



Substituting Labor for Capital

By [Dr. Mason Gaffney]

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Substituting Labor for Capital

Vocabulary: Valence; Revolving Fund; In parallel; in series; vertically integrated; horizontally integrated

Why should a fledgling manager care about making jobs, or saving on the use of capital? Isn't this just the concern of statesmen, or unions, or social reformers? It's because the future belongs to those who will make jobs. The present belongs to those who lay off workers, cut the payroll, and downsize the work force. This cannot go on: people are desperate for work, and these people vote. People are our most valuable resource, and they are begging for opportunities. Be you the one who creates those opportunities, and the future is yours.

1. P.137.¹ Investments differ in their valence for labor. The range of difference is very great.
2. P.137. Policymakers err to subsidize investing, , e.g. by lending out capital at low i.r.s, when the declared objective is to make jobs. What low i.r.s do is foster substituting capital for labor. The result is a low MP/AP ratio for labor.
3. P.137. The cash flow that hard capital yields mostly goes to pay interest on the initial cost, rather than pay the labor that constructed it. This is necessary because the capital is frozen a long time before the owner gets it back, and capital must be paid every year it is frozen up and unavailable for re-use.
4. P.138. Distinguish two kinds of investment: hardware and software. Hardware is high cost, long-lived, and slow to pay out. Software is low cost, short-lived, and fast to pay out. Adam Smith and John Stuart Mill, leading classical political economists, are quoted.
5. P.139, Knut Wicksell, a smart Swede, is quoted. "Only the part of labor annually set free can pay labor." Software frees capital; hardware freezes capital. To freeze is to lock up.

Wicksell correctly describes a nation's capital as a Great Revolving Fund. Its RPM (Revolutions per Month) is variable. The higher the RPM, the more labor it sets in motion.

¹Page references are to a publication, "Toward Full Employment with Limited Land and Capital," available on Reserve. Referring to them is optional.

6. Here are some examples of substituting capital for labor.

A. Putting thicker tread on tires. It makes them cost more, last longer, and consume more energy to rotate.

B. Building thicker nap into rugs. They cost more, and last longer.

C. Building road with thicker layers of asphalt. They cost more, use more energy, require fewer repairs, and last longer.

D. Buying a new car to replace an old clunker. The old one requires lots of labor; the new one represents lots of value.

E. Replacing an old building with a new one. The old building requires so much labor for maintenance, retrofitting, and repairs, it has little value. The new one (if you are lucky) provides worry-free service for a long time.

People who live in old houses are, in effect, supplied with shelter more by labor (and of course land) than by capital. An old city like Boston manages to survive, and have great charm and vigor, in spite of its old buildings, because they are continually maintained. (This is also true of the antiquated Boston subway, which you may experience first-hand.)

F. This is a metaphor. Imagine you are building and tending a fireplace fire. Heavier logs represent hard capital. They have a high ratio of volume to surface. Burning occurs at the surface, the "action edge" of the capital. A big log, therefore, last a long time: not because it is big, but because it has a high ratio of volume to surface.

Small logs burn faster, so they make more work, and steadier work, for the tender, replacing them as they burn. They represent soft capital. They have a low ratio of volume to surface. Their "action edge" is high relative to their volume.

You can carry this metaphor further, and gain a lot of insight into economics. You need small logs as kindling, to start the fire. Large logs are ponderous: slow to start, and also slow to stop. They are unwieldy to handle: they require more labor at first, and much less later.

G. This is another metaphor. Toilet paper comes in large rolls, and small. The service is provided by the thin layer of squares at the outer edge of each roll. With small rolls you can

serve more bathrooms with a given capital. You can release the value quicker. At the same time, you need more labor to replace the rolls, which disappear quicker. Thus, large rolls represent the substitution of capital for labor.

H. A Rolls-Royce costs as much as 15 or 20 Yugos. It may last 20 times longer, and yield classier service. Thus, the RR represents substitution of capital for labor. Still, with a fleet of 20 Yugos you can keep 20 salesmen on the road with the same investment as required to equip one with a RR. The labor requirements of driving and servicing and replacing the Yugos are much higher. In addition, each RR complements just one salesman, at the cost of complementing 20 with Yugos. Clearly, the capital in the RR does not complement as many workers as the same capital in 20 Yugos, either in parallel or in series.

I. You can build with bamboo to last 3 years, or with cement to last 30. The cement might cost 6 times as much, but it lasts 10 times as long. Thus, cement represents substitution of capital for labor.

J. You can have an operation to correct a problem to last for your life - say, 20 years more. Or, you can have acupuncture, to be repeated regularly once a month. The operation is capital-using; the acupuncture is labor-using. It is understandable that acupuncture was developed in China, where labor is cheap and capital has been scarce.

K. Building excess capacity into new capital to accommodate higher future demand. The excess capacity takes less labor to build than later "twinning," because of scale economies in construction; but you have to wait and pay interest on the capital cost until the future demand arrives - and take the risk that it may never arise. Thus, excess capacity is substituting capital for labor. Accordingly, it is most commonly observed where administrators are in charge of other people's capital.

L. You have \$1,000 of capital. You can invest it (along with yourself) in the inventory of a bakery on a busy corner (which you rent) and turn it over daily. Your volume is \$365,000 a year; maybe out of that you can earn a living; so will several other people.

At the other extreme you can plant Douglas-fir saplings on a poor site for harvest after 80 years. Your annual volume is \$1,000/80 (and you won't see the first \$ until you are sitting on your heavenly throne). Your annual rate of return may be as

great from the trees as from the bakery, but you will need another job in the meantime.

M. The City of Riverside has an admitted debt of about \$850 million (plus various contingent liabilities tucked away here and there that people forget to include in the debt). Much of this debt was incurred to pay for power generating facilities. This money was so unwisely invested that city administrators now doubt if they could sell the city utility for enough to cover the portion of the debt that is secured by utility revenues.

Part of the debt went to build the City's airport. This is nearly a complete white elephant, meaning a large chunk of land and capital practically unused. It is doubtful if its revenues even cover its current expenses, let alone debt service.

As a rough stab, interest is \$70 million a year. Meantime, the City is laying off over 200 workers. If the average salary plus benefits of the workers is \$40,000, the payroll savings will be about \$8 millions.

It does not have a similar option of "laying off" the debt. Sanctions for repudiating debt are severe. Workers, on the other hand, are expendable. They demonstrate and protest, but lack the kind of organized power bankers have. Thus, as we retrench, we become more capital-intensive than before. This is a kind of forced substitution of capital for labor that happens to overextended debtors.

7. P.141. Some "Revolving Funds" fail to revolve. These are permanent capital "sinks." The example is given of the U.S. Bureau of Reclamation, which builds dams in the arid west. In 1902, Congress endowed it with a Revolving Fund. It was to build dams etc. to serve certain lands with irrigation water, recoup the money each ten years, and use it then to build new dams elsewhere. The problem is, it never completed the first Revolution. In result, the Revolving Fund is frozen. Congress has kept the U.S.B.R. going by appropriating new funds, taken from other uses.

The U.S.B.R. probably could have recovered most of the capital it expended, if it had been authorized to recoup its benefits by levying taxes on the lands it upvalued. It lacked this power, however, so the benefits it created were regarded as current income by the owners of the benefited lands. In the normal course of events, they consumed added amounts equal to this "income." Thus, the capital was dissipated.

8. Investing is the outlay that creates incomes for labor. A closed economy cannot invest in excess of its CCAs, plus saving.

It must deliver the goods, or cut the payroll. Pie in the sky won't cut it.

9. A good way to perceive this is from the bankers' view. Every time a bank recovers its principal from an outstanding loan, it can make a new loan, which the borrower can use to hire people to work. If the average dollar takes 20 years to come back, that is making work once every 20 years; if it takes one year, that is 20 times as much labor employed with the same principal. Thus, high "loan turnover" substitutes labor for capital; low loan turnover does the opposite.

10. Capital structure and jobs

Capital may either complement labor or substitute for it, and which kind of capital investors create depends on relative prices. Thus the capital structure may adjust so that the existing supplies of capital and labor will match each other. In addition to relative prices, however, the capital structure is affected by institutional bias, including tax bias; and such bias may interfere with the market's homing in on full employment.

We may approach this idea first of all from the horizontally integrated viewpoint. An investor who is contemplating substituting machinery for labor observes that the machinery gets him an investment tax credit; while to employ labor costs him a payroll tax. The high minimum wage and generous unemployment compensation keep wage rates from falling, and the combination makes entrepreneurs substitute capital for labor. Similarly the deductibility of interest and property taxes, and the capital gains preferences, lure him to substitute land for labor.

Replacement of persons by machines is the most dramatic example of substitution, but probably not the most important. Some other kinds of substitution are the substitution of capital- and resource-intensive materials for labor-intensive materials. Processes as well as products are malleable. We can substitute capital by building in more durability at the front end to reduce maintenance and repair later. We can adapt to variability of demand by having excess capacity on standby in preference to utilizing more labor. We can shift the stage of production at which value is added as for example letting timber add more value on the stump so that less labor is required in the mills. We can substitute land for labor by using fewer men per acre on farms and shifting to less laborious kinds of crops. The possibilities are limited only by the imagination and the observation of actual practice.

Critics of the idea might now say, Ah-ha! Capital "locked-up" in power plants and hydro-electric dams and premature highways and excess capacity represents investment opportunities, exactly what Dr. Keynes ordered. Investment is what draws money out of hoards, keeps it circulating, and keeps the big clock from running down.

In answering that, this idea gets particularly interesting and wonderfully useful, giving important insight into where modern macroeconomics has gone wrong. Austrian economics, following some insights from Ricardo, has long anticipated this objection by looking at factor proportions in a vertically integrated scheme. When we look at the relations of capital and labor in sequence instead of in parallel, the capital content of value added depends on how long capital is tied up before its recovery.

For example if we finance a house over thirty years we pay twice as much in interest as in principal. The service flow over life is highly capital intensive because $2/3$ of the payments go as interest to pay for the use of capital.

Production of houses accordingly is very sensitive to the cost of capital, as we know. It is much less sensitive to wage rates. Observation has it, therefore, that if interest rates are low they entice investors into housing, and other investments of long life. High wage rates push them out of short investments like textiles or vegetable farming, but have small relative effect on housing.

Using this approach, we allow for the fact that labor produces capital, and investment creates jobs. But the capital in housing only creates jobs once every twenty years or so on the average (assuming it is half recovered and reinvested after twenty years). Let's compare this with a farmer's investment in growing carrots. The farmer recovers and reinvests his capital at least once a year (and maybe more often because he won't let it sit idle during the off season). Carrots are to be compared to Adam Smith's capital in the "home trade" making twelve operations while the same capital in foreign trade makes only one. Foreign trade here is comparable to housing. In a word a given sum of capital keeps more people busy over the years if it turns over faster. Each act of reinvesting creates a new payroll.

But at the same time each year's output of carrots feeds the brutes. The house to be sure also shelters them; but the value

of its service flow is only interest on the value plus a small recovery of principal. The value of the carrots is interest on the capital plus the whole principal. The house gives a year's service; the carrot gives its all.

It is common to justify tax shelters for housing (or municipal bonds or oil exploration or other capital-intensive investing) by pointing to the jobs created. But all this capital is switched away from other investing, like growing carrots. The true comparison is not between something and nothing, but between capital-intensive and labor-intensive investing. The comparison has to be made over the whole life cycle of the slower capital, wherein the fast capital may, as Adam Smith said, make 12 operations while the slow capital makes but one.

It follows that in any one year, in a balanced economy where retirements are matched by new investments, a given capital in (things like) carrots generates a regular flow of gross investment 12 times greater than an equal capital invested in (things like) trees of 12-year life.²

But are the carrots an efficient use of capital? The margin of profit is much less. Here we hark back to another paragon of the Age of Reason, Benjamin Franklin, who told us that "little and often makes much." It is not just the margin of profit that makes capital efficient, it is margin times turnover. This has been one of the leading principles of rational business management at least since Alfred Sloan reorganized General Motors in the 1920's with some advice from Donaldson Brown who came in from Dupont to help straighten out the cash flow crisis created by the over-expansive Mr. Will Durant. Sloan and Brown took great pains to require each division to earn a minimum return on capital. The rate of return was defined as margin times turnover, divided by capital.³

Elementary as this may sound (and oversimplified besides), it played a leading role in the rational management of that enormously successful mass of capital at General Motors. And it is not so elementary that we can assume it to be incorporated in the management of the nation's capital as influenced by its tax

²This is not limited to examples that resemble trees. It includes any other capital, e.g. a commercial jet airframe, whose average recovery period is 12 years.

³Thomas J. McNichols, EXECUTIVE POLICY AND STRATEGIC PLANNING, (New York: McGraw-Hill Book Company, 1977) p. 44.

system. The tax system, based on the working principle "shoot anything that moves," militates against turnover, because each turnover creates one or more taxable events.

When a manager considers turnover in addition to profit margin this pushes his capital into faster turning forms. These have smaller margins, but more of them, so the return on capital may be just as high or higher.

What, then, is the difference? A given capital rolling over faster employs more labor and produces more output for consumers. It "sets in motion," as Adam Smith would have said, more workers; and it sets them in motion productively so their employment does not simply generate inflation.

I would not recommend that all our investing go into working capital like carrots, and none into fixed capital like roadbeds, harbors, telephone poles, plant and equipment. There is an equilibrating market mechanism that finds an optimal balance. If capital is scarce and labor surplus, this should lead to higher interest rates and lower wage rates. These, in turn, draw investing into working capital, and away from fixed capital, until the "valence" of capital for labor shall have risen, soaking up the surplus labor.