constituted only a small part of the benefits they have derived from government policy. Since they constituted only a fraction of the workforce as a whole, much of which was unorganized labor in agriculture, it would have been impolitic to make transfers too openly. The need to conceal transfers has made them particularly distortionary and has involved much waste of resources. In democracies in which the subsistence sector has vanished, on the other hand, (progressive) transfers are likely to be less distortionary, since there is no need for concealment.

The political contrast between India and the United States in the introduction of efficiency-enhancing changes in economic policy that hurt organized labor's immediate interests is interesting. In India, while pursuing economic liberalization in the 1980s and 1990s, the government has sought to move quietly. While business support has been courted, no attempt has been made to persuade the subsistence sector that it stands to gain significantly from the process. This indicates that such a campaign would simply not be plausible, and in fact opposition parties were fairly successful in painting the liberalization as being pro-rich and anti-poor (Kohli, 1989). This is understandable, as the backlog of surplus labor would prevent wages from rising in the short run in response to faster growth. The gains to the subsistence sector (and to unorganized labor in capitalist agriculture) would come in the long run while any cut in subsidies to capitalist-sector workers would provoke immediate and strong opposition.

In the United States, the North American Free Trade Agreement was expected to have similar economic effects in that some workers would face temporary unemployment. But the political campaign on behalf of the accord in the US stressed the possibilities for job growth and increased prosperity for the majority of workers as the economy benefited from the accord. This campaign was politically possible because US workers have historically been accustomed to wage growth in tandem with output growth so that the claim seemed plausible.

India is an exceptional case; democracies with surplus labor have been rare. Democracy has usually arrived after the exhaustion of the labor surplus.[11] The change in the intensity of the labor–capital conflict described above may be one reason for this. Democracy may have been most strongly resisted by elites when the interests of the working class were most opposed to theirs. This possibility introduces a new dimension to the large literature on democratic transition.[12]

4. APPENDIX

Proof of Theorem 1. Given an initial capital stock K_0, notice that choosing a sequence of tax rates $\{\tau_t\}_{t=0}^{\infty}$ is equivalent to choosing a sequence of capital stocks $\{K_t\}_{t=1}^{\infty}$. Let $X = (0, \bar{K})$, where $\bar{K} = (\rho A\alpha)^{1/(1-\alpha)}$, be the set of possible initial capital stocks. $\bar{K}$ is the steady-state value of K when there is no taxation, i.e. $\bar{K}$ satisfies

$$\bar{K} = \rho(1 + r_t)\bar{K},$$

where $1 + r_t$ is given by (5) evaluated at $K_t = \bar{K}$ and $L_t = 1$.[13]

Now it follows that any sequence of capital stocks that satisfies the constraints in (9) must lie entirely in X. Such a sequence of capital stocks will be called a *feasible plan*, and any feasible plan that solves (9) will be called an *optimal plan*.

[11] Time series of real wage indices for unskilled labor starting in 1830 (from Williamson, 1995, table A1.1), together with the Polity III data set by Jaggers and Gurr (1996) show that lasting democracy was achieved in the absence of an upward trend in the wage in only one of the 16 countries for which data are available. In the early part of the period for which the wage data are available, many of the countries (Australia, Great Britain, the Netherlands, Portugal, Spain, and Sweden) show no discernible upward trend in wages.

An earlier version of this paper presents the details, and is available from the author upon request.

[12] Collier's (1999) book contains a large bibliography on transitions to democracy. Recent work on this subject by economists includes Acemoglu and Robinson (2000), Feng and Zak (1999), and Rosendorff (2001).

[13] By assumption, the growth rate of capital at the turning point is positive if there is no taxation [see equation (10)]. Using this, it is easily checked that $\bar{K}$ is greater than the turning point.

Lemma 1. For every K_0 in X, there exists an optimal plan starting at K_0.

Proof. Let the *return function* be the real-valued function on $X \times X$ given by

$$R(K_t, K_{t+1}) = \begin{cases} \log\left(s + (1+r)\frac{K_t}{L_t} - \frac{1}{\rho}\frac{K_t}{L_t}\frac{K_{t+1}}{K_t}\right), & \text{for } K_t < \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha} \\ \log\left(AK_t^{\alpha} - \frac{1}{\rho}K_{t+1}\right), & \text{for } K_t \geqslant \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha}. \end{cases} \tag{14}$$

The return function gives a worker's utility in period t, given a capital stock K_t, and given a choice of next-period capital stock K_{t+1}. It is obtained by writing τ_t from the objective function in (11) in terms of K_{t+1} and K_t by using the constraint, and by substituting for r_t and W_t from (5) and (6).

Next define the *feasible correspondence* $\Gamma : X \longrightarrow X$ by

$$\Gamma(K_t) = \begin{cases} [K_t, \rho(1+r)K_t], & \text{for } K_t < \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha} \\ \left[\left(\frac{s}{A(1-\alpha)}\right)^{(1-\alpha)/\alpha} K_t^{\alpha}, \rho A\alpha K_t^{\alpha}\right], & \text{for } K_t \geqslant \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha}. \end{cases} \tag{15}$$

$\Gamma(K_t)$ is the set of capital stocks attainable in the next period, given this period's capital stock.

Hence the workers' dynamic programming problem can be rewritten as

$$\max_{\{K_t\}_{t=1}^{\infty}} \sum_{t=0}^{\infty} \rho^t R(K_t, K_{t+1}) \tag{16}$$

subject to

$$K_{t+1} \in \Gamma(K_t), \quad \text{for all } t = 0, 1, 2, \ldots,$$
$$K_0 \in X, K_0 \text{ given.}$$

Observe that

$$\Gamma(K) \text{ is non-empty for all } K \in X, \tag{17}$$

$$\text{for all feasible plans } \{K_t\}_{t=0}^{\infty}, \lim_{n\to\infty} \sum_{t=0}^{n} \rho^t R(K_t, K_{t+1}) \text{ exists.} \tag{18}$$

Equation (18) follows from the easily verified fact that R is bounded on the graph of Γ, $\{(K, \hat{K}): K \in X, \hat{K} \in \Gamma(K)\}$. Let B be a bound for R.

Equation (17) ensures that a feasible plan starting at K_0 exists for all K_0 in X while (18) ensures that $\sum_{t=0}^{\infty} \rho^t R(K_t, K_{t+1})$ exists and is less than or equal to

$B/(1-\rho)$ for all feasible plans $\{K_t\}_{t=0}^{\infty}$. Hence one can define the supremum function $v^*: X \longrightarrow \mathbf{R}$ by

$$v^*(K_0) \equiv \sup_{\{K_t\}_{t=0}^{\infty},\ K_{t+1} \in \Gamma(K_t)} \sum_{t=0}^{\infty} \rho^t R(K_t, K_{t+1})$$

and note that v^* is bounded.

Equations (17) and (18) imply (Stokey and Lucas, 1989, theorem 4.2) that v^* satisfies the functional equation

$$v^*(K) = \sup_{y \in \Gamma(K)} R(K, y) + \rho v^*(y). \tag{19}$$

Next, note that

$$X \text{ is a convex subset of } \mathbf{R}. \tag{20}$$

$$\Gamma: X \longrightarrow X \text{ is compact-valued, and upper and lower hemi-continuous,}^{14} \tag{21}$$

$$R: X \times X \longrightarrow \mathbf{R} \text{ is continuous.} \tag{22}$$

Equations (21) and (22) are easily verified from the definitions of Γ and R.

Equations (17)–(18) and (20)–(22) imply (Stokey and Lucas, 1989, theorem 4.6) that v^* is continuous. Since R and v^* are continuous and $\Gamma(K)$ is compact, therefore the supremum in (19) is attained for every K in X. So the *optimal policy correspondence* $G^*: X \longrightarrow X$ defined by

$$G^*(K) = \{y \in \Gamma(K): v^*(K) = R(K, y) + \rho v^*(y)\}$$

is non-empty for all K in X.

The boundedness of v^* implies that $\limsup_{t\to\infty} \rho^t v^*(K_t) \leqslant 0$ for all feasible plans $\{K_t\}_{t=0}^{\infty}$. This, together with (17) and (18) implies that all plans generated by G^*, i.e. all plans $\{K_t\}_{t=0}^{\infty}$ such that $K_{t+1} = G^*(K_t)$ for all $t = 0, 1, 2, \ldots,$ are optimal plans (Stokey and Lucas, 1989, theorem 4.5). Since G^* is non-empty-valued, this establishes the lemma. □

The next lemma shows that the optimal tax rate is constant in the scarce labor phase.

Lemma 2. In a dual economy with scarce labor, the optimal tax rate is always $(1+\alpha\rho-\rho)/(1+\alpha\rho)$.

[14] The definition of upper hemi-continuity used here is that of Stokey and Lucas (1989) and is slightly less restrictive than the usual definition. In particular, it does not require that the graph of Γ be closed, a fact that is used here. The definition is: Γ is said to be upper hemi-continuous if Γ is upper hemi-continuous at every point in X. Γ is upper hemi-continuous at x in X if it is non-empty-valued and compact-valued at x and if, for every sequence $x_n \to x$ and every sequence $\{y_n\}$ such that $y_n \in \Gamma(x_n)$ for all n, there exists a convergent subsequence of $\{y_n\}$ whose limit y is in $\Gamma(x)$.

Proof. Define the *hatted return function* $\hat{R}(K_t, \tau_t)$ to be what the utility workers get in period t if the capital stock is K_t and the tax rate is τ_t. Now any optimal plan $\{K_t^*\}_{t=0}^{\infty}$ has to satisfy the Euler equation

$$\frac{d}{d\tau_t}[\hat{R}(K_t^*, \tau_t^*) + \rho\hat{R}(K_{t+1}(\tau_t^*), \tau_{t+1}^*)] = 0,$$

where $\{\tau_t^*\}_{t=0}^{\infty}$ is the corresponding optimal sequence of tax rates. For K_t^* not less than the turning point this reduces to

$$\frac{d}{d\tau_t}[\log(1 - \alpha + \alpha\tau_t) + \rho\alpha \log(1 - \tau_t)] = 0,$$

which implies

$$\tau_t^* = \frac{1 + \alpha\rho - \rho}{1 + \alpha\rho}.$$

Since by Lemma 1, an optimal plan exists, therefore the (unique) optimal tax rate in the scarce labor phase is $(1 + \alpha\rho - \rho)/(1 + \alpha\rho)$. □

Lemma 3. In the surplus labor phase, if τ_t is ever less than $\bar{\tau}$, i.e. if the growth rate of capital is ever positive, then the tax rate declines monotonically from time t onwards, so that the growth rate of capital increases monotonically from time t onwards.

Proof. Suppose the optimal tax rate in period t, $\tau_t^* < \bar{\tau}$. Let $R(K_t, K_{t+1})$ be the utility of a worker in period t when the plan is $\{K_t\}_{t=0}^{\infty}$; that is, when the sequence of capital stocks is $\{K_t\}_{t=0}^{\infty}$. An optimal plan $\{K_t^*\}_{t=0}^{\infty}$ must satisfy for all t,

$$K_{t+1}^* \in \underset{K_{t+1}\in\Gamma(K_t)}{\arg\max}\ R(K_t^*, K_{t+1}) + \rho R(K_{t+1}, K_{t+2}^*).$$

Let K_t^*, K_{t+1}^* be less than or equal to the turning point. Then K_{t+1}^* is the value of $K_{t+1} \in [K_t^*, K_{t+1}^*]$ that maximizes

$$\log\left(s + (1+r)\frac{K}{L} - \frac{1}{\rho}\frac{K}{L}\frac{K_{t+1}}{K_t^*}\right) + \rho\log\left(s + (1+r)\frac{K}{L} - \frac{1}{\rho}\frac{K}{L}\frac{K_{t+2}^*}{K_{t+1}}\right)$$

where K/L denotes the constant capital–labor ratio in the surplus labor phase. Since $\tau_t^* < \bar{\tau}$, therefore $K_{t+1}^* > K_t^*$. A necessary first-order condition for this is

$$\left(\frac{-1}{s+(1+r)\dfrac{K_t}{L_t} - \dfrac{1}{\rho}\dfrac{K_t}{L_t}\dfrac{K_{t+1}^*}{K_t^*}}\right)\frac{K_{t+1}^*}{K_t^*} + \left(\frac{\rho}{s+(1+r)\dfrac{K_t}{L_t} - \dfrac{1}{\rho}\dfrac{K_t}{L_t}\dfrac{K_{t+2}^*}{K_{t+1}^*}}\right)\frac{K_{t+2}^*}{K_{t+1}^*} \geqslant 0. \tag{23}$$

Note that if $K_{t+2}^*/K_{t+1}^* \leqslant K_{t+1}^*/K_t^*$, then the second term in (23) is smaller in absolute value than the first, because $\rho < 1$. This contradicts (23).

Therefore $K^*_{t+2}/K^*_{t+1} > K^*_{t+1}/K^*_t$, and the growth rate of capital in period $t+1$ must exceed that of period t. Hence the tax rate in period $t+1$ must be less than that of period t.

Furthermore, this implies that $\tau^*_{t+1} < \bar{\tau}$. So if K^*_{t+2} is less than or equal to the turning point the argument above can be repeated to show that the tax rate continues to decrease and the growth rate continues to increase. □

Lemma 4. For any optimal plan that reaches the turning point, the corresponding tax rate in the period in which the turning point is reached equals $(1+\alpha\rho-\rho)/(1+\alpha\rho)$.

Proof. Let t be the time period in which the turning point is reached, i.e. let

$$K_t < \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha} \quad \text{and} \quad K_{t+1} \geqslant \left(\frac{s}{A(1-\alpha)}\right)^{1/\alpha},$$

where $\{K_t\}_{t=0}^{\infty}$ is an optimal plan. Let $\{\tau_t\}_{t=0}^{\infty}$ be the corresponding sequence of tax rates. Now the Euler equation

$$\frac{d}{d\tau_t}[\hat{R}(K_t, \tau_t) + \rho\hat{R}(K_{t+1}(\tau_t), \tau_{t+1})] = 0$$

holds. This is equivalent to

$$\frac{d}{d\tau_t}\left[\log\left(s + \frac{s\alpha\tau_t}{1-\alpha}\right) + \rho\alpha\log(1-\tau_t)\right] = 0,$$

which reduces to

$$\tau_t = \frac{1+\alpha\rho-\rho}{1+\alpha\rho}.$$ □

Part (1) of the theorem now follows immediately from Lemmas 1, 2, 3, and 4.

To see part (2), recall that the growth rate of the capital stock in the surplus labor phase depends solely and negatively on the tax rate. By part (1), therefore, the capital stock must either grow at an increasing rate, or remain constant during the surplus labor phase. By (8), the capital stock must grow at a declining rate in the scarce labor phase because the marginal product of capital $1 + r_t$ declines and the tax rate is constant (by Lemma 2). This proves part (2).

From footnote 9 and part (2), the growth rate of output is also zero, or positive and increasing till the turning point is reached. In the scarce labor phase, the economy is neoclassical with a Cobb–Douglas production function and so the growth rate of output is simply a constant fraction of the growth rate of capital. This establishes part (3). □

E. SOMANATHAN
Planning Unit, Indian Statistical Institute

REFERENCES

Acemoglu, D. and J. A. Robinson, 2000, Why did the West extend the franchise? Democracy, inequality, and growth in historical perspective. *Quarterly Journal of Economics* 115, 1167–1199.

Alesina, A. and D. Rodrik, 1994, Distributive politics and economic growth. *Quarterly Journal of Economics* 109, 465–490.

Bates, R. H. and W. P. Rogerson, 1980, Agriculture in development: a coalitional analysis. *Public Choice* 35, 513–527.

Collier, R. B., 1999, *Paths toward Democracy: The Working Class and Elites in Western Europe and South America* (Cambridge University Press, Cambridge).

Deaton, A., 1989, Saving in developing countries: theory and review in: S. Fischer and D. de Tray, eds., *Proceedings of the World Bank Annual Conference on Development Economics* (The World Bank, Washington, DC) 61–96.

Feng, Y. and P. J. Zak, 1999, The determinants of democratic transitions. *Journal of Conflict Resolution* 43, 163–177.

Gersovitz, M. R., 1983, Saving and nutrition at low incomes. *Journal of Political Economy* 91, 841–855.

Hicks, J., 1969, *Theory of Economic History* (Oxford University Press, Oxford).

Jaggers, K. and T. R. Gurr, 1996, *Polity III: Regime Change and Political Authority, 1800–1994*. Computer file (Inter-university Consortium for Political and Social Research, Ann Arbor, MI).

Kohli, A., 1989, Politics of economic liberalization in India. *World Development* 17, 305–328.

Lal, D., 1988, *The Hindu Equilibrium*, 2 vols. (Oxford University Press, Oxford).

Lancaster, K., 1973, The dynamic inefficiency of capitalism. *Journal of Political Economy* 81, 1092–1109.

Lewis, W. A., 1954, Economic development with unlimited supplies of labor. The Manchester School, May.

Mundle, S. and M. Govinda Rao, 1991, Volume and composition of government subsidies in India, 1987–88. *Economic and Political Weekly* 26, 1157–1172.

Olson, M., 1965, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Harvard University Press, Cambridge, MA).

———, 1982, *The Rise and Decline of Nations* (Yale University Press, New Haven, CT).

Planning Commission, 1999, *A Statistical Profile* (http://planningcommission.nic.in/dataf.htm).

Przeworski, A. and M. Wallerstein, 1982, The structure of class conflict in democratic capitalist societies. *American Political Science Review* 76, 215–238.

Rosendorff, B. P., 2001, Choosing democracy. *Economics and Politics* 13, 1–29.

Sen, A. K., 1966, Peasants and dualism with and without surplus labor. *Journal of Political Economy* 74, October.

Shleifer, A. and R. W. Vishny, 1993, Corruption. *Quarterly Journal of Economics* 108(3), 599–617.

Stokey, N. L. and R. E. Lucas Jr. (with E. C. Prescott), 1989, *Recursive Methods in Economic Dynamics* (Harvard University Press, Cambridge, MA).

Williamson, J. G., 1995, The evolution of global labor markets since 1830: background evidence and hypotheses. *Explorations in Economic History* 32, 141–196.