

Chapter Six

**WORKPLACE-MARKETPLACE
SYNTHESIS**



James E. Annable

CHAPTER SIX

WORKPLACE-MARKETPLACE SYNTHESIS

This chapter completes construction of the introductory two-venue general-equilibrium model. In the spirit of Walras, the Workplace-Marketplace Synthesis has been erected on behavior that is the aggregated outcome of rational agent choice.¹ The principal difference from Walras is that optimizing activity is not restricted to the marketplace. Price-mediated workplace exchange has become an essential part of the macro narrative. Only one of Walras's two fundamental ideas survives the generalization of exchange. Markets remain deeply interconnected, but they are no longer in (or even necessarily moving toward) the particular class of general equilibrium that equilibrates demand and supply.

In two-venue general equilibrium (TVGE) modeling, both marketplace and workplace exchange is self-organizing. The former is spontaneous, while the latter (concentrated in large, specialized establishments) is intentional. The much larger spontaneous venue includes small firms, familiar from textbook analysis, that cede resolution of their employee-exchange problem to the marketplace; it is also home for most other input and final-product transactions. The intentional venue, despite its relatively compact size, is critically important. Its consequence is largely rooted in its rational payment of wages that are both downward rigid over the business cycle and chronically in excess of market-opportunity costs. Generalized exchange has been shown to ration good jobs as well as hours on those jobs and to be the wellspring of the class of meta-externalities that justify the discretionary management of aggregate demand.²

This chapter begins with an overview of two-venue macroeconomics, featuring a pared-down AS-IS-LM model enriched with generalized exchange. The analysis that follows focuses on

¹ Recall that the model designations WMS (workplace-marketplace synthesis) and TVGE are used interchangeably, just as SVGE (single-venue general equilibrium) and the more familiar DSGE are interchangeable.

² The WMS microfounds an idea long present in the labor and organization literatures, variously illustrated by Kerr's (1954) "balkanized" labor markets, Robertson's (1923) colorful "islands of conscious power in this ocean of unconscious cooperation, like lumps of butter coagulating in a pail of buttermilk" (p.84), Piore's (1980) "dual labor markets", and the opinion of Simon's (1991) visiting Martian that "organizational economy" (rather than market economy) would better describe most production and distribution on Earth.

aggregate demand. In Part II, the long moribund fixed-wage general-equilibrium (FWGE) model class, inspired by Clower and Patinkin and associated with Barro, Grossman, Malinvaud, Drèze, Bénassy, *et al.*, is reconfigured to be consistent with the generalized-exchange methodology and used to investigate the nature of continuous-equilibrium consumption. The primacy of income and wealth in household spending is microfounded. Next is an overview of the complex of TVGE forces governing the cyclical and trend calibration of firms' production capability, with an emphasis on capital investment. Part IV summarizes modern work on rational investor/lender inaction and the revival of Keynes's emphasis on investor confidence. Both are used to model extreme demand instability, an under-appreciated policy-relevant phenomenon. The accumulated tools help explain troubling facts produced by the 2007-09 Great Recession.

The TVGE version of the natural rate of unemployment is outlined in the fifth section, followed by a in-depth look at the consensus New Neoclassical Synthesis. A relatively long Part VII assesses and compares the TVGE and SVGE model classes, using the contemporary labor-wedge literature to facilitate evaluation. Finally, there is a conclusion.

I. OVERVIEW OF THE WORKPLACE-MARKETPLACE SYNTHESIS

Two venues. Building on fundamental heterogeneities (in decision rules, constraints, and mechanisms of exchange), workplace exchange in the unbundled large-establishment and bundled small-firm venues has been derived:³

$$\begin{aligned}
 (6.1) \quad & \dot{Z}_j(t) = f(W_j(t), W_j^n(t), \dot{Z}_j^m), \\
 & \text{such that if } W_j(t) \in [W_j^n(t), W^m(t)], \\
 & (\Delta \dot{Z}_j(t) / \dot{Z}_j^n(t)) / (\Delta W_j(t) / W_j^n(t)) > 1; \\
 (6.2) \quad & \dot{Z}_K(t) = \dot{Z}_K^m \text{ and } W_K(t) = W^m(t), \\
 & \text{such that if } W_K(t) > W^m(t), \\
 & (\Delta \dot{Z}_K(t) / \dot{Z}_K^m) / (\Delta W_K(t) / W^m(t)) < 1.
 \end{aligned}$$

Exchange generalization has powerful implications. LEV labor pricing occurs only in the workplace; SEV wages default to the marketplace. The two venues are combined into a

³ Recall that, if $W_j > W_j^n$, then $(\Delta \dot{Z}_j / \dot{Z}_j^n) / (\Delta W_j / W_j^n) = 0$. The notation is defined in the Glossary.

continuous-equilibrium framework that microfounds meaningful wage rigidity (MWR), good-job rationing, and consequential meta-externalities resulting from a range of nominal-demand disturbances.

LEV equilibrium features unbundled exchange, resulting from the simultaneous optimization of employer labor pricing and employee on-the-job behavior at $W_j(t) = W^n_j(t) = \max(\dot{Z}_j(t)/W_j(t)) = \sup \mathbf{K}_j(t) > W^m(t)$ and $\dot{Z}_j(t) = \dot{Z}^n_j(t)$. Workplace macrodynamics are rooted in employees' inter-temporal calibration of their reference standards ($\mathbf{K}_j(t)$), a process governed by rational substitution of consumption for equitable treatment by employers.⁴ The tradeoff is informed by production-capability decisions motivated by rational profit expectations, reducing the role of interest rates relative to mainstream thinking.

Pure profits (Π_j), the income-distribution residual claimed by owners of sunk capital, are restored to the central role they played in classical thinking. Generalized-exchange modeling is then able to assign, as needed, coherent roles to increasing returns, proprietary technological innovations, wage cartelization, product-pricing power, the hold-up problem, and fluctuations in nominal demand. Enriched profit dynamics imply a strong tendency for employee reference standards (\mathbf{K}_j) to be durable, always unchanged in response to business cycles and not unreasonably unchanged deep into the medium term. The efficiency wage (W^a_j), chronically exceeding labor opportunity costs, pushes workers off their market-supply schedule. Rational work-leisure substitution is suppressed, restricting LEV employee choice to optimizing his or her OJB.

Meanwhile, SEV employers effectively monitor workplace behavior, bundling their Workplace-Exchange Relations (WER) and optimizing labor pricing at $W_K(t) = W^m(t)$ and labor behavior at $\dot{Z}_K(t) = \dot{Z}^m_K$. Firms and workers can do no better than being market-price takers. Employees lack workplace information imperfections needed for the spontaneous establishment of interpersonal/intertemporal reference standards. \mathbf{K}_K is truncated ($\mathbf{K}_K(t) = \{W^a(t)\}$), $\sup \mathbf{K}_K(t) = W^a(t) = W^m(t)$, and worker attention is focused on optimizing work-leisure choice as well as the ongoing search for good (rent-receiving) employment.

⁴ Recall that, for convenience, employees are posited always to prefer consumption to equitable treatment.

Involuntary job loss requires the suppression of wage recontracting and is, therefore, confined to LEV firms with their characteristically unbundled \dot{Z} . If SEV labor pricing and use is not government restricted, TVGE economies tend to generate relatively robust total employment, while being vulnerable to socioeconomic problems rooted in earnings inequality not meaningfully grounded in inherent or general human capital.

Rational employment. It will comfort practitioners that, unlike market-centric modeling, LEV workplace equilibrium does not simultaneously determine the rational wage and level of employment. The central innovation in large-firm management of labor input is the substitution of the workplace-exchange relation for market labor supply in optimizing employer-employee interaction. The baseline labor-input supply schedule, on its own, determines the rational wage on its own, making labor pricing demand-independent.

LEV management identifies its production schedule, with its particular levels of labor hours, capital services, and material input, as a function of expected product demand subject to rational profit seeking. As a result, optimal labor input is recognizably adjusted over the business cycle. Given that labor hours available for production (H_J^P) are increasing in the level of employment ($H_J^P=f(E_J)$, such that $\Delta H_J^P/\Delta E_J>0$), rising demand at some point pushes firms to hire more workers, a process that is influenced by overtime premiums as well as physical/socioeconomic constraints on the length of the workweek. Opposite-direction adjustments (reduced workweek, layoffs and job downsizing) were analyzed in Chapter 3.

Given $W_J=W_J^a=W_J^a$, labor input that is in 1:1 correspondence to production can be measured by worker hours. Chronic wage rent combines with the substantial pool of SEV employees to produce an elastic market-supply schedule to LEV firms at their profit-seeking wage (W_J^a).⁵ Large establishment employment determination is consistent with the generalized-exchange reorientation of macroeconomics to feature powerful causation from nominal demand disturbances to same-direction changes in employment and output.

⁵ The TVGE mechanics recall Oskar Lange's (1942, 1944) early interpretation of *The General Theory's* "unemployment equilibrium" in which Keynes implicitly assumes an infinitely elastic labor-supply curve in response to a rigid money wage,

Venue linkages. In addition to the intermarket linkages retained from mainstream SVGE modeling, including relative prices and elasticities that allocate various demands and supplies, the workplace and marketplace venues are largely connected via three mechanisms. First is the dominance of LEV labor pricing and use, generating powerful constraints on decision-rule optimization in both venues. Those restraints are rooted in the necessary rationing of both rent-receiving employment and hours worked in those good jobs. Second is Harris-Todaro (1970) inter-venue labor transfer (also named Lewis Transfer) that is rationally mediated by LEV wage premiums and job prospects. Third is Baumol's (1967) "cost disease" that helps reconcile sectoral unbalanced productivity growth.

Large establishments populate the dominant venue, i.e., the locus of workplaces governed by decision rules, constraints, and exchange mechanisms that rationally prices market-homogeneous labor higher than remaining (SEV) firms. The existence of LEV wages powerfully constrains the optimization of marketplace decision rules. Because job rationing must follow from the payment of wage rents, SEV workers are forced to exchange hours on the job at less preferred terms than comparable LEV employees, who are themselves frustrated by the rationed workweeks in their rent-paying jobs. (Chapter 2) That inter-venue constraint on market optimization enables the simultaneous existence of continuous general decision-rule equilibrium, the failure of markets to clear, periodic involuntary job loss, income-driven consumption, and profit-driven investment.

The Harris-Todaro model (Chapter 3) is a venerable, underappreciated contribution to economic thinking that links dominant and subordinate venues via labor transfer motivated by the rational assessment of relative opportunities.⁶ The inability of many job-seekers to find work at the going (relatively high) LEV wage, despite being qualified for such jobs, is indicative of chronic market failure. Newspaper reports during the 2007-09 recession describe persons "... working two or three jobs as they looked for a good one." (*New York Times*, November 22, 2009, p.30) Such behavior, broadly accepted as unexceptional, only makes sense in the context of persistent wage rents, rationed high-wage jobs, and plentiful low-wage employment.

⁶ In 2011, Harris and Todaro (1970) was selected as one of the twenty most important articles appearing in the first 100 years of the *American Economic Review*. The most rigorous modeling of the Harris-Todaro linkage, developed independently, can be found in Annable (1971).

The remaining mechanism was identified in Baumol's insightful analysis of the dynamic interaction of two sectors with strictly different labor-productivity growth. He restricts his model to competitive wages and concludes that relative unit costs increase without limit in the low-productivity sector, pushing up its relative price and, within a normal range of demand elasticities, shrinking its relative size. TVGE modeling generalizes Baumol's conclusions, demonstrating that axiomatic preferences and technology produce labor rents that restrict the growth of the high-productivity sector. More general "cost-disease" problems are implicated in the generalized-exchange class of market inefficiencies, including restricted consumption, arbitrary wage inequality, chronic joblessness, and socioeconomic disruptions resulting from periodic downsizing of good jobs.

Filling out the small model. Adopting the familiar model-building strategy of limiting compact macro analysis to explicating business cycles, central TVGE innovations can be illustratively introduced into the familiar three-part AS-IS-LM framework of the sort I used to estimate:⁷

$$\begin{aligned}
 (6.3) \quad & X(t)=f(E_J(t),K_J(t),H_K(t)), \text{ such that} \\
 & E_J(t)=\dot{Z}_J(t)H_J(t), \quad K(t)\leq K^P(t)=f(K(t)), \\
 & \Delta X(t)/\Delta E_J(t)>0, \quad \Delta X(t)/\Delta K_J(t)>0, \\
 & \Delta X(t)/\Delta H_K(t)>0; \\
 (6.4) \quad & w(t)=b_0+b_1(U^N-U(t))+b_2p_L(t), \text{ such that} \\
 & w(t)=f(w_J(t),w_K(t)), \quad W(t)=(1+w(t))W(t-1);^8 \\
 (6.5) \quad & p(t)=f(w(t), K(t)/K^P(t)), \text{ such that} \\
 & \Delta p(t)/\Delta w(t)>0, \quad \Delta p(t)/\Delta(K(t)/K^P(t))>0, \\
 & P(t)=(1+p(t))P(t-1); \\
 (6.6) \quad & H(t)=f(Y(t),\Pi(t),L_\lambda(t)), \text{ such that} \\
 & L_\lambda(t)=\ell L_\lambda(t-1), \quad \dot{Y}(t)=W(t)H(t); \\
 (6.7) \quad & U(t)=1-(N(t))/L_\lambda(t), \text{ such that } N(t)=H(t)/\ddot{a}.
 \end{aligned}$$

⁷ The notation is defined in the Glossary. Confining attention to business cycles implies baseline unchanged K_J . (See Chapter 3.) Reducing the economy to a small model requires usual simplifying assumptions.

⁸ The TVGE reduced-form Phillips relation used here was derived in the Chapter 4 (equation 4.26), implicitly incorporating the J th-venue simultaneous optimization of OJB ($\dot{Z}_J=\dot{Z}_J^m$) and labor pricing ($W_J=W_J^m=W_J^h$) as well as the more familiar rational wage determination ($W_K=W_K^m$) in the K th-venue. Note that the expectations term from Chapter 4 ($b_3(E_t p^N(t+1)-E_{t-1} p^N(t))$) is suppressed by the model's assumption of constant money growth (\dot{m}).

$$(6.8) \quad Y(t) = C(t) + I(t) = W(t)H(t) + \tilde{r}^m(t)K^r(t) + \Pi(t), \text{ such that} \\ Y(t)/P(t) = X(t), K^r(t)/K(t) = \tilde{a};$$

$$(6.9) \quad C(t) = f(Y(t)), \text{ s.t. } 0 < \Delta C(t) / \Delta(Y(t)) < 1, S(t) = Y(t) - C(t);$$

$$(6.10) \quad I(t) = f(\Pi(t), \tilde{r}^m(t)), \text{ s.t. } \Delta I(t) / \Delta \Pi(t) > 0, \\ \Delta I(t) / \Delta \tilde{r}^m(t) < 0, \Delta K(t) = I(t-1) / P(t-1), I(t) = S(t)$$

$$(6.11) \quad M(t) = L(Y(t), \tilde{r}^m(t)), \text{ such that } M(t) = mM(t-1), \\ \Delta L(t) / \Delta Y(t) > 0, \Delta L(t) / \Delta \tilde{r}^m(t) \leq 0.^9$$

Generalized-exchange innovations are captured in equations 6.3, 6.4, 6.5, 6.6, 6.8, 6.9, and 6.10. Most critically, the continuous-equilibrium MWR Channel is embedded in equation 6.4 in the aggregate-supply section. (Chapter 4.) TVGE modeling imposes a tight structure on b_i . In LEV firms, the efficiency wage is paid, good jobs are rationed, and cyclical nominal wage reductions are irrational. Recall that the influence of market unemployment is restricted to SEV labor pricing. Equation 6.6 notably reflects the consequent reorientation of employment determination to reflect the now causal role of aggregate nominal demand.¹⁰

The tight structure imposed by the MWR Channel broadly shoves the compact model away from its SVGE roots. Notional market-clearing plans, disrupted by good-job rationing, are replaced by effective plans that take into account quantity restrictions; downward wage rigidity forces quantity signals into model coordination. Equation 6.9 is an income-centric Keynesian consumption function, microfounded as an continuous-equilibrium specification in the next section. Similarly, in equation 6.10, rational expectations of pure profit recognizably replace interest rates as the dominant determinant of capital investment.¹¹ (See Section III.)

⁹ In the compact model, the simple liquidity-preference function is interchangeable with a central-bank policy rule, which is elaborated upon in Chapter 10.

¹⁰ That reorientation is the indispensable Keynesian innovation. From the preface to the 1939 French edition of the *General Theory*: “It is shown that, generally speaking, the actual level of output and employment depends, not on the capacity to produce or on the preexisting level of incomes, but on the current decisions to produce which depend in turn on current decisions to invest and on present expectations of current and prospective consumption.” See Johnson and Moggridge (1973), vol. VII, p. xxxiii.

¹¹ Kalecki (1935) notably separated consumption into the two classes, motivating his path-breaking widow-cruise analysis. Consistent with Kalecki’s theory of effective demand, LEV investment decisions in the circumstances of underutilized economic capacity ($U > U^N$) are understood to be at least partly independent of concurrent saving,

BOX 6.1: RECOGNIZABLY CALIBRATED MACRODYNAMICS

The generalization of exchange motivates a monetary theory of production that coherently accommodates a great deal of Keynesian macrodynamics. Stochastic shocks are propagated by consequent demand disturbances that combine with the fully microfounded MWR Channel to produce recognizably-sized contractions. The consequent welfare loss depends on the size and speed of total-spending instability and can be ameliorated by discretionary interventions in total spending. TVGE theorists are deeply skeptical of the recurring argument, typically reappearing in extended expansions, that instability has been fundamentally tamed. Mainstream macro-economists, building models wholly within the SVGE framework that coherently accommodates neither involuntary job loss nor recessions that generate recognizable welfare loss, are understandably vulnerable to misinterpreting periods of relative calm as the structural shift needed to usher in some great moderation that makes consensus macro theory more stabilization relevant.

Prior to the 2008-09 economic crisis, Robert Hall fell victim to the mainstream allure of “great moderations”, writing a series of papers that separated U.S. recessions into two chronological classes. He asserted a metamorphosis of cyclical contractions into their “modern” form some time after the challenging 1981-82 downturn. From Hall (2005a): “In the modern U.S. economy, recessions do not begin with a burst of layoffs. Unemployment rises because jobs are hard to find, not because an unusual number of people are thrown into unemployment.” He argued that in “modern” recessions familiar search/match/bargain modeling, focusing on voluntary unemployment that occurs while looking for “hard-to-find” jobs, provides adequate explanation of labor cyclical. Hall concluded that, once embedded in the coherent SVGE framework, S/M/B was sufficiently robust to support operational policy theorems.

The capacity to assess the “modern-recessions” hypothesis was itself made more robust with the expansion of the sample size from two to three. Table 1.1 shows that the 2007-09 recession (by definition part of the modern class of business cycles) was severe, with its labor-market deterioration dominated by job losers. The six million increase in involuntarily lost jobs accounted for more than three-quarters of the increase in total unemployment. People who were, in Hall’s words, “thrown into unemployment” were the overwhelming cause of the damaging rise in joblessness. The 2007-09 cyclical contraction reduces the analytic value of the modern-recessions hypothesis to little more than illustrating the eagerness of SVGE theorists to claim some stabilization relevance for their stabilization-challenged model class.

Sufficiently adverse movement in nominal demand causes macro instability that, in the compact model, is manifest in recession. The most compelling feature of the compact model is that the

spontaneously generating their own financing via increased economic activity and the more efficient utilization of available resources.

weakening phase of a stationary demand disturbance ($\Delta Y < 0$) interacts with the tightly restricted wage equation to induce, consistent with the minimum-transactions rule and reasonable price discovery, continuous-equilibrium involuntary job loss ($\Delta N < 0$). Disturbances are propagated via constrained-spending and related multipliers. The resulting market failure is best understood as a meta-externality that critically justifies government intervention in total nominal spending, a response easily introduced into the model via a discretionary policy rule (focused on joblessness and inflation) that makes money endogenous. (Chapter 10) Given its microfounded MWR Channel, the compact TVGE model is more stabilization-relevant than any coherent SVGE model in the literature.¹²

II. KEYNSIAN CONSUMPTION

Coherent monetary theory is fundamentally transformed by the keystone TVGE innovation, i.e., the derivation of meaningful wage rigidity from axiomatic model primitives:

$$(6.12) \quad W_J(t) = W_J^n(t) = \max_w (\dot{Z}_J(t)/W_J(t)) = \sup \mathbf{K}^n(t).$$

The most parsimonious version of the two-venue macro model retains the SVGE formulation of product markets, non-labor factor markets, and divisible physical capital stocks. Generalized-exchange innovation is effectively confined to labor supply. That model-building strategy recalls the Neoclassical Synthesis. The difference, of course, is that Early Keynesians simply posited nominal wage stickiness (in the *General Theory*, a nominal wage floor) supplanting, in the short-run, the powerful three-way equilibration of the nominal wage, firms' marginal value of labor input, and workers' marginal value of time. The repeal of Keynes's Second Classical Postulate reorients, especially for short periods, macro modeling to focus on total spending.

As promised, this section focuses on fixed-wage general-equilibrium (FWGE) modeling, pioneered as a "non-Walrasian equilibrium" extension of Keynesian thinking by Don Patinkin

¹² Among the useful innovations that will not be further considered in this introduction to generalized-exchange macroeconomics is extending the axiomatic role of positional concerns from employee to household utility, producing insightful implications for consumer spending, that was originally modeled by Duesenberry (1949) and powerfully developed by Frank (1985, 1999, 2005, 2011). Another interesting innovation easily accommodated by the TVGE thinking has come from Luttmer (2013), who models total consumption informed by "... an analytic exposition of the effect of sudden belief revisions on job creation and destruction".

(1948, 1956) and Robert Clower (1965). The literature demonstrates that the (arbitrary) imposition of downward-rigid labor pricing generates coexisting persistence of excess supply and constrained decision-rule equilibrium.¹³ The common FWGE denominator is that only those agents on the short-side of the market can satisfy their exchange preferences. Remaining agents are rationed, with their optimal decision-making subject to quantity constraints that frustrate consumption-leisure preferences. When choosing the amount of consumer goods to buy, rational workers must take into account their actual hours of employment.

Rationed exchange requires some subset of prices to respond inflexibly to changing market conditions. If the rationing features involuntary job and income loss, labor pricing must be subject to meaningful rigidities that uniquely suppress wage recontracting. Stabilization-relevant macro analysis is never far from the cornerstone contribution of generalized-exchange modeling: its capacity to make the MWR Channel consistent with optimizing, price-mediated exchange anchored by continuous general equilibrium. Do not forget that rational MWR generates both downward inflexible nominal labor pricing over the business cycle and chronic wage rents, producing Keynesian and classical shortfalls from full employment. Once located in the TVGE framework, Early Keynesianism must be recognized as no less an exercise in dynamic stochastic general equilibrium than the stabilization-irrelevant SVGE models that have replaced it.

Fixed-Wage General Equilibrium Theory

Contributors to fixed-wage general equilibrium macro modeling include Solow and Stiglitz (1968), Barro and Grossman (1971,1976), Drèze (1975), Bénassy (1976), Malinvaud (1977, 1980), and a number of others. Their work received substantial attention in the 1960s and 1970s but ultimately fell into disfavor, initially in the United States, as the economics profession became more (reasonably) insistent that wage recontracting cannot be arbitrarily suppressed in any macro analysis asserting the coherent elimination of foregone gains to trade. For theorists

¹³ In particular, FWGE theorists followed the lead of Patinkin and modeled involuntary unemployment as a dynamic disequilibrium outcome. They simply posited rigid wages, which were vaguely thought to capture delays involved in the economy's absorption and resolution of macro shocks. The continuous-equilibrium MWR channel transforms the useful FWGE analysis, sufficiently hampered by its arbitrary suppression of wage recontracting to induce Barro and Grossman to disavow their important contribution (see below), into a coherent general-equilibrium model.

focused on market exchange, demonstrating that the MWR Channel is Pareto-efficient is an inherently unrewarding task; and few persisted in the challenge.

From Blanchard and Fischer (1989, p.373): “By the end of the 1970s,... it had become clear to many that the [FWGE] approach had reached a dead end: the assumption of given prices, which had appeared initially to be a useful shortcut, turned out to be a misleading one. Further, in the absence of microfoundations that accounted for the price stickiness, it was difficult to make progress on several ambiguities that emerged from the framework.... More fundamentally, there was no real justification for the asymmetry between the treatment (or lack of treatment) of price decisions and the sophisticated treatment of other decisions, such as investment or consumption.”

Blanchard and Fischer, and almost everybody else, gave up too soon. The Workplace Marketplace Synthesis, accommodating the necessary generalization of optimizing exchange in the aftermath of the Second Industrial Revolution, constrains market decision-rule optimization with dominant rational intra-firm labor pricing in large establishments offering routinized jobs. TVGE modeling properly microfound FWGE analysis, providing analytic coherence to Early Keynesian thinking.¹⁴ In return, the early exogenous-wage literature (with its emphasis on the inter-related effects of job rationing, truncated work-leisure choice, and spillover effects from labor-market excess supply on the ability of other markets to clear) is ready-made to facilitate the identification and explanation of important TVGE implications. FWGE analysis, brought low by its apparent arbitrary inattention to rational behavior, can be resurrected by correcting the equally arbitrary SVGE inattention to optimizing exchange to the workplace.

Enriching the Barro-Grossman Model

In its best-known Barro-Grossman (1971, 1976) application, FWGE modeling posits nominal wage rigidity in order to investigate the relationship between aggregate demand and involuntary job loss that results from the interdependence of rationing in the labor and goods markets. Such

¹⁴ A standard objection to the FWGE model class was its lack of any serious story about how wages eventually move. Once enriched with generalized exchange, however, FWGE modeling features a robust, intuitive explanation of labor-price dynamics.

analysis must be general; partial-equilibrium labor-market analysis is inherently inadequate to the task.¹⁵ Barro-Grossman identify several regimes, the applicability of each depending on which markets are experiencing excess demand or supply. TVGE modeling is most compatible with their Keynesian regime, in which the labor market exhibits excess supply.¹⁶

Labor analysis. Generalizing exchange powerfully enriches the original Barro-Grossman (1971) FWGE model. Adding rational workplace behavior to their single (marketplace) venue microfounds the assumption of wage rigidity. The enhanced model variables are:

- X_J and X_K are the quantities of commodities produced in the large-establishment (LE) and small-establishment (SE) venues respectively;
- H_J and H_K are the quantities of labor services;
- M_J and M_K are the initial stock of nominal money balances held by households supplying labor to the LE and SE venues respectively;
- m_J and m_K are the increments to household money balances (in commodity units);
- Π_J^R and Π_K^R are profits (in commodity units);
- P_J and P_K are money prices of real commodities produced;
- P denotes the price index; and
- W_J^R and W_K^R are wage rates (in commodity units) consistent with the WMS.

¹⁵ That fixed-wage macroeconomics was eventually, and fiercely, recanted by both Barro and Grossman captures the mood of the times. Indeed, by the publication of *Money, Employment, and Inflation* (1976, p.6), the authors were feeling the heat of increasing New-Classical insistence that all macro models be explicitly constructed on optimizing market exchange: “One other omission from our discussion is especially embarrassing and should be explicitly noted. Although the discussion stresses the implications of exchange at prices which are inconsistent with general market clearing, we provide no choice-theoretic analysis of the market-clearing process itself. In other words, we do not analyze the adjustment of wages and prices as part of the maximizing behavior of firms and households. Consequently, we do not really explain the failure of markets to clear, and our analyses of wage and price dynamics are based on *ad hoc* adjustment equations.”

¹⁶ Bénassy (1993) is a notable, early contributor to the gathering revival of interest in non-clearing markets. He usefully distinguished between decentralized markets’ net demands and net transactions, introducing rationing arrangements that convert inconsistent market supplies and demands into consistent (market) transactions. His decentralized markets exchange information that includes quantity, as well as price, signals. Combining that plausible framework with TVGE modeling powerfully restores total effective demand and disturbance multipliers to starring roles in macro modeling. See also Drèze (1991) and, more recently, Chiarella, Flaschel, and Franke (2005).

Labor is the only variable input in both venues' production.¹⁷ Commodities (X) are consumable and the only form of current production; there is no investment. Money is the store of value, the medium of exchange, and unit of account; its quantity is exogenous and constant. Barro-Grossman further simplify their analysis by positing that households receive profits according to a predetermined distribution function. Firms maximize profits; households maximize utility.

In the *SEV (marketplace) sector*, market-price-taking firms understand profit maximization to be constrained only by the production function. Firms can hire all the labor they desire and sell all the output they produce, implying the specification of real profits such that $\Pi_K^R = X_K^S - W_K^R H_K^D$, subject to the production function, $X_K = X_K(H_K)$, demonstrating positive, diminishing marginal productivity). The superscripts S and D denote, respectively, supply and demand quantities. Profit maximization implies $X_K^S = X_K(H_K^D)$ and $H_K^D = H_K(W_K^R)$, such that $\delta X_K / \delta H_K = W_K^R$

In the *LEV (workplace) sector*, the familiar market-clearing conditions break down. Posit that current production (X_J) is equivalent to demand-determined sales and that $X_J < X_J^S$, where X_J^S becomes notional supply. The profit-maximization problem, as described by Patinkin (1956), is then restricted to selecting the minimum labor hours needed ($H_J^{D'}$) to produce X_J . Profit maximization implies that: $H_J^{D'} = F_J^{-1}(X_J)$, for $\delta F_J / \delta H_J \geq W_J^R$. It follows from the constraint $X_J < X_J^S$ that $H_J^{D'} < H_J^D$, with $H_J^{D'}$ approaching H_J^D as X_J approaches X_J^S . An effective-demand shock $\Delta H_J^{D'} < 0$ forces involuntary job loss. It also follows that the effective demand for LEV labor services ($H_J^{D'}$) can vary despite unchanged W_J^R . The market breakdown is Keynesian (i.e., involuntary job loss resulting from combining inadequate demand and wage rigidity) rather than classical (i.e., persistent unemployment wholly caused by excessively high real wages).

In the enriched Barro-Grossman model, the workplace and marketplace venues are linked, given perfect market information, by Harris-Todaro inter-sectoral labor transfer (see above).¹⁸ If the

¹⁷ Other inputs are restricted to be fixed, to have no alternative use, and to have no user cost.

¹⁸ The workplace venue produces a dominant labor-pricing optimizing decision-rule equilibrium, which constrains the marketplace venue's subordinate decision-rule equilibrium. Aggregate economic behavior is described by $X = X_T(X_n, X_m)$, $W = W_T(W_n, W_m)$, $\Pi = \Pi_T(\Pi_n, \Pi_m)$, $H = H_T(H_n, H_m)$, and $P = P_T(P_n, P_m)$.

acquisition of labor-market information is, more intuitively, permitted to follow a lagged learning process (especially useful in allowing job losers to engage in time-intensive price-discovery, calibrating their previous wage rents and better informing W^R), joblessness consistent with continuous equilibrium is made even more congruent with the available evidence.

Consumption analysis. Barro-Grossman close their model, which so far has been restricted to elaborating Patinkin's (1956) macro labor analysis, with Clower's interpretation of the Keynesian consumption function. In that important contribution, the relation between income and consumer spending is a manifestation of Walrasian disequilibrium in the labor market. Worker income, now representing the constrained effective demand for current output resulting from the excess supply of labor, critically influences rational household consumption-saving choice.

LEV job rationing has been demonstrated to be consistent with optimizing workplace exchange anchored by continuous general equilibrium. Households cannot sell all the labor services that they prefer ($H_J < H_J^S$) and, as a result, receive labor income $W_J^R H_J < W_J^R H_J^S$. From the employees' perspective, hours at work are exogenously given, pushing households off their market supply curve and making effective supply inelastic.

The LEV household optimization problem is reduced to the rational disposition of constrained income $W_J^R H_J + \Pi_J$, optimizing $U_J(H_J, X_J^{D'}, (M/P)_J + m_J^{D'})$ subject to $W_J^R H_J + \Pi_J = X_J^{D'} + m_J^{D'}$. Effective consumption demand is understood to be $X_J^{D'}$, while effective demand for more real balances is $m_J^{D'}$. Maximizing $U_J(\cdot)$ implies that $X_J^{D'} = X_J^{D'}(W_J^R H_J + \Pi_J, (M/P)_J)$ and $m_J^{D'} = m_J^{D'}(W_J^R H_J + \Pi_J, (M/P)_J)$. It follows that household consumption and saving ultimately depend on labor income and wealth.¹⁹ From Barro-Grossman (1971, p.88): "The important property of [the commodity and real-balances effective demands] is that they do have the form of the usual Keynesian consumption and saving functions. Labor income enters the consumption

¹⁹ The FWGE approach suppresses work-leisure choice but not the intertemporal substitution of consumption that results from expectations of current versus future income. The simple FWGE consumption specification would benefit from attention to the familiar permanent-income concept. See Barro-Grossman (1971), footnote 15.

BOX 6.2: QUANTITY-CONSTRAINED GENERAL EQUILIBRIUM

Once endowed with generalized exchange, FWGE modeling enhances our understanding of quantity-constrained general equilibrium. The following, drawn from John Hicks (1980-81), is a simple elucidation of the formal model at the core of the FWGE analysis.

Walrasian Identity

Consider the familiar Walrasian model with four goods-markets denoted by α , β , γ , and δ , where δ is the standard numéraire ($P_\delta=1$). Demands and supplies in the α , β , γ markets are functions of their respective prices, which are determined by three equations ($D_\alpha=S_\alpha$, $D_\beta=S_\beta$, $D_\gamma=S_\gamma$). The Walrasian identity, rooted in the Continental tradition of working wholly in terms of price parameters, is:

$$D_\delta=P_\alpha S_\alpha+P_\beta S_\beta+P_\gamma S_\gamma; S_\delta=P_\alpha D_\alpha+P_\beta D_\beta+P_\gamma D_\gamma.$$

Given that the supply and demand equations are satisfied for the α , β , γ markets, δ -market equilibrium follows. At this point, the Walrasian identity is typically used to eliminate the δ -market. But any one of the four markets may be eliminated.

Introducing a Fixed Price

Posit that α -market goods are transacted at a rigid price ($P_\alpha=P_\alpha^0$). The amount sold is now governed by Clower's minimum-transactions rule, i.e. the lower of D_α or S_α . Returning to the Walrasian identity, P_α^0 now appears as a fixed parameter in $D_\beta=S_\beta$, $D_\gamma=S_\gamma$, which determine the system's variable prices. If $D_\alpha < S_\alpha$ at P_α^0 , only D_α^* can be rationally traded. When specifying S_δ and D_δ in the Walrasian identity, actual D_α^* must be substituted for both S_α and D_α . The equilibrium system has become quantity constrained.

The modified identity is:

$$\begin{aligned} D_\delta &= P_\alpha^0 D_\alpha^* + P_\beta S_\beta + P_\gamma S_\gamma; S_\delta = P_\alpha^0 D_\alpha^* + P_\beta D_\beta + P_\gamma D_\gamma. \\ P_\beta S_\beta &= D_\delta - P_\alpha^0 D_\alpha^* - P_\gamma S_\gamma; P_\beta D_\beta = S_\delta - P_\alpha^0 D_\alpha^* - P_\gamma D_\gamma. \\ P_\gamma S_\gamma &= D_\delta - P_\alpha^0 D_\alpha^* - P_\beta S_\beta; P_\gamma D_\gamma = S_\delta - P_\alpha^0 D_\alpha^* - P_\beta D_\beta. \end{aligned}$$

Price flexibility in the β , γ markets causes $S_\beta=D_\beta$, $S_\gamma=D_\gamma$ and $S_\delta=D_\delta$. System adjustment no longer depends only on prices. In the flexible-price β , γ markets, demand and supplies will likely be influenced by outcomes in the fixed-price α market that, of course, cannot be captured by P_α . They must instead be embodied in quantities transacted (D_α^*). In the β , γ markets, demands and supplies are now functions of P_β , P_γ , and D_α^* . While the β , γ , δ markets' subsystem is no longer complete, the addition of D_α^* as a parameter allows the entire system to be in equilibrium.

The IS-LM Model

From Hicks (1980-81, p.145): "It must be this which, in the *IS-LM* model, is supposed to happen. We are now to take α to be the labor market, γ the market for loanable funds, and β the market for finished products (consumption and investment goods not being, so far, distinguished). P_α is the fixed money wage; P_β , the fixed price level of finished products [via a posited mark-up rule]; P_γ , the rate of interest, the only price that is left to be determined on a flexprice market."

Forced to accommodate $D_\alpha < S_\alpha$, equilibrium is best understood as a rest point in the space of optimizing decision rules.

and saving functions as it represents the constraints upon the demand for current output imposed by the excess supply of labor.”²⁰ Patinkin’s analysis is motivated by profit maximization subject to an output constraint, while Clower’s model maximizes utility subject to an employment constraint.

Rationed J th-venue jobs also forces SEV employees to accept zero hours in high-wage jobs for which they are qualified, well below the quantity of higher-productivity work they prefer. Their optimization problem is similarly reduced to the rational disposition of constrained income, which becomes the central determinant of their consumption decision. Putting the pieces together, WMS-enriched FWGE modeling provides a coherent continuous-equilibrium interpretation of Keynesian consumption, the centerpiece of stabilization-relevant effective demand.

III. EXPECTATIONS, PURE PROFIT, AND PRODUCTION CAPABILITY

More Keynesian modeling. Given long payout periods for capital (K), the demand for investment goods depends on how decision-makers view the future, including their convictions about the prospective stability of the macroeconomy. In TVGE analysis, the latter is captured by introducing a variable C that measures the credibility of the stabilization authority’s (explicit or implicit) real-side objective.²¹ The SVGE model class deals with the C -class problem more generally, using wage-price flexibility to impose simplifying expectations of continuous full employment (implying the capacity to sell all future production at the prevailing market price) on investor/lender decision-making. Market interest rates become, as a result, the critical variable set equilibrating the supply of saving and the demand for capital goods.

Once rational exchange is no longer arbitrarily restricted to the marketplace, continuous-equilibrium wages and prices demonstrate reduced flexibility. The SVGE investment narrative

²⁰ In a recent example, de Nardi, French, and Benson (2012) demonstrate that the drop in consumption during the 2007-09 recession is explained by income expectations and household wealth.

²¹ The real-side objective is typically calibrated with respect to unemployment. Recall that the introductory compact TVGE model specified above assumed a credible central-bank low-inflation regime.

breaks down, and things get recognizably interesting. Pure profits exist, with a future path that is subject to reliable probability distributions. (Recall Chapter 3.) Expectations for future profit (Π) and the credibility of authorities' management of aggregate demand (C) replace interest rates as the central determinants of investment. TVGE investors confront a more complex, more recognizable profit-seeking decision set than their SVGE counterparts. Elaboration on those choices, suggestive of future lines of research, will prove useful.

The brief analysis begins with Jensen-class LEV factor-income distribution, a fundamental building block of generalized-exchange macroeconomics that was introduced in Chapter 3.²² In its compact aggregate version:

$$(6.13) \quad P_J(t)X_J(t) = W^n(t)H_J(t) + \tilde{r}^m(t)K_J^r(t) + \Pi_J(t).$$

Recall that pure profits (Π_J), claimed by owners of sunk capital (K_J^s), are a residual payment, defined as product-sales revenue in excess of the cost of labor hours and financial capital.

Expected real discounted profits were also specified (equation 3.3):

$$(6.14) \quad \Pi_J(0) = E_{0j} \sum (1 + \tilde{r}^e(t) + p^e(t))^{-t} \Pi_J(t).$$

LEV product pricing consistent with generalized-exchange income distribution is:

$$(6.15) \quad P_J(t) = W^n(t)(H_J(t)/X_J(t)) + \tilde{r}^m(t)(K_J^r(t)/X_J(t)) + \Pi_J(t)/X_J(t).$$

In compact TVGE modeling, product pricing (P_J) is best understood in terms of unit costs of both labor and financial capital and the residual-rent mark-up ($\varphi = \Pi_J/X_J$).²³

²² Simplifying assumptions used in the brief examination of LEV input-adjustment decision-making include the following. Capital investors estimate the overall hold-up problem (H) at $\beta^o K_i$, where β^o is constant. (Recall that hold-up was introduced in Chapter 3.) The expectations formulation assumes investor information adequate to enable assigning effective probabilities to future states of pure profit. The LEV workweek is constant, $H_J/N_J = \bar{a}$. The nonstationary capital-labor ratio is constant ($K_J^T/H_J^T = \bar{a}$) as is the ratio of sunk to total capital ($K_J^s/K_J = 1 - \bar{a}$). Relevant investment at $t=0$ is posited to be a one-time process, eliminating the need to keep track of different capital vintages; there is no depreciation. In compact TVGE modeling, product-price inflation is credibly anchored by central-bank stabilization policy, as described in Chapter 10; the monetary authority establishes and effectively defends its price regime ($p^T(t) = p^N$). Model variables have been defined earlier in the analysis and can be found in the website Glossary.

²³ From Woodford (2003, p.140): "The evolution of U.S. inflation can be well explained by the evolution of unit labor costs".

BOX 6.3: WHAT ABOUT INFLATION?

Late in a career that included insightful contributions to the interpretation of Keynes and the development of Keynesian macroeconomics, Abba Lerner was asked whether inflation analysis could be adequately done within the context of The General Theory. His answer, part of a recorded interview, is included in Colander and Landreth (1996, p.101):

“No. Not within [Keynes’s] context. You must go further, and that means some developments. Keynes did not deal with the problem of inflation and depression at the same time.... If you look through *The General Theory*, and you look very closely with a bit of a magnifying glass, you will find that there are references to this possibility – to what happens when the wage unit increases. He didn’t want to go into that; it wasn’t a problem of practical concern. In order to do this you must go into the question of why wages are sticky.”

Like *The General Theory*, this book will be criticized for ignoring price inflation. The reason for the relatively small attention paid to product-price dynamics is certainly not any reluctance to explain labor-price stickiness. The focus on employment and unemployment results instead from real-side macrodynamics having receiving much less adequate treatment in mainstream SVGE modeling than inflation. Fully developed TVGE treatment of product-price inflation would be familiar, preserving a great deal of SVGE analysis. The most significant innovation beyond the treatment of LEV labor pricing in Section III is that the generalization of exchange can rationally accommodate, but does not require, the explicit modeling of LEV product-pricing power, notably including the analyses of Chamberlin and Robinson.

The tangential look at product prices occurring in this chapter’s section on firms’ rational management of production capability as well as Chapter Four’s more in-depth analysis of the Phillips curve and stagflation and Chapter Ten’s examination of monetary-policy rules provides sufficient groundwork to support a satisfactory, if not full-blown, TVGE theory of inflation. The analysis is consistent with the central-bank objective of credibly committing to low, stable inflation: $E_t p^N(t+1) - E_{t-1} p^N(t) = 0$. Balancing nominal and real-side objectives is an ongoing task of central banks as it makes sense of current and likely future course of the economy. Central bankers understand that immediate and longer-term nominal/real consequences of policy actions must be identified and factored in decision-making. (See Chapter 10.)

The dynamic interaction between *capital-capacity* utilization ($\mathcal{A}(t) = K_J(t)/K^P_J(t)$, $K^P_J(t) = f(K_J(t))$) and the product-price mark-up plays a significant role in two-venue modeling.²⁴ Excess capacity

²⁴ See Chapter 3. The variables K_J , K^P_J , and K_J respectively denote capital services used in current production, maximum capital services available, and physical capital stock.

puts downward pressure on product prices and $\varphi(t)$ in a generalized-exchange process that depends on whether the excess capacity is anticipated to be stationary or nonstationary. Conversely, inadequate capacity induces upward pressure on prices and $\varphi(t)$. Higher mark-ups that are expected to be both nonstationary and sufficiently robust will motivate, with lags associated with planning, coordination, and execution, increased capital investment and jobs. (See below.) The dynamics are similar to Samuelson's motion rule, i.e., market prices move in the direction of, and are proportional to the magnitude of, excess demand.²⁵

LEV production *capability* ($\mathcal{C}(t)=X_J(t)+\hat{\mathcal{C}}_J(t)\leq X_J^P(t)$), $\mathcal{C}(t)=\mathcal{C}^V(t)+\mathcal{C}^T(t)$) also plays a significant role in TVGE macrodynamics. \mathcal{C}_J^V denotes stationary adjustments in production capability, rooted in the profit-seeking management of labor input.²⁶ High-frequency nominal disturbances (given the rational MWR Channel reinforced by plausible demand elasticities) largely induce quantity, rather than price, reductions. In the familiar process, layoffs in recession are followed by rehiring in recovery. Correspondingly, \mathcal{C}_J^T reflects movement in nonstationary production capability that variously results from job downsizing or, in the opposite direction, capital investment. Expectations that motivate rational LEV noncyclical capability adjustments are largely rooted in anticipated pure profit (H_J). Perceived future profits are notably subject to the ever-present hold-up problem (H), which is elaborated upon below. Investment, as a result, is the most volatile component of aggregate demand in generalized-exchange macroeconomics.²⁷

²⁵ Product-price inflation in generalized-exchange modeling is principally rooted in excess demand, which affects unit costs and capacity utilization. Given MWR and Lewis transfer, excess-demand innovations exert a muted, lagged influence on LEV labor pricing. The book's relatively rudimentary treatment of inflation reflects the author's choice to emphasize employment in the introductory TVGE model. For some elaboration, see the modeling of the 1970s stagflation decade in Chapter 4 and Box 6.5.

²⁶ Production capability (\mathcal{C}_J) reflects the workplace availability of inputs needed to support scheduled output, while $\hat{\mathcal{C}}_J(t)$ denotes firms' desired unused production capability. The latter is best understood as a short-term buffer against increases in product demand. Significant stationary variations in product demand alter both production capability (\mathcal{C}_J), wholly via adjustments to labor input, and capital-capacity utilization ($\mathcal{X}(t)$).

²⁷ Lucas and Prescott were working on the dynamic general-market-equilibrium properties of capacity and production in response to recurring shocks to demand at a critical stage of the development of the rational-expectations hypothesis. (Lucas (2001), p.15) The gulf between their application of the coherent SVGE model class (Lucas and Prescott (1971)) and the TVGE treatment of the same question set is instructive.

Stationary production-capability adjustments (ϵ^V_J). Consider a simple LEV workplace equilibrium model, for which labor hours are the single variable production input.²⁸

$$(6.16) \quad X(t)=f(H(t)).$$

Posit an adverse phase of a stationary cycle in demand. TVGE downward wage rigidity implies $\Delta W^n(t)=0$ and $\Delta(X/H)^n(t)=0$.²⁹ The problem faced by profit-seeking firms is simplified to a bimodal choice on how to adapt to lower revenues (\underline{R}). Cut production ($\Delta X < 0$, i.e., reduce labor hours, H) or cut the product price ($\Delta P < 0$):

$$(6.17) \quad \underline{R}(t) < P_o X_o; \underline{R}(t) = P_o(X_o + \Delta X(t)) = (P_o + \Delta P(t))X_o,$$

where P_o and X_o denote price and production prior to the adverse revenue disturbance.

The rational-choice condition for relying on production, rather than price, cuts is:

$$(6.18) \quad \begin{aligned} & (P_o(X_o + \Delta X(t)) - W_o(H_o + \Delta H(t))) \mid \\ & \underline{R}(t) = P_o(X_o + \Delta X(t)) > ((P_o + \Delta P(t))X_o - W_o H_o) \mid \\ & \underline{R}(t) = (P_o + \Delta P(t))X_o; \\ & \underline{R}(t) - W_o(H_o + \Delta H(t)) > \underline{R}(t) - W_o H_o, \\ & \text{where } \Delta H(t) < 0. \end{aligned}$$

Downward-rigid wages impose a cost penalty ($W_o \Delta H(t)$) on the price-reduction strategy, making it (given plausible demand elasticities) the inferior option. Management rationally responds to adverse stationary nominal disturbances with some combination of reducing the workweek and laying off workers, temporarily reducing production capability, rather than an interim cut in product prices.³⁰ Generalized-exchange labor pricing microfounds the LEV reluctance to cut product prices in response to temporary demand shocks.³¹

²⁸ The assumption is consistent with a focus on cyclical behavior. To reduce clutter, the subscript J is dropped in this section.

²⁹ Unchanged labor productivity also requires proportional adjustment to $\hat{C}_j(t)$, e.g. there can be no labor hoarding.

³⁰ An interesting option here is *Kurzarbeit* (or “short-work”). In some European countries, a frequent response to a reduction in nominal demand is to avoid layoffs by broadly reducing working hours – an income loss which public subsidies largely replace. In Germany, for example, the government pays affected workers roughly three-fifths of

BOX 6.4: NOMINAL DEMAND

The most fundamental macro question for more than a century has concerned the direction of causation in equation 6.13. In the coherent SVGE model class, preserving Keynes's First and Second Classical Postulates, wage and price flexibility enables Walrasian market-clearing (implying $W^n/W^m=1$). Causality runs from monetary payments received by inputs to nominal income ($Y=PX$). Market-centric optimizing exchange limits the modeling of factor-income distribution to demonstrating that SVGE exhausts total product while eliminating pure profit.

In the *General Theory*, Keynes reversed causality in equation 6.13, arguing that total employment/production must adjust to nominal demand. But Keynes, Early Keynesians, and New Keynesians worked and continue to work within the mainstream SVGE model and have had debilitating difficulty squaring that assertion with rational behavior. It is good news, at least for stabilization policymakers, that the generalization of optimizing exchange enables the derivation of the MWR Channel and, therefore, microfounds robust Keynesian nominal-to-real causality. Say's law and its associated classical dichotomy are thoroughly rejected. Formal employment analysis is now understood to be critically informed by nominal spending choices.

The reversal of SVGE nominal-real causality shifts the focus of stabilization to the adequacy of nominal demand to support full employment. In a process that must guide firms when scheduling production, a sufficiently adverse nominal shock ($\Delta Y < 0$) damages profits ($\Delta \Pi < 0$) and induces involuntary job loss ($\Delta H < 0$, $\Delta N < 0$).* Generalized exchange and its powerful MWR Channel microfound the fundamental message of *The General Theory*. Aggregate nominal demand critically influences total economic activity and is anchored by investor expectations about the future state of profits. Another of Keynes's innovations, i.e., "animal spirits" that cope with uncertain future events, is considered later in this chapter.

* Following Frisch (1928) and Slutsky (1937), the TVGE analysis of macro fluctuations focuses on impulses (shocks) and propagation, identifying the role of meaningful wage rigidities in each.

their lost salaries. (Undergoing training programs often enables employees to maintain their pre-recession incomes.) Employee acceptance of this arrangement as equitable is a product of the public subsidies and institutional history.

³¹ It could be reasonably posited that, in recession, posted product-price cuts by an individual LEV establishment will be matched by its competitors, i.e., firms are oligopolistic. (Wage recontracting implies that oligopolistic pricing, on its own, cannot support the existence of involuntary job loss.) Also recall that LEV wages tend to be at least implicitly cartelized. Given generalized exchange, cartelization is motivated by firm profit-seeking supported by the interpersonal reference standard (W^b) and, perhaps, industry-wide labor unions, making industry-demand elasticity relevant for rational decision-making. TVGE conceptually, if not tractably, accommodates generalization to multiple same-product venues (industries), for which oligopolistic product pricing and wage cartelization are industry-specific. Finally, note that, especially given contracting demand directly exerting downward pressure on SEV prices, overall price inflation is predicted to be decreasing in episodes of economic slack.

Nonstationary production-capability adjustments (ϵ^T_J). Chapter 3 modeled rational job downsizing, an inherently nonstationary process, in the production-capability contraction that accompanies intertemporal recalibrations of established reference standards (\mathbf{K}_J). That analysis permits this brief investigation to focus on a more familiar optimization problem, i.e., identifying conditions that support physical-capital outlays and associated labor hiring. The economy continues in dynamic general equilibrium, implying $W_J=W_J^n=\sup \mathbf{K}_J$ and $\dot{Z}_J=\dot{Z}_J^n$. Expected pure profits (I_J) relative to investor-required returns ($I_J^{\dot{}}$) critically motivate capital-expansion decisions, the noncyclical timepath of LEV employment, and Lewis Transfer. The intuitive idea that investment occurs when expected profit exceeds some required level goes back at least to Ricardo.

Given technology, expected returns at the time of the capital outlay ($t=0$) are determined by anticipated growth in both nominal demand and unit costs (equations 6.13, 6.14). Meanwhile, in generalized-exchange modeling, required returns are rooted in financial-capital opportunity costs (\dot{r}^M) and perceived risk, which has been simplified to a representative hold-up problem (H):

$$(6.19) \quad \begin{aligned} \Pi_J^{\dot{}}(t) &= f(\dot{r}^m(t), H(t), \Delta K_J(0)), \text{ such that} \\ \Pi_J^{\dot{}}(0) &= E_{oJ} \sum (1 + \dot{r}_t^e(t) + p^e(t))^{-1} \Pi_J^{\dot{}}(t). \end{aligned}$$

The conditions posited above (footnote 21), including estimating H at β^o , simplify equation 6.20:

$$(6.20) \quad \begin{aligned} \Pi_J^{\dot{}}(0) &= (\dot{r}^M(0) + \beta^o) \Delta K_J(0) = \beta^{\dot{}}(0) \Delta K_J(0), \\ \text{such that } & 0 < \dot{r}^M < 1, \quad 0 < \beta^o < 1, \end{aligned}$$

where $I_J^{\dot{}}$ denotes required returns at $t=0$ and \dot{r}^M the expected mean price of financial capital over investors' planning period. Hold-up problems (H) join the credibility of stabilization authorities' effective management of nominal demand (C) to play interesting, overlooked roles in nonstationary economic activity, motivating rational investor inaction (see below) and generally providing useful content to Keynesian "animal spirits".³² Putting all the pieces together implies

³² Hold-up is generally defined, notably including the critical features of supply-side economics. From Skousen (2005, p.233): "What incentives would encourage the supply side? Supply siders focus primarily on how government policies encourage thrift, industry, and entrepreneurship. To them, the greatest threats to a robust

that nonstationary as well as stationary aggregate demand and employment (linked by the keystone MWR Channel) are vulnerable to significant, costly instability.³³

IV. CAUSES AND CONSEQUENCES OF ACUTE DEMAND INSTABILITY

Expectations-driven investment, along with income-driven consumption, incorporates key elements of Keynesian aggregate demand into coherent generalized-exchange modeling. Both are microfounded by the MWR-centric reworking of aggregate supply. This section takes the important, little-traveled next step, i.e., modeling the extreme nominal-demand instability that characterized the 1930s Great Depression and, more recently, the 2007-09 Great Recession. Acute instability differs substantially, in causes and consequences, from the more familiar, contained fluctuations of total spending associated with garden-variety business cycles.

A central characteristic of extreme-instability macrodynamics is the large gap such disruptions open between mark-to-market financial asset prices and the notional pricing implied by economic fundamentals. The mismatch reflects a breakdown in economists' baseline efficient-market hypothesis, in which security prices are determined by expected profitability in a fully employed economy. High-stress macroeconomics is motivated by a class of spending contraction that unmoors market asset prices from their fundamental determinants.

The extension of demand analysis draws heavily on two ideas that have recently appeared in the literature. The first describes rational investor inaction in conditions of uncertainty. The second revives the independent role of investor confidence in total-spending determination. Both play central roles in TVGE modeling of unchecked nonstationary demand disturbances (NDD), the extreme instability defined in the previous chapter. (Box 6.5.) Despite their failure to attract much mainstream attention, the two ideas' capacity to explicate highly stressed macro episodes, including the 1930s and 2008-09, is important. Explaining periods of huge welfare costs must

growing economy are burdensome commercial regulations, including price/wage controls, an unstable inflationary money policy, and high progressive tax rates.”

³³ The hold-up problem is further related to, and extended by, Shackle's (1967) analysis of “crucial” choice, defined as one-shot decision-making that inherently precludes repeating the experiment, in conditions of uncertainty. Shackle argues that such restricted options, introduce substantial volatility into aggregate demand.

matter to theorists who aspire to stabilization-policy relevance. General macroeconomist inattention to NDD is one of the most damaging by-products of the consensus reliance on the coherent SVGE model class, with its deeply restricted accommodation of market failure. It is discouraging to try to model acute instability within an analytical framework that cannot reconcile its own coherence and involuntary job loss, let alone generate the huge-scale employment, income and wealth destruction characteristic of unchecked demand contractions.

Expectations and NDD

Investor/lender expectations are more complex than just using all available information. They are also influenced by the nature of relevant information. A longtime macroeconomic issue concerns the degree to which effective probabilities can be assigned to future states of the economy. Frank Knight (1921) famously analyzed the distinction between priceable risk, requiring informed priors on outcome likelihoods, and unpriceable uncertainty, arising from unknown probability distributions.

A principal source of macro-prospect uncertainty for investors/lenders is the loss of the real-side (employment) credibility of stabilization authorities, which was earlier identified to be a necessary condition of NDD regardless of the originating macro shock. Such uncertainty is the centerpiece for the analysis that follows. During the extreme 2008-09 instability in the United States, many agents assigned a nontrivial possibility to a 1930s-class collapse in total spending. The assessment was not an unreasonable response to the virulent breakdown in asset prices and wealth, forced job loss measured in many millions, and doomsday comments from the most powerful stabilization policymakers (as they attempted to motivate positive action from a badly ill-prepared Congress). Depressions are infrequent, poorly understood, and largely idiosyncratic in their origins. As a result, investor/lender priors with respect to the severity of the brewing instability's impact on macro prospects are governed more by uncertainty than predictable risk.

The point deserves emphasis. The nature of information on NDD acute-instability likelihood and severity complicate rational investor/lender expectations. In usual circumstances, they are comfortable assigning a trivial probability to an unchecked aggregate-demand contraction and its

huge welfare loss. (In other words, the real-side objective of stabilization authorities is broadly credible.) In an instability crisis, however, decision-makers have shifted to a nontrivial likelihood of unchecked NDD. Given inherent uncertainty about the size and nature of the prospective market failure, that probability is unpriceable; and inaction has been shown to be rational. The loss of stabilization authorities' credibility is at the heart of the extreme instability problem.

BOX 6.5: CRITICALLY HETEROGENEOUS DEMAND DISTURBANCES

Nominal demand disturbances (DD) are usefully separated into two analytic classes, an exercise described in greater detail in Chapters 5 and 10.

In the first and most usual class, macro shocks are promulgated by *stationary demand disturbances* (DD→SDD) that yield familiar, contained business cycles. In the SDD class, adverse shifts in total spending are fully corrected, after a relatively short period, by automatic stabilizers augmented by standard central-bank “lean-against-the wind” intervention. The stabilizers include lower interest rates and increased public deficits, income-support programs triggered by involuntary job- and income-loss, and other countercyclical transfer payments. Meanwhile, confronted by adverse SDD, the central bank undertakes actions tasked to speed up cyclical recovery, using open-market purchases of short-term Treasury debt to increase system liquidity and further reduce interest rates. Greater liquidity and lower rates encourage investment and consumer-durables spending.

The second category of nominal propagation of macro shocks, much less frequent but much more costly, resolves into an unchecked *nonstationary demand disturbance* (DD→ NDD). NDD features contracting aggregate spending sufficient to overwhelm both automatic stabilizers and orthodox central-bank interventions. If not contravened, NDD's extreme instability will induce rapidly cumulating job and income loss, collapsing profits, price deflation, broad debt default, wealth destruction, and chronic depression – all adding up to massive welfare loss. At its earliest stage, NDD is inherently associated with a breakdown in the credibility (denoted below by C) of stabilization authorities' real-side (employment) objective. The emergence of a broadly held assessment of a nontrivial likelihood of depression will be shown to restrict the willingness to invest in residential and nonresidential construction, equipment, and software and to purchase consumer durables, while simultaneously driving substantial losses in asset markets. Characteristic NDD circumstances, which also impair the funding to and lending by banks and nonbank financial institutions, require much more aggressive aggregate-demand management to prevent welfare loss that greatly exceeds more typical SDD business cycles. The two stabilization problem classes are fundamentally different.

Rational inaction. Cataclysmic depressions distort cost-benefit decision-making. Even a small likelihood of depression translates into such a large expected loss that any plausible return from most lending or investing, especially if postponable at little cost, is overwhelmed. It follows that rationally responding to a macro environment that admits a nontrivial likelihood of depression is to stop acquiring risk assets, preserving cash, until a convincing market floor has been established. (Moving to the sidelines is consistent with the maxim of veteran traders not to try catching a falling knife.) Strategic inaction, postponing lending or investment, is centrally characteristic of NDD crises. Such episodes of uncertainty also provide low-risk opportunities for short-sellers, further helping to generate extreme trading-market instability. In the circumstances of nonstationary demand disturbances, mark-to-market assets are subject to outsized downward pressures. Moreover, if stabilization policymakers are successful or the NDD threat is otherwise dissipated, the rebound in asset prices will be correspondingly large.³⁴

Investor/lender inaction is a powerful idea that greatly enhances policy-relevant analyses of macro instability. The model has roots in earlier work on household saving behavior. The development of precautionary saving theory enhanced the reach of standard life-cycle analysis by extending the role of saving from rationally allocating resources over the life cycle to additionally insuring against uncertainty. (See Browning and Lusardi (1996).) Despite the recent efforts of Nancy Stokey (2009), however, the important insights from rational inaction have not been effectively introduced into mainstream macroeconomics. Incorporating such inaction into tractable NDD modeling has long been the most important policy-relevant innovation in the treatment of expectations available to macro theorists interested in extreme instability.³⁵

³⁴ In the process, a many uncertain, risk-adverse households will have panicked, selling near the bottom, swearing off equities, missing the rebound, and suffering sizeable permanent wealth losses. Macro crises are inherently accompanied by reduced signal to noise in available information, especially to small investors, placing a great responsibility on stabilization policymakers. They need to get much more serious about their real-side credibility.

³⁵ The most consequential (albeit failed) effort to introduce investor uncertainty into consensus thinking was by Keynes (1936). Indeed, there is a serious macro school of thought (see, for example, Fitzgibbons (1988)) that believes the *General Theory* is most usefully understood as an exercise in the economics of uncertainty. Keynesian “animal spirits” attempted to cope with the temporary, idiosyncratic nature of the short-run and the more-or-less-present threat of NDD.

Investor confidence. The generalized-exchange reconstruction of macro theory has so far ignored investor confidence (denoted by \mathcal{C}). That model-building choice is typical. In macro modeling, such confidence is typically understood to be increasing in expected profits ($\Delta\mathcal{C}/\Delta I_j > 0$), typically making \mathcal{C} redundant.³⁶ With the assumption of redundancy, however, near-universal investor descriptions of an independent role of confidence become a red flag, suggesting circumstances in which the setting aside of \mathcal{C} may mislead.

Building on Keynes's *General Theory*, Roger Farmer (2010b, p.18) has emphatically rejected \mathcal{C} redundancy: "Confidence matters. It is a separate, *independent* factor that helps to determine the unemployment rate."³⁷ In constructing his alternative treatment, he provides a central role for confidence in aggregate demand. His key innovation is rooting \mathcal{C} in a positive feedback relationship with equity prices, represented here by a notional stock-market price index (V).

Posit an illustrative feedback mechanism:

$$(6.21) \quad \mathcal{C}(t) = f(V(t-1), \Delta V(t-1)),$$

such that $\Delta\mathcal{C}/\Delta V > 0, \Delta\mathcal{C}/\Delta(\Delta V) > 0$, and

$$(6.22) \quad V(t) = f(I_j(t), \mathcal{C}(t), C'(t)),$$

such that $\Delta V/\Delta I_j > 0, \Delta V/\Delta\mathcal{C} > 0, C' \in [0, 1]$.

C' was earlier defined as a notional measure of investor/lender perceptions of the real-side credibility of the stabilization authority.³⁸ It is increasing in the degree to which investor/lender assessments of the future states of the macroeconomy are consistent with the objectives of the stabilization authority, introducing conditional uncertainty into decision-making. An instructive linear version of the feedback model is:

³⁶ Again, recall from Chapter 3 that I_j is governed by known, priceable risk.

³⁷ See also, for more complete expositions of his argument, Farmer (1999, 2010a). The basic idea that agents' expectations of a given outcome can, in a range of circumstances, produce that outcome was formalized by Cass and Shell (1983) in their sunspot equilibrium theory. Neary and Stiglitz (1983) also introduced confidence into aggregate demand via the intertemporal bootstrap effect, i.e., pessimistic expectations about the future economic conditions increasing the likelihood of such conditions in the present, in the quantity-rationed model class.

³⁸ While Farmer (1999, 2010a) does not provide an explicit role for C' , he does not object to the TVGE reformulation of his basic model. Note that the model lags are inherent in a real-time marketplace, defined by the time required for data reporting as well as the planning and execution of stock-market transactions.

$$(6.23) \quad V(t) = C^r(t)I_J(t) + (1 - C^r(t))[c_1 V(t-1) + c_2 \Delta V(t-1)], \text{ such that } c_1 + c_2 = 1.$$

As assessments of macro prospects become more uncertain, decreasingly governed by credible stabilization authorities ($C^r \rightarrow 0$, $0 \leq C^r < 1$) and therefore priceable risk, the influence of economic fundamentals (I_J) on V is diminished. Asset pricing is increasingly driven by the unanchored positive feedback mechanics of \mathcal{C} . A feature of the simple model is that confidence becomes destabilizing in macro episodes featuring nonstationary demand disturbances.

It is easy to extend \mathcal{C} - V feedback from asset pricing to total nominal spending, the focus of the acute-instability analysis. In the enriched framework, investment outlays (like asset pricing) are determined by I , \mathcal{C} , and C^r , with policymaker credibility again mediating the relative influence of profit fundamentals and confidence.³⁹ Macro model equation (6.10) is extended:

$$(6.24) \quad I(t) = f(I_J(t), \check{r}^m(t), \mathcal{C}(t), C^r(t)),$$

such that $\Delta I / \Delta I_J > 0$, $\Delta I / \Delta \check{r}^m < 0$, $\Delta I / \Delta \mathcal{C} > 0$.

In addition, consumption spending is influenced by household wealth and is, therefore, sensitive to mark-to-market equity and home prices as well as current income. Moreover, in episodes of contracting aggregate demand, incomes throughout the economy are destabilized by powerful macrodynamic multipliers. Putting the pieces together, investor/lender uncertainty produces a second, more extensive destabilizing feedback, this time between confidence (\mathcal{C}) and aggregate demand. This larger feedback system motivates NDD instability.⁴⁰

An enhanced role of self-referential confidence is easily accommodated by generalized-exchange thinking.⁴¹ Once embedded in TVGE modeling with its keystone MWR Channel, the feedback

³⁹ Economic fundamentals reflect the available levels of capital, labor, and technology. Once efficiently utilized, those factors produce output and mean living standards at the economy's potential.

⁴⁰ To reiterate, C^r mediates the relative influence of expected fundamental profitability (I) and investor confidence (\mathcal{C}). As investor expectations become more uncertain, decreasingly governed by credible stabilization authorities and priceable risk, the influence of economic fundamentals on asset value and total spending is diminished. The model helps explain the sometimes extreme volatility of investment relative to other components of total spending.

⁴¹ Absent the MWR channel uniquely derived from model primitives in the TVGE theory, Farmer cannot rationally suppress wage recontracting and cannot coherently accommodate involuntary job loss and policy-relevant recession/

model implies conditional dependence of aggregate demand and employment dynamics on \mathcal{C} . Confidence becomes critically influential when the economy is experiencing NDD stress and is inherently rooted in damaged stabilization-authority credibility. Lucas correctly insisted that, to be rational, expectations must effectively use available information on government policy. In the 2008-09 financial crisis, investors used existing information to negatively assess the credibility of real-side stabilization policies. In question was government's capacity to manage aggregate nominal demand, halting and reversing the rapid contraction in total spending and hemorrhaging forced job loss. From the feedback-model's perspective, investors' distrust of monetary/fiscal competence was clearly manifest in the collapse in equity prices. In the month that followed the Lehman bankruptcy in September 2008, the S&P 500 fell by 27%; and, in the subsequent six months, the index had lost nearly half its value. Yet, by yearend 2009, the S&P 500 experienced a greater than 60% rebound from its lowest reading in March. Theorists must choose whether to explain that extreme instability or to look the other way, assigning it anomaly status.

The two models. In Roger Farmer's (1999, 2010a, 2010b) macroeconomics, investor confidence directly influences, and is influenced by, the stock market. In the simple feedback model used to capture that idea, equity prices are increasingly motivated by self-referential confidence as aggregate-demand prospects are decreasingly governed by priceable risk. The acute-instability macrodynamics are greatly enhanced by Nancy Stokey's (2009) argument that, as investors become uncertain, greater inaction is rational. Macro crises plausibly generate a high incidence of buyers waiting for the emergence of a credible floor under asset prices. While confidence and inaction help propagate a range of nominal and real shocks, their influence becomes central in circumstances that feature a breakdown in the real-side credibility of stabilization authorities.

stagnation/depression. Once embedded in the Workplace-Marketplace Synthesis, however, the rigorous analysis of the independent role of investor confidence becomes relevant to stabilization policymaking. Notable support for an independent role of confidence has come from Alan Greenspan in 2009 (writing in the *Financial Times*): "... a significant driver of stock prices is the innate human propensity to swing between euphoria and fear, which, while heavily influenced by economic events, has a life of its own. In my experience, such episodes are often not mere forecasts of future business activity, but major causes of it." Quoted in Farmer (2010b), p.110.

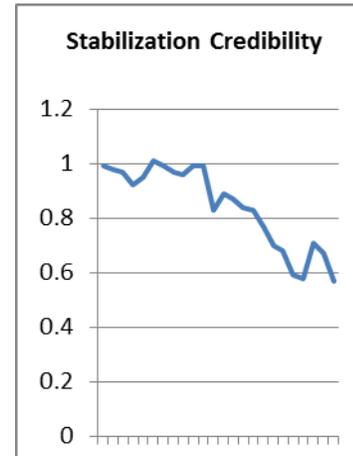
BOX 6.6: THE FEEDBACK MODEL AND STABILIZATION CREDIBILITY

Consider a simple dynamic exercise in which the linear feedback model is plausibly calibrated:

$$V(t) = \hat{C}(t)I_3(t) + (1 - \hat{C}(t))[c_1V(t-1) + c_2\Delta V(t-1)], \text{ such that } c_1 = c_2 = 0.5.$$

The model, where V represents the S&P 500 equity-price index, was simulated over the month (24 trading days) that followed the Lehman bankruptcy on September 15, 2008. Discounted profit expectations (I_3) were reduced by 5% on the first day and subsequently held constant. The timepath of the measure of the real-side credibility of stabilization authorities (\hat{C}) was determined by the sequence of values that minimized the difference between the actual behavior and the linear-model estimate of the S&P index.

The timepath of \hat{C} produced by the linear model is presented in the Chart. It is remarkably intuitive. The S&P Index dropped by nearly 30% in the month after the Lehman bankruptcy, much more than can be reasonably attributed to the impact on future profits from the financial crisis. While the direct damage was indeed significant (e.g., the inefficient regulation likely to be imposed on the financial industry), it was surely insufficient to reduce longer-term discounted profits (I_3) of the entire economy more than 5%. The assessment of a relatively modest role in the equity crash played by the fundamental reduction in I_3 is supported by the sharp S&P 500 rebound that occurred once the contraction in total nominal demand was reversed in the first half of 2009. What had, of course, disappeared was the fear that the financial crisis would morph into a depression, not the real effects of the crisis itself.



The huge reduction in equity prices in the 30 days after the Lehman bankruptcy must be, as the simple model suggests, mostly attributable to a substantial loss of confidence that stabilization authorities would be able to contain and turn around the breakdown in total spending. Recall the widespread, much debated fear of another 1930s-class depression. There is no other plausible candidate for the starring role in the perilous 2008-09 macrodynamics and its consequent outsized welfare loss. If the real-side credibility of the Federal Reserve, the U.S. Treasury, Congress, and the White House had been robust, i.e., if investors had been convinced that stabilization authorities had the means and the will to effectively stabilize aggregate demand, the stock-market breakdown as well as most of the overall 2007-09 welfare loss would have been avoided. Real-side confidence is a big deal that stabilization authorities must closely monitor and manage.

NDD Propagation of Financial Crises

Adverse nonstationary demand disturbances (NDD), associated with outsized welfare loss, necessarily occur outside Leijonhufvud's (1981) self-correcting corridor. Recall his argument, cited earlier, that markets are similar to mechanical control systems. While handling a normal range of disturbances well, mechanical systems have limits to the size or type of disturbance they can stabilize. Once embedded in coherent generalized-exchange modeling, the macro-confidence and inaction models combine with the MWR Channel to provide continuous-equilibrium microfoundations for the important class of extreme aggregate-demand disturbances.⁴²

Nonstationary demand disturbance reemerged with a vengeance as a practical U.S. stabilization problem in the 2007-09 Great Recession. In those circumstances, the inability of coherent SVGE modeling to accommodate recognizable NDD market failure profoundly damages the relevance of current consensus thinking. The NDD threat alone renders the mainstream model class inadequate to the task of supporting monetary policymaking.

TVGE model mechanics. Financial crises, inherently particular, are generally propagated by adverse disturbances in total nominal spending. The welfare costs of the two-part process are analytically separable. Losses uniquely associated with the originating banking crisis are a small fraction of those that can result from its propagation. Only the relatively few financial-system disruptions that are NDD-linked damaged overall welfare sufficiently to become infamous.

Three interrelated linkages between breakdowns in the banking system and total nominal spending have been identified. First, shrinking bank balance sheets restrict credit, restricting the range of outlays supported by borrowing. Second, the breakdown in stabilization authority real-side credibility broadly increases the preference for liquidity. Third, investor/lenders become rationally inactive when predictable probabilities governing macro outcomes are sufficiently

⁴² Central-bank real-side credibility supports priceable macroeconomic risk, helping to motivate a class of dynamic instability that is effectively represented as a stationary stochastic process. Stationary demand disturbances (SDD) are understood to occur inside the Leijonhufvud corridor. Samuelson (1939) introduced, perhaps inadvertently, the NDD concept into formal macro theory in his early synthesis of the accelerator-multiplier models. His macrodynamics produced bounded spending cycles for only a limited range of parameters, suggesting the feasibility (if not the importance) of unchecked nonstationary demand contractions operating outside Leijonhufvud's corridor.

displaced by uncertainty. A nontrivial likelihood of depression then becomes sufficient to induce reluctance to invest or lend, preserving cash until convincing asset-price bottoms are established.

Two background points about NDD mechanics deserve emphasis. First, a necessary condition for the overall process is the existence of the MWR Channel. Wage recontracting must be suppressed if financial dislocations are to be powerfully propagated by destabilizing positive feedback between collapsing aggregate demand and lost jobs, production, income, and profit. The absence of MWR in coherent SVGE modeling causes modern theorists to ignore the all-too-evident role of spending contractions in the real-side propagation of financial crises, dooming mainstream aspirations for stabilization relevancy. Second, the complex interaction of profit expectations, investor confidence, and stabilization-authority credibility that rationally dominates TVGE investor/lender decision rules significantly diminishes the SVGE dominating role of interest rates in ameliorating macro fluctuations.

BOX 6.7: MAINSTREAM EXPLANATION OF THE GREAT RECESSION

Robert Hall (2010, p.3) has explained the extreme 2007-09 instability using “a simple macro model that captures the most important features of modern models.” His analysis features “realistic increases in financial frictions that ... generate declines in real GDP and employment of the magnitude that occurred.” His mainstream model provides a SVGE benchmark that sharply contrasts with the TVGE analysis of the Great Recession.

Financial friction. From Hall (2010, p.6): “The dominant view among macroeconomists today is that a financial crisis causes real economic activity to collapse by raising frictions.” He calibrates his candidate 2008 financial friction with the jump in the interest-rate spread between the Baa corporate bond and the 10-year Treasury note. The friction itself is rooted in well-known agency costs that, in the aftermath of the Lehman bankruptcy, helped push the spread more than four percentage points higher. Standard DSGE simulation tools are used to size the cost-of-capital macro effects.

Mainstream problems. Financial frictions, by themselves, don’t explain much. From Hall (p.7): “...research generally shows that in standard neoclassical models, with normal preferences and technology and competitive markets, [financial-friction] shifts of realistic magnitude fail to deliver anything like the volatility seen in the U.S. economy.” SVGE financial-friction models must find sufficient juice elsewhere. Hall (p.6) provides the elsewhere by positing two “... departures from the neoclassical benchmark”: (i)

countercyclical pricing power and (ii) countercyclical, substantial, voluntary unemployment. His results follow from those assumptions. Logically and empirically, neither is – no softer assessment is accurate – acceptable in policy-relevant analysis.

Also unacceptable is the broad range of facts that Hall must ignore. His narrative provides little role for contracting nominal spending. There is no room for, and therefore no mention of, the *six million* involuntary job losers, who accounted for most of the increased unemployment that actually occurred and that practitioners who actually laid-off workers know to have resulted from collapsing aggregate demand. Hall makes no distinction between NDD and SDD. Indeed, he must pretend that, in his Great Recession, NDD does not exist. The real-side credibility of stabilization authorities also has no place in his coherent SVGE analysis. Even in 2008-09 circumstances, Hall must assume that interest rates always exert the primary influence on investment outlays, despite investors making no secret about paying most attention to profit expectations and product demand. Hall achieves 16% and 23% reductions in real consumption and output by tolerating a nearly 40% cut in real wages as well as a halving of the capital stock, wildly out-of-bounds results that did not occur and must be indicative of a deeply flawed model. Also telling is his concession (p.3) that the theory “... cannot explain why GDP and employment failed to recover once the financial crisis subsided – the model implies a recovery as soon as financial frictions return to normal.”

The illustrative, far from exhaustive, logical and factual shortcomings are familiar from the ongoing effort to model continuous-equilibrium macro behavior while restricting exchange to the marketplace. Despite the debilitating problems, Hall believes his SVGE model provides a promising, albeit “highly stylized”, explanation of the Great Recession. His analysis is made more Ptolemaic than promising by its inability to accommodate substantial market failure, rendering it unable to come close to describing what actually happened. By contrast, TVGE modeling is burdened with none of Hall’s destructive logical and factual problems. The TVGE-vs-SVGE methodological choice matches Occam versus Ptolemy, evidence versus epicycles. Modern theorists must stop being pushed into acceptance of an increasingly obvious Ptolemaic worldview.

A better liquidity trap. Acute-instability macrodynamics recall the Keynesian liquidity trap, occurring when a money increase does not push down the interest rate, instead adding to idle balances and failing to stimulate total spending. In the *General Theory* (1936), Keynes motivated the trap with a speculative motive, i.e., investors believing that bond prices are already too high and the risk of capital losses too great to make bond purchase rational.

The Great Recession stimulated new interest in zero-bound interest rates, especially with respect to preserving the Fed’s capacity to stimulate the economy. Many ideas were floated by mainstream economists. For example, Charles Evans, from his seat on the FOMC, suggested a

temporary increase in the central bank's inflation target, which in the SVGE model would stimulate spending by lowering expectations of real interest rates. In addition, at the Fed's 2012 Jackson Hole symposium, Michael Woodford argued for specific forward guidance about the circumstances that would induce the FOMC to raise its target interest rate, believing would stimulate spending by increasing confidence in the central bank's commitment to low interest rates. He forcefully argued that the stimulative power of forward guidance, in both theory and evidence, clearly trumps quantitative easing.

The GEM Project reveals the Evans and Woodford ideas to be woefully ineffectual responses to the 2008-09 challenges and the slow-growth aftermath. TVGE modeling downgrades interest rates relative to pure-profit expectation in the determination of investment outlays, shedding light on a formidable class of liquidity-trap inhibition on spending out of cash balances. To reiterate, investor/lenders confidence in future macro stability is definitionally linked to the credibility they assign to the real-side objective of the stabilization authorities (denoted by C'). Uncertainty results in rational inaction, waiting for asset prices to find a credible floor. Sidelined investors/lenders inevitably feed collapsing total demand that, if unchecked, combines with the rational MWR Channel to produce depression. The reconstructed inhibition plays a critical, recognizable role in episodes of acute instability (SDD→NDD).⁴³

TVGE characteristics. Generalized-exchange modeling of financial crises, propagated (at least for a while) by adverse nonstationary demand disturbances, generates a large list of predictions. Nominal demand must be observed to weaken sharply, and the shortfall must be concentrated in investment outlays. Total spending is initially constrained both by reductions in both credit availability and macro uncertainty rooted in faltering stabilization-authority credibility. Unemployment increases rapidly, with most of the jump resulting from involuntary job loss. (Recall Table 1.1.) At first, LEV money wages are not cut; however, if the economy sinks into a

⁴³ In circumstances of acute instability, the appropriate Federal Reserve response to the reconstructed liquidity trap is to use its balance sheet in an explicit, aggressive effort to halt and reverse the collapse in total spending. Given financial markets role in recycling saving into investment, the stabilization program reasonably focuses on frozen asset markets, becoming a buyer-of-last resort in the attempt to establish credible price floors. To further reiterate, if investors/lenders had not become C' -uncertain in 2008-09, the Great Recession would have been much diminished, creating welfare loss more in line with the internet-bust plus nine-eleven financial crisis of 2001.

prolonged depression with persisting excess capacity and depressed profits, the incidence of job downsizing and wage givebacks increases with time. (Chapter 3.)

Contracting C' exerts early, extraordinary downward pressure on equity prices, substantially reinforcing NDD propagation. Stocks sharply rebound if and when the collapse in total demand is reversed. In TVGE modeling, the only effective macro policy response to a SDD→NDD metamorphosis is to implement available policies, quickly and in size, that work to reverse the demand contraction. In 2008-09, thankfully, Ben Bernanke understood; dangerously, many in high reaches of government did not and still do not.

V. NATURAL RATE OF UNEMPLOYMENT

Modern analysis of the of the natural rate of unemployment (U^N) typically cites Friedman's (1968) iconic definition: "... the level that would be ground out by the Walrasian system of general equilibrium equations provided there is embedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the costs of mobility and so on." Friedman argued that $U(t)=U^N$ implies price-inflation stability, making his natural rate equivalent to the more operational nonaccelerating inflation rate of unemployment (NAIRU).

TVGE innovations. The natural rate is broadly understood as a notional variable, around which actual unemployment fluctuates. Generalized-exchange modeling elaborates on that approach. The organizing idea is that U^N is a nonstationary phenomenon that is invariant with respect to shifts in aggregate nominal demand.⁴⁴ In rebuilding the natural-rate model to accommodate MWR, the strong-attractor hypothesis is rejected, permitting $U(t)>U^N(t)$ persistence that is characteristic of depression and stagnation.⁴⁵

⁴⁴ In this introductory exposition of generalized-exchange theory, the tractability of the natural rate is greatly facilitated by the assumption of labor's market homogeneity, which eliminates structural unemployment rooted in mismatched skills and job vacancies.

⁴⁵ The natural-rate hypothesis that centrally motivates changes in product-price inflation with changes in labor-market conditions is also rejected. Recall that SVGE thinking, in order to allow $U(t)$ to deviate from $U^N(t)$, typically

TVGE continuous-equilibrium unemployment is rooted in the independence of LEV wages from rational labor-market exchange. Any estimated correlation between LEV labor pricing and labor-market conditions largely results from collinearity between the latter and overall product price inflation. Indeed, counter to coherent SVGE macroeconomics, TVGE causation typically runs from wages to unemployment: (i) from MWR to layoffs (cyclical unemployment) via adverse high-frequency shifts in nominal demand and (ii) from MWR to job downsizing (producing more persistent market joblessness) via lower-frequency nominal disturbances. Further complexity in the generalized-exchange relationship between nominal labor pricing and unemployment results when low-frequency job destruction induces wage givebacks via the long-lagged rational recalibration of employee reference standards (\mathbb{K}_J) modeled in Chapter 3.

TVGE reduced-form nominal-wage macrodynamics deduced in Chapter 4 (equation 4.25) helps organize this section's brief look at the natural rate of unemployment (U^N):

$$\begin{aligned} w(t) = & \Phi(t)r^n_J(t) + \Phi(t)\beta\sigma p^n_{kJ}(t) + \Phi(t)\beta(1-\sigma)p^m_k(t) \\ & + \Phi(t)(1-\beta)p^I_k(t) + \Phi(t)(E_t p^N(t+1) - E_{t-1} p^N(t)) \\ & + (1-\Phi(t))(\gamma^m_k(t) + p^m(t)) + (1-\Phi(t))(a_1(U^N(t) - U(t))) \\ & + (1-\Phi(t))a_2\Delta\mu(t). \end{aligned}$$

Recall that, in the model, unemployment appears in a limited role, directly influencing only SEV labor pricing. Among job-seekers willing to accept low-wage employment, the use of all available cost-effective information in the formation of their expectations restricts the capacity of misperceived opportunity costs to generate unemployment persistence.⁴⁶

assumes short-lived lags in information discovery. That labor-market friction set is consistent with continuous decision-rule optimization and also exists, but no longer plays a starring role, in the TVGE model class.

⁴⁶ In such circumstances, famously modeled by Lucas (1972), total demand interventions by monetary policymakers are ill-advised, having been reduced to a practical null set by inherently limited capacities to identify and manage small market failures.

BOX 6.8: MORE ON UNCERTAINTY

Uncertainty is the trickiest of Keynes's fundamental ideas. On the one hand, it manifestly exists and is obviously important in macrodynamic stability. On the other, its liberal use in macro modeling causes the analysis to become unmoored. Almost any result the theorist wants is available by jiggling uncertainty parameters. Model-builders must carefully husband their use of uncertainty in order to preserve the capacity to produce operational theorems.

TVGE model. Given its emphasis on macro instability, compact TVGE analysis manages the most difficult expectations problem by identifying and preserving the critical uncertainty influencing investor choice. Macro uncertainty occurs when investors conclude that the real-side objective of the stabilization authority is not credible, a subjective evaluation denoted by C^* . It is monotonically increasing in the degree to which the future state of the economy is governed by known probabilities conditional on the stabilization authority's goal.

Forward assessments other than central-bank credibility are simplified by excluding uncertainty. In particular, the other critical determinant of investor expectations is future profits. Expected real discounted profits (II) are posited (equation 3.3) to be conditional on known probabilities. Recall that pure profits (II), claimed by owners of sunk capital (K^S), are a residual payment, defined as product-sales revenue in excess of the cost of labor hours and financial capital. In effect, future II in the compact TVGE model is understood to be a micro exercise influenced by the homogeneous LEV firm's circumstances, including assessments of its product competitors, input availabilities, infrastructure, technology, and hold-up problems. Investors are assumed to have a sufficient grasp of firms' micro challenges and opportunities to support, at least for the purpose of introducing generalized exchange, restricting II to be effectively governed by known probabilities.

More general uncertainty. Thoughtful post-Keynesians have long insisted on the broad use of uncertainty, loosely motivated by *The General Theory's* "animal spirits". (After assigning expectations a starring macrodynamic role, Keynes had relatively little to say about how they were formed.) That insistence is an excuse for a reiteration. While uncertainty is indeed omnipresent in economic behavior, broad dependence on animal spirits in constructing macro theory introduces substantial, irreducible indeterminacy into the analysis, sharply restricting its capacity to generate operational theorems useful to stabilization authorities. The art of policy-relevant macro model-building critically includes figuring out how to effectively limit reliance on uncertainty. The introduction of C^* is the compact generalized-exchange model's attempt at an effective balance. It is assigned the important task of incorporating into the TVGE model class Keynes's insights about financial-market psychology, the relative instability of investment, and liquidity preference during extreme (nonstationary) contractions of aggregate demand.

* For elaboration, see Chapter 10. The corresponding nominal objective is less consequential in terms of potential welfare loss and, in order to simplify the compact TVGE model, is assumed to be always credible.

In contrast to relatively uninteresting market misperceptions provided early emphasis by Lucas, the richly specified (once rational exchange is no longer arbitrarily restricted to the marketplace) $r^n_J(t)$ is quite helpful in explicating the complex role of unemployment. The term has been named the “wage-aspiration effect” in the literature. It is uniquely microfounded in TVGE modeling by the equilibrium timepath of \mathbf{K}_J , which ultimately reflects the dynamic trade-off between the equity-based reference standards and expected consumption. (Chapter 3) In highly specialized economies, such rational intertemporal decision-making has been shown to be consistent with extended periods of durable \mathbf{K}_J and, consequently, stable r^n_J .

LEV macrodynamics generate meaningful wage rigidities that interact with high- and low-frequency movements in nominal demand to produce both involuntary layoffs and job downsizing. Layoffs, reflecting job loss that is (from the perspective of firms) temporary, increase $U(t)$ but cannot affect $r^n_J(t)$. Downsizing, reflecting permanent job loss, also increases $U(t)$ but also rationally affects $r^n_J(t)$. While downsizing is especially time-intensive, reference standards motivating wage aspirations are eventually recalibrated. In the model as well as the evidence, the relationship between unemployment and nominal inflation is both relatively weak and subject to long lags, presenting a fundamental challenge to the ubiquitous SVGE focus of stabilization policy on the specification and maintenance of a single price-inflation objective.

Reservation wages and the natural rate. Chapter 5 elaborated on the generalized-exchange extension of continuous-equilibrium joblessness beyond frictional unemployment (U^F) that results wholly from the time required in the rational matching of job vacancies and job seekers in the labor market.⁴⁷ TVGE macrodynamics assigns a critical role to reservation wages (W^R) in the timepath of nonfrictional joblessness. A broad class of job seekers, denoted by $U^R(t)=U(t)-U^F(t)$, is restricted by $W^n \geq W^R > W^m$. The prevailing wage in LEV employment, jobs for which the unemployed worker is qualified but cannot obtain, is greater than or equal to the reservation wage, implying that U^R is involuntary despite $W^R > W^m$. (See Patinkin (1956), Chapter 13.)

⁴⁷ To reiterate, TVGE labor-market homogeneity eliminates the structural class of joblessness associated with skill mismatches. Even with that simplification, continuous-equilibrium unemployment generated in two-venue macroeconomics is substantially richer and intuitive than joblessness featured in S/M/B modeling. (See Chapter 5.)

BOX 6.9: MORE ON LEIJONHUFVUD'S CORRIDOR

Leijonhufvud's corridor is central to the debate on properly modeling the Great Recession. From Robert Hetzel (2012, p.xiii): "Prior to the 2008-09 recession, considerable professional consensus existed that a prolonged, deep recession required contractionary monetary policy. With the 2008-09 recession, this consensus disappeared. Popular and professional discourse revived the view that dominated thinking in the nineteenth century and first half of the twentieth century. According to this view, the business cycle derives from excessive swings in risk taking by investors. Although popular expressions of this view ignore the operation of the price system, the implicit assumption is that these fluctuations in investor sentiment between optimism and pessimism overwhelm the ability of the price system and, especially, the real interest rate to maintain full employment."

Economists who see the coherent SVGE model class as a serious guide stabilization policymaking must believe that plausible disturbances do not push, absent policy mistakes, the economy outside Leijonhufvud's corridor. Again from Hetzel: "... the monetary-disorder view is that the price system works well to equilibrate the economy, provided that monetary creation and destruction do not prevent the interest rate from adjusting. There is no inevitable movement from boom to bust. This view received empirical content from the hypothesis that to prevent the monetary emissions and absorptions that destabilize the price level, the central bank must follow a rule that provides for a stable nominal anchor and that allows market forces to determine the real interest and, by extension, other real variables."

Taking the coherent TVGE model class seriously leads to different conclusions. Market failure is understood as not unusual in continuous-equilibrium economies. As described by Modigliani (1977), such economies "need to be stabilized, can be stabilized, and therefore should be stabilized by appropriate monetary and fiscal policies." Debate about the size of Leijonhufvud's corridor turns on the existence and power of the MWR Channel, which has been shown to be uniquely microfounded by generalized exchange.

There is general agreement that the policy response to the Great Recession should include the identification and cost-effective correction of externalities implicated in the breakdown in the funding of globally interrelated financial institutions. Insightful analysts also understand that even optimally designed regulatory reform is relatively unimportant to stabilization policy. (The causes of financial crises are known to mutate in kind and place in order to avoid regulations.) From the TVGE perspective, the most significant policy reforms would instead support more effective management of nominal-demand disturbances that propagate real financial shocks, spending instability that can generate self-referential dynamics. Stabilization authorities must be provided more robust capacity (i) to intervene, quickly and in size, to halt and reverse contracting total demand and (ii) to manage associated investor/lender expectations about macro prospects.

In a world reorganized by the Second Industrial Revolution, motivating the monetary authority wholly by a low-inflation objective is badly deficient. The central bank must also commit to real-side stability represented by full employment, with contingency plans that both effectively support the real objective and are persuasively communicated to global investors/lenders. A powerful message of generalized-exchange theory is that real-side credibility is the stabilization authorities' most important deterrent to outsized welfare loss from financial crises.

Also in Chapter 5, U^R was usefully divided into four interrelated components. First, denoted by \check{U}^R ($\check{U}^R < U^R$), are workers laid-off with recall who are inhibited by their reservation wage from taking a SEV job while waiting to return to their rent-paying LEV jobs. Second, \tilde{U}^R ($\tilde{U}^R < U^R$) represents permanent job losers who, reflecting their preferences for leisure over consumption or imperfect information about their true market opportunity costs, refuse low-wage employment.⁴⁸

Third is the class ($\hat{U}^R < U^R$) that results from income-replacement programs triggered by job loss. \hat{U}^R is understood to be especially sensitive to support-program duration and generosity. In TVGE modeling, rational permanent job losers who exhaust income-replacement eligibility either join the LEV queue (\hat{U}^R , considered next) or exit unemployment by taking a SEV job or dropping out the labor force. Fourth is the class of reservation-wage joblessness ($\hat{U}^R < U^R$) that is associated with the inter-venue, two-way labor transfer required by continuous-equilibrium meaningful wage rigidities and the consequent LEV rationing of good jobs. The Harris-Todaro transfer mechanism, summarized in Chapter 3, occupies a central place in TVGE analysis. The decision to join the good-job-seeking queue (\hat{U}^R) is governed by perceived LEV employment growth and wage-rent size, a process that is little influenced by match technology.

Putting the pieces together, compact TVGE modeling motivates a better definition of U^N :

The compact natural rate of unemployment is comprised of the frictionally jobless (U^F) and those who rationally participate in the rationed-jobs queue (\hat{U}^R).⁴⁹

⁴⁸ Imperfect information is especially problematic when rents paid in previous, now lost, LEV employment muddle workers' perception of their true market price and job prospects are complicated by sensitivity to stationary versus nonstationary labor-market conditions. Such learning processes are well understood to require time, indicating that involuntary job losers are particularly vulnerable to relatively long-duration unemployment. (See Chapter 5.) Meanwhile, differing preferences violate the useful worker market-homogeneity assumption in the compact TVGE theory and will not be emphasized here.

⁴⁹ The name "compact natural rate" recognizes that, in practical applications, U^N must also include structural mismatches, including the skill requirements of job vacancies relative to the human capital of unemployed workers, which in the compact TVGE model have been suppressed by the assumption of point-of-hire labor homogeneity. Also recall that the continuous-equilibrium existence of rationed jobs and hours in LEV firms implies that almost the entire TVGE labor force, including U^N , has been pushed off its market labor-supply schedule, a wholesale repeal of Keynes's second classical postulate that fundamentally microfounds macroeconomics.

Discretionary aggregate-demand intervention, which targets LEV employment, production, and profits, cannot effectively reduce either component of the compact natural rate ($U^N = U^F + \hat{U}^R$).

Implications. TVGE thinking explains many interrelated characteristics of the Phillips-curve empirical literature that have long puzzled SVGE theorists: (a) unemployment is a relatively weak determinant of wage change; (b) the relationship between unemployment and inflation is very malleable over the postwar period; and (c) high unemployment can persist for prolonged periods. Proper elucidation of the first fact requires rejecting the core hypothesis of the natural-rate literature, i.e., that changes in the inflation rate are predominately motivated by the changes in the labor market. Labor costs, given their size, remain important; but generalizing exchange substantially restricts the labor market's role in overall wage determination. The second (see equation 6.25) and third facts largely result from the inherent dynamics in the composition of unemployment in two-venue analysis. Unusually persistent unemployment is frequently associated with increased incidence of forced permanent job loss, especially job downsizing, and its associated time-intensive price discovery, as well as increased generosity of income-support programs for the jobless. As shown in Chapter 4, the aftermath of the stagflation decade became the 20th-century poster child for the painful, continuous-equilibrium \mathbf{K}_J -recalibration process.⁵⁰

Other forces, TVGE-identified as influencing inflation and unemployment, further diminish the role of the natural rate. LEV labor-productivity growth (γ^n_J) exerts a significant macrodynamic influence, microfounding virtuous and vicious cycles. Interacting with r^n_J , $\Delta\gamma^n_J$ produces same-direction change in pure profit, which in turn generates same-direction pressure on capital investment, good-job creation, and \mathbf{K}_J durability, while putting opposite-direction pressure on p_J and w_J . Meanwhile, SEV labor-productivity innovations ($\Delta\gamma^m_K$) motivates same-direction shifts in small-firm employment and output, directly influencing average wages and prices.

TVGE modeling additionally microfounds the varying influence of terms-of-trade shifts (Δb_L) on LEV labor pricing.⁵¹ As demonstrated in the stagflation decade, Δb_L can induce complex, same-

⁵⁰ The TVGE stagflation analysis is also consistent with the prolonged decline in U^N from the mid-1980s to the turn of the century that has been identified in the empirical work. (See, for an early example, Stiglitz (1997).)

⁵¹ In Chapter 4, LEV terms-of-trade dynamics are represented by $b_L(t) = \beta\sigma p_K^n(t) - \Phi\beta(1-\sigma)p_K^m(t) - (1-\beta)p_K^l(t)$.

direction effects on price and wage inflation as well as on U^N . The power of those effects is conditional on \mathbf{K}_J durability and ultimately depends on the timepath of profits (Π_t). (Chapter 4) Changes in direct government intervention ($\Delta\mu$) can also produce significant shifts in the natural rate. Finally, the reconstructed rational expectations term ($E_t p^N(t+1) - E_{t-1} p^N(t)$) prevents a policy-exploitable long-run trade-off between inflation and unemployment.

VI. NEW NEOCLASSICAL SYNTHESIS

A remarkable four-decade run of model-building choices by New-Classical, RBC, and New-Keynesian theorists has culminated in the New Neoclassical Synthesis (NNS), which is constructed wholly within the coherent SVGE framework. Most modern theorists share the conviction, having deep roots in Walras and others working in the Continental tradition, that economic exchange is best modeled as the outcome of intermarket equilibrium. Rejecting as a atheoretic convenience the assumption of downward-sticky wages central to the original Neoclassical Synthesis, next generation academics were bold enough to challenge Early-Keynesian hegemony by asserting the obvious. Macroeconomics cannot coherently differ from fully specified general-equilibrium microeconomics. Factoring that endogenous frictions may prevent markets from always clearing, the space of marketplace decision rules is best understood in the context of continuous, endogenously constrained equilibrium.

The peace treaty. Approaching the turn of the century, leading theorists (beginning in the United States) effectuated a truce in the 30-year macro-modeling war by cobbling together a working consensus that combines tenets of New Classical, RBC, and New Keynesian thinking. As has been emphasized, the NNS mandates two critical areas of compromise between the RBC/New Classical and New-Keynesian camps.⁵² The latter acknowledges that macro models must always be constructed on coherent intertemporal SVGE microfoundations, motivating Woodford's well-known conclusion that "the methodological stance of the New Classical and real-business-cycle

⁵² Woodford (2009), p.269. The NNS peace treaty, proffered by Goodfriend and King (1997), is reminiscent of the truce declared by Samuelson (1955) in the long-running Keynes-versus-Classics debate. He simply asserted that the vast majority of American economists were committed to a "neoclassical synthesis" that allowed for the time-dependent coexistence of Keynesian macroeconomics and neoclassical microeconomics.

theorists has become the mainstream.”⁵³ Meanwhile, in victory, RBC/New Classical theorists must recognize that SVGE modeling can legitimately “incorporate a variety of [endogenous] adjustment frictions that allow these models to provide fairly realistic representations of both short-run and long-run responses to economic disturbances.”

Permissible frictions must be SVGE-consistent, implying that New Keynesians should eschew using free parameters to produce interesting results. Again from Woodford (2009, p.270): “What is important is having general-equilibrium models in the broad sense of requiring that all equations of the model be derived from mutually consistent foundations, and that the specified behavior of each make sense given the environment created by the behavior of the others.” Free parameters, especially those used to suppress wage recontracting, damage model coherence and eliminate any meaningful distinction between the Early and New Keynesians.

Absent the will-o’-the-wisp Super Friction (so-named in Chapter 1) that endogenously suppresses wage recontracting, NNS scholars’ proper insistence on model coherence requires an array of interrelated macro outcomes that many economists (especially those working for stabilization authorities) find troubling, including the nonexistence of involuntary job loss; demand-related cyclical contractions that are restricted to Lucas-class money illusion or costly price discovery and are so mild as to be indistinguishable from market-efficient resource reallocations; and apparently high, persistent joblessness always being nonmonetary in nature. Relatively few economists seriously believe those outcomes describe actual economies. It is dispiriting that, despite the exhaustive work done on SVGE-consistent frictions, dynamic coherent general equilibrium in mainstream modeling remains stubbornly coterminous with full employment.

The problem, of course, is that no SVGE-coherent Super Friction has materialized. What’s worse, it has become clear that none will emerge. Nonexistence is inherent to the nature of the

⁵³ Woodford (2009), p.269, here and following. The formal macro literature has separated the SVGE model into two (Ramsey (1928) and Diamond (1965)) variants. In the former, agents are infinitely lived, while the latter features overlapping generations. It is, however, the shared assumptions of the Ramsey and Diamond models, most notably restricting exchange to the marketplace, that most matter in the assessment of SVGE macroeconomics relative to the TVGE model class. As a result, this introductory analysis usefully ignores the Ramsey-Diamond distinction.

rigorous market-centric model. Give employees a choice between losing their jobs and wage reductions that do not violate opportunity costs, and there is a single rational outcome. And, given the nature of profit-seeking market exchange, employers must offer that choice. Super-Friction prospects for the New Keynesians branch of the New Neoclassical Synthesis are no better than they were in the much maligned Early Keynesian quest to microfound their “old” Neoclassical Synthesis.⁵⁴ A lot of (SVGE) work by a lot of good economists has produced discouragingly, albeit instructively, little stabilization-relevant progress.

Most modern theorists, giving in to exhaustion, now simply sidestep labor pricing. Many focus instead on the class of product-price stickiness for which a more developed framework has been inspired by menu-cost theory.⁵⁵ The emphasis is without apology, despite the intrinsic inability of sticky product pricing to microfound involuntary job loss. Woodford’s (2003, p.140) admirable NNS bible illustrates the avoidance strategy: “I focus primarily on models with sticky prices, though I discuss the consequences of wage stickiness as well. In this I follow most of the literature of the past 20 years....” That the policy relevance of macro modeling has deteriorated

⁵⁴ Illustrative of the inherent mainstream difficulties are the SVGE wage rigidities constructed in Hall (2005b), Blanchard and Galí (2010), and Galí (2011). Those examples typically sidestep wage recontracting and cannot accommodate involuntary job loss and recognizably-sized business cycles. From Galí (2011, p.497): “... the wage does not ‘automatically’ adjust to guarantee that all the labor supplied is employed. Instead, the wage is bargained bilaterally between individual workers and firms to split the surplus generated by existing employment relations. Employment is then the result of the aggregation of firms’ hiring decisions, given the wage protocol.”

⁵⁵ See, for example, Mankiw (1985) and Parkin (1986). The modern treatment of the Calvo price-setting mechanism cites reoptimization costs (rooted in information gathering, communication, and decision-making) but never overcomes the basic problem that interesting stabilization conclusions continue to depend on the use of free parameters to suppress wage recontracting. Moreover, the rationality of meaningful menu-class sticky pricing has also never been demonstrated; nor is the model particularly intuitive. From Sims (2001, p.265): “... firms with sticky prices are offering unbounded call options. That is, they are offering to sell as much of their product as the market demands at their ‘stuck’ prices, no matter how long their price is stuck. This is not the way actual sticky prices work. Even in retail catalogues, everyone understands that an attractively priced and popular product may sell out, and the seller has no obligation to provide arbitrary amounts of the product at the quoted price.” Woodford (2003, p.141) also illustrates the modern reluctance to explain, in an optimizing framework, state-independent pricing. “While I give detailed attention to the consequences of assumed delays in the adjustment of prices and/or wages, I do not attempt to say anything new here about the underlying reasons for these delays. My assumptions about the frequency with which firms adjust their prices or the time lag that may be involved between the decision about a price and the time that the new price takes effect are treated as structural features of the environment in which firms sell their products, with the same status as their production functions.” That extraordinary rationale motivates a kind of meta-assumption to suppress rational recontracting that is somehow an improvement over Early Keynesians simply positing wage stickiness.

badly between the Old and New Neoclassical-Synthesis eras, despite the outsized investment in developing and marketing SVGE analysis, is both understandable and deeply troubling.⁵⁶

NNS policy implications. Seeking to navigate the tricky terrain produced by coherent SVGE modeling, many theorists turned to emphasizing real shocks, choosing to believe that aggregate market-efficient allocations fluctuate sizably and quickly. A central NNS stabilization-policy message, at least prior to the 2007-09 Great Recession, has been organized around the difficulty of distinguishing Pareto-optimal market adjustments from market failure. (See Hall (2007).) For a substantial number of theorists, nominal-demand management directly targeting employment stabilization had become a problematic tool best set aside.

Chari, Kehoe, and McGrattan's (2009, p.244) NNS message, published with remarkable chutzpah during the worst of the 2008-09 stabilization crisis, is representative: "The Old Keynesian view is eloquently and forcefully summarized by Franco Modigliani (1977), who argues that the fundamental, practical policy implication that Old Keynesians agree on is that the private economy *'needs to be stabilized, can be stabilized, and therefore should be stabilized by appropriate monetary and fiscal policies.'* The neoclassical [SVGE] economists, of course, recommend quite different policies: commitment to low average inflation rates on the monetary side and tax-smoothing on the fiscal side. Moreover, neoclassicals argue that even efficient allocations could fluctuate sizably."⁵⁷

⁵⁶ Many macroeconomists, working throughout their careers wholly within the SVGE analytical framework, have great difficulty imagining model-building outside that comfort zone. Illustrative is Ferreiro and Serrano's (2010, p.309) confident assertion that "the existence of rational expectations guarantees the existence of a competitive equilibrium outcome, that is, an outcome that clears all markets" If the assertion were true, macro theory could never be simultaneously coherent and stabilization relevant. It is then good news that their conclusion is conditional on the exclusive use of the SVGE model class. In TVGE theory, which generalizes exchange beyond single-venue general equilibrium, rational expectations are transparently compatible with market failures to clear.

⁵⁷ SVGE implications for tax policy are considerably weakened in TVGE modeling. See below.

BOX 6.10: MORE ON PTOLEMAIC MODELING

The SVGE variant of S/M/B modeling provides an appealing, albeit incomplete, explanation of the natural rate of unemployment. When extended to employment/unemployment fluctuations at cyclical amplitudes, however, the theory encounters problems that reduce it to a Ptolemaic exercise, consistent with SVGE macro thinking but irrelevant to stabilization policymaking.

Voluntary unemployment. Coherent S/M/B modeling is restricted to frictional (voluntary) unemployment. It has no access to meaningful wage rigidity produced by the generalization of exchange and cannot rationally motivate the suppression of wage recontracting, the existence of involuntary job loss, or the chronic wage rent that rations good jobs. Given that frictional joblessness is decreasing in recruitment efficiency, time required in matching vacancies and applicants is the inadequate raw material with which S/M/B theorists must construct cyclical models.

Job separation. Coherent S/M/B job separation is inherently restricted to voluntary quits, typically posited to occur at a constant rate. That model requirement suppresses a critical part of cyclical dynamics associated with involuntary job loss. S/M/B theorists proactively avoid dwelling on this restriction.

Substantial match capital. The vast majority of new hires are for nonsupervisory, routinized jobs, the human capital for which is largely employer-specific and provided via on-the-job training. Substantial idiosyncratic match capital, a ubiquitous characteristic of S/M/B modeling, mischaracterizes most employees and the needs of their employers. Intensive information gathering in the matching process is not cost-effective, especially when ubiquitous probationary periods more efficiently provide information about absenteeism, other work habits, and productivity.

Reverse causation. S/M/B theorists arbitrarily posit that causation runs from the number of recruiters (N), mediated by their productivity (ξ), to new hires (\dot{N}): $\dot{N}(t) = \dot{N}(t)/\xi(t)$. Practitioners consider such causation nonsense, arguing instead that the level of vacancies drives application processing productivity. If the unit cost of recruiting new hires for nonsupervisory, routinized jobs is low (reflecting the absence of significant match capital), reasonable levels of ξ reduce S/M/B modeling to the SVGE baseline. Positing ξ^* to be aggregate recruiter efficiency, A to be labor productivity, and \dot{N} to be production workers, the hard-line search-theoretic set-up is $X = A\dot{N}$, $N = \dot{N} + N$, $\xi^* \dot{N} = N$. It follows that $W/P = (1 - 1/\xi^*)A$. Reasonable recruitment efficiency implies the S/M/B labor market collapses to the SVGE outcome ($W/P = A$). Recruitment importance goes away.

Nash bargain. S/M/B modelers' reliance on Nash bargaining is puzzling. Strong assumptions are required to yield a determinant wage, which must be downward flexible at cyclical frequencies. Nash cannot suppress wage recontracting and, by varying the hire-wage for similar jobs, creates an unmanageable wage structure. No LEV firm claims such wage setting, but they do assert reluctance to cut nominal wages. Those facts suggest an impermissible question. Why are we so pleased with replacing the Keynesian rigid-wage labor market with the SVGE version of S/M/B model?

Evidence. The S/M/B model does not come close to fitting stabilization-relevant evidence. We have, of course, always known that. How can consensus theory explain available data when most of the cyclical variation in unemployment is caused by model-nonexistent involuntary job loss?

Chari *et al.* (2009, p.245) continue: “Something insufficiently appreciated today is that even though the New Keynesian model has many elements of the Old Keynesian stories, such as sticky [product] prices, the New Keynesian policy implications are drastically different from those of the Old Keynesians and are remarkably close to those of the neoclassicals.” RBC theorists have been least shy about embracing the policy implications of coherent SVGE thinking. Their reservations with respect to aggregate-demand management are emphasized in Prescott’s (2002, p.1) previously cited Ely lecture, which he began by throwing down the gauntlet: “Business-cycle theory ... provides little guidance to policy except for the important policy implication that a stabilization effort will have either no effect or a perverse effect.”

Illustrative of the New Keynesian perspective, Woodford (2003, p.13) is more circumspect in his deprecation of using demand management to directly influence employment and output: “... because of the difficulty involved in measuring the efficient level of economic activity in real time – depending as this does on variations in production costs, consumption needs, and investment opportunities – it may well be more convenient for a central bank to concern itself with monitoring the stability of prices.”⁵⁸ Woodford’s assessment of what is “more convenient” for central banks is consistent with the coherent SVGE restriction that adverse cyclical shifts exclude involuntary job loss and must, therefore, be exceptionally mild.⁵⁹

⁵⁸ Woodford (2003, pp.4-5) additionally uses his analysis of wage variations to express the same reservations about the effectiveness of real-side nominal demand management, arguing that Phillips-curve relations have mistakenly been thought to imply that “monetary policy should be used to achieve output or employment goals, rather than giving priority to price stability. The present study argues instead for a different view of the proper goals of monetary policy. Its use to stabilize an appropriately defined price index is in fact an important end toward which efforts should be directed – at least to a first approximation, it should be the primary aim of monetary policy.... Moreover, the existence of predictable real effects of monetary policy need not imply that policy should be based primarily on a calculation of its effects on output and employment. For the efficient aggregate level and sectoral composition of real activity is likely to vary over time, as a result of real disturbances of a variety of types.”

⁵⁹ Woodford (2003, p.13-14) goes on to specify the “stability of prices” that governs central-bank concerns: “The [product] prices that monetary policy should aim to stabilize are the ones that are infrequently adjusted and that consequently can be expected to become misaligned in an environment that requires these prices to move in either direction.... Furthermore, insofar as wages are also sticky, a desirable inflation target should take account of wage inflation as well as goods prices.” The passage reflects a first-order misjudgment rooted in consensus inattention to real-side consequences from adverse shifts in nominal demand, critically including the SDD→NDD metamorphosis described in the previous chapter. Reliance on the capacity of *sticky* wages and prices to signal gathering weakness in total spending must damage the capacity of policymakers to stabilize the employment and output. Woodford continues: “The empirical results ... suggest that wages and prices are sticky to a similar extent, suggesting that a desirable inflation target should put roughly equal weight on wage and price inflation.”

Centrality of wages. Problems most damaging to the stabilization-relevancy of the NNS consensus reflect long-characteristic hubris in the academy. Theorists who have constructed and maintain the coherent DSGE workhorse model are surprisingly ill-informed about 20th century labor economics. More to the point, they have only the sketchiest notion of the evolution of labor pricing in the global aftermath of the Second Industrial Revolution. As a result, mainstream theorists have been, and continue to be, ill-suited to the task of rigorously reconstructing Early Keynesian theory. They arbitrarily distrust the idea that wage rigidity can play a meaningful role in macroeconomics motivated by optimizing, price-mediated exchange organized by continuous general equilibrium. Consequently, many simply rule out a keystone role for nonmarket labor pricing. By making that model-building choice, NNS scholars are rejecting the intuition of a Who's Who of insightful economists, including Marshall, Fisher, Hicks, Modigliani, Patinkin, Samuelson, Freidman, Solow, Clower, Malinvaud, Drèze, Fischer, Lindbeck, Stiglitz, Summers, Akerlof, and Phelps. As noted above, good economists do not shrink from the obvious. And a huge pile of evidence makes it obvious that adverse nominal disturbances produce involuntary job loss, the coherent modeling of which requires the rational suppression of wage recontracting.

Perhaps the major practical problem, also as emphasized, is that stabilization-relevant modeling turned out to be difficult. In response to the New Classical challenge to Early Keynesianism, research agendas were initially shaped by an invigorated quest for rational foundations for state-independent labor pricing. Despite much work by able theorists, proffering a variety of models including market misperceptions, implicit and staggered contracts, insiders-outsiders, and efficiency wages, the effort to provide a broadly recognized reconciliation of meaningful wage rigidity and optimizing price-mediated exchange had, at least until the recent GEM Project completion of original efficiency-wage theory, failed.⁶⁰ Think about that list. Except for original efficiency wages, the various research programs to microfound MWR were all rooted in marketplace exchange. Failure was preordained.

⁶⁰ Martin Baily (1974) and Costas Azariadis (1975) originated the implicit-contract literature. (For elaboration, see Box 2.4.) The staggered-contract approach, associated originally with Edmund Phelps and John Taylor (1977), derives sticky wage behavior from the empirical observation that compensation adjustments for most workers are discrete events, typically occurring once a year. For insiders-outsiders modeling, see Assar Lindbeck and Dennis Snower (1984, 1988).

BOX 6.11: CHRONIC USE OF FREE PARAMETERS

Many New Keynesians, uncomfortably shackled to the SVGE mainstream, simply refuse to overlook the market failure evident in cyclical contractions of employment and output. They attach less importance to the formal economic method and more to stabilization relevancy, a preference that is manifest in their persisting faith in the real-side effectiveness of discretionary demand management. Awaiting identification of the will-o'-the-wisp Super Friction, they frequently push the SVGE envelop beyond its limits of coherence by using free parameters to suppress rational wage recontracting.

There is nothing new in the New-Keynesian efforts to be stabilization relevant while working within an inhospitable mainstream theory. The use of free parameters to reconcile a pedagogic commitment to SVGE microfoundations and the desire to be policy-useful has been vigorously debated by macroeconomists for generations. Perhaps most famously, *The General Theory's* attack on classical economists was not much motivated by contemporary differences in policy recommendations. In a 1937 letter to Richard Kahn, Keynes complained, referring to Pigou and Robertson, that “when it comes to practice, there is really extremely little [disagreement] between us.” (Quoted in Clarke, 1988, p.306) Keynes’s classical straw-man is best understood as representing mainstream economists’ commitment to a theory that requires free parameters in order to align with their policy recommendations. Again from the Keynes’s letter: “Why do they insist on maintaining theories from which their own practical conclusions cannot possibly follow?”

After the 1930s global depression, the mainstream shoe was on the other foot. Early Keynesians, following the lead of Modigliani, Patinkin, and Samuelson, used free parameters to make nominal wages downward-sticky and their macro analysis operational within textbook market-centric modeling. The Neoclassical Synthesis arbitrarily reconciled cyclical involuntary job loss with consensus SVGE growth analysis. Given the Early Keynesians’ inability to follow up with a proper derivation of wage stickiness from axiomatic model primitives, the shotgun marriage eventually stumbled during the stagflation decade and was eagerly rejected by a new generation of macroeconomists. In the evolution of macroeconomics, the use of free parameters has generated trouble largely as a result of their necessarily arbitrary, i.e., guesswork, specification of labor-price rigidity capable of suppressing wage recontracting.

In that modern context, Keynes’s question about Pigou and Robinson remains relevant; but it is now directed to New Keynesians. Why are they complicit in a coherent SVGE theory “from which their own practical conclusions cannot possibly follow”?

Moreover, research in this area has slowed dramatically. With the Early and New-Keynesian chronic inability to identify a Super Friction capable of embedding meaningful wage rigidities in coherent SVGE modeling, good theorists tired of the unyielding problem and began setting aside

the substantial accomplishments of the Neoclassical-Synthesis era, focusing instead on explanations for cyclical employment behavior that conveniently omit the role of labor-pricing inflexibilities. Hall (2003, p.149) captured the fundamental reorientation of mainstream research: “[T]he old idea of wage rigidity [is] ... almost forgotten in modern theory where wages are continuously updated through a Nash bargain.” That consensus choice is short-sighted and, ultimately, self-defeating. Building coherent, stabilization-relevant macro models, if provided microfounded meaningful wage rigidity, is easy. Without MWR, the task is not possible.

VII. SVGE VERSUS TVGE MODELING: THE LABOR WEDGE

The labor wedge is defined as the ratio of the marginal rate of substitution between consumption and leisure (MRS) to the marginal product of labor (MPL). The concept has become, perhaps not surprisingly, a source of mischief in macro modeling. In coherent SVGE theory, the wedge is unitary. Keynes’s First and Second Classical Postulates are satisfied, and the labor market clears.

In TVGE modeling, by contrast, LEV labor rents are chronically paid, causing good jobs and hours to be rationed; MPL exceeds MRS; wage recontracting is suppressed; labor is pushed off its market supply schedule. The less-than-unity wedge is consistent with a labor market in continuous decision-rule equilibrium that never clears. Moreover, a unitary labor wedge is inconsistent with involuntary job loss, and the less-than-unitary version is a necessary condition for the discretionary real-side management of aggregate nominal demand.

The hard fact is that mainstream SVGE thinking, aspiring to be both coherent and stabilization-relevant while still being unable to suppress wage recontracting, transforms labor-wedge analysis into a Ptolemaic muddle.⁶¹ The following takes a close look at the burgeoning wedge literature

⁶¹ In the modern macro literature, labor-wedge measurement is the product of two endogenous variables (a) average hours (the ratio of total labor hours worked divided by the adult population) and (b) the consumption share (the ratio of total nominal consumption to nominal GDP), calibrated by parameters critically including labor-supply elasticity, disutility of labor supply, and labor share. The mainstream SVGE derivation of the labor wedge, to have meaning, requires that the labor market continuously clears. The modern wedge empirical literature is a curious exercise in *corrupted-priors modeling*, which posits a characteristic of the economy and subsequently interprets evidence from the perspective of the assumption in order to “test” whether the characteristic is valid.

and what it implies for modern macro analysis, an exercise that illuminates basal differences between the TVGE and SVGE analytical frameworks.

BOX 6.12: MODERN THEORISTS' BIG MISTAKE

The most recent Palgrave three-volume summary of modern macroeconomics has only two Index entries for wage inflexibility (“wage rigidity”, p.1055; “fixed wage”, p.1157), reflecting the widespread practice of ignoring nonmarket labor-pricing in aggregate analysis. That choice, a relatively recent break with at least a century-long practice of macro theorists, is the most damaging model-building mistake of the modern era. Nothing else comes close.

The generalization of exchange, uniquely microfounding meaningful wage rigidity, produces powerful implications. Fluctuations in aggregate nominal demand become the most important source of employment/output instability. Rent-paying jobs and workweeks exist and must be rationed. Rational households must take quantity rationing into account in their consumption decisions, and firms must assess the real-side, as well as inflation, credibility of stabilization authorities in their investment decisions. The role of interest rates in maintaining continuous decision-rule general equilibrium is diluted from its SVGE centrality. Involuntary job loss, both layoffs and downsizing, crucially influences the macrodynamic timepath of employment. Informed policymaker management of nominal disturbances ameliorates welfare loss resulting from the inherent instability of modern, specialized economies.

Given the challenge of generalized exchange, modern macro theorists would do well to heed the model-building advice of J. Willard Gibbs, the 19th century polymath best known for championing the mathematization of science. For Gibbs, the role of the theorist was “to find the point of view from which [his or her] subject appears in its greatest simplicity.” (Rukeyser (1942), p.231) In macroeconomics, Occam’s razor as well as consistency with rationality and relevant evidence provides a commanding argument for moving expeditiously on integrating optimizing workplace exchange into the SVGE modeling ubiquitously featured in macro textbooks.

With the generalization of rational price-mediated exchange from the marketplace to the workplace, the widespread modern practice of deemphasizing downward wage inflexibility in macro modeling must be understood to have been a debilitating mistake. Meaningful wage rigidity is easily shown to motivate a simple, powerful, continuous-equilibrium explanation of macro instability. Absent MWR, the formal modeling of unemployment and business cycles has become implausible, numbingly convoluted (e.g., the unhappy S/M/B attempt to get frictional unemployment to fluctuate at cyclical amplitudes), and still unable to fit enough of the important evidence to be at all convincing. It is time to accept that continuous workplace equilibrium is the necessary innovation that makes coherent macro theory consistent with rationality, the evidence, and Occam’s razor.

For the inaugural issue of *American Economic Journal: Macroeconomics*, its editors selected two articles that focused on the wedge, indicating its contemporary importance. In one, Chari, Kehoe, and McGrattan (2009, p.243), henceforth CKM, assert an emergent consensus among macroeconomists that the labor wedge is one of the “two particular reduced-form shocks [that] play a central role in generating US business cycle fluctuations”. Wedge significance in the cutting-edge literature derives from its capacity to improve the empirical fit of SVGE models.⁶²

New Classical/RBC and New Keynesian (NK) Wedges

The chronic employment-volatility puzzle has pushed the mainstream search for endogenous SVGE frictions that improve their market-centric general-equilibrium models’ capacity to explain ubiquitous cyclical evidence. The quest has moved the labor wedge to the center of the modern debate on the proper nature and application of macro frictions. The New Classical/RBC and New Keynesian camps disagree on how to use the wedge to help transform the New Neoclassical Synthesis into a framework capable of generating stabilization-relevant theorems. Indeed, the disagreement’s intensity makes today’s celebrated methodological consensus look not much different from the anti-Keynesian open warfare that preceded it.

CKM (2009, p.243) argue that the New-Classical/RBC model-building tradition is rooted small, simple models that eschew free parameters. New Classical/RBC theorists also “put up with the reality that no model can, or should, fit most aspects of the data.” By contrast, the New Keynesian tradition, typified by Christiano, Eichenbaum, and Evans (2005), henceforth CEE, tolerates greater model complexity in the pursuit of ever better fits to available data, leading researchers to being less parsimonious in their definitions of shocks and use of free parameters. Moreover, New Keynesians are frequently less attentive to the rigorous content of Barro’s recontracting critique. CEE, for example, risk their membership in the NNS consensus by using

⁶² In the other inaugural AEJ:M wedge-focused article, Shimer (2009) celebrates the convergence of macro thinking to the New Neoclassical Synthesis by devoting attention wholly to the SVGE behavior of MRS relative to MPL. Chari *et al.* also cite, but pay relatively little attention to, the original RBC technology wedge, associated with time-varying total-factor productivity, perhaps indicative of the practical problems that have accumulated around that explanation.

econometric evidence to posit a three-quarter lag in the wage-response to changed market conditions. The assumption endows their now incoherent SVGE model with much of its capacity to generate stabilization-relevant behavior in the aftermath of a monetary shock.⁶³

CKM (p.243) remained unconvinced: “Our main concern with the New Keynesians’ preferred tradition is that it leads to models that simply cannot be relied on for policy analysis.” Their familiar critique emphasizes “dubiously structural shocks” used by new Keynesian models to achieve relatively good data fits. CKM and other New-Classical/RBC theorists are particularly offended that new Keynesians inadequately specify the labor wedge, tolerating multiple, conflicting interpretations of the ratio. Multiple meanings are indeed indicative of problematic wedge credentials as a structural feature of macro modeling.

Structural Models

It is a central tenet of modern macro thinking that only structural models are acceptable for use in policy analysis. CKM reasonably argue that such models must be coherent and demonstrate two properties:

- Relevant elements of the model must be invariant with respect to the policy intervention being considered.⁶⁴
- Model shocks must be uniquely interpretable within the dynamic stochastic SVGE framework, in order for policymakers to assess which are beneficial (to be encouraged) and which are harmful (to be ameliorated).⁶⁵

⁶³ They illustrate the frequent confusion in modern NK thinking by providing a narrative for their wage assumption rooted in Calvo’s random partial wage recontracting, a model that can never reflect rational behavior.

⁶⁴ It is usefully recalled here that Chapter 4 demonstrated that, in the circumstances of a credibly stable monetary regime, only catch-up to past price inflation (not expectations of future inflation) is used in rational, periodic LEV nominal wage adjustments. That structural model implies wage-price inertia and real labor-price fluctuations at business-cycle frequencies, identifying additional restrictions on the proper labor-wedge specification.

⁶⁵ In TVGE modeling, in which labor-wedge behavior is governed by continuous general decision-rule equilibrium, it makes little sense to think of the wedge as a macro shock. Also making little sense is the use of a measured wedge, for which a principal component is average total hours worked, to track either output or different versions of labor hours. The amateur circularity makes good fits as unsurprising as their meanings are ambiguous.

Models that demonstrate both properties are structural. Those that do not are reduced-form. Moreover, an implicit third property, i.e., consistency with the observed behavior of relevant macro variables (at least at business-cycle frequencies), is also required if models are to provide useful guidance for stabilization policymakers. Monetary policy cannot be reasonably assessed, or optimal policy rules derived, with structural models that cannot accommodate the facts.

Market Frictions

The SVGE literature's familiar market frictions, many providing competing interpretations of the labor wedge, are summarized in this section. They are assessed with attention to rationality (in particular, their vulnerability to Barro's recontracting critique), coherence (notably the nature and use of free parameters), effective restrictions on interpretation, and policy relevancy (especially their accommodation of involuntary job loss).

Calvo's price-adjustment model. Guillermo Calvo (1983) posited that a fixed fraction (\bar{v}) of prices remain unchanged each period, permitting the remaining prices to be recalibrated. The probability that any given price (product or labor) will be adjusted in any given period is $(1 - \bar{v})$, implying very strong restrictions on rational behavior. At any given time, pricing policies of most firms must ignore the time lapse since prices were last changed, the size and nature of changes in market conditions, and the current price level. Calvo's staggered pricing enables tractable aggregation and appears to be, despite its dependence on deeply arbitrary free parameters, the market-friction mechanism of choice in many New Keynesian SVGE models.

Calvo's free parameter prevents wage adjustments in circumstances of mutual benefit and can never be consistent with optimizing behavior. The Calvo mechanism particularly runs afoul of model coherency requirements in its suppression of wage recontracting. As a result, it differs little from Early Keynesian practices that led to their banishment from modern graduate-school curriculums and cutting-edge journals. Given their proclaimed rejection of Early Keynesian acceptance of expedient incoherence, NNS theorists' use of Calvo pricing is a puzzle.

Staggered wage contracts. Prior to Calvo's revolving price-adjustment restrictions was John Taylor's staggered wage contracts. From Taylor (1999, pp. 1013-14): "For most workers employed in medium to large-sized firms, wages (including benefits) are normally adjusted at rather long discrete intervals, most commonly once a year. The wage adjustment is typically associated with an extensive performance and salary review. A large fraction of the wage payment is usually stated in a fixed amount of dollars (or other currency) per unit of time (hour, week or month)..." Taylor posits that posted overlapping contract periods makes wage setting unsynchronized across the economy. He provides some narrative for sticky wages by arguing that cost savings result from restricting the incidence of labor-price adjustments. (Chapter 4)

Despite the enriched SVGE narrative, there can be no debate that staggered contracts incoherently suppress wage recontracting. Administrative costs are clearly insufficient (a) to frustrate workers' voluntary acceptance of reduced wages, if opportunity costs are not violated, in place of job loss and (b) to prevent firms from offering such reductions. The critical process is *recontracting*. Taylor lags do no more than introduce arbitrary, inconsistent free parameters into SVGE modeling, making little stabilization-relevant progress relative to the Early Keynesians.

Sticky information. Reis (2009, p.7) has attempted to motivate Calvo-class market frictions: "[My] approach assumes that there are fixed costs of acquiring, absorbing, and processing information, so agents optimally choose to update their information sporadically.... This is the model of inattentiveness and, in principle, it leads to a rich distribution of agents updating their information on different dates and at different frequencies.... [In] every period a constant fraction of agents update their information and write plans into the future that they revise only when they obtain information again. This is the model of sticky information, where information disseminates slowly throughout the population."

It must be extremely difficult to come up with innovative frictions capable of suppressing wage recontracting even if they are permitted to obviously violate the consensus mandate for macro model coherence. Rational inattentiveness differs little from Taylor's or Calvo's staggered adjustment. Each implausibly restrict choices that involve forced employment separation. Models claiming rationality must allow employees to pay attention when offered the choice of

wage cuts versus job loss. Moreover, mistakes about true opportunity costs can only result in voluntary, not involuntary, job loss. Like Taylor and Calvo, Reis is doing no more than introducing arbitrary free parameters into SVGE modeling.⁶⁶ On the plus side, his analysis does usefully illustrate the multiplicity of interpretations that is a key free-parameter characteristic.

Variable work-leisure preferences. Some theorists have posited that the disutility of labor fluctuates, countercyclically, at business-cycle frequencies, causing stationary movements of employment and output. On the plus side, their approach differs from the Taylor-Calvo-Reis class of market frictions. On the minus side, its serious treatment is much more troubling. A problem is that all employment separation resulting from changed worker preferences must be voluntary and, as such, has little relevance to actual business cycles dominated by forced job loss. More important is the arbitrary abandonment of preference stability (in the analysis of high-frequency fluctuations), violating a fundamental principle of the formal economic method. It is well understood that preferences freed from their axiomatic roots, beyond being psychologically unsound, can be manipulated by theorists to yield any result they wish.

Ptolemaic manipulation best describes theorists' use of variable work-leisure preferences. It is indicative of the problematic state of SVGE macro modeling, especially as it reaches to be stabilization-relevant, that reputable mainstream macroeconomists persist in positing convenient shifts in preferences in their explanations of cyclical data.⁶⁷ The CKM (2009, p.244) assessment of the variable-preference shock is cuttingly correct: "In the fluctuating value of leisure view, a contagious attack of laziness among workers leads them all to take vacations by quitting, causing an economic downturn."

⁶⁶ Reis (2009, p.2) argues that his sticky-information model can "be used to provide concrete guidance to policymakers". Unless the mainstream SVGE model is being dumped (if so, Reis needs to provide a more powerful replacement), his argument functionally differs little from what we all already know. Free parameters improve the fit of any model and good luck to policymakers in interpreting what the better fit means.

⁶⁷ Examples include Smets and Wouters (2003) and Gali and Rabanal (2004). Gali-Rabanal "find" that shifting preferences account for 57 percent and 70 percent of the variance in output and hours respectively. Why rely on nonsensical preference shifts that lack any empirical support when everybody knows that the ubiquitous cyclical evidence is more much powerfully explained by broadly documented, practitioner-recognized wage rigidities?

Taxes. If SVGE labor supply is sufficiently price-elastic, wedge distortion resulting from rising labor and consumption taxes will reduce aggregate employment and production.⁶⁸ Tax-induced wedge increases, however, do not alter the SVGE requirement that labor be paid its opportunity cost. Recontracting still requires that any wage inconsistent with such opportunity costs results in voluntary, not involuntary, job separation. One of the tax-argument's major difficulties is its overwhelming rejection by the evidence, which shows that rising unemployment in recession is largely associated with forced job loss. Voluntary quits decline. It is embarrassing that economists continue to conveniently set aside well-known, consistent evidence by motivating cyclical job loss with voluntary separation.⁶⁹

Moreover, the capacity of labor or consumption taxes to reduce labor-force participation and increase wages, sufficiently to distort or neutralize the intended macro effects of the fiscal policy, is greatly reduced by the generalized-exchange rejection of Keynes's Second Classical Postulate. As modeled in Chapter 2, chronic labor rents push almost all LEV employees off their market supply schedule, forcing them into chronic excess-supply circumstances.

Variable bargaining power. Employee wage-setting power is assumed to exist and to fluctuate, countercyclically, at business-cycle frequencies. The existence and hypothesized variable use of bargaining power, having never been microfounded in mainstream SVGE analysis, require free parameters that upon examination are nonsensical. The variable use of such power cannot occur in a coherent SVGE modeling, in part running afoul of the representative household's axiomatic preference for more versus less consumption. Moreover, given that rational recontracting rules out SVGE wages that are downward inflexible at the cost of involuntary job loss, the mainstream model cannot produce cyclical contractions of sufficient size to be policy-relevant.

⁶⁸ See, for example, Prescott (2004). See also footnote 37 above.

⁶⁹ There are, moreover, the problems of (a) empirically implausible high supply elasticities that are required in work-leisure substitution models tasked to explain cyclical variability in employment and (b) the evidence of procyclical average taxes.

BOX 6.13: LISTENING TO KOCHERLAKOTA, PART II

Recall that Narayana Kocherlakota is the President of the Federal Reserve Bank of Minneapolis. He has thought deeply about the limited capacity of mainstream macro theory to explain the 2008-09 economic crisis, including the troubling restrictions on the nature of macro shocks permissible in the consensus SVGE model class.

In the 2009 Annual Report of the Federal Reserve Bank of Minneapolis, Kocherlakota (2010, p.16) took a stand: “The sources of disturbances in macroeconomic models are (to my taste) patently unrealistic. Perhaps most famously, most models in macroeconomics rely on some form of large quarterly movements in the technological frontier (usually advances, but sometimes not). Some models have collective shocks to workers’ willingness to work. Other models have large quarterly shocks to the depreciation rate in the capital stock (in order to generate high asset price volatilities). To my mind, these collective shocks to preferences and technology are problematic. Why should everyone want to work less in the fourth quarter of 2009? What exactly caused a widespread decline in technological efficiency in the 1930s? Macroeconomists use these notions of shocks only as convenient shortcuts to generate the requisite levels of volatility in endogenous variables. Of course, macroeconomists will always need aggregate shocks of some kind in macro models. However, I believe that they are handicapping themselves by only looking at shocks to fundamentals like preferences and technology. Phenomena like credit market crunches or asset market bubbles rely on self-fulfilling beliefs about what others will do. For example, during an asset market bubble, a given trader is willing to pay more for an asset only because the trader believes that others will pay more. Macroeconomists need to do more to explore models that allow for the possibility of aggregate shocks to these kinds of self-fulfilling beliefs.”

Hopefully, Kocherlakota’s thoughtful critique will encourage serious debate on the role of self-fulfilling prophecies in fluctuations of total spending. To most effectively participate in such debate, he will need to extend his overall criticism to the most problematic feature of the modern treatment of macro shocks. The absence of a rational MWR Channel in coherent SVGE modeling implies that meaningful macro shocks are limited to real disturbances. Once optimizing exchange is generalized, however, macro theorists can coherently accommodate the broadly recognized (outside of the academy) fact that most aggregate employment fluctuations result from fluctuations in total nominal demand.

Despite the Ptolemaic nature of the dicey variable-power friction, some NNS theorists have assigned importance to it in their cyclical analyses.⁷⁰ Again, the mockery from CKM (2009, p.244) is deserved: “In the bargaining power view, a contagious attack of greediness among

⁷⁰ Three notable examples are Smets and Wouter (2003), Gali, Gertler, and Lopez-Salido (2007), and Smets and Wouters (2007). In the latter, wage mark-up shocks accounted for a fifth of output variation and more than half of inflation variation.

workers [during business-cycle downturns] leads them to demand higher wages. In general equilibrium, this attempt is frustrated, and workers simply bid themselves out of jobs.” If such irrational bidding did exist, it would produce voluntary, not involuntary, job loss.

VIII. CONCLUSION

Workplace-Marketplace Synthesis. Modeling heterogeneous workplace and marketplace venues of employer-employee exchange should not be difficult for macroeconomists to accept. The two classes of rational exchange are complimentary, not contradictory. Both are needed to adequately describe modern economies. In the SEV subset of rational behavior, worker-hours supplied and demanded are equilibrated in the labor market with short lags rooted in price-discovery frictions, the familiar process that is consistent with continuous decision-rule equilibrium. Effective supervision bundles employee OJB ($\dot{Z}_K(t)=\dot{Z}_K^n$), restricting worker discretionary actions to the marketplace and inducing investment in information acquisition related to stay-quit decisions and the ongoing quest for rent-paying, long-tenured (LEV) jobs. Rational behavior generates labor churning, into and out of SEV jobs, into and out of unemployment, and into and out of the labor force. Information costs and asymmetries limit SVGE workers’ grasp of the true state of the economy as well as their own opportunity costs, requiring stochastic decision-making.

By contrast, LEV cooperative labor input ($E_J=\dot{Z}_J H_J$) is rationally unbundled and, as a result, cannot be measured by hours alone. Optimizing exchange necessarily relocates from the marketplace to the workplace, a distinct venue constructed by large, bureaucratic firms to facilitate the effective management of employee behavior. Establishments pay wages, from the relevant Workplace-Exchange Relation, that minimize unit costs while workers use their latitude on the job to pursue axiomatic preferences that govern their satisfaction with management policies. (Recall Figure 2.1.)

The efficiency wage (W^n_J), embodying cyclical downward rigidity as well as chronic time-varying rent, is the lynchpin of dynamic workplace decision-rule equilibrium. Worker stay-quit decisions, for those who remain in the labor force, generally collapse to a rational decision to stay. Employers and employees both invest in acquiring information relevant to managing

workplace reference standards (\mathbf{K}_J) and, consequently, to the transformation of labor hours into cooperative input (E_J). The large, specialized firm's fundamental labor question is well understood, at least by practitioners, to be nonmarket in nature:

How to induce, given costly, asymmetric workplace information and routinized jobs, employees' acceptance of management's goals?

Being nonmarket, however, does not mean that the question is noneconomic. If the crucial task of policy-relevant macroeconomics is the description of instability in large, specialized economies, how can such a fundamental labor-pricing question be ignored?

Imperfect workplace/marketplace information makes choices with respect to both reference-standards (\mathbf{K}_J) and production-capability (C_J) stochastic in nature. Firms play the averages with respect to OJB and unit labor costs, while their employment policies are motivated by stationary and nonstationary profit expectations. The latter critically influence the interdependent timepaths of wage rents and workers' intertemporal substitution of consumption for equitable treatment.⁷¹ Downward LEV wage adjustment that reduces, rather than increases, unit costs requires voluntary recalibration of established reference standards (\mathbf{K}_J), a change motivated by job downsizing, not temporary layoffs. Job destruction is rooted in product-market developments that adversely affect pure profit, with little influence from the labor market.

Large-establishment compensation practices, rationally suppressing wage recontracting in lieu of forced job loss, dominate market labor pricing. They powerfully constrain marketplace decision-rule optimization and generate crucial intermarket spillovers from temporary and chronic job and hours rationing. LEV constraints on household and small-firm decision-making permit the coexistence of dynamic general (decision-rule) equilibrium and the failure of markets to clear, featuring involuntary job loss and joblessness at both business-cycle and longer-term frequencies. Putting the pieces together, interacting workplace and marketplace venues, especially as the economy adjusts to their inconsistent labor pricing, motivates much of what is stabilization-relevant in monetary theory. The MWR Channel reconciles rigor and relevancy in macro modeling, meeting the challenge of the Two-Venue Theorem introduced in Chapter 1.

⁷¹ Think of the ultimatum game writ large.

BOX 6.14: AUSTRIAN-SCHOOL BUSINESS CYCLES

In modeling business cycles, Mises, Hayek, and other Austrian-school theorists confined their thinking to the SVGE framework and, consequently, had no access to meaningful wage rigidities or the critical MWR Channel. Their belief that an exclusive focus on the control of money inflation (as well as the associated benefits of deflation) would be capable of stabilizing specialized economies is best understood as an artifact of their arbitrary limits on the scope of rational exchange.

From Lawrence White (2012, pp.76-77): “The Mises-Hayek theory was first and foremost a theory of the ‘upper turning point’; it aimed to explain why the cheap-credit boom must give way to bust.... The recession is a corrective period in which the needed readjustments take place. The firms that made nonviable investments must wind them down, perhaps go bankrupt, laying off workers and idling machines, leading to above-normal unemployment and unused capacity until those workers and machines are reabsorbed into more sustainable employment elsewhere. The more rapidly the economy adjusts wages and prices and reallocates resources, the shorter the recession will be.”

Criticism of Austrian business cycles was, unsurprisingly, increasingly vigorous as the Great Depression persisted. (Hayek published in 1932.) It became widely understood that a cyclical lengthening and shortening of the structure of production, an idea rooted in Böhm-Bawerk’s capital theory, cannot possibly account for the size and nature of employment/production variation in garden-variety recessions, let alone depressions. However, a lesser ambition of the Austrian School, i.e., describing the role of unfulfilled expectations with respect to investment projects toward the end of credit expansions, is more plausible and helps elucidate some recurring characteristics of periodic macro instability. While the evidence indicates that Keynesian modeling of investment expectations more powerfully motivates cyclical behavior, there is no reason why the Keynesian and the lesser-ambitious Austrian macrodynamics cannot work in concert.

The more fundamental problem is that, given their shared SVGE analytical framework, Austrian and Keynesian models, even if combined, remain badly incomplete. Along with Keynes, Mises and Hayek had little that was both relevant and coherent to contribute on the speed or nature of labor-price adjustments in a contracting economy. A half-century after “new corporate forms” were necessitated by the Second Industrial Revolution, Austrian theorists still did not recognize that deflation could no longer restore competitive wages and that the misguided attempt to do so would inflict huge damage on economic welfare.* As a result, they were unable to answer important stabilization-relevant questions, including why unemployment persists above its natural rate or, more generally, why adverse nominal disturbances induce involuntary job loss.

* Hayek (1975, p.5) later apologized for his Depression-era stabilization advice, especially his opposition to monetary expansion to counter deflation, which he claimed resulted from naïveté about the nature of labor pricing in increasingly specialized economies: “At that time [early 1930s] I believed that a process of deflation of some short duration might break the rigidity of wages which I thought was incompatible with a functioning economy. Perhaps I should have even then understood that this possibility no longer existed.”

Moreover, this chapter's introduction of Stokey's rational inaction in the circumstances of uncertainty, Farmer's investor confidence, and the credibility of the central bank's (explicit or implicit) real-side objective (C^f) substantially enhances the capacity of GEM modeling to explicate the perilous NDD propagation of macro shocks. Responding to investor/lender inaction and deteriorating stabilization-authority credibility, faltering confidence (revealed in the real-time behavior of the stock market) exerts substantial influence on the acquisition of physical and financial assets and, more broadly, on total spending in specialized economies.

Instructive episode. Two-venue macro thinking encourages the reconsideration of an unhappy episode in the development of formal macroeconomics. The period in question featured the insightful modeling, and relatively quick crushing, of the Clower/Patinkin inspired fixed-wage general-equilibrium (FWGE) School. Once embedded in the TVGE framework, the disparaged and discarded non-Walrasian equilibrium with rationing (also associated with young Barro, young Grossman, Malinvaud, Bénassy, Drèze, and other highly accomplished Keynesians) is transformed into the coherent, stabilization-relevant macrodynamic equilibrium sought by Keynes, Hicks, Modigliani, Samuelson, von Hayek, Robinson, Meade, Friedman, Solow, Tobin, Klein, Phelps, Lucas, Prescott, Akerlof, Stiglitz, Krugman, and almost everybody else.⁷² It turns out that Paul Krugman was right. Stabilization-useful microfoundations are not feasible in the coherent SVGE analytical framework.⁷³ The profoundly important, hugely underappreciated problems that result from arbitrarily restricting rational exchange to the marketplace have impeded progress on high theory since the Second Industrial Revolution.

The macro story, increasingly Ptolemaic over the last three-plus decades, features mistakes piled on mistakes. By now, it is surely evident that the banishment of Keynes and the Early Keynesians from serious study in our most respected graduate programs has been a profound blunder – an egregious overplaying of the RBC/New Classical victory in the macro methodology war. Can there be serious doubt that the mainstream disrespect (there is no other word) of the

⁷² Hicks and Solow got especially close.

⁷³ Krugman, however, has been wrong in concluding that stabilization-relevancy requires scrapping of the formal economic method.

great theorists who founded macroeconomics as a separate branch of economic theory has ill-served at least a generation of students and badly impeded a timely reconstruction of monetary theory to be both rigorous and relevant?

A rallying cry of the anti-Keynesian counter-revolution quickly became iconic: “The Lucas critique led economists to understand that people’s decision rules change where there is a change in the way policy is conducted.”⁷⁴ The Annable critique pushes economists to understand that decision rules change, more consequentially than in Lucas, where there is a shift in venue (from the marketplace to the workplace) in which optimizing exchange is conducted. If ignoring the Lucas critique is fundamentally unacceptable in coherent thinking, and it is, then ignoring the Annable critique must be an even greater offense against the proper way to do macroeconomics.

⁷⁴ Chari and Kehoe (2006, p.5).

BOX 6.15: REES, LUCAS, AND GENERALIZING EXCHANGE

Some readers may have, by now, tired of the always lurking Barro critique. Unfortunately, it is too important to ignore. It is critical to the capacity of models rooted in the formal economic method to answer questions that have mattered at least since Keynes. Asking how seriously to take the SVGE labor-supply schedule is ultimately asking how to do macroeconomics. Generalized exchange, with its careful attention to axiomatic preferences and technical constraints, uniquely illuminates the rational suppression of wage recontracting and consequent macro breakdowns in market efficiency. Understanding the frustrated gains from trade requires understanding why employers' interests are damaged by wage cuts. The narrower problem set leads to the voluminous literature on workplace best practices, then to the modeling done by original efficiency-wage theorists, and finally to the bedrock extension of optimal exchange from the marketplace to the workplace. Mainstream macro theorists continue to insufficiently trust the explanatory power of rational behavior to be fully alert to optimizing exchange outside their comfort zone of the marketplace.

Albert Rees (1951) knew a lot about labor pricing and has already been identified as one of the earliest proponents of the necessity of *employer* refusal to cut wages in any explanation of involuntary job loss. His formidable human capital helped spark an interesting confrontation with Robert Lucas (speaking of formidable human capital) – a quarrel that only appeared to turn on rational behavior as a proper guide for useful macro narratives. Rees refereed the 1969 Lucas-Rapping paper that became foundational in the successful methodological revolution to require the modeling of joblessness to satisfy conditions of continuous market-centric general equilibrium.

Rees (1970, p.308) published a comment in which he did not disguise his disgust: “Though scientific discussion is supposed to be dispassionate, it is hard for one old enough to remember the Great Depression not to regard as monstrous the implication that the unemployment of that period could have been eliminated if only all the unemployed had been more willing to sell apples or to shine shoes.” While Lucas did not engage Rees on the existence of involuntary joblessness, his views (i.e., that the phenomenon is properly ignored by macro theorists) have long been well known. Recall Box 5.5. A pleasing feature of the TVGE model class is its capacity to prevent fights among good economists, peacemaking that is accomplished by reconciling the formal economic method with the existence (and welfare cost) of involuntary job loss. Generalized exchange, surely in itself a good thing, accommodates the necessary rigor of Lucas and the admirable consciousness of Rees. Insisting on rational behavior does not overcome problems resulting from inadequate models (especially if policymakers are asked to pay attention), while models accommodating irrationality cannot be adequate..