At Last, A Modern Theory of Production

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Date : Apr 17, 2015

This is the third and final installment of the “At Last” blogs. Next week will very briefly summarize generalized-exchange macroeconomics, followed by an elaboration on the Project’s biggest idea. The six blogs summarizing the GEM theory constitute a small reference collection on the Project’s core innovations that are collected in the “First-Look” section on the website’s Blog page. Each provides a quick-read introduction to essential GEM features, allowing the much more fulsome manuscript to be taken on at readers’ leisure.

In the GEM treatment of production, the two venues in the bifurcated generalized-exchange macroeconomics are each defined for a given state of technical knowledge. The large-establishment venue (LEV) is populated by homogeneous firms, characterized by big scale and input specificities that generate costly, asymmetric workplace information and routinized jobs. Homogeneous firms in the small-establishment venue (SVE) demonstrate little scale, the absence of meaningful specificities, and cost-effective worker monitoring.

In the simplest version of the GEM Project, SEV production is highly simplified. First-degree homogenous output is posited to be increasing in its single input, labor hours. Innovative modeling is confined to LEV production, $X_J = f(\acute{E}_J, \acute{K}_J)$ such that $\acute{E}_J = \acute{Z}_J H_J$ and $\acute{K}_J(t) \leq \acute{K}_J^P(t) = f(\mathcal{K}_J(t))$; the variables are defined below. (Also see the website Glossary.) In the short-run, encompassing cyclical deviations from trend but excluding technological change, cooperative labor input ($\acute{E}$) is reasonably posited to be used in fixed proportion with capital services ($\acute{K}$).

LEV employee behavior is the intuitive starting point for the construction of the modern theory of production. (Chapter 2, 3) Define, from the perspective of the representative establishment, a measure of labor input ($\acute{E}_J$) for which the production function is well defined. Variable $\acute{E}_J$ is linked to labor hours paid for (H_J) by a scalar $\acute{Z}_J$, which in TVGE modeling captures worker rational on-the-job behavior (OJB):

$$\acute{E}_J = \acute{E}^Q{}_J + \acute{E}^G{}_J + \acute{E}^S{}_J(t) = \acute{Z}_J H_J, \text{ such that } \acute{Z}_J \geq 0,$$

where $\acute{E}^Q$ measures the contribution from unenhanced employee hours, $\acute{E}^G$ denotes the contribution from general human capital, and $\acute{E}^S$ the contribution from firm-specific human capital.

With respect to the input of capital, there exists maximum real output (X_J^P) described by a capacity function, $X_J^P = f(\mathcal{K}_J)$, such that X_J^P is increasing in capital stock $\mathcal{K}_J$ and provides an upper bound on production, $X_J \leq X_J^P$. The relationship is posited to accommodate variable returns to scale, a technological law that is understood to be axiomatic. Capital services $\acute{K}_J$ flow from the capital stock, $\acute{K}_J^P = f(\mathcal{K}_J)$, s.t. $\acute{K}_J \leq \acute{K}_J^P$).

Here’s the GEM rub. Large-scale production, ubiquitous after the Second Industrial Revolution, corrupts the analytic integrity of marginal productivities for both labor hours ($\delta X_J/\delta H_J$) and capital stock ($\delta X_J/\delta \mathcal{K}_J$), depriving coherent market-centric modeling of critical microfoundations. The generalization of rational exchange imposes $H_J = \acute{E}_J/\acute{Z}_J$ on labor services, the complications from which have occupied much of the two previous weeks’ blogs. [(Chapter 2)]() Meanwhile, large-establishment capital stock ($\mathcal{K}_J$) is both insufficiently divisible and excessively firm-specific to support Euler-theorem distribution. [(Chapter 3)]() Given indivisibility, proportional amounts of capital cannot be withdrawn in response to relatively small reductions in output, as illustrated by the absence of small-lot capital-stock liquidations in cyclical downturns. What is instead marginally withdrawn, with a cut in output, is some utilization of capital services ($\acute{K}_J$) that are made available by the existing capital stock. Neither LEV input, $\acute{E}$ nor $\acute{K}$, can be rationally priced in the marketplace.

The reformulated LEV production-function permits a useful distinction between *capital-capacity utilization* ($\exists(t) = \acute{K}_J(t)/\acute{K}^P{}_J(t)$, $\acute{K}^P{}_J(t) = f(\mathcal{K}_J(t))$) and *production-capability* ($\epsilon(t) = X_J(t) + \hat{C}_J(t) \leq X_J^P(t)$), $\epsilon(t) = \epsilon^V(t) + \epsilon^T(t)$). The former is a familiar concept. The latter is more novel, reflecting the workplace availability of inputs needed to support scheduled output, with $\hat{C}(t)$ denoting firms’ desired margin of unused production capability that is best understood as a short-term buffer against unanticipated increases in product demand. Significant stationary variations in product demand alter both production-capability (ϵ), wholly via adjustments to labor input, and capital-capacity utilization ($\exists(t)$).

LEV production-capability ($\epsilon(t) = \epsilon^V(t) + \epsilon^T(t)$)) plays a significant role in GEM macrodynamics that would benefit from some elaboration. ϵ^V denotes stationary adjustments in production capability, rooted in the profit-seeking management of labor input, around its trend. Given rational meaningful wage rigidity, high-frequency adverse nominal disturbances (with plausible demand elasticities) induce quantity, rather than price, reductions. In the familiar process, layoffs in recession are followed by rehiring in recovery. Correspondingly, ϵ^{T} reflects movement in nonstationary production capability that variously results from capital investment and associated hiring or, in the opposite direction, job downsizing. Expectations that motivate rational LEV noncyclical capability adjustments are rooted in rational expectations of pure profit (*И*). (Chapter 6) Perceived future profits are subject to both anticipated total spending and the ever-present hold-up problem (*Ɥ*), which is elaborated upon in Chapter 3. Investment, as a result, is the most volatile component of aggregate demand in the GEM Project.

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