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RETHINKING REPRODUCTION SCHEMES

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Abstract:

This article aims to develop reproduction schemes in two ways: It introduces the "depreciation" (wear and tear) of fixed means of production explicitly into the schemes. A separation of fixed means of production from its depreciation provides a clearer vision for the general nature of capital accumulation in a capitalist economy. It also argues that disaggregating the means of production into fixed means of production (capital equipment) and the circulating means of production (raw materials) is essential for the accuracy of the schemes. Our analysis shows that constant capital in department 2 (C2) must be larger than constant capital in department 1 (C1) in the simple reproduction scheme, and the difference between C1 and C2 must be equal to the circulating means of production.

Keywords: Simple and expanded reproduction schemes, capital accumulation, political economy.

INTRODUCTION

Marx's simple and expanded reproduction schemes have significant advantages over the standard macroeconomics and have great direct relevance to the real economies. This is because production by means of production provides much richer insights into how economies actually work and renders marginal productivity theory absurd. The schemes attracted widespread attention from Marxist and non-Marxist scholars over the years. While many valuable contributions have been made to the schemes, they remain relatively undeveloped compared to its mainstream rivals. While maintaining the essence of Marx's analysis, this article aims to develop Marx's reproduction schemes in two ways:

Introducing the "depreciation" (wear and tear) of fixed means of production explicitly into our model is an important contribution. A separation of fixed means of production from its depreciation provides a clear vision for the general nature of capital accumulation in a capitalist economy. It will be shown that capital accumulation starts when production of fixed means of production exceeds its depreciation. In the simple reproduction scheme, where economy is reproducing itself without any expansion, the production of fixed means of production is equal to its depreciation. Savings and investments that exist in the simple reproduction scheme neither create any net investments (extra capital) nor require any net savings (savings that require capitalists to reduce their consumption).

We also show that disaggregating the means of production into fixed means of production (capital equipment) and the circulating means of production (raw materials) is essential for the accuracy of the schemes. While the full value of circulating means of production (raw materials) are transferred into the value of means of consumption in a particular circuit of capital (therefore destroyed through consumption), the value of fixed means of production (capital equipment) are transferred gradually which constitute the basis of net savings and net investments. Our analysis shows that constant capital in department 2 (C2) must be larger than constant capital in department 1 (C1) in the

simple reproduction scheme, and the difference between C1 and C2 must be equal to the circulating means of production.

SIMPLE AND EXPANDED REPRODUCTION SCHEMES

In this section we will summarise the simple and expanded reproduction schemes, and explain their standard conclusions. Marx divides the economy into two departments. Department 1 produces means of production and department 2 produces means of consumption. Marx commences with the following numerical example:

Dept 1	4000C1 + 1000V1 + 1000S1 = 6000
Dept 2	2000C2 + 500V2 + 500S2 = 3000
	6000C + 1500V + 1500S = 9000

There are a number of standard assumptions of the reproduction schemes:

- There is no technical progress.
- Commodities are exchanged at their values.
- The capital-labour ratio and the value (and price) of a unit of output are constant.
- Real output, real and money wages, real surplus and value created per worker are constant.
- There is a reserve army of labour willing to take employment when offered.
- All means of consumption are consumed and there is no demand deficiency.

In this simple reproduction scheme, the total value of the means of production is £6,000 and the total value of the means of consumption is £3,000. The value of the output of each department is divided into three units: the value of the means of production (constant capital - C), the value of the labour-power (variable capital - V) and the surplus-value (S). The continuation of this simple reproduction requires the replacement of the means of production in the preceding period. Department 1, thus, uses £4,000 of its own product, sells the remaining £2,000 to Department 2 and buys means of

consumption in return. The remaining £1,000 worth of means of consumption is consumed in department 2. Values are created in the production of both the means of production and means of consumption. However, they only leave the cycle as means of consumption, as only the consumption of means of consumption can destroy values. The consumption of the means of production is productive consumption and cannot exterminate values.[1] The logic of simple production requires the consumption of all values that are produced in each circuit of capital. For uninterrupted reproduction, the total new values (variable capital and surplus-value) in both departments must be spent on means of consumption and spending on means of consumption by workers and capitalists in department 1 must equal spending on means of production by department 2. A failure of capitalists to spend all of the surplus-value on the means of consumption will result in demand deficiency in the absence of possibilities for investment for expansion of production.

At this stage it is useful for our purposes to define the following concepts that will play an important part in our analysis: "capital", "revenue", "savings" and "net savings". Marx defined "capital" as a fund that must be maintained intact to replace the means of production, while "revenue" as a flow of income that may be spent on consumption. "Net savings" can be defined as a part of "revenue" that is spent on means of production to expand production (net investments). In other words, "net saving" is a part of "revenue" that is spent not on means of consumption but on the expansion of production. Savings, then, can be defined as the total income that is spent to buy means of production regardless of its components: to replace the means of production that are consumed in the production process (replacement investment) and to buy new capital and hire new labour to expand production (net investment). We will show that only expansion of production requires "net savings" in form of a temporary reduction in capitalists' consumption. Capitalists do not need to reduce their consumption in order to keep the production at the same level. In other words, simple reproduction process requires no "net savings", although savings exist in form of "capital" to maintain the means of production.

[1] Unless they are wasted in production.

The nature of constant capital (particularly C1) in this reproduction scheme is complex and requires a detailed investigation. One interesting feature of the scheme is that although the total values created and consumed (thus destroyed) in a particular circuit of capital are equal to the values of the means of consumption, the total values of output are larger. The values of means of consumption (3000) are added to (in production process) and subtracted from (in consumption process) the values of the means of production in department 1 (4000) which travels through time without being destroyed. Where does this extra value (values of means of production in department 1) come from if it is not created in the production process in a particular circuit of capital? There are two interrelated issues that need to be investigated: First, the production of means of consumption can only take place if the means of production have already been produced. In other words, there is a time lag between the production of means of production and the production of means of consumption, and although the production of means of production takes place in a particular circuit of capital, the society has to wait for the production of means of consumption. Second, there is a need to separate fixed means of production and circulating means of production. Unlike the circulating means of production (raw materials) that are fully used up in the production process in the same circuit of capital, fixed means of production (capital equipment) is used up gradually and its value is transmitted into means of consumption (MC) slowly over many circuits of capital. Fixed means of production, therefore, can be defined as the means of production that has a life longer than one circuit of capital.

The expansion process, in its simplest form, involves two stages. The expansion starts when capitalists in department 1 decide to increase the production of the means of production. Given that the productivity level is fixed, the only way to increase the production of means of production is to employ more labour.[2] The newly employed workers to facilitate the expansion of means of production will need to be paid to maintain their labour power before the values they create are transmitted into means of

[2] Obviously more labour will be employed not only in the production of means of production but also in the production of means of production that is used to produce more means of production.

consumption which may take a long time. In other words, newly employed workers will create demand for the means of consumption before the expansion of means of consumption is realized. Because the means of consumption that are available at this stage remains constant, an increase in the consumption of workers (due to extra employment) will require an equivalent reduction in the consumption of capitalists.

Note that the expansion of capital does not cause a decline in the total production and consumption of the means of consumption as sometimes suggested. It is incorrect to argue that "while capitalists try to buy more means of production (to expand production) and less consumer goods, the result will be a surplus of unsaleable consumer goods" (Brewer, 1984: 122). Rosa Luxembourg was also confused by the same puzzle when she asked if capitalists save and exploitation rate is constant, where extra demand comes from for the new extra production. The answer is clear, the extra demand needed for expansion will come from extra workers employed and so as long as more workers are impregnated into the economy there will be no shortage of demand. Capitalists reduce their consumption (save) in order for the newly employed workers to meet their immediate needs without waiting the values they create to become ready for consumption. If workers were willing to wait for the production of means of consumption, there would be no reason why expansion should be tied to the savings of capitalists. Savings in this sense are not a reduction in the total number of means of consumption but a reduction in the consumption of the capitalists. To increase production more workers need to be employed and they need to be paid prior to the expansion of means of consumption.

In the second stage, the capitalists in department 2 need to buy extra units of means of production as well as extra labour power to increase the production of means of consumption. Once the expansion is complete and the extra means of consumption are in the market, capitalists and workers in both departments can increase their consumption and the capital accumulation may continue in the same manner. The larger the savings and investments, the larger the accumulation of capital, employment and the production of means of consumption.

A NEW THEORETICAL MODEL

As it was stated earlier, this article aims to develop Marx's simple and expanded reproduction schemes by means of a number of additions to the above model. The model is not an alternative to Marx's model but develops and elucidates it by means of a number of new tools.

First, we introduce the "depreciation" (wear and tear) of fixed means of production (FMPD) explicitly into the schemes which allows us to distinguish the depreciation of fixed means of production from the stock of fixed means of production. One cannot easily understand and explain capital accumulation in the absence of this separation. Capital accumulation occurs when the production of capital exceeds its productive consumption (depreciation) in a particular circuit of capital. Simple reproduction implies the economy is using as much capital as it is producing and there is no capital accumulation. And capital de-accumulation will take place if less capital than used is created. Therefore the depreciation of capital has to be explicitly introduced into the model.

Second, we separate the fixed means of production (FMP - capital equipment) from the circulating means of production (CMP - raw materials) which improves the accuracy of the schemes. The full value of CMP are transferred into the value of means of consumption (MC) in a particular circuit of capital and destroyed through consumption. The value of FMP, however, is transferred into the value of MC gradually and lasts more than one circuit of capital.

The following equations will be useful to demonstrate the nature of capital accumulation.

1. MCVA = V2 + S2

Means of consumption value added (MCVA) is the value added in department 2. In the same manner V1+S1 is the value added in department 1.

2. MC (P2) = C2 + V2 + S2 = FMPD + CMP + MCVA

The value of MC (P2) is equal to C2 + V2 + S2. It is also equal to, the values added in department 1 (FMPD and CMP) and the values added in department 2 (MCVA) to the total value of MC. In other words, FMPD, CMP and MCVA are the values that are added to the MC which are destroyed through the consumption of MC in a particular circuit of capital.

3. GDP = V1 + S1 + V2 + S2 = FMP + CMP + MCVA

This is the total values created in department 1 and 2 in a particular circuit of capital. It is, therefore, equal to V1 + S1 + V2 + S2. It is also equal to the values of fixed means of production (FMP), circulating means of production (CMP) and values added in department 2 (MCVA).

4. GDP = MC when FMPD = FMP

The GDP is the values created in a particular circuit of capital and MC (P2) is the values that are destroyed through unproductive consumption. The difference between MC (P2) and GDP is equal to the difference between FMP and FMPD. When FMP is larger than its depreciation (FMPD) in a particular circuit of capital, the economy is experiencing capital accumulation (expanded reproduction). In this case the economy is producing more fixed means of production than it is using in that particular circuit of capital. When FMP is equal to FMPD the economy is using as much fixed means of production as it is producing and there is no capital accumulation (simple reproduction). Equations 2 and 3 imply that when FMP = FMPD, then GDP = MC.

5. C1 = FMP

C1 is equal to the fixed means of production in department 1 by definition. This is the only value that is transferred to the next time period. Although the total values created and consumed in a particular circuit of capital are equal to the values of the means of consumption, the total values of output are larger.

6. C2 = FMPD + CMP

C2 is the fixed means of production in department 2 and is equal to P2 - (V2+S2) (from equation 2). It is also equal to the sum of FMPD and CMP which can easily be confirmed:

C2 + V2 + S2 = FMPD + CMP + MCVA (equation 2) and
MCVA = V2 + S2 (equation 1).
Therefore C2 + MCVA = FMPD + CMP + MCVA
If we delete MCVA from both sides
C2 = FMPD + CMP.

THEORETICAL FINDINGS AND CONSLUSIONS

First, our model is fully consistent with the basics of Marx's reproduction schemes. In Marx, simple reproduction requires V1 + S1 = C2, and expanded reproduction requires V1 + S1 > C2. Our analysis suggest that simple reproduction requires FMP = FMPD and expanded reproduction requires FMP > FMPD. These are identical and express the same phenomenon in two alternative ways. To demonstrate this claim we will express V1+S1 and C2 in terms of our new notations. We know that

V1 + S1 + V2 + S2 = FMP + CMP + MCVA (equation 3) and
MCVA = V2 + S2 (equation 1).
Therefore V1 + S1 = FMP + CMP.

We also know that C2 = FMPD + CMP (equation 8).

Therefore V1 + S1 = C2 can also be expressed as FMP + CMP = FMPD + CMP.

If we delete CMP from both sides, simple reproduction requires FMP = FMPD and expanded reproduction requires FMP>FMPD.

In other words, FMP = FMPD (FMP > FMPD) is an alternative manifestation of V1 + S1 = C2 (V1 + S1 > C2).

Second, the most important finding of the above theoretical framework is that, in simple reproduction C2 must be larger than C1, and the difference between C2 and C1 must be equal to the value of CMP (raw materials). This implies that if no CMP is used, then C1 must be equal to C2. And if no FMP is used, C1 will be zero and C2 must be equal to CMP. These are easy to prove by using the above equations:

- C2 = FMPD + CMP (equation 8)
- Under simple reproduction (zero net investments) FMP = FMPD (equation 6)
- Therefore C2 = FMP + CMP
- C1 = FMP (equation 7)
- Therefore C2 = C1 + CMP
- C2 > C1 and C2 - C1 = CMP
- If CMP = 0, then C1 = C2
- If C1 = 0, then C2 = CMP. This implies no net savings and investments.

C1 exists simply because FMP lasts more than one time period. If the economy had only CMP, then C1 would be zero and there would be no net savings and investments. In simple reproduction process there are no net savings and investment. Net savings and investment are required when economy expands.

Finally, our theoretical framework provides a clear vision on the net savings and net investments. Net saving is equal to the difference between GDP and MC (Net savings = GDP - MC) and net investment is equal to the difference between FMP and FMPD (Net investment = FMP – FMPD).

Equation 2, 3 and 4 imply that when the economy is expanding the GDP (values that are created) exceeds the means of consumption (values that are destroyed). Therefore there are net savings in the economy, i.e. not all the values produced are consumed. When GDP is equal to the means of consumption (MC), however, all the produced values are consumed and there are no net savings. The existence of net savings here does not mean that there is lack of demand for the means of consumption. It means that (in that particular circuit) more fixed means of production than can be (transferred into the MC) consumed is produced (FMP>FMPD).

When the economy produces more fixed means of production than can be used up in that particular circuit, then there is capital accumulation which requires net investment. In simple reproduction there is no expansion of capital, therefore no net investment. In this case FMP is equal to FMPD.