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Introduction to Multiple-Product Industries Models

8.1 Fixed Capital and Land

The models analysed in Chapters 2–7 are without doubt very unrealistic. Absent from consideration were durable capital goods, non-produced means of production and intrinsic joint production of the wool-and-mutton variety – an impressive list of omissions. Yet the models in Chapters 2–7 embody the important feature that means of production are advanced, with profits paid at a uniform rate on their value. Furthermore, the study of these simpler models provides the foundation for the analysis of multiple-product industries models in the sense that the principles established for the former apply mutatis mutandis to the latter. This remark can best be appreciated by considering a particular example.

Suppose that, in the two-sector model, one of the commodities, say the first, is a machine which has a maximum physical lifetime of one year when employed in the first industry and two years when employed in the second. The machine is thus a circulating capital good in the machine sector and a fixed capital good in the other, say the iron, sector;¹ assume that iron is used as circulating capital in both sectors. As the machine can be used for two years in the iron sector, there are two corresponding processes. In the first, a new machine is combined with iron and labour inputs to produce as gross output a quantity of iron and a one-year-old machine. This one-year-old machine can then enter the second process with iron and labour inputs (possibly different from those in the first process)
to produce a quantity of iron (again, possibly different from that in the first process). There are two points to be made about this model, which is the simplest multi-sector model that can be constructed with fixed capital. There is joint production in the first process, with iron and the ageing machine as outputs. More importantly though, it should be recognised that the item of fixed capital is analysed as two circulating capital goods – a new machine in the first process which becomes a one-year-old machine in the second process. This brief discussion suggests similarities between the analyses of fixed and circulating capital goods – a proper treatment of the former should be in terms of the framework provided by the latter. This is not to say that results on single-product industries, circulating capital models can be immediately applied to fixed capital models: for, in the first process of the example above, joint production necessarily arises.

Two points have been established above: explicitly, that the analysis of circulating capital is relevant to the analysis of fixed capital; and, implicitly, that fixed capital must be treated within a joint production framework. Similar conclusions apply if a non-produced means of production such as land is employed. By way of example, suppose that the first sector produces iron, the second wheat on homogeneous land which is unaffected by production. Then, in this case of intensive rent, there will be room for two processes operating on the land, determining a uniform rent per acre. In each process, land enters as means of production with the circulating capital and labour inputs to emerge as part of the gross output with wheat.

8.2 Arrangement of Chapters 9–11

In Chapter 9, I deal with fixed capital, concentrating on the simple model used for illustrative purposes in section 8.1. Having established the basic results for this case, I describe how the model can be generalised to permit, inter alia, the use of fixed capital in both sectors. Next, in Chapter 10, I analyse models with non-produced means of production, the emphasis being mainly on the familiar cases of extensive and intensive rent. It will be seen that some of the results from Chapter 6 cannot be extended to the models of Chapters 9 and 10. In Chapter 11, I relax the assumptions of Chapters 2–7 in a different way by examining pure joint pro-