GEM | Generalized Exchange
Macroeconomics

Chapter Ten

MONETARY POLICY
AND RELEVANT EVIDENCE

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In his masterwork, Adam Smith (1776) provides two particularly deep insights about economic activity: the spontaneous organization of self-interested market exchange (the "invisible hand") and the nature and implications of production specialization (the "pin factory").[1] Smith sought to explain decentralized market cooperation by large numbers of persons who efficiently price and distribute specialized output. Much later, Arthur Okun (1981) fundamentally enriched Smith's insights with his "invisible handshake".[2] The handshake became the organizing metaphor for Okun's (incomplete) analysis of optimizing exchange inside large, specialized establishments, featuring a class of wage rigidity through which nominal-demand disturbances induce same-direction movement in production, employment, income, and profits.

Okun, like Smith, was onto something important. Nonmarket rational price-mediated exchange is necessary if formal economic theory is to accommodate the mutation of pin factories into the large, specialized corporations ubiquitously organized in the aftermath of the Second Industrial Revolution. Bureaucratic workplaces, producing goods or services, are needed to motivate employee cooperation in circumstances of costly, asymmetric intra-firm information and routinized jobs. It is not surprising that Alfred Chandler's "new corporate forms", distilling over time best-practices management of workplace behavior, became globally characteristic.

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[1] John Stuart Mill notably generalized Adam Smith's division of labor to the "more fundamental" principle of worker cooperation.

[2] Okun's invisible handshake helped introduce economists to fair treatment as a critical determinant of employer-employee relations. Adam Smith anticipated that contribution. In *The Theory of Moral Sentiments*, Smith identifies critical motivators of behavior to be the interrelated factors of status, respect, and justice, with the latter generally equivalent to equitable treatment: "… we find ourselves to be under a stricter obligation to act according to justice than agreeably to friendship, charity or generosity; that the practice of these last-mentioned virtues seems to be left to some measure to our own choice, but that, somehow or other, we feel ourselves to be in a peculiar manner tied, bound, and obliged to the observation of justice."

It is surprising, and increasingly problematic, that macro theorists did not adapt. Deep thinking about integrating production and price-mediated exchange in the tradition of Smith. Chandler, and Okun is little rewarded in modern macroeconomics. Mainstream theorists are expected to think incrementally, pushing aside the massively altered production landscape that transformed workplace exchange into a critical economic activity. Coherent macro thinking has, for many generations, remained fixed in the profession's comfort zone of market transactions. Meanwhile, the intra-firm class of optimizing decision rules, constraints, and exchange mechanisms has been studied elsewhere, finding homes in business schools and the burgeoning best-practices management literature. The cavalier dismissal of workplace modeling as insufficiently incremental is an exercise in hubris that has greatly damaged the stabilization-relevance of consensus theory.[3]

It has been demonstrated that, in clearly defined circumstances, optimizing employees and employers generate meaningful wage rigidity that especially informs the aggregation and analysis of supply in axiomatic modeling. Most fundamentally, the exhaustion of mutually beneficial trades is now understood to be sufficient to produce full employment only if exchange is arbitrarily restricted to the marketplace. Recognizing the readily apparent workplace venue enriches dynamic general equilibrium, making it consistent with broad continuous-equilibrium market failure that microfounds activist management of nominal demand.

The chapter opens with a brief celebration of the discovery of the keystone economic law that enables coherent *and* stabilization-relevant macro theory. Monetary-policy implications of TVGE versus SVGE modeling are then summarized in some detail. Particular attention is paid to

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[3] The crowding out of the powerful implications of specialized production was inspired by Walras, Jevons, Menger, and other authors of the marginalist revolution, who conceptualized economies as market systems in search of general equilibrium. It is interesting that Continental-tradition economists worked during, but were able to contain their interest in, the onset of the global transformation to large-scale, specialized production. Today, rigorous analysis that occupies the profession's mainstream remains proudly coterminous with the study of market exchange, as illustrated by the otherwise admirable micro textbook by Mas-Colell, Whinston, and Green (1995, p.127): "Many aspects enter a full description of a firm: Who owns it? Who manages it? How is it managed? How is it organized? What can it do? Of all these questions, we concentrate on the last one. Our justification is not that the other questions are not interesting (indeed, they are), but that we want to arrive as quickly as possible at a minimal conceptual apparatus that allows us to analyze market behavior. Thus, our model of production possibilities is going to be very parsimonious: The firm is viewed merely as a 'black box', able to transform inputs into outputs."

BOX 10.1: GENERALIZED-EXCHANGE MACRO NARRATIVE

Good theories accommodate compact descriptions. This box summarizes, in 391 words, the Workplace-Marketplace Synthesis.

TVGE modeling bifurcates both households and firms, each of which rationally pursues self-interests governed by axiomatic preferences and technology. Households are constrained by heterogeneous initial endowments of financial assets. For the largest class, earnings from wealth contribute relatively little to household income; in the much smaller share of households, financial assets are the source of income. Meanwhile, more crucially, firms are separated into two venues that reflect size-related heterogeneity, arising from specialization, the nature of workplace information, and routinized jobs. The organizational diversity is fundamental. Labor is point-of-hire homogeneous; Harris-Todaro transfer governs inter-venue worker flows. Generalized exchange locates LEV labor pricing in the workplace, where firms construct exchange mechanisms and pay the continuous-equilibrium efficiency wage (W^n_J) that equals rational employees' reference wage ($W^{\acute{n}}_J$). Workplace-exchange microfounds the keystone MWR Channel. Meanwhile, SEV firms can do no better than paying workers' opportunity cost, i.e., the market wage (W^m).

Macrodynamics are crucially enriched by rational MWR, which suppresses wage recontracting, uniquely motivates involuntary job loss in response to adverse nominal demand disturbances, and pushes workers off their labor-supply schedule. Keynes's Second Classical Postulate and Wicksell-Wicksteed income distribution are both scrapped in LEV modeling. Income and wealth become the primary determinants of consumption, and expectations of pure profit principally influence investment. Interest rates play secondary roles in each, while coherent hold-up problems are introduced into production-capacity management. Stationary spending disturbances are associated with temporary layoffs, while persisting nonstationary demand shocks generate permanent job downsizing as well as rationally recalibrated worker reference standards ($Ҝ_J$) and wage givebacks. Unemployment follows a continuous-equilibrium macrodynamic path. Labor is employed in rationed rent-paying LEV jobs or readily-available market-wage SEV jobs, involuntarily or voluntarily unemployed, or voluntarily out of the labor force. Job quits are procyclical and play no significant role in the stabilization narrative. Job-matching efficiency also does not much matter, insignificantly influencing employment fluctuations.

Rational exchange in LEV workplaces produces dominant labor pricing and job rationing that constrain optimization in the marketplace, reconciling continuous decision-rule equilibrium and supply-demand disequilibrium. In the simplest TVGE version, all rational exchange, except between LEV employers and employees, occurs in the marketplace and is largely governed by familiar textbook analysis. The fundamental message, once the model pieces are assembled, is definitive. Macroeconomics that is both stabilization-relevant and consistent with the formal economic method is not feasible absent MWR and, consequently, the generalization of exchange.

the modern relevance of the Federal Reserve's dual, nominal and real, mandate. Next is an unsystematic, far-ranging overview of relevant evidence. The chapter closes with thoughts on the practical core of macroeconomics and the need for modeling workplace exchange, rooted in true axioms and organized by intertemporal general decision-rule equilibrium. The case for the generalization of exchange in order to fulfill macroeconomists' special responsibility, carefully cultivated by Early Keynesians, to government and business policymakers is summarized.

I. MONETARY POLICY AND THE DUAL MANDATE

The first chapter introduced the useful *meta-externality* concept, describing broad market failure that can result from optimizing micro behavior. The class of macro failure produces welfare loss that is sufficient to dominate other negative externalities and typically results from meaningful wage rigidity interacting with adverse nominal disturbances (either as a primary shock or propagating a real shock). It is the most consequential illustration of Pigou's separation of private and social costs, microfounding the discretionary management of total spending. Once the various analytic strands are pulled together, generalized-exchange implications for the proper design and execution of central-bank stabilization policies are understood to be fundamental, providing substantial contrast to SVGE thinking.[4] Those inferences, most of which have already appeared in scattered fashion throughout this book, are collected and summarized in this section.

Aggregate Demand Disturbances

Generalized exchange reprises the earlier starring role for the propagation of macro shocks by disturbances in total nominal spending, producing powerful same-direction employment and output instability. Responding to observable meta-externalities, Early Keynesians emphasized the discretionary management of aggregate demand. In TVGE modeling, monetary interventions in support of real-side objectives are reasserted and refined.[5] Activist stabilization policy has

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[4] Central banks operate in a wide variety of economic and political circumstances. In order to simplify the analysis, the following focuses on the U.S. Federal Reserve.

[5] There is little disagreement between the SVGE and TVGE model classes on the need to establish and maintain credible inflation regimes, an issue that has been well researched in the macro literature. See, for example,

been microfounded by replacing the unhappy, properly criticized Keynesian reliance on free parameters with the derivation, from axiomatic model primitives, of the MWR Channel that uniquely links adverse nominal disturbances and involuntary job and income loss.

Stationary Demand Disturbance (SDD). Recall from Chapter 5 that demand-management problems confronting stabilization policymakers can be usefully separated into three classes.[6] SDDs produce garden-variety recessions, for which automatic stabilizers and routine Fed open-market operations to reduce short-term interest rates and thereby ease credit conditions constitute an effective response. Stationary demand disturbances are the most easily managed class of instability. In mainstream macroeconomics, SDD is the focus of New Keynesian (NK) analysis, as illustrated by Woodford restricting the total spending disturbances in his NK bible, *Interest and Prices* (2003), to be stationary. Only in such limited circumstances can competent central bankers agree with Woodford that " … the crucial monetary policy question is that of the appropriate level for short-term interest rates."[7]

SDD instability little impacts trend growth in LEV employment. Profit effects are sufficiently transitory that feedback to longer-term growth in output and LEV employment can usually be ignored in the compact TVGE model. Occurring at high frequencies, the central SDD stabilization problem portrayed by Woodford in *Interest and Prices* as well as other SVGE theorists is rooted in the Fed's capacity to distinguish between (i) adverse demand disturbances that, in combination with relevant market frictions, induce short-lived market inefficiency and

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Woodford (2003). In compact TVGE modeling, macro shocks can be real or nominal and are – consistent with mainstream SVGE practice – simply posited to be stochastic.

[6] Lacking a coherent MWR Channel, significant disturbances in SVGE modeling must results from real shocks. Responding to the wake-up call provided by the 2008-09 economic crisis, Kocherlakota (2009, p.16) has sharply criticized that restricted range of attention: "… macro models are driven by patently unrealistic shocks…. Macroeconomists… are handicapping themselves by only looking at shocks to fundamentals like preferences and technology."

[7] (p.xiii) *Interest and Prices* is characteristic of New Keynesian thinking in that it struggles terribly with labor pricing. It cautiously assumes, and then ignores, the simplistic and misleading variety of wage stickiness that prevents instantaneous adjustment to market conditions, typically in a random subset of firms. (Chapter 4, Section 4; also Box 10.9) It is illustrative that Woodford cites, but does not defend, Taylor's staggered labor pricing. Given its promised construction wholly within the coherent SVGE framework, *Interest and Prices* actively avoids confronting Barro's recontracting critique. Woodford must awkwardly minimize the roles of meaningful wage rigidity and involuntary job loss. As a result, *Interest and Prices* has little of substance to contribute to our understanding of and proper response to the extreme instability in nominal demand that developed in 2008-09.

(ii) spending slowdowns associated with market-efficient reallocations of resources. The focus on distinguishing between slight deviations in the longer-term growth path that are inefficient or efficient follows from the coherent SVGE model class inherently restricting stationary contractions in employment to be wholly voluntary and therefore small.

Unchecked nonstationary demand disturbance (NDD). The most perilous stabilization problem is the mutation of a demand disturbance into a NDD capable of generating market failure on the scale that occurred in the 1930s. (Chapter 5) In TVGE modeling, the long lags required for job destruction to induce rational reference-standard ($\mathbb{K}_J$) recalibration and consequent LEV wage give-backs are critically important. Unchecked NDD substantially damages the longer-term paths of profits, investment, output, and LEV (good) jobs. Stabilization authorities, in order to design and implement an effective response, must understand acute-instability demand macrodynamics, especially with respect to necessary remedial-policy speed and size. (Chapter 6)

When unfolding conditions indicate, especially to lenders and investors, that an adverse demand disturbance is overwhelming the combination of automatic stabilizers and orthodox "lean-against-the-wind" monetary stimulus focusing on short-term interest rates, macro policymakers must act quickly and aggressively to stabilize and restore growth in total nominal spending, creatively using the central-bank's balance sheet. Authorities must be prepared; and their preparations must be credible. (Chapter 6) The extreme-instability problem class was vividly illustrated in the United States by the mutation of the SDD that developed in 2007 and early 2008 into the virulent NDD that was organizing itself later in 2008 and 2009.

NDD macrodynamics assigns a central role to the robust MWR Channel. That keystone TVGE feature has been shown to be inherently incompatible with coherent SVGE modeling, disqualifying mainstream macroeconomics from effective analysis of the NDD instability class. For example, in a NDD context, a focus by stabilization policymakers on price-inflation and short-term interest rates is both wrong and dangerous. The Fed's playbook must be expanded from standard open-market operations to active, creative use of its balance sheet to halt and reverse collapsing total spending. Nonstationary demand disturbances threaten mega-externalities that incur huge welfare loss in modern, specialized economies. Confronting such

risk, product-price behavior provides inadequate information; and directing the Fed to focus on managing inflation is simply foolish.

Constrained Nonstationary Demand Disturbance (denoted by CNDD). The third class of demand disturbance occupies middle ground between SDD and NDD. The characteristic CNDD problem is persistently elevated, but not destabilizing, joblessness ($U(t)>U^N(t)$). This class of market failure reflects the intertemporal interaction of sluggish total-spending growth and meaningful wage rigidities, depressing profit expectations and pushing unemployment stubbornly above its natural rate.[8] Unlike the SDD variant, CNDD episodes significantly influence the macrodynamic paths of profits, investment, output and good (LEV) jobs beyond the short run.

In two-venue modeling, growth in total nominal spending can be sufficiently sluggish to make the medium-term timepath of LEV wages inconsistent with full employment ($U(t)=U^N(t)$), resulting in chronic market inefficiency. (Chapter 5) Ameliorative policies are, however, frequently complicated by various structural impediments to greater spending. The problem set includes public and private debt approaching unsustainable levels, sharp labor-adverse terms-of-trade shifts, "beggar-thy-neighbor" currency manipulation in the international community (producing unbalanced global financial flows that force destabilizing adjustments on national economies), and nations' free-riding on others' nominal-stimulation policies. Other drags on spending affect investment outlays, typically associated with shifts in the hold-up problem that damage profit expectations and reduced confidence about future macroeconomic performance. Monetary interventions responding to stagnation are most effective when working in tandem with structural policies. The proper stabilization response of central banks identifies and manages negative meta-externalities that accompany rational, albeit begrudging, wage givebacks motivated by time-intensive, cumulating job destruction (modeled in Chapter 3), stimulating aggregate demand to a level more efficiently compatible with LEV labor-price macrodynamics.

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[8] For elaboration, see Chapter 5. Chapter 6 motivates content of the general hold-up problem (*H*) that, once also combined with the MWR Channel, further informs stagnation-relevant profit expectations.

In compact generalized-exchange modeling, high-frequency SDD, low-frequency CNDD, and unchecked NDD are stochastic with respect to the nature and incidence of their originating shocks. They are, however, each endogenous to the extent that mutations of demand into the various classes of real-side instability are governed by continuous-equilibrium TVGE behavior, including firm and household rational assessments of the credibility to be assigned to policymakers' real and nominal objectives. The three-part decomposition of monetary-stabilization problems draws attention to proficiency in modeling and interpreting the behavior of total spending as a core competency of central banking. That skill set is necessary to support the design and implementation of effective responses to each class of market failure.

Generalized Exchange and the Watershed Great Recession

Deconstructing the crisis. The 2007-09 cyclical contraction in the United States earned its watershed status largely as a result of the Fed's rewriting its monetary-stabilization playbook in order to prevent a SDD→NDD metamorphosis. As indicated, the critical policy challenge was rooted in the mutation of the nominal demand disturbance that developed in late 2007 and early 2008 into the virulent NDD that was organizing itself in the second half of 2008 and into 2009. Central real shocks were, at a first approximation, the reduction in housing activity and damaged investor/lender confidence associated with the topping out of a speculative bubble rooted in low interest rates, degradation of underwriting standards for residential lending, and deeply flawed securities ratings.[9] Nonstandard mortgages had been deconstructed and packaged into complex collateralized debt obligations (CDOs), offering higher yields than similarly rated U.S. Treasury debt, and sold to institutional investors via extensive distribution and servicing networks, broadening the global vulnerability to U.S. subprime (and other exotic) defaults. Such defaults, once they began to occur, motivated market participants' reassessment of the creditworthiness of highly leveraged financial firms that held large inventories of the faltering asset class.

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[9] The bubble was also critically rooted in international currency manipulations that sustained huge, chronic global trade and saving imbalances and generated persistently depressed longer-term dollar interest rates in an extended period leading up to the financial crisis. Also, see White (2010) on the role of credit rating agencies.

The Lehman bankruptcy in September 2008, closely following the U.S. Treasury's takeover of Fannie Mae and Freddie Mac and closely followed by the implosion of AIG, transformed negative reassessment into sharply increased fear of systemic credit losses, reorganizing the garden-variety recession into a NDD. The collapse of lender/investor confidence, as market participants began assigning nontrivial likelihoods to depression, and the consequent hoarding of liquidity converted the market markdown of subprime mortgages – a manageable macro problem – into a crisis of frozen or collapsing financial markets that quickly and substantially weakened aggregate nominal demand.[10] The contractionary damage to total spending was further amplified by a breakdown in borrower confidence, resulting in large cutbacks in loan demand by creditworthy firms and households and damaging investment and consumer durable spending.[11]

Federal Reserve response. The Federal Reserve properly sought to stabilize, and reverse, the nominal demand contraction. However, as indicated by the NDD-characteristic collapse of mark-to-market asset prices, the Fed's real-objective interventions lacked credibility. While agents were broadly aware of Fed goals and actions, they were insufficiently convinced that the remedial policies would be successful in the context of 2008-09 spending disruption. Huge losses that are understood to result from investing in front of depression/deflation cause even small, albeit nontrivial, probability of an unchecked NDD to induce rational inaction, preserving liquidity until credible asset-price floors are established. (Chapter 6) The Fed understood what was happening, properly rejected the dangerous guidance of mainstream coherent SVGE thinking, and promptly undertook demand-stabilization policies of uncommon size and design.

The Fed also understood that the origins of financial panics matter less to the design and implementation of central-bank stabilization policy than does the nature of crisis propagation. Most significant to monetary policymakers is how financial disruption spreads via weakening

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[10] Chapter 5 modeled incomplete financial contracts that are both settled in the future and variably restricted by information asymmetries. Chapter 6 modeled uncertain macro expectations that induce inactive investors/lenders, rationally waiting for a credible bottom for asset prices.

[11] Models of economic instability that feature procyclical credit powered by positive feedback from changes in market-participant confidence have a long tradition among economic theorists, notably including John Stuart Mill, Alfred Marshall, Knut Wicksell, Irving Fisher, John Maynard Keynes, Hyman Minsky, and Ben Bernanke. The approach has been used to explicate the sort of financial crisis associated with nonstationary demand disturbances by Charles Kindleberger (2000). The MWR Channel, of course, must play a fundamental role in the familiar process.

total spending, including the channel through which such nominal disturbances induce job loss.[12] It is noteworthy here that lost output and income in the 2007-09 U.S. recession can be wholly attributed to reduced labor input, not reduced productivity.[13] From peak to trough, employee hours dropped 8.7% while total product fell 7.2%. Fitting the Great Recession into a general-equilibrium business-cycle research program ultimately turns on the capacity of the formal economic method to accommodate the size and nature of the labor-input contraction. Table 1.1 shows that job separations in recession, including the recent 2007-09 variant, are overwhelmingly involuntary.[14] The message is clear. If they are to be both coherent and

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[12] The point is important, deserving emphasis. By its nature, even the most enlightened monetary policy plays little role in the prevention of financial crises, an objective more properly assigned to other central-bank functions such as the discount window as well as to other classes of regulatory policymaking. Monetary policy, however, does play a central role in containing and reversing contracting aggregate demand that always propagates financial crises. The MWR channel through which adverse nominal disturbances damage profits and induce involuntary lost jobs critically propagated the 2008-09 financial crisis, helping to transform it into the most perilous instability since the 1930s depression. The TVGE propagation of the financial turmoil and associated collapse of confidence reconciles continuous-equilibrium analysis with actual events as well as apparently inconsistent events with each other. Consider two phenomena cited (but not juxtaposed) in *The Financial Crisis Inquiry Report* (2011). First is the risk of failure then facing the largest U.S. banks. From Bernanke: "As a scholar of the Great Depression, I honestly believe that September and October of 2008 was the worst financial crisis in global history, including the Great Depression. If you look at the firms that came under pressure in that period … only one … was not at serious risk of failure…. So out of maybe the 13, 13 of the most important financial institutions in the United States, 12 were at risk of failure within a period of a week or two." (p.354) Second was the actual default behavior of exotic mortgages, identified as an originating cause of the financial panic. "Overall, for 2005 to 2007 vintages tranches of mortgage-backed securities originally rated triple-A, despite the mass downgrades, only about 10% of Alt-A and 4% of subprime securities had been 'materially impaired' – meaning that losses were imminent or had already been suffered – by the end of 2009." (pp. 228-9) Authors ignoring propagation in order to concentrate on the causes of the financial crisis cannot explain why mark-to-market prices of nearly all non-Treasury assets fell so sharply. In particular, playing the blame game does not explain how a small amount of nonstandard mortgages pushed the economy to the brink of depression. Notable examples are Zuckerman (2009) and Lewis (2010), popular "blame-game" books that do not come close to answering the most important stabilization questions.

[13] Jobs declined 6.7%. In the average postwar U.S. recession, jobs contract 3.8%, output 4.4%, and hours 3.2%.

[14] As a result of its arbitrary restriction on the scope of rational exchange, SVGE analysis misidentifies the critical question posed by the Great Recession's empirical configuration. From Ohanian (2010, pp. 51-52): "… hours worked during the 2007-2009 recession are much too low relative to the marginal product of labor. Thus, the key to understanding this recession is finding a factor that works like a large increase in the tax on labor income that depresses the incentive to work relative to the observed marginal product of labor." The SVGE presumption that reduced labor input resulted from voluntary job separation sharply contrasts with both TVGE thinking and the facts. Reiterating the former, generalized exchange microfounds the meaningful wage rigidity that pushes employees off their neoclassical market supply schedule, compromising optimization at the consumption-leisure margin. In large, complex workplaces, employees instead optimize their OJB with respect to axiomatic preferences for both consumption and fair treatment, conduct that is broadly recognized by practitioners. Rational MWR implies that LEV employees' market-opportunity costs, while equaling workers' marginal value of time, are chronically below labor's marginal product. Most significantly, MWR provide the central nominal-real channel that critically propagated collapsing confidence and produced the outsized 2007-09 jump in involuntary job loss.

stabilization relevant, macro models must be capable of rationally suppressing wage recontracting.

From the TVGE perspective, the Fed's prompt identification of the late-2008 SDD→NDD mutation, followed by its quick implementation of a massive demand-stabilization program, was the appropriate response to the unfolding economic crisis.[15] The aggressive policy, utilizing the Fed's balance sheet to guarantee critical financial institutions' creditworthiness, provide liquidity to investment banks, and to finance huge quantities of asset purchases in the attempt to revive largely frozen credit markets and reverse the contraction of confidence and total spending, was the rational response to the threat posed by the developing NDD crisis.

TVGE message. The Fed rewrote its policy guidebook in order to adequately respond to the SDD→NDD problem class. Macroeconomists need to recognize, understand, and take well-informed public positions with respect to the proper use of those policy innovations in the circumstances of nonstationary collapses in total spending. Given that rational MWR uniquely provide the robust channel through which adverse demand shifts induce involuntary job and income loss, workplace-equilibrium theory must play a central role in that debate.

The generalization of exchange accommodates the Early-Keynesian mandate to manage nominal demand (seeking to stabilize employment) as well as the Classical mandate to facilitate market efficiency, capital accumulation, and innovation. The Classical policy agenda, broadly organized around property rights, free trade, free markets, low inflation, moderate and well-designed taxes, structural government budget balance, efficient recycling of savings into investment, and tolerance of the creative-destruction aftermath of innovation, also must include the effective response to adverse market externalities. Neither the Keynesian nor Classical mandate, taken

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[15] To help present a balanced picture, an example of misidentifying the *SDD→NDD* problem occurred in 2002-05 when the Fed, fearing price deflation but lacking evidence of contracting aggregate demand, kept short-term interest rates extraordinarily (and improperly) low. The good news here is the substantial differences in the macro landscape between 2008-09 and 2002-05, suggesting that the *SDD→NDD* problem class is not particularly difficult to identify. It should also be reiterated here that TVGE modeling relieves discretionary fiscal policy of Ricardian-equivalence constraints, making well-designed public tax- and spending-interventions an important stabilization tool.

alone, is adequate to effectively manage the incentives and market externalities that govern modern, specialized economies.

TVGE versus SVGE Monetary-Policy Design

Using the formal method of continuous, optimizing equilibrium to model the 2007-09 Great Recession is a task separable into two parts. First is explaining the origins of the breakdown in the funding of, and lending by, financial firms, likely focusing on imperfect information, externalities, missing markets, and flawed government regulation. Second is the rigorous analysis of how the crisis was propagated; in particular, how total spending contracted and induced more than six million involuntary lost jobs. While origins tend to be rooted in particular historical circumstances, meaningful financial crises are alike in featuring sharp deteriorations in confidence associated with liquidity hoarding, collapsing mark-to-market asset prices, and broad reductions in total nominal spending. (Chapter 6)

It is not surprising that origins questions (answers to which are needed to assign blame) occupied most of the public debate in the aftermath of the financial crisis. That concentration of attention, however, cannot justify ignoring the second part of the formal analysis of the 2008-09 instability. Nominal-demand propagation generates the lion's share of implications from the financial turmoil for the proper design and implementation of monetary interventions, informing the critical monetary-policy questions.[16] Credible assessments of the Fed's interventions to contain the developing NDD must focus on the nominal propagation process.

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[16] In 2011, Mitt Romney's Presidential campaign was asked what immediate actions he would have taken to deal with the 2008-09 crisis. The response was ripped from the SVGE playbook: "Lowering the corporate tax rate. Enacting a permanent extension of the 2001and 2003 tax cuts. Immediately ratifying our pending trade agreements with Columbia, Panama and South Korea. In the energy sector, freeing up the necessary land to enable greater domestic production." (Robert Draper (2011), p.41.) Insightful observers of macro behavior understand that those actions would have been woefully inadequate to the task of halting and reversing a 2008-09 magnitude contraction of aggregate nominal demand. The Romney example illustrates the important role of the economic mainstream in defining broadly accepted boundaries of what is sensible in public debate. His response would have been unacceptable to the economic mainstream if it were still organized by Early Keynesians. It would have been more powerfully rejected if the mainstream were occupied by generalized-exchange theorists. And the prospect of broad rejection would assure a markedly different, more serious response from any electable politician. The economic mainstream matters well beyond the academy and must be organized to the highest standards of public responsibility. That this obligation has been, for decades, ignored by mainstream macro theorists is shameful.

Moreover, whatever the current round of regulatory reforms, they will not prevent future breakdowns in aggregate demand rooted in *sui generis* episodes of lost investor/lender confidence.[17] Central banks, seeking to limit welfare loss, must be up to the task of effectively managing nonstationary spending shifts that may accompany persistently-mutating financial crises.

Rebalancing the monetary-policy consensus. Since the 1980s, central banks throughout the world have been adopting single-objective inflation-targeting frameworks for their stabilization policymaking, variously constructed on two interrelated tasks:

- A low-inflation regime is explicitly established in order to provide a nonstationary nominal anchor for forward-looking behavior throughout the economy.

- Analytical and empirical guidance is provided for the discretionary management of total spending in response to a range of plausible disturbances to price inflation, seeking convergence to the target regime sufficient to maintain central-bank credibility. In general, such convergence is also expected to ameliorate market-inefficient fluctuations in unemployment.[18] The policy instrument is short-term interest rates, requiring state-of-the-art knowledge on their interaction with total spending.

While its operational resurgence was motivated by the global stagflation experience, the single-objective approach is fundamentally rooted in SVGE modeling and is, therefore, consistent with mainstream thinking prior to the 1930s Great Depression. Irving Fisher in his *Stabilizing the*

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[17] The 2008 *Squam Lake Report* is illustrative. (See French *et al*. (2010).) That plan for financial regulatory reform, assembled by leading economists, would not prevent the periodic idiosyncratic collapses in investor/lender confidence in future macro conditions that translate into NDD. Ricardo Caballero (2010, p.100) has come to a similar conclusion: "From a policy perspective, the specifics of a crisis are only known once the crisis starts. For this reason, my sense is that, contrary to the hope of policymakers and regulators, there is a limited scope for policy that can in advance eliminate the risk or costs of financial crisis, beyond some common-sense measures (like capital requirements for financial institutions) and very general public-private insurance arrangements (like deposit insurance). By the time a true financial crisis is underway, the immediate relevant policy issues are no longer about whether intervention might breed moral hazard, but about socially wasteful reluctance to invest and to hire, and the extent to which predatory trading and fire sales can be minimized."

[18] Carlin and Soskice (2003, p.131), in their admirable New-Keynesian macro textbook, describe monetary stabilization policy in terms of single-objective inflation targeting: "The main idea is that central bank behavior can be thought about in terms of a 'reaction function' that the central bank uses to respond to shocks to the economy and steer it toward an explicit or implicit inflation target." Bernanke and Mishkin (1997) are a notable example of the large literature on inflation targeting.

Dollar (1920) and John Maynard Keynes in his *Treatise on Money* (1930) are illustrative, both arguing that central banks' efforts to control business cycles should focus on price stabilization. Then, as now, the tagged-on nature of managing forced job loss is indicative of the underdevelopment of coherent real-side analysis. Absent an endogenous MWR channel, an unemployment target for monetary policy is little more than an empirical (free-parameter) black box.

BOX 10.2: CENTRAL BANK MANAGEMENT OF TWO OBJECTIVES

Much is made in the modern macroeconomic literature about the difficulty of the central-bank management of real-side and nominal objectives. The general problem is greatly exaggerated. Practical emphasis on one objective over the other is almost always clearly identified by economic circumstances, the effective understanding of is made possible by the enriched TVGE coherent modeling of the relationship between unemployment and inflation.

René Lalonde and Nicolas Parent (2006) have provided a useful dual-mandate modeling framework in which the effective weights on various economic indicators vary over time, as monetary-authority priorities shift between inflation and employment. In the TVGE model class, the central employment-stabilization role assigned to the management of nominal demand must be supported by state-of-the-art modeling of the operational natural rate (U^N) as well as the various components of Okun's law and nonstationary productivity growth. Such oversight must be a core competency of a responsible central bank, joining the careful monitoring of the behavior of inflation relative to its established regime. The skill set associated with the real-side demand management is deemphasized by SVGE theorists to the detriment of central-bank effectiveness. Indeed, emphasizing a single goal generally distorts the efficient allocation of central-bank research resources. The problem is symmetrical. In the early postwar period, the dominance of the Keynesian Neoclassical Synthesis and its inherent emphasis of employment control diverted attention from adequately understanding the causes and consequences of inflation. See also Dodge (2008).

The mainstream SVGE model class deprives monetary policymakers of a rigorous analytical framework sufficiently robust to guide the design, implementation, and communication of adequate responses to actual meta-externalities associated with broad market failure. Most tellingly, market-centric theory provides no coherent justification for the extraordinary actions, necessarily quick and sizable, needed to meet the challenge of the SDD→NDD problem class. (The behavior of inflation gave no adequate indication of the coming collapse in total spending.)

Illustrative of the general problem, the Fed had no coherent analytical framework through which its three quantitative-easing initiatives in 2009-13, motivated by its perception of inadequate nonstationary aggregate demand and featuring the aggressive use of its balance sheet, could be presented and assessed.[19] Absent microfoundations hinder communication and generate misunderstandings, contributing to the unhelpful controversies aroused by the various iterations of quantitative easing (QE).

TVGE theory, given its more fulsome analysis of the meta-externalities rooted in labor pricing and involuntary job loss, informs a rebalancing of the consensus monetary-policy framework:

- Establish explicit nonstationary inflation *and* unemployment regimes, providing nominal and real macro anchors for forward-looking behavior throughout the economy.[20] Operationally, both the real and nominal regimes are best specified as ranges, with urgency to get within the range (once either indicator is displaced) and more patience for properly locating unemployment and inflation within its target span.

- Analytical and empirical guidance is provided for the discretionary management of aggregate nominal demand in response to a more comprehensive range of possible shocks and their propagation. Operational responsibility focuses on managed convergence to one or the other target regime sufficient to maintain its credibility. Intertemporal primacy between the inflation and employment goals is contingent on the current state and best-practices projection of aggregate-demand growth and its nominal-real breakdown.

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[19] Rothstein (2012) analyzed the high unemployment in the aftermath of the 2007-09 recession, concluding that poor performance resulted from inadequate aggregate demand, not structural factors. Stagnation presents particularly interesting identification and execution problems for the monetary authority. First, policymakers must decide whether a boost aggregate nominal demand would reduce the jobless rate. Second, they must decide whether available monetary tools (including creative uses of the Fed's balance sheet) are capable, in the particular circumstances, of stimulating total spending. (See Chapter 5.)

[20] Relatively few of the world's significant central banks have dual objectives, explicitly targeting price inflation and unemployment. A single objective targeting low inflation is the norm, despite the evidence produced by New Keynesians (e.g., Galí (2011a)) that supports systematic monetary responses to disturbances in unemployment. From Galí (2011b, p.84): "The optimal monetary policy in the context of the standard New Keynesian model with [assumed] nominal wage and price stickiness implies a high degree of stabilization of the unemployment rate. This is true, in particular, when compared to a conventional Taylor rule."

Elaborating on the policy rebalancing. SDD→NDD metamorphoses, as has been emphasized, provide the most insistent argument for an explicit central-bank employment objective. Depression-sized welfare losses imply correspondingly large welfare gain from establishing credibility for the monetary authority's employment regime. Generalized-exchange modeling contends that the Fed's response to the 2008-09 SDD→NDD crisis, while preventing depression, would have been substantially more effective if its employment objective had been credible.[21]

Beyond recognizing the existence and nature of the fundamental meta-externality microfounded by the MWR Channel, the case for explicit central-bank targeting of inflation and employment regimes ultimately rests on conclusions already derived in the construction of the TVGE model. Most significantly, rational macrodynamics governing the behavior of wages and prices in specialized economies imply that inflation alone provides information that is neither sufficiently timely nor useful to support the effective monetary management of employment.[22] Product prices are rationally sticky, much more loosely related to the labor market that suggested by the natural-rate hypothesis, and as a result inadequately inform a leading-indicator role for real-side stabilization.[23] Such a central role for inflation is no more than a misleading artifact of SVGE thinking. In TVGE modeling, properly targeted employment and inflation outcomes are each necessary on their own terms. Stabilization policymakers principally seek to manage employment consequences of adverse SDD, or more urgently SDD→NDD, in order to reduce the welfare cost of involuntary job and income loss, not to reduce real distortions associated with a lower level of price inflation. It is not surprising that the employment goal is badly misunderstood in macro thinking that coherently accommodates neither job loss nor sizeable recessions.

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[21] The Fed's 2008-09 real-side stabilization policy was successful, despite broad evidence of the lack of credibility of its real-side objective. For example, equity markets fell dramatically in 2008 and early 2009 only to rebound dramatically when Fed action halted the collapse in total spending. (Recall Box 6.7.) A critical question in the aftermath of the crisis is why the Fed failed to aggressively use its policy success to enhance the credibility of its employment objective. See Solow (1998a) for an earlier rationale for practical importance of the Fed's real-side objective; see Taylor (1998a) for the opposing view.

[22] Moreover, in their review of the relevant evidence, Christiano *et al.* (2011) found that the unemployment rate is a promising indicator of the output gap.

[23] Taylor (1997, p.234) is illustrative of the empirical-regularity argument for using inflation as leading indicator for real-side instability: "Every recession since the 1950s has been preceded by a run-up in inflation; by keeping inflation from rising in the first place, the chances of such recessions are diminished." After the 2007-09 Great Recession, which lack an indicative run-up of inflation, Taylor illustrates the danger of empirical-regularity rules.

Moreover, a central-bank focus on inflation, declared publicly and promulgated internally, makes real-time stabilization policymaking hopelessly nontransparent, harming its capacity to both be communicated effectively and garner credibility. The root problem is that the single-goal policy is not descriptive of actual behavior. In the illustrative circumstances of late 2008, with rapidly contracting spending and employment not correspondingly reflected in the behavior of price and wage inflation, competent central banks wholly shifted their operational attention to the active stabilization of employment and output. It is not useful to enshrine, in the public mind, single-mandate policymaking that, over the plausible range of circumstances, does not and should not exist. Avoidable policy nontransparency has been long understood to be a first-order mistake.

Finally, it deserves emphasis that broad acceptance of SVGE modeling by Fed economists has also damaged the central bank's capacity to obtain credibility for its employment-stabilization policies. Analytical thinking that arbitrarily confines rational exchange to the marketplace has discouraged adequate investment in, and sufficient urgency about, understanding the continuous-equilibrium channel through which adverse nominal disturbances, stationary and nonstationary, induce involuntary job and income loss. Inattention to the central "mysteries-of-money" theoretical problem affects policymaking, e.g. necessitating that the extraordinarily response to the watershed 2008-09 crisis be understood as an inherently ad hoc exercise. It is not too much to ask that the large research staffs at the Fed Board and the twelve District Banks direct their efforts back to the effective analysis of monetary-policy relevant problems, taking a careful collective look at the limitations of mainstream SVGE thinking.

Woodford (2003, pp.2-3) has insightfully advocated for theoretical foundations for monetary policy: "The development of such a theory is an urgent task, for rule-based monetary policy in the spirit that I have described is possible only when central banks can develop a conscious and articulate account of what they are doing. It is necessary in order for them to know how to act systematically in a way that can serve their objectives…. It is also necessary in order for them to be able to communicate the nature of their systematic commitments to the public…. [T]he advantages of a sound monetary policy are largely dependent upon the policy's being understood and relied upon by the private sector in arranging its affairs."

BOX 10.3: THE CURIOUS CASE FOR A SINGLE MONETARY OBJECTIVE

In a book on the lessons for central bankers from the Great Recession, Pill and Smets (2013, p.21) argue that: "… the conduct of monetary policy should neither be changed fundamentally nor overburdened with additional objectives. Rather, it should remain focused on maintaining price stability over the medium term." The authors acknowledge the obvious welfare cost of the 2008-09 acute instability by adding an addendum to their pronouncement: "Nonetheless, we recognize the need for some refinement of the existing policy framework in order to avoid and reduce the costs of large financial crises."

The confident Pill-Smets verdict is deeply problematic, especially once exchange generalization coherently suppresses wage recontracting. Why, in the aftermath of 6 million involuntarily lost jobs in the U.S. Great Recession, would they advise the Fed to reject its coequal full-employment objective? Five reasons, pretty much exhausting the possibilities, are briefly considered.

First, *the welfare costs of inflation so exceed the damage caused by high joblessness and otherwise low capacity utilization to make attention paid to real-side stabilization relatively unimportant.* The available evidence broadly and consistently rejects that belief.

Second, *monetary interventions are relatively ineffective in pursuit of a policy-relevant real-side objective.* Available evidence powerfully rejects that implication of coherent SVGE modeling. Perhaps most noteworthy, Ben Bernanke's virtuoso performance during the Great Recession strongly supports the contrary position.

Third, *inflation control may be thought to be so powerful that close attention to real-side determinants is rendered unnecessary.* That is a such an extraordinary conclusion, sanctioning ignoring the lion's share of the evidence normally monitored by central banks, that surely no reputable economists actually believes it. Moreover, the coherent TVGE macro model generates inherently poor correlation between the contemporary behaviors of price/wage inflation and involuntary job loss. Used as a single stabilization objective, low inflation is badly misleading.

Fourth, *central banks are inherently limited to a single objective.* Multiple objectives are inherently in conflict, implying that one must be chosen. Such a belief does not make much sense. Box 10.3 shows that the design of a dual (real-side and nominal) objective monetary policy is not complex. There is also little substance to the related argument that a single goal prevents irresponsible behavior.

Fifth, *limitations of the mainstream coherent SVGE macro model make it very difficult for modern theorists to accept a full-employment monetary objective.* At last, we have the real reason for clinging to the single-objective mandate. Indeed, from the SVGE perspective, accepting a coequal real-side objective is not possible absent rejection the consensus NNS rules of how to properly do macroeconomics.

Think about it. Given a robust analytic blueprint for endogenous nominal-real interaction in modern economies, especially in circumstances of adverse NDD, the Federal Reserve could have been aggressively proactive in pursuit of its dual mandate. Prior to the 2008-09 crisis, the central bank could have constructed, and effectively communicated, a coherent, plausible plan to halt and reverse NDD contractions as they are being spontaneously organized, likely as a result of idiosyncratic financial crises. The plan, and the macro modeling that both engenders it and enables its effective communication, would have had time to be thoroughly debated and (if microfoundations for the necessary MWR channel are derived from model primitives) would have been incorporated into the academy's New Neoclassical Synthesis.

Criticizing the U.S. dual mandate. In the U.S., a dual mandate for stabilization policymaking ("maximum employment, production, and purchasing power") was established in the 1946 Full Employment Act. Fed employment and inflation goals were restated, not significantly altered, in the Federal Reserve Reform Act (1977) and the Humphrey-Hawkins Act (1978).[24] While the dual mandate was routinely accepted in the academy in the early postwar period, that changed with the New Classical challenge to Early Keynesian hegemony. An explicit real-side objective for central banks has been rejected by many prominent macro theorists for many years. The criticism is not surprising, given a mainstream theoretical perspective that lacks a coherent channel through which adverse nominal disturbances induce involuntary job loss.

Perhaps most problematic, the academy's rejection of a real-side objective has fostered much broader misunderstanding of the proper use of the Fed balance sheet in macro stabilization. The SVGE argument, apparently respectable, abetted a wave of political criticism of the employment mandate in the aftermath of the 2007-09 Great Recession. In late 2010, prominent Congressman Michael Pence introduced legislation requiring the Fed to focus only on inflation. In his statement announcing the bill, Pence implicitly invoked the presumed absence of the MWR Channel: "The Fed can print money, but they can't print jobs. Printing money is no substitute for sound fiscal policy and we ought to be looking to the Congress to embrace the kind of policies

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[24] I wrote the Federal Reserve Board testimony on the original Humphrey-Hawkins bill, which established an aggressively low numerical target for national unemployment. The 1978 Act was allowed to lapse in 2000.

that will get this economy moving again." Rep. Paul Ryan, the unsuccessful 2012 Vice-Presidential candidate, and Sen. Robert Corker, an influential coalition-building member of the Senate Banking Committee, additionally supported eliminating the dual mandate.[25] Even James Bullard, then President of the Federal Reserve Bank of St. Louis, joined the chorus.

Enhancing the Fed's Stabilization Capability

The outsized welfare loss during the Great Recession and its aftermath motivates the need for a more credible, effective response to nonstationary demand disturbances.[26] Generalized-exchange modeling identifies a three-part strategy to enhance the Fed's stabilization capability. The first element, i.e., commitment to an employment objective that is no less important than low-inflation, has been examined in some detail. The remaining two elements are (i) expanding the central bank's toolkit of interventions designed to halt and reverse adverse NDDs and (ii) inducing investor/lender credibility with respect to the toolkit's effectiveness and the Fed's commitment to promptly and properly use it. Private-sector confidence that the stabilization authority understands and can manage the economy's behavior outside Leijonhufvud's corridor of normal market adjustments is fundamentally important. (Recall Chapter 6.)

NDD characteristics. Three NDD characteristics, previously analyzed, are most pertinent to the design of stabilization policy. First, the welfare costs of unchecked demand contractions, interacting with the MWR Channel and producing gathering price deflation, are huge. Deep depressions induce collapsed profits, widespread job loss, chronically depressed capital-stock utilization, destruction of wealth, an explosion in government debt, widespread bankruptcies, and a breakdown in the financial system. (Recall Chapter 4.) In the modern U.S. economy, greatly specialized with widespread, substantial nominal debt, a sustained collapse in total nominal spending would make the 1930s look like a walk in the park.

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[25] In his *Washington Post* op-ed (11/18/2010), "The Fed's Dual Mission Impossible", George Will builds on Rep. Ryan's argument.

[26] The analysis is specific to the U.S. Great Recession and the Federal Reserve. The need for improvement should be understood as not diminishing the Fed's heroic 2008-09 behavior that was centrally responsible for preventing a depression.

BOX 10.4: MANAGING WELFARE LOSS FROM MACRO INSTABILITY

Robert Hetzel is Senior Economist and Research Advisor at the Federal Reserve Bank of Richmond and an active contributor to the System's internal debate on the proper design of monetary policy. In his instructive 2012 book on the Great Recession, he identifies two fundamentally different approaches to understanding instability in specialized economies, market-disorder versus monetary-disorder modeling. Hetzel, an advocate of the coherent application of the mainstream SVGE framework, makes the case for the monetary-disorder paradigm.

Market-Disorder View

"Adherents of the market-disorder view believe the sharp swings in expectations about the future from unfounded optimism to unfounded pessimism overwhelm the ability of offsetting changes in the real interest rate to stabilize economic activity. Those expectational swings arise independently of central bank actions and require discretion in the conduct of monetary policy. The failure of the price system to mitigate fluctuations in output provides an opening for the central bank and government to manage aggregate demand." (Hetzel (2012), p.2)

Monetary-Disorder View

"Adherents of the monetary-disorder view believe that the real interest rate works well as a flywheel to stabilize fluctuations in aggregate demand around potential produced by real demand shocks. However, money creation and destruction can interfere with those self-equilibrating powers. The conduct of monetary policy by a rule providing a nominal anchor and allowing market forces to determine the real interest rate and real output makes expectations into a stabilizing force by causing the public to anticipate that shocks that produce divergences between real aggregate demand and potential output will be short-lived." (Hetzel (2012), p.2)

Stabilization-Relevant View

TVGE modeling degrades the dominating power of interest rates required in SVGE thinking, helping to sweep away the case for monetary disorder as the principal cause of macro instability. Attention shifts to (i) the vulnerability of specialized economies to destructive mega-externalities rooted in the interaction of the continuous-equilibrium MWR Channel and total-spending disturbances and (ii) the credibility of stabilization policymakers' capacity to manage nominal demand sufficiently to effectively contain welfare loss. Friedman's assertion of the inherent stability of the private economy is inconsistent with generalized optimizing exchange organized by continuous general equilibrium and must be rejected.

The related, second characteristic is the remarkable speed of the spending collapse. In a generalized-exchange economy, few lags inhibit the NDD market-failure process. By contrast,

rational market adjustments to restore the efficient utilization of resources, including $\mathbb{K}_j$ recalibration and nominal wage givebacks (modeled in Chapter 3), are inherently slow. Third, NDD meta-externalities necessarily reflect damaged confidence that stabilization authorities can or will effectively respond to the widespread market failure. The continuous-equilibrium unraveling process, described in Chapter 6 and above, is fueled by deteriorating assessments of macro-demand prospects, the effect of which is critically aggravated by rational investor inactivity. The Fed's ability to sustain confidence in its capacity to control aggregate demand and its will to use that capacity is the crucial component of efforts to control welfare loss.

Assembling an effective toolkit. The Fed balance sheet enables discretionary asset purchases that increase prices, reduce interest costs, and directly boost demand in financial markets. The tools used in 2008-09 included programs that guaranteed private and public debt in critical areas, increased liquidity and credit availability, provided emergency loans to troubled financial institutions, and becoming the buyer of last resort in a range of debt securities in particular frozen-demand markets.

Those programs do not exhaust the effective use of the central bank's balance sheet. The Federal Reserve should undertake an exhaustive effort to identify the range of useful, contingent on spontaneously and variably organizing NDD conditions, interventions in aggregate demand. One notable example, aggressively argued by Roger Farmer (2010a), is carefully constructed equity purchases, which would affect wealth, investor confidence, and Fed real-side credibility.

Policies directly affecting Fed real-side credibility. More general policies designed to proactively manage real-side stabilization credibility (earlier denoted by $\hat{C}$) can take guidance from the SVGE-artifact single focus on low inflation. The Fed should assemble a best-practices plan of aggregate-demand intervention to manage the metamorphosis of SDD into NDD, featuring the expanded toolkit and well-designed commitment to the high-employment objective, and effectively communicate it to investors/lenders globally. The message should be that, given our power and commitment, betting against the Fed is a loser's bet.

BOX 10.5: ZERO-BOUND INTEREST RATES: PART I

In expanding their toolkit, monetary authorities must be particularly wary of innovations rooted in SVGE thinking. For example, Eggertsson and Woodford (2003) and Evans (2011) have offered an interesting new monetary tool for central banks wanting to stimulate investment when operational (overnight) interest rates are near zero. They should adopt, and loudly announce, a temporary increase in the inflation regime.

In SVGE thinking, the real interest rate equilibrates desired saving and investment; saving is increasing, and investment decreasing, in the inflation-adjusted rate. The proper inflation adjustment is to deduct expected price change from the nominal interest rate, with rationally expected inflation equaling the monetary authority's credible price regime. The central bank can then stimulate investment and overall spending, even if the overnight nominal rate is zero-bound, via announcing a temporary increase in its inflation regime, thereby reducing the real interest rate that governs capital outlays.

In a generalized-exchange economy, such a strategy encounters debilitating problems, again illustrating the limited policy relevancy of the SVGE model. Most important, the empirical/logical fact of meaningful wage rigidities chronically restricts markets' capacity to clear, compromising the ability of real interest rates to equilibrate desired saving and investment. In the broad range of circumstances, expectations of nominal demand growth will dominate interest rates in rational choices to invest versus hoard liquidity. Even if the announcement effect actually lowered expected real interest rates, the reduction would be ineffective in reversing investor reluctance in circumstances of (widely anticipated) chronically slow or contracting nominal demand growth.

Moreover, in the context of zero-bound restrictions, the announcement effect would not reduce relevant real interest rates. Given contracting or weak aggregate demand, the efficacy of the proposed increase in the established inflation regime would be damaged by both its promised temporary status and its lack of credibility. The latter is largely rooted in the absence of companion policies that would actually stimulate total spending, reduce excess supply, and eventually put upward pressure on price inflation. Finally, the problem of dubious benefits is compounded by the transparently significant costs of the announcement policy. Credibility for an inflation regime is hard won and requires careful maintenance. A temporary upward-violation of the established regime reintroduces the time-inconsistency problem into central-bank policymaking and its management of expectations throughout the economy. The result must be some weakening of the credibility of the monetary authority's commitment to low inflation.

A stabilization-relevant mainstream macro model would make the selling job much easier. Effective monetary policy, especially in highly stressed macro circumstances, cannot be coherently supported by consensus SVGE theory. It must be replaced by the TVGE model class if the Fed is to explain convincingly, with the necessary backing of a consensus of leading

macroeconomists in the academy, how the expanded toolkit would be used and why it would be successful. The stakes in the debate on the proper nature of the mainstream macro model, which must occur if the generalization of rational exchange is taken seriously, are very large.

Modern Monetary Macroeconomics

If monetary theory is to be both coherent and stabilization-policy relevant, it must feature continuous-equilibrium meaningful wage rigidity. MWR suppresses wage recontracting, uniquely reconciling rational behavior and involuntary job loss. The MWR Channel, providing the causal link from adverse nominal disturbances to employment loss, cannot be coherently accommodated in the market-centric SVGE model class. At least one additional venue of optimizing price-mediated exchange is required. Monetary theorists must recognize the fundamental transformation in the means and organization of production that has occurred with the global spread of the Second Industrial Revolution's "new corporate forms" and model self-interested exchange that occurs in the workplace as well as the marketplace. If the goal is monetary macroeconomics that is both coherent and capable of supporting effective stabilization policymaking, models constructed wholly within the SVGE analytic framework cannot suffice.[27]

Undeterred, modern macroeconomists continue to work almost wholly within the confines of marketplace exchange. What's worse, mainstream theorists have increasingly become less shy about providing SVGE-restricted stabilization advice, perhaps most problematically in their broad support for limiting central-bank stabilization efforts to a single nominal (inflation) objective. From the perspective of generalized exchange, degradation of the real (employment) objective is an artifact of arbitrary single-venue macro modeling. Taking SVGE results seriously especially damages our understanding of the inherent stability of modern, specialized economies. Among the most challenging consequences of SVGE policy guidance has been the crowding out of attention paid to the SDD→NDD disturbance class. The Federal Reserve was ill-prepared, and

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[27] Keynes, in his *General Theory*, provides the most celebrated (albeit unsuccessful) attempt to reconcile relevancy and rigor. The former is served by reorienting monetary theory around the causal role of nominal demand in the determination of total employment. The latter is reflected in his effort to depart as little as possible from the canonical SVGE framework. Model coherency, as a result, is sacrificed. Once MWR is understood to be (i) a necessary condition for involuntary job loss and (ii) nonexistent in coherent SVGE modeling, Keynes's roundabout and frankly confused treatment of wages can be better understood.

had itself ill-prepared political authorities and the public, for the perilous NDD propagations of the 2008-09 U.S. financial crisis.

BOX 10.6: ZERO-BOUND INTEREST RATES: PART II

Stanley Fischer, a veteran central banker as well as a proficient macroeconomist, provides an experienced-based identification of effective monetary-policy options in the circumstances of zero-bound interest rates. Note that his interventions, unlike Box 10.5, are consistent with coherent TVGE modeling as well as the behavior of the Federal Reserve during and after the Great Recession.

Fischer (2013, p.2) first identifies "… the policy of *quantitative easing* – the continuation of purchases of assets by the central bank even when the central bank interest rate is zero. Although these purchases do not reduce the short-term interest rate, they do increase liquidity. Further, by operating in longer term assets, as in QE2, the central bank can affect longer term interest rates, which may have an additional impact on the private sector's demand for longer term assets, including mortgages and corporate investment.

"Second, there is the approach that the Fed unsuccessfully tried to name 'credit easing' – actions directed at reviving particular markets whose difficulties were creating serious problems in the financial system. For instance, when the commercial paper market in the United States was collapsing, the Fed entered on a major scale as a purchaser, and succeeded in reviving the market. Similarly, it played a significant role in keeping the mortgage market alive. In this regard, the Fed became the *market maker of last resort*." In particular, the various market breakdowns critically aggravated the collapse in total nominal spending that, via the MWR Channel, generated involuntary lost jobs and income and its associated multipliers. They were a central part of the acute-instability mechanics of 2008-09.

Fischer continues, identifying another intervention channel (considered in Chapter 6) that has never been used by the Fed. "In a well-known article, James Tobin in 1963 asked in which assets the central bank should conduct open market operations. His answer was the market for capital – namely the stock market…. Although central banks have occasionally operated in the stock market – notably the Hong Kong Monetary Authority in 1997 – this has not yet become an accepted way of conducting monetary policy." (pp.2-3) While the TVGE emphasis on confidence and uncertainty in Chapter 6 turns Tobin's argument (rooted in SVGE thinking), upside down, the larger message of both remains intact. The search, especially in circumstances of acute instability, for effective monetary interventions in total spending is far from complete.

The dangerously poor preparation was at least partly rooted in the reliance of Fed staff on mainstream SVGE thinking to interpret and anticipate economic events. In the academy, the

most prominent theorists provide the analytic lens through which the best graduate students, some of whom become employees of central banks, are tasked to understand the increasingly interdependent, increasingly NDD-vulnerable world. A generation of students has been taught, with inexplicable confidence, that the dominating objective of monetary authorities must be low inflation and of economic researchers the explanation of trend growth. (See Lucas (1988) for a seminal SVGE interpretation of the proper research agenda for macroeconomists.) Given the misunderstood nature of instability in modern specialized economies, it is unsurprising that the analytic infrastructure at the Federal Reserve and other central banks was not adequate to effectively ameliorate the meta-externality costs of the Great Recession.

II. EVIDENCE REVIEW

This section draws from the body of evidence, found in a variety of disciplines and over a substantial period of time, that is relevant to the reconstruction of macroeconomics around the generalization of rational exchange. The goal is to gather the findings in one location, tolerating some repetition with previous chapters. No attempt is made to be comprehensive, a task rendered impractical by the exceptionally large pool of pertinent data. Coverage problems, however, are mitigated by the consistency of the evidence. Mainstream theorists have long had sufficient, consistent facts to support policy-relevant descriptions of macrodynamic behavior. What have been missing are axiomatic, coherent theories that help us understand what is already known.[28]

Testable TVGE characteristics. The TVGE model class alters the standard textbook specification of employees' preferences, incorporating a deeply-rooted axiomatic desire for fair treatment by employees, replacing the discredited assumption of worker utility always

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[28] The broad time range is especially important, given the suppressing effect of increasingly broad acceptance of coherent SVGE macro modeling on the empirical analysis of the workplace. More fundamentally, Greenwald and Stiglitz (1993, p.24) have argued for richer testing protocols, persuasively criticized the generous standards that economists use to evaluate modern SVGE macro models. "Statistical analyses based on variances and covariances of the principle aggregate time series simply do not have enough power to distinguish among many of the alternative theories. Good macro theories should do more. A host of other facts clamor to be explained; for instance, good macro theories must explain why variations in the number of hours worked should take the form of layoffs rather than work-sharing; why layoffs tend to be concentrated among certain parts of the labor force; why investment in general, and inventories and construction in particular, should be so volatile; and more. Beyond that, the microfoundations from which the aggregate behavior is derived can often be tested directly. A rejection of the underlying micro-hypotheses should suffice to cast doubt on the validity of the derived macro theory."

decreasing in his/her cooperative effort. Also rejected, for large establishments offering Class-I jobs, is the ubiquitous technological assumption of 1-1 mapping of $\mathbf{H_j}$ onto $\mathbf{X_j}$. Axiomatic technological heterogeneities, preserved by the refusal to aggregate large and small establishments, bifurcate optimizing labor price/use decision rules, associated constraints, and mechanisms of exchange. Rationally unbundled on-the-job behavior ($\acute{Z}_j$), derived from the nature of large, specialized corporations, is associated with routinized jobs, generates cyclical downward wage rigidity, produces chronic time-varying wage rents, rations good jobs, and implies long LEV employee tenure. W_j and $\acute{Z}_j$ are simultaneously optimized in large-firm workplaces. By contrast, bundled $\acute{Z}_j$ occurs whenever firms are small or jobs are Class-II, suppressing discretionary OJB in support of nonmarket reference standards and resulting in market-wage taking and unstable job tenure.

Evidence consistent with the TVGE preference and technical innovations is abundant, broadly documenting for LEV employees (i) revealed preferences for fair treatment as well as tit-for-tat strategic behavior, (ii) workers' active dissatisfaction with rewards (W_j) that are perceived to be inequitable, (iii) endogenous productivity variation under different compensation regimes, and (iv) employers' belief that employee dissatisfaction is harmful to productivity.

TVGE theory generates a substantial set of outcomes that can be assessed against available data and practitioner recognition. LEV evidence supportive of generalized-exchange modeling includes large establishments paying market-equivalent labor higher wages than do their small counterparts, long job tenure, reliance on catch-up to inflation that has already occurred (diminishing the role of inflation expectations) in the periodic adjustment of nominal wages, and extensive firm investment in workplace (equity-based) mechanisms of exchange. Furthermore, rational intertemporal behavior of the LEV reference wage (W^n_j) maximizes expected discounted wage income over employees' desired tenure in the labor force, subject to the expected paths of pure profit (Π_j) and the associated incidence of job downsizing (ω^T_j).

In TVGE macrodynamics, optimization occurs over sequential periods of unchanged and variable reference standards ($\mathbb{K_J}$), implying periodic wage-giveback. Input specialization and scale, the hold-up problem, industry labor-cost cartelization, product-pricing power, and

government intervention motivate substantial lags from the organization of wage rents to permanent job loss sufficient to motivate $\mathbb{K}_J$ recalibration. The durability of W^n_J is further strengthened by free riders, seniority-age heterogeneities, and employee decision-rule myopia resulting from workplace information asymmetries.[29]

For rent-receiving LEV employees, effective hours-supply is price-inelastic; SEV labor supply is more responsive to wage variations. For LEV firms, pure profit exists and reflects residual rents claimed by owners of sunk capital. Consumption is largely driven by income and wealth; investment largely by profit expectations, which cost-effectively use all available information and are therefore influenced by hold-up problems and the nature and credibility of stabilization authorities. Investor confidence also plays an important role, especially in periods of uncertainty motivated by low real-side credibility of stabilization authorities, in extreme instability. Putting it all together, the TVGE generalization of exchange is understood to be a wellspring of costly meta-externalities. Involuntary job loss exists, is consistent with continuous equilibrium, and is manifest either as cyclical layoffs or nonstationary job downsizing. Stationary and nonstationary demand disturbances produce same-direction changes in employment and output. Given the relatively compact wage structure of the early 1970s, substantial labor-adverse terms-of-trade shifts induced continuous-equilibrium stagflation, the existence of which turns out to have had little to do with the inflation credibility of the Federal Reserve.

Meaningful wage rigidity.   The core innovation of the TVGE model class, i.e., continuous-equilibrium meaningful wage rigidity and the associated MWR channel, deserves emphasis. While the missing model can be viewed as restoring nonmarket wages to their keystone role in

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[29] Evidence supportive of LEV dynamic labor-price optimization includes the existence of chronic, variable wage rents; path-dependent labor pricing; a low incidence of nominal wage cuts; labor-pricing sensitivity to adverse terms-of-trade shifts that is conditional on the wage structure and the nature of government intervention; and the existence of job downsizing that is sensitive to expectations of pure profit and leads to wage givebacks. Well-grounded theory is generally needed to avoid misinterpreting economic evidence. In a notable example, TVGE modeling has identified a variety of sources of downward wage flexibility in specialized economies: (a) labor-market-induced wage (nominal and real) flexibility, which is confined to small firms or those offering class-II employment; (b) product-market-induced (nominal and real) wage flexibility, which occurs in large establishments experiencing ongoing job destruction (eventually producing $\mathbb{K}_j$ recalibrations); (c) government intervention in the wage-determination process to facilitate wage restraint, frequently drawing on its capacity to enrich the nonwage outcome side of the fundamental workplace exchange; and (d) management innovations with respect to workplace organization, defined as a component of technical change (assumed to be exogenous in this book), which reduces employee capacity to maintain $\mathbb{K}_j$.

Early Keynesian analysis, it must also be understood that labor pricing has come a long way from Modigliani's simple assumption that money wages cannot be cut. Building on true axioms, generalized exchange has enabled the derivation of chronic, variable wage rents that reflect LEV firms' rational unwillingness to reduce the price of labor to its market opportunity cost. In the compact two-venue model, fully flexible labor pricing characterizes small firms, while large firms cut nominal wages only after job downsizing that is sufficient to convince rational employees to recalibrate their established reference standards ($\mathbb{K}_J$). Trained economists know that the actual instability in employment and involuntary unemployment requires substantially, but not completely, restricted labor-price flexibility. We also know that the evidence does not fit simple downward wage rigidity. LEV labor prices can go down, but only infrequently and in response to poor profit prospects and a rising incidence of permanent job loss, contributing to the variability of chronic labor rents.

TVGE labor pricing requires particularly configured economies, generating specific, complex arrays of facts and institutions. The simple wage restrictions of Modigliani, Patinkin, Samuelson, and Calvo will not do. The economy must produce measureable wage rents, locating them in large establishments and influencing them with specific classes of macro shocks. The economy must produce good and bad jobs that have little to do with inherent or general human capital. Involuntary layoffs, not product-price reductions, characterize stationary nominal disturbances; and job downsizing, eventually inducing wage givebacks, occurs in response to adverse nonstationary nominal or real disturbances. (In depression, nominal wages must fall and real wages rise.) Some firms are large and bureaucratic, with detailed personnel policies and practices; others are tiny and owner-managed. A modern economy cannot be effectively modeled as wholly one or the other. Labor unions, modern human-resources management, and hold-up problems (causing labor-cost bankruptcies and important meta-externalities) are familiar features.[30]

Wages have been pushed aside in mainstream macro modeling in part because macroeconomists have had no robust theory with which to organize their understanding of the available evidence.

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[30] Critical episodes that must be accommodated by proper macro modeling include the Great Depression, chronically low then high joblessness in postwar Europe, stagflation, the Thatcher revolution in Britain, the six million involuntarily lost jobs in the U.S. 2007-09 Great Recession, and the sovereign-debt crisis in the Euro-zone.

The interpretation of the empirical landscape of modern economies is much more intuitive, much more coherent, and much less Ptolemaic when guided by the TVGE, rather than the SVGE, model class. TVGE innovations boil down to solving the labor pricing conundrum posed by the Two-Venue Theorem. The central hypothesis is that generalized exchange is necessary to microfound nonmarket wages that are consistent with practitioner/ household descriptions of their own behavior and fit the facts.

Wage-Rent Evidence

Chronic wage rents are a central organizing fact of TVGE modeling, earning pride of place in this evidence review. The literature convincingly demonstrates that wage rents both exist and are time-varying in size. One particularly informative study, Katz and Summers (1989), will be considered in atypical detail. Other empirical analyses relevant to wage rents are more briefly summarized in various places later in this section, demonstrating that the 1989 analysis remains consistent with more recent empirical work.

Drawing from multiple data sources and studies, Katz-Summers provide an unusually rich picture of inter-industry labor pricing in the United States. Their findings include:

- Industry affiliation has a large effect on wage differentials even after observed differences in occupation, human capital, and demographic background are taken into account. The inter-industry ranking of wage rents closely corresponds to capital intensity, which is a useful proxy for establishment size and LEV firms. The structure was illustrated by durable manufacturing, mining, and chemicals paying large wage rents relative to the earnings of comparable point-of-hire workers in retail trade and services.

- Katz-Summers indicate mean rent magnitudes on the order of 30 to 40 percent.

- Wage rents for jobs classified as "routine and repetitive" are increasing in establishment capital intensity.

- Katz-Summers cite evidence on the existence of job-queues at firms paying wage rents. Lewis transfer, governed by the Harris-Todaro mechanism, plays a critical role in TVGE modeling but cannot be accommodated by coherent SVGE analysis.

- Katz-Summers accounting for union status shows a small positive effect on wage rent.

- Katz-Summers (pp.230-31) cite three contemporary longitudinal studies constructed on different data sets (Krueger and Summers (1988), Gibbons and Katz (1987), and Blackburn and Neumark (1988)) finding "that when individual workers move between industries, either because of displacement or because of normal labor-market processes, their wages change by amounts similar to the industry differentials estimated in cross-sectional regressions. The three studies find that workers who move between industries experience relative wage change of 60 to 100 percent of the amount that would be predicted from a cross-section wage equation."

Assessment: The detailed picture assembled by Katz-Summers closely corresponds to the particular labor pricing and use mechanics derived in the TVGE model class. Their detailed description of wage rents and associated characteristics cannot be accommodated in the mainstream coherent SVGE model class.

Microeconomic Evidence

Pay for performance. One of the few areas of practitioner research that has interested economic theorists is worker response to pay-for-performance incentive plans. The economic research on that issue has been largely undertaken to test various predictions of agency theory with respect to the optimal design of wage contracts. But the general findings additionally provide more general evidence of OJB endogeneity in response to changing compensation.

Lazear (1996), for example, examined workers who installed auto windshields and reported a 35 percent increase in productivity following a shift to piece rates. He attributed two-thirds of the improvement to increased effective effort and a third to selection effects (better workers being attracted to the enhanced compensation opportunities). Other studies by economists similarly show productivity response to contingent wages, demonstrating that employees exercise some degree of independent control over their workplace behavior: Paarsch and Shearer on Canadian tree planters; Banker, Lee, and Potter on sales employees in department stores; and Fernie and

Metcalf on British jockeys. Notably, Bandiera *et al*., using personnel data, found support for positional concerns by comparing worker effort under piece rates and under relative incentives.

Economists are, of course, latecomers to this area of research and have been hampered by the particular data requirements necessary to test agency-theory predictions. Labor-management practitioners, and associated academics, have produced a huge, and much more general, literature on the worker response to piece rates. Their results identify the problems with such pay plans, which were summarized in Chapter 4. But they also demonstrate that, in many workplace environments, employees exercise substantial discretion over their on-the-job behavior, a latitude apparently sensitive to monetary incentives. Lawler (1971, p.124) surveyed the available practitioner evidence on the conversion to piece-rate pay systems and concluded "… even the most conservative studies seem to suggest that individual incentive plans can increase productivity from 10 to 20 percent."

Assessment: The large body of evidence on piece-rate pay arrangements demonstrates the existence of discretionary $\acute{Z}_{ij}$, rejecting the fundamental SVGE positing of 1-1 mapping of H_j onto X_j.

Workplace equity and worker behavior. General perceptions of fairness in the workplace, especially with respect to wages, have long been believed by managers to influence worker on-the-job behavior. Employers have long believed that dissatisfied employees, given the latitude, adversely alter their behavior on the job. A Daniel Yankelovich poll of business leaders asked the question: Does job dissatisfaction lead to high turnover, tardiness, loafing on the job, poor workmanship, and indifference to customers and clients? Of the 563 respondents, 94 percent thought that such an association does exist.[31]

Jonas Agell and Per Lundborg (1995) examined management views of workplace conduct in response to adverse departures from established reference wages in a survey of 170 manufacturers in Sweden. Most firms responded that fairness and worker morale are of overriding importance in wage policymaking. Eighty percent believed that at least half of their

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[31] Katzell and Yankelovich (1975), p.114.)

jobs would have to be clearly at risk for employees to accept wage cuts with no adverse effects on productivity on the job. From his interviews with 26 nonunionized firms in Britain in 1982, Roger Kaufman (1984) similarly reported that the related issues of fairness and worker morale were the most cited reasons for not cutting wages.

Alan Blinder and Don Choi (1990) surveyed nineteen firms in 1988 and found that managers believed that a wage policy perceived to be unfair would have predictable effects:

- All interviewees thought that the quality of job applicants would be reduced;
- Eighteen of nineteen responded that worker effort on the job would be adversely affected; and
- Sixteen of nineteen concluded that such a policy would cause turnover problems.

Most of the managers in the survey believed that the justification for wage cuts was important. If clearly made to save the firm or to bring wages in line with competitors, employees were more likely to accept them without adverse effects on workplace productivity.

Carl Campbell and Kunal Kamlani (1997) attempted to quantify worker response functions (i.e., the relation between worker effective effort and wage cuts), reporting results that support the rational payment of efficiency wages. Surveying 184 compensation executives from large firms, they asked how much workplace effort would decrease if wages were cut by 10 percent. The mean response was 20 percent. Nearly 7 out of 10 believed that the principal reason for the harmful effects was damaged worker loyalty. Most also thought that effort would be most impacted if employees believe that their employer is profitable and least affected if there are credible financial losses that threaten jobs.

The most impressive investigation of wage policymaking was conducted by Truman Bewley (1999a). His interview results are especially instructive and have been cited previously. Perhaps most notably, Bewley asked 104 businesses why worker morale matters to them: "Managers were concerned about morale mainly because of its impact on productivity. They said that when morale is bad, workers distract one another with complaints and that good morale makes workers willing to do extra, to stay late until a job is done, to encourage and help one another, to make

suggestions for improvements, and to speak well of the company to outsiders" (pp.47-48). The incidence of their responses was presented in the first chapter and deserves reiteration:

Reason	Percentage of Businesses Citing the Reason
Low worker productivity	89%
Poor customer service	14
Turnover	13
Recruiting	7
Absenteeism	4
Unionism	3

Bewley (1999b, p.1) concluded: "Employers were reluctant to cut pay because they believed doing so would hurt employee morale, leading to lower productivity and current or future difficulties with hiring and retention. It was thought that these effects would in the end cost more than the savings from lower pay."

David Romer (2001) has usefully summarized economists' survey-based results: "The surveys consistently suggest that workers' morale and perceptions of whether they are being treated appropriately are critical to their productivity. The surveys also suggest that workers have strong views about what actions by the firm are appropriate, and that as a result their sense of satisfaction is precarious." (p. 460)

Similar results come from a broad range of specialties outside economics. For example, in the December 2002 issue of the *Journal of Occupational and Environmental Medicine*, researchers found that sick days taken were strongly influenced by employee assessment of management fairness. They found that men who felt that workplace decision-making was arbitrary were 41 percent more likely to use sick days than men who did not. Meanwhile, disgruntled women took 12 percent more sick days than satisfied women.[32] Laboratory experiments have also yielded results that are consistent with the TVGE model class. They provide, for example, the evidence

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[32] *The New York Times* (December 24, 2002), p.6.

gathered by Ernst Fehr and his coauthors in a number of studies that demonstrate the importance of social norms and reciprocal behavior in the determination of worker effort.[33]

Also outside of economics, various forms of the input-outcome framework featured in Chapter 2 have been used extensively by psychologists and sociologists in studies designed to explicate behavior while engaged in tasks for pay. Named "exchange theory", the general approach was developed in the 1960s, most notably by Homans (1961), Adams (1963), and Blau (1964). Of course, very little in social science is ever completely new. Exchange theory has extensive roots, including the work of the hands-on labor economists who worked from the 1930s into the 1980s. John Dunlop's descriptions of wage contours receive especially frequent mention.[34]

Psychologists and sociologists have used both field studies and controlled experiments to test the predictions of exchange theory. Two classes of findings are particularly noteworthy:

- Individuals use multiple reference standards in assessing their satisfaction with pay, most frequently including comparisons with coworkers, comparisons with workers performing similar tasks in other firms, and wage history. Examples of field studies producing those results are Finn and Lee (1972), Goodman (1974), Hills (1980), White (1981), Ronen (1986), Dornstein (1988), and Cappelli and Sheer (1988).

- Individuals' perception of wage equity affects job performance, a hypothesis that has been strongly supported in controlled experiments. There have been several useful surveys of this literature including Pritchard (1969), Goodman and Friedman (1971), Adams and Freeman (1976), Greenberg (1982), and Dornstein (1991).

Indicative of deep, genetic roots of the preference for equitable treatment in hierarchies of authority, evolving to facilitate cooperation that capture efficiencies of group-living

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[33] See Fehr and Falk (1999), Fehr *et al.* (1996), and Fehr *et al.* (1993).

[34] As noted earlier in the analysis, the earliest application of the input-outcome framework to formal macroeconomic theory is Annable (1977, 1980), followed after a time by Akerlof's (1982) gift-exchange model. A significant difference between the two approaches is Annable's maintenance of the fundamental transitivity principle that higher wages are preferred to lower (i.e., over-payment relative to established reference standards does not cause dissatisfaction), while the Akerlof rejects such transitivity.

arrangements, is the famous study of monkey behavior. In the September 18, 2003 issue of *Nature*, Sarah Brosnan and Frans de Waal of Emory University reported on their study indicating that capuchin monkeys have evolved a finely developed sense of grievance with respect to unfair treatment. The researchers taught female monkeys to trade pebbles for food. The animals were caged in pairs, so each could observe the transactions of the other. If one monkey received a highly desired grape in exchange for a pebble, the other would be reluctant to trade for a less desired cucumber slice. Refusal was often accompanied by expressions of exasperation such as throwing the pebble (sometimes at the researcher) or refusing to eat the cucumber. Exasperated body language was twice as likely if the other monkey was given a grape without even having to trade a pebble for it.

In the wild, capuchin monkeys are a cooperative, group-living species. Cooperation is hypothesized to be more likely to be effective if group members feel they are being treated fairly. If so, the evolution of feelings of righteous indignation in response to inequity facilitates the capacity of the capuchins to live and work together productively. Brosnan concluded: "We showed the subjects compared their rewards with those of their partners and refused to accept a lower-value reward if their partner received a higher-value reward. This effect is amplified when the partner does not have to work for the reward…. People often forego an available reward because it is not what they expect or think is fair. Such irrational behavior has baffled scientists and economists, who traditionally have argued all economic decisions are rational. Our findings in nonhuman primates indicate the emotional sense of fairness plays a key role in such decision-making."[35] The behavior, of course, is not irrational if preferences are extended to include fair treatment.

Assessment: The large body of evidence strongly supports (a) the preference for fair treatment in hierarchies of authority and (b) that managements believe that worker morale affects OJB.

Nature of workers. When economic theorists do permit worker behavior to vary, they almost always motivate employees solely by a desire to shirk. Positing a universal urge to loaf on the

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[35] "Sense of Fairness Documented in Monkeys," *Scienceagogo.com* (September 18, 2003).

job combines with monitoring costs to animate the shirking variant of efficiency-wage theory, in which wage premiums are paid to increase the employee cost of loafing (usually being fired if caught). Such premiums are modeled to vary inversely with the unemployment rate. (Recall Chapter 9.) It is instructive that Bewley (1999, p.111) asked the managers of 118 companies about the shirking description of employee behavior. The responses are summarized as follows:

Type of Reaction	Number of Businesses
Does not apply	103 (87%)
Applies in some cases	10 (8%)
Applies	4 (4%)
No opinion	1 (1%)

From Bewley (1999): "Most managers insisted that the [shirking] theory did not describe their own behavior, but rather a form of bad management. They thought of punishment only as an extreme measure for dealing with antisocial behavior and said that the best results were obtained with a forthright and positive management style. Such a style is defeated by pay cuts, for they withdraw rewards and are interpreted as penalties. A small amount of evidence suggested that the shirking theory may apply at the bottom end of the labor market, especially to the market for low-paid temporary labor, where wages are downward flexible." (p. 110)

The TVGE theory also posits that LEV worker fixed characteristics are more important determinants of wages than attempts to measure on-the-job effective effort. Medoff and Abraham (1980, 1981) are illustrative of a number of studies that have found compensation to be more strongly related to seniority and education than to internal performance ratings. Given information asymmetries, such ratings are imperfect measures of productivity but do provide some indication of managements' view of employee conduct. In a related study, Charles Brown (1990) analyzed data from 1,700 non-union and 1,500 union firms and found significantly greater reliance on seniority in wage-adjustment decisions in large or unionized organizations, as predicted by TVGE theory. In particular, he reported that in the non-union case, for every 10 percentage point decrease in establishment size, there was a 4 percentage point decrease in the

firm's employees paid on the basis of seniority on the job. Seniority was important for both large and small unionized firms.

More fundamentally, the preference for equitable treatment has long been a subject of research in experimental economics. Werner Güth, Rolf Schmittberger, and Bernd Schwarze (1982) constructed an early, insightful experiment based on the "ultimatum game". There are two players, and the first is given a sum of money and a choice. He or she has to give some part of the money to the second player, who then also has a choice. If the offered cash is accepted, both players keep the allocated money. If rejected, each gets nothing. Any subgame-perfect equilibrium of the ultimatum game dictates that the (permissible) minimum be offered and accepted. Economists typically motivate utility functions parsimoniously with the preference of more money to less, implying that any positive sum is preferable to nothing and providing both players with clear marching orders.

Contrary to the predictions of models of utility motivated by simplistic preferences, Güth *et al.* found a strong desire for fair treatment and an urge to retaliate when denied that outcome. Their experiment and the many that followed have established that the modal offer is to split the money evenly and that an inequitable offer is likely to be rejected, with the chances of rejection increasing as the second player's share decreases. The results of ultimatum-game experiments are significant and must make economists suspicious of naïve formulations of individual preferences and utility.

That suspicion is made acute by the broad practical application of the ultimatum game. A version of it, made more complex by established workplace reference standards, incomplete information, quasi-rents, and available gradations of retaliation, is played every day in large work establishments. In the workplace game, worker desire for fair treatment is strengthened by the near-zero expected costs associated with reciprocal reductions in effort and cooperation if management fails to pay the established wage norm. Market opportunity cost is the minimum offer, but neither employers nor employees believe that the minimum (market-wage) offer is an optimal solution to this real-life game, a result that is consistent with the findings of experimental economists. If economic theorists are to catch up to what everybody else knows, they must drop

their insistence on simplistic, SVGE-convenient preferences in specialized economies and, consequently, abandon their market-centric approach to labor pricing.

Theorists, who care about the explanatory and predictive capacity of economic theory, must become more learned in their motivation of employee behavior. The evidence against the ubiquitous SVGE approach is overwhelming. In his recent survey of experimental economics, Larry Samuelson (2005) concluded: "… experimental evidence has mounted that people will incur costs not only to bestow benefits on others, but also to penalize others, with the preference for reward or punishment hinging upon perceptions of whether the recipient has acted appropriately or inimically." (p.97)

Assessment: The evidence supports motivating worker behavior with extended preferences (for fair treatment and, more richly, tit-for-tat strategies) rather than expanded preferences (linking positive-good leisure with shirking on the job).

Establishment size. Large establishments pay more than their smaller counterparts for equivalent workers. That is one of the most established facts in labor economics. Lester (1994), whose mid-twentieth century empirical work called attention to the ubiquity of nonmarket wage differentials by establishment size, summarizes his findings and provides updated commentary. As Lester emphasized, the apparent repeal of the law of single price is one of the most difficult labor-market facts for mainstream SVGME theorists to accommodate. Instead, they frequently argue that high-wage large establishments attract workers whose greater abilities are not captured by measureable characteristics such as education.

By their nature, unobserved differences are a suspect explanation. Their serious consideration requires additional evidence supportive to the existence and nature of hidden quality diversity that is not collinear with measurable indicators. In contrast to convenient free parameters, the explanation that large and small establishments' labor pricing practices differ fundamentally, producing fundamentally different results, has been formally derived from axiomatic model primitives in TVGE theory. A central prediction of that overdue generalization of exchange,

building on broadly recognized workplace information costs and asymmetries, is a positive relation between wages and establishment size.

Size-heterogeneous wage determination is a common denominator in numerous empirical studies. Despite lacking a coherent model of heterogeneous labor-pricing practices to specify the exercise, Abowd and Kramarz (2000a,b) used matched employer-employee data for the U.S. and France and found that wage-policy differences explain, in both countries, 70 percent of pay differentials. A sampling of the other available studies on size differentials provides weight to the WMS explanation. Brown, Hamilton, and Medoff (1990) carefully analyzed U.S. data on wages by firm size in a variety of industries. They concluded:

- Large firms pay wages that were about a third higher than small firms. Once they accounted for education, training, experience, and occupation, the size-wage differential is reduced to 10 to 13 percent.

- Non-wage monetary benefits (heath insurance, pensions, paid vacations, etc.) were more than 30 percent higher in large versus small firms.

- Unions reduce the wage-size effect. Wages paid in large unionized firms were only 14 percent above rates paid in small unionized firms.

Siebert and Addison (1991) examined British data and found that, holding human-capital influences constant, establishments with more than 1,000 employees paid 8% more than those with fewer than 100 employees. Using U.S. data, Idson and Feaster (1990) and Mellow reached similar conclusions. Additional studies adjusting for quality differences and finding an establishment-size wage premium include Green, Machin, and Manning (1992).

Coming at the same issue from a different perspective, Krueger and Summers (1988) showed that wages are higher in industries that have high capital-labor ratios. Capital-intensive firms tend to be large and produce substantial quasi-rents. More generally, Dickens and Katz (1987b) investigated the characteristics of industries that pay relatively high wages, finding that they are populated by larger establishments, have higher capital-labor ratios, have more educated and experienced workers, have higher profits, and a larger share of their workforces are both male and unionized.

When interpreting this literature, recall that, chronic wage rents in the TVGE theory are inherently time-varying. efficiency-wage premium varies over time. Less empirical attention has been paid to the dynamic behavior of employee rents. Davis and Haltiwanger (1991, 1996) examined CPS data matching individual earnings with the identity of his or her (manufacturing establishment) employer. They found that, in 1967 when the wage structure was relatively compact, that establishments employing 5,000-plus workers paid a 42 percent differential in the average hourly wage relative to establishments employing 20-to-49 workers. By 1982, and the interim adverse shifts in worker terms-of-trade resulting from rising commodity prices and dollar depreciation, the differential had risen to 69 percent. The results are consistent with Annable (1984), who modeled the determinants of the coefficient of variation of wages paid for 116 three-digit SEC industries quarterly from 1958 to 1980 in the United States. The results showed that the relatively rapid rise in energy and food costs played a particularly important role in the sharply increased dispersion of the inter-industry wage structure.

Additionally recall that in TVGE modeling causality between labor quality and wages is simultaneous, running in both directions. If a large-establishment employer rationally pays the labor rent dictated by workplace reference standards, the hiring firm must also rationally "cream" the excess supply of job applicants. Firms' capacities to hire measurably higher-quality workers increases with the size of the wage rent paid. Moreover, causation runs largely from the rational wage rents to long job tenure (often used as a proxy for productive experience), not the other direction. Consequently, including measureable human-capital variables misspecifies single-equation econometric models of the effect of establishment size on wages, imparting a downward bias to the estimates.

Assessment: A well-known empirical fact is that large establishments pay more than small firms for the same quality labor, repealing the law of single price and undermining mainstream SVGE analysis of wage determination.

Macroeconomic Evidence

Nominal demand disturbances. Quarterly changes in employment, hours, and outputs are powerfully explained by changes in the nominal demand. That was a central finding of the wave of research conducted by Early Keynesian econometricians, the best known of which remains component equations of the large macro models that were constructed during this period. See, for example, Klein and Goldberger (1955).

Assessment: The Early Keynesian finding has never been, for obvious reasons, successfully challenged. It is a fundamental fact of macroeconomics.

Wage downward rigidity. The evidence that wages adjust sluggishly in response to a short-term rise in unemployment is ubiquitous. The simplest testimony is that average money wages, everywhere, continue to rise, not fall, in recession. In an early study, Annable (1977) reported such compensation behavior during each of the first six U.S. cyclical downturns of the postwar period in an early attempt to formally model nonmarket efficiency wages. That evidence additionally showed that job loss moved in concert with the jobless rate, while quitting and labor-force entry moved counter to overall unemployment.

Holzer and Montgomery (1990), investigated data from the Employment Opportunity Pilot Project (covering more than 3,400 firms between 1980 and 1982). With respect to nominal wage behavior, they concluded: "Wage adjustments in response to demand shifts appear to be quite asymmetric, with significant adjustment in response to positive shifts but little in response to negative shifts." (p.4) Data drawn from German Social Security accounts, analyzed by Beissenger and Knoppik (2001), also reveal substantial downward nominal wage rigidity. Recent surveys by Altonji and Devereux (1999) and Lebow *et al*. (1999) found the same sharp asymmetry.[36] Nominal wages in specialized economies are sticky downward not upward.

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[36] Altonji and Devereaux econometrically tested data from the Panel Study of Income Dynamics, estimating that notational wages must decline by at least 20% for a nominal wage cut to occur.

Moreover, in a detailed survey of the microeconomic evidence, Francis Kramarz (2001) found general support for wage stickiness. Specifically, he reported that the data show that "… firms prefer to cut employment rather than cut wages in a downturn."[37] That preference, especially how it squares with profit-maximizing behavior, has long been a central question in macroeconomic research.

Economists have furthermore been using a variety of statistical techniques to mine aggregate data in their attempts to produce dynamic pictures of business-cycle behavior. For example, King and Rebelo (1999) used the Hodrick-Prescott filter to isolate cyclical components of postwar U.S. macro variables, finding that the transitory component of trend employment greatly exceeds the transitory component of the trend real wage:

- The ratio of the detrended standard deviations of total labor hours to total real output is 0.99, with employment as volatile as, and hours per worker much less volatile than, output;

- The ratio of detrended standard deviations of the average real wage to total real output is 0.38.

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[37] Kramarz (2001), p. 215. Although not used in the generalized-exchange theory, which was designed to be compatible with consistent preferences, money illusion (especially with respect to significance attached to nominal wage cuts) is also supported by a variety of evidence. More careful empirical analyses have also documented the fact of wage stickiness. Shulamit Kahn (1997) and David Card and Dean Hyslop (1997) each used panel data to find that cross-sectional distributions of worker pay changes are asymmetric around zero. Pierre Fortin (1996) examined Canadian collective-bargaining results and found the same sharp spike at zero nominal wage change, reflecting a reluctance to cut compensation rates. Bewley's (1999) numerous interviews with managers in the early 1990s cyclical downturn in the United States revealed extreme reluctance to cut wages. Money illusion itself is supported by experimental evidence. Using telephone surveys conducted in Canada in 1984 and 1985, Kahneman *et al.* (1986) asked for an assessment of a series of situations, including:

> Question 4A. A company is making a small profit. It is located in a community experiencing a recession with substantial unemployment but no inflation. There are many workers anxious to work at the company. The company decides to decrease wages and salaries 7% this year. (p. 731)

Of 125 respondents, 38% found the nominal wage cut to be acceptable; 62% did not. The assessment contrasted sharply with the companion situation:

> Question 4B. A company is making a small profit. It is located in a community experiencing a recession with substantial unemployment and inflation of 12%. There are many workers anxious to work at the company. The company decides to increase salaries only 5% this year. (p. 731)

Of 129 different respondents, 78% assessed the firm's action to be acceptable; 22% said it was unfair. It may be, however, that casual observers may not think as hard about nominal-real distinctions as workers whose standards of living are on the line.

Those results only sample the plethora of studies that empirically demonstrate, in a variety of circumstances, employer reluctance to cut money wages. (Also notable are Akerlof, Dickens, and Perry (1996); Card and Hyslop (1997); and Dickens, Goette, Groshen, Holden, Messina, Schweitzer, Turunen, and Ward (2007).) Incomplete downward stickiness of nominal labor pricing must be recognized as an established fact of modern economies.

 One additional study is illustrative of another interesting characteristic of the modern analysis of wage rigidity and will be briefly summarized. Le Bihan, Montornés, and Heckel (2012) examined wage data that the French Ministry of Labor gathered quarterly from 1998 through 2005 for establishments with at least 10 employees. The mail survey covered roughly half of total comparable employment. They found that only 15% of all quarterly wage changes reflected labor-price reductions, with the incidence of cuts declining monotonically in firm size up to establishments with 150 or more employees.[38] From Le Bihan *et al*. (p.2): "Our finding can be summarized as follows. The distribution of wages is right skewed reflecting downward nominal rigidity, as found in other studies. We compute an original figure, the frequency of wage change, found to be about 38 percent [per quarter]. The degree of cross-sectional heterogeneity in wage stickiness is found to be low. The hazard function of wage changes has a noticeable spike at four quarters but is rather flat otherwise. Also, we find seasonality in wage changes, and we find that wage adjustment is mainly time dependent as opposed to state-dependent."

Those results are unsurprisingly consistent with the TVGE model class. What is more interesting about the study is how the authors' SVGE framework influences the interpretation of the familiar evidence, drawing conclusions that differ substantially from the Early Keynesians. Perhaps most tellingly is the focus on the frequency of wage change, not on downward rigidity. The inability to coherently suppress rational recontracting has increased the importance, if mainstream modeling is to be monetary-policy relevant, of validating the Calvo (1983) duration model.[39] Think about

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[38] It should be noted here that significant share of the reported quarterly nominal wage cuts occurs at quite small amounts (reductions of one-half of one percent or less). It is not credible that such minor adjustments resulted from actual personnel decisions, suggesting instead that measurement errors (including rounding effects and the use of survey-reported "normal working hours" in the calculation of the results) cause some of the always large number of unchanged hourly wages to be misreported as very small wage reductions.

[39] Calvo arbitrarily assigns a fixed random probability that each establishment will adjust its labor pricing in a given period, a backdoor free parameter that introduces wage adjustment lags into macrodynamic behavior. It is almost

it. The fact of low-incidence wage cuts, if overtly interpreted as downward stickiness, directly challenges the maintained SVGE hypothesis, providing a powerful alternative (Occam's razor) explanation for observed macro phenomena. Le Bihan *et al.* (p.12) need a dark corner in which to confine their old Neoclassical-Synthesis results: "… we interpret base wage decreases as being compensated by working conditions that improve following, for instance, a switch from night work to day work." Practitioners are always surprised that there is no room for profit shortfalls in macroeconomists' rationale for wage givebacks and are typically offended that economists are not interested in their surprise.

Assessment: The evidence consistently shows that nominal wage adjustments both respond sluggishly to contemporaneous shifts in labor-market conditions and are asymmetric – i.e., employers are reluctant to cut nominal hourly pay.

More on wage rents. In a path-breaking paper, Slichter (1950) investigated the average wage for unskilled and skilled manufacturing workers from 1923 to 1946. The data revealed substantial, persistent wage differences for unskilled labor by industry. He further found that average unskilled wages were strongly positively correlated with industry value-added per worker (a proxy for capital intensity and establishment size) and negatively correlated with the payroll-to-sales ratio. In more recent influential paper, Jacobson, LaLonde, and Sullivan (1993) explored the relationship between rents and employment destruction using a large sample of employees' earnings histories drawn from Pennsylvanian administrative data. They found that the immediate effect of job displacement of high-tenured workers was a two-fifths reduction in earnings; after six years, earnings remained one-quarter lower.

Empirical analysis of wage rents is typically not conducted in a job-destruction context. The evidence from the larger literature is consistent, demonstrating that wage rents exist, with predictable incidence and variability over time.[40] Crandall (1993) estimated that, by the early

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always ignored that the Calvo formulation is a poster child for Barro's critique and cannot be consistent with coherent SVGE modeling.

[40] GWET has identified three interrelated determinants of the size of the wage gap: (i) the dynamic effects of established wage norms (including, but not limited to, bargaining power manifest when the employees are

1990s,a manufacturing wage gap of 14% to 24% existed between the North Central region of the United States and the South and West regions. That gap was chronic, persisting through a dramatic shift of factory jobs. In 1963, the east north central region produced 30.1% of manufacturing gross state output compared to 21.1% in the South and 13.9% in the West. By 1989, the shares had changed substantially: east north central (15.4%), South (28.9%), and West (17.9%). The union wage premium is well established and variable. For the United States, Lewis reports that estimates of the size effect ranges from 12% in the late 1950s and 1960s to 18% in 1970s. Layard, Nickell, and Jackman found more variation in Britain, from 15% in the late 1950s to 32% in the early 1980s.

Dickins and Katz (1987a) and Krueger and Summers (1988) approached the gap issue more generally by examining inter-industry data. They found, after accounting for worker characteristics (age, education, occupation, etc.), that wages differ substantially among industries and that the difference is largely the same if the sample excludes workers covered by union contracts. Krueger and Summers also found that workers in high-wage industries quit much less often, suggesting that the observed gap is not wholly rooted in employee-quality differences. And Gibbons and Katz (1992), examining workers who permanently lost jobs, discovered that wage cuts experienced in their new employment were much bigger if their previous jobs were in a high-wage industry, again suggesting the existence of labor rents. A prediction of GWET is that, as the relative wage paid in the workplace venue rises, labor absorption decreases and workers are crowded into the marketplace venue, depressing those wages. Lawrence Kahn (1978), using (from the perspective of the WMS) unionization as a proxy for the workplace venue, constructed an ingenious test based on variations in two separate metropolitan labor markets for clerical, sales, private households, and service workers. He reported that "… unions lead to a skewing of the income distribution among employed workers. That is, unions, by crowding nonunion workers into low-paying jobs, indirectly contribute to divergent development in the labor market." (p. 216) From the vantage point of neoclassical workplace economics, the crowding-out effect would be expected to vary by type of job and size of establishment. Indeed, for clerical employees who are more likely to work in conditions of intra-firm information

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unionized), (ii) the effect of investment in specific human capital, and (iii) the effect of rational wage-setting arrangements (i.e. compensating for the adjustment lag in inflation catch-up).

asymmetry that the other occupations examined by Kahn, there is no evidence of crowding out or in. Explicit attention to the determinants of the worker response function explains a great deal of the observed (and often puzzling) behavior of labor markets.

Studies of wage time series at the firm level are more limited. Those that exist report that the negative effect of unemployment on wages is more important in smaller firms. (See Nickell and Wadhwani (1990b), Brunello and Wadhwani (1989), and Christofides and Oswald in the Layard *et al.* (1991), p. 199.)

Assessment: The repeal of the law of single price is chronic. Long-term wage rents, with or without unions, persistently characterize specialized economies. Union wage gaps vary over time and are inconsistent with the monopolist model favored by market-centric theorists.

Labor-supply elasticities. Modern business-cycle theory was originally constructed within a dynamic stochastic general market equilibrium framework that identified high labor-hours elasticities as playing a central role in propagating the periodic fluctuations in employment and production. The extraordinary elasticities required to motivate coexisting cycles and market-clearing, however, are both intuitively suspect and unsupported by the evidence. For example, in their extensive review of the literature, Browning et al. (1999) report (while documenting modeling limitations) that estimates of the intertemporal substitution of work for leisure are between 0.1 to 0.4 for adult men and 1.6 for adult women, well below the response needed to produce realistic cycles.[41] They also found that job entry and exit is the critical determinant of empirical labor-supply elasticities. For example, the large gender difference is mostly attributed to greater labor-force attachment and job tenure demonstrated by men relative to women. Moreover, in the evidence, consumption appears complementary with male labor supply, but the relationship is unclear for women.

The empirical work on market labor supply is consistent with the rational-worker theory. GWET derives a dual function for wages, helping both to allocate labor in the marketplace and to

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[41] Estimates of labor-supply elasticities fail to account for the fundamentally different choice constraints on workers attached to LEV firms versus those attached to their SEV counterparts and are, therefore, biased.

manage worker behavior on the job and establishing inconsistent labor pricing. One consequence of workplace-dominant wages is job rationing in the large-establishment venue of the economy. Once wage gaps exceed unity, high-wage firms experience a chronic excess supply of labor, while people holding or seeking high-productivity jobs, pushed off their supply schedules, become broadly insensitive to changes in the offer rate. If adult males are more attached (relative to adult females) to the specialized venue, workplace economics would predict significantly lower male supply elasticities.

Assessment: Empirical work on labor-supply elasticities is inconsistent with the baseline real business cycle and other market-centric approaches. It is, however, consistent with the WMS two-venue analysis. Indeed, the combination of workplace and marketplace optimizing labor choice is more consistent with estimated elasticity levels and structure than any alternative model of labor supply.

Chronic shocks. The OJB model predicts that chronic shocks (especially shifts in worker terms-of-trade and productivity growth as well as changed unionization or government intervention) displace the natural rate of unemployment over time. That prediction is consistent with the finding by Layard, Nickell, and Jackman (1991), using postwar data from 19 OECD countries, that lagged unemployment exerts a marked positive effect on the current jobless rate.

In addition, Phelps [1994], estimating a set of regression equations explaining the behavior of unemployment over time in each of 17 countries, found that a higher world price of oil increased joblessness in every nation. And Annable [1984], testing a two-sector rational-worker variant of efficiency wage theory, found (as noted earlier) that the three-digit inter-industry dispersion of wages was significantly and substantially sensitive to energy and food terms-of-trade shifts in the United States from 1958 through 1980.

Assessment: The natural rate of unemployment varies over time and is sensitive to a range of macroeconomic variables including shifts in worker terms of trade and labor productivity growth as well as compactness of the industry wage structure and government intervention.

BOX 10.7: SAMUELSON STOPPED WORRYING

My first faculty appointment after graduate school had the significant fringe benefit of becoming a colleague of Paul Samuelson.

In an extensive interview, Samuelson (1986) recalled his initial resistance to Keynes's *General Theory*. In particular, he cites getting stuck on its assertion of equilibrium unemployment. He remembered much of his confusion being rooted in the role of labor-price rigidity. Why are employers reluctant to cut nominal wages? Would such cuts help eliminate high joblessness? Does labor-supply elasticity, influencing income loss associated with lowered wages, matter? Are workers even on their supply curve? Those issues, and others like them, were chronic. The evidence is strong that large firms are reluctant cut wages in lieu of temporary layoffs but do seek and obtain wage givebacks after significant permanent job destruction. Despite the facts, however, nobody (including Keynes) could figure out how to wedge meaningful wage rigidity into single-venue continuous-equilibrium modeling. On the other hand, no SVGE theorist could produce, absent MWR, involuntary job loss. Free parameters would work but at the cost introducing troubling incoherence into macro modeling. Samuelson's (pp.159-161) solution to the most difficult of macroeconomic dilemmas was characteristically practical: "The way I finally convinced myself was to just stop worrying about it…. I assumed a disequilibrium system, in which people could not get on the supply-of-labor curve." The Neoclassical Synthesis took root.

The generalization of exchange provides a long overdue, elegant solution to the multi-faceted macro conundrum produced by the evolution of labor pricing and use over the past century and a half. In LEV workplaces, optimizing price-mediated exchange organized by continuous equilibrium generates MWR that, in turn, constrains decision-rule optimization in the marketplace. Markets continue to provide the neoclassical mechanism for SEV wage determination. But rational behavior in information-constrained large workplaces suppresses labor-price recontracting, induces coherent involuntary job loss (layoffs and downsizing) in the context of adverse nominal demand disturbances, and produces procyclical fluctuations in wage income. Longstanding confusions dissipate once theorists stop aggregating away Chandler's new corporate forms.

Backward-looking versus forward-looking wage adjustments. The rational-worker theory has examined the periodic adjustment of nominal wages for price inflation and derived plausible circumstances in which catch-up is rational and expectations are not. More generally, rational behavior requires that expectations operate as a latent influence on LEV wages, working to calibrate wage premiums to shifts in the inflation regime.

A consistent message of econometric estimation of nominal wage equations is the importance of lagged consumer-price inflation, making the empirical wage-price nexus inherently inertial. The mean lag centers around one year. In a particularly relevant exercise, Rudd and Whelan (2005) tested the "natural compromise" hybrid approach suggested by David Romer (2001, p.251), in which catch-up and expectations are both included in a Phillips-class equation with their relative weights determined empirically. (Recall from Chapter 4 that Romer speculated that the true weights were theoretically indeterminate.) They found little support for an important role played by forward-looking adjustments.

The other part of the wage-price nexus appears to operate more quickly. For example, Roberts, Stockton, and Struckmeyer (1989) used U.S. time-series data from 20 two-digit industries from 1958 to 1983 to show a speedy adjustment of product prices to changes in labor and material costs. For no industry was the first-month adjustment lower than 45 percent; in four industries, it was greater than 90 percent.

Using a much less rigorous approach, Annable (2007) reviewed forty-four personnel management and wage administration texts to investigate informed descriptions of firms' periodic adjustment of nominal wages for price inflation. Some texts did not even mention the adjustment of wages for price inflation. The ones that did typically devoted a section to the (fairly standard) criteria that are used by firms in periodic adjustments. The inflation criterion cited is, without exception, catch-up to price change that has already occurred. The treatment of the topic varied little from text to text, almost always focused on descriptions of the strengths and weaknesses of the government-published price index used in the catch-up exercise, the consumer price index.

The following passages capture the flavor of the expert analysis of the wage-price nexus:

- Brennan: "Cost-of-living adjustments are made so as to change wage rates, up or down, to match changes in the level of consumer's prices…. Common practice is to tie the adjustment in wages to the Consumers' Price Index prepared by the Bureau of Labor Statistics." (pp. 208-9)

- Miner and Miner: "For the purposes of establishing a company wage level, it is important not only to understand the various considerations and influences that may operate, but also to have some kind of yardstick that will indicate just how much of an increase (or decrease) in existing wage rates is appropriate. This is what various *wage criteria* attempt to provide. Among the commonly noted criteria are … the Consumer Price Index put out by the federal government…. companies use this measure to adjust wage levels to cost of living changes on a periodic basis." (p.380)

- Haire, Ghiselli, and Porter: "Changes in the Consumer Price Index (popularly called 'cost-of-living index'), as reported by the U.S. Bureau of Labor Statistics, should also be considered as a factor in a firm's general level of wages and salaries, particularly in relation to upward revisions." (p.367)

- Bohlander, Snell, and Sherman: "Because of inflation, compensation rates have had to be adjusted upward periodically to help employees maintain their purchasing power. Employers make these changes with the help of the consumer price index (CPI)…. Changes in the CPI can have important effects on pay rates." (p.371)

None of the personnel or wage administration texts mentions even the possibility of using expected future price inflation as in compensation adjustment. Forward-looking adjustments are never recommended, never noted. The only mechanism described is catch-up, both when the wage is periodically reopened and via automatic escalator clauses. The uniformity of textbook descriptions of wage-setting arrangements provides an interesting, and total, contrast to modern economic theory, where the only adjustment mechanism taken seriously is expectations.[42]

TVGE modeling transforms the paucity of evidence showing expectations actually being used in periodic wage adjustments from an embarrassment to a comfort. Practitioners know, and make no effort to keep this knowledge secret, that forecasts are not among the criteria used to in

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[42] Perusing textbooks in libraries is recognized to be a casual source of evidence that is no more than suggestive. But there is reason to take the suggestion seriously. The choice of an inflation-adjustment strategy is not a subtle exercise, obscured from even practitioner view by the complexity of the immense amount of transactions, and supporting information, that make up a modern economy. There is no forest-trees problem here. If practitioners use inflation forecasts as a criterion in wage adjustments, they – and those who observe them – would know it.

regularly scheduled adjustments of labor compensation. We now can understand that such behavior is rational and use it to shed light on other important aspects of labor-related conduct.

Assessment: There is no real-world evidence of inflation forecasts being used in the periodic adjustment of nominal wages for price change, absent a shift in the central bank's inflation regime. Catch-up to price inflation that has already occurred is consistent with both rational employer-employee behavior and the documentation of actual practice.

The curious Calvo model. The Calvo model class generates product/labor price stickiness by arbitrarily restricts, during a given period, price adjustments to changing market conditions to a relatively small, randomly selected subset of all firms. The model is clearly inconsistent with coherent rational-behavior theories and cannot support policy-relevant stabilization analysis. Despite what appear to be fatal drawbacks, the Calvo approach is easily introduced into mainstream SVGE modeling, a feature that has (in the Ptolemaic reductionism that governs modern empirical work) made it the go-to New Keynesian approach to introduce stickiness into macro models. The attention it has received is phenomenal.

In a broad survey of price-change frequency studies, concentrated in but not limited to the United States and the Eurozone, Klenow and Malin (2011, p.276-7) found an interesting fact, especially with respect to the product-price microfoundations outlined in Chapter 6, that avoids distortion from incoherent Calvo restrictions: "Recent research has revealed a noticeable link between price and wage rigidity. In the cross-section, firms (or categories of goods) with a higher share of labor costs in total costs make less frequent price adjustments, potentially resulting from the fact that wages adjust less frequently than other input prices. Survey evidence also suggests synchronization between wage and price adjustments over time, as well as a cross-sectional correlation between wage flexibility and price flexibility… Moreover, wage adjustment exhibits substantial degree of time-dependence. Firms tend to concentrate wage changes in a specific month, mostly January in a majority of European countries….This could lend a degree of time-dependence into price-setting, further contributing to a higher contract multiplier."

BOX 10.8: SCHOLARLY ADVICE FROM A GOOD SCIENTIST

Toward the end of his extraordinary career, Richard Feynman, the theoretical physicist who solved some of the toughest problems associated with modeling elementary particles, offered advice on how to do scientific research: "The scientist analyzes something like a detective does. Like a detective trying to find out what happened when he wasn't there, given clues. We are trying to figure out what nature is like from clues given by experiments. We have the clues and we try to figure it out. It is more analogous to detective work than anything else." (Mlodinow (2003), p.42)

Macro theorists like to think of themselves as scientists, engaged in proper scientific research. For most problems, while unable to conduct controlled experiments, they are provided plentiful clues from the broad array of evidence that has been, for an extended period, systematically gathered on the behavior of the economy. Unlike scientific research, however, modern practice in mainstream macroeconomics permits analysts to pick and choose which facts to recognize. Chari *et al.* (2009, p.243) are illustrative, arguing that macro theorists properly "put up with the reality that no model can, or should, fit most aspects of the data." That loose standard of behavior allows many clues to be suppressed for no better reason than they contradict consensus theory. The deeply flawed approach makes untenable mainstream macro theorists' self-description as scientists.

The list of important, widely-known facts that coherent SVGE scholars, even as they seek policy relevance, simply disregard is long. First and foremost is involuntary job loss, the coherent-model existence of which requires derivation of the MWR Channel. Macro researchers, constructing single-venue FEM models of employment instability, must ignore the most important characteristic of actual fluctuations. As noted earlier, Robert Lucas instructed his colleagues in the New Classical revolution that, given that forced job separation cannot be accommodated by coherent SVGE modeling, it should be set aside: "Involuntary unemployment is not a fact or a phenomenon which it is the task of theorists to explain." (Lucas (1981), p.243) Surely only really poor detectives knowingly ignore the most essential clue. Other significant, interrelated facts that are conveniently ignored include nominal demand disturbances that produce significant same-direction changes in employment and output; chronic, time-varying wage rents paid by large establishments; the rationing of LEV hours and jobs, pushing many workers off their neoclassical supply schedule; the concentration of temporary layoffs in large establishments; relatively long LEV versus relatively short SEV job tenure for employees in routinized jobs; the interrelated U.S. progression (beginning in the early 1970s) of stagflation to increased inter-industry wage dispersion to the increased incidence of job downsizing and wage givebacks; the critical importance of reference standards ($\mathbb{K_J}$) in job satisfaction; the tit-for-tat response to job dissatisfaction, cleverly indicated in the Ultimatum Game and other experiments of behavioral economists; and the existence and nature of LEV human resource departments, almost all of the functions of which reflects substantial firm investment in constructing and maintaining workplace (equity-based) mechanisms of exchange and relatively little of which reflects employee recruitment. Insufficient attention is also paid to powerful evidence that consumption is largely driven by income and wealth, the practitioner consensus that investment is largely driven by pure-profit expectations, and powerful stock-market indications that investor confidence exerts independent influence on total spending, especially during periods of macro uncertainty rooted in unconvincing stabilization-authority credibility.

Overall Assessment

The broad range of evidence has illustrated the TVGE theory's unmatched capacity to capture the richness of the complex arrangements and macro adjustments of specialized market economies. Generalizing exchange produces models replete with particular characteristics that closely correspond with available facts. Such a detailed explanation is beyond the dreams of theorists who have constructed and maintain the more limited SVGE model class.

III. PARTING THOUGHTS

Robert Solow (2000, p.151) was typically on-target in his turn-of-the-century assessment of the past and future of macroeconomics: "… it is widely understood that macroeconomics is at the heart of economics…. This centrality will continue, for the best possible reason: the need to understand current events, especially unfavorable ones, and to formulate policies – even benign neglect is a policy – to deal with them." The relative importance of macro theory imparts special weight to its century-long struggle to find footing simultaneously compatible with the formal economic method and stabilization relevance. Theorists, in and out of the mainstream, have never properly reconciled deep-structure coherent modeling and the usable macro core.

Core of Usable Macroeconomics

Three principles. The generalization of exchange identifies three principles that constitute the core of usable macro theory. The compact set effectively supports stabilization and growth policymaking while still being fully microfounded by rational transactions organized by dynamic general decision-rule equilibrium.[43] The first two are recognized as the familiar hypotheses from which Samuelson cobbled together his Neoclassical Synthesis in the early 1950s. (For elaboration, see Solow *et al.* (1997).) The third is the keystone generalized-exchange innovation

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[43] Equilibrium modeling, motivated by optimizing agents, has proven to be a powerful methodology for the explanation of economic activity, setting formal economic analysis apart from other social sciences. FEM-based macro thinking is superior to the alternative organizing concepts of macroeconomics, including atheoretic empiricism and complexity theory. See Chapter 1.

that transforms the two assumptions into fundamental principles that are both FEM consistent and in harmony with relevant evidence.

First, *the trend behaviors of total production and employment are predominately driven by the supply side of the economy*, i.e., input dynamics and total factor productivity. In particular, potential GDP macrodynamics depend on growth in the labor-force and overall worker productivity, which in the TVGE model class depends on capital accumulation, technological change, Lewis Transfer, and the organization of large-scale production. The last two determinants are uniquely associated with the generalization of exchange. Intra-corporate optimization implies meaningful wage rigidity, rationing of LEV employment, and the partial repeal of Keynes's Second Classical Postulate. Public-policy implications notably include consequences for optimal taxation from pushing a substantial portion of the labor force off its neoclassical supply schedule, overturning significant operational theorems of mainstream SVGE thinking.[44]

Second, *fluctuations around macro trends are predominately motivated by disturbances in total nominal demand*. That core proposition necessitates the careful construction of coequal real-side and nominal objectives by stabilization authorities, informing the discretionary management of aggregate spending, and has especially powerful implications for public policy. The basic causal-demand idea has, for at least a century, stirred great controversy. Samuelson and other Early Keynesians simply assumed the centrality of nominal spending in their short-term macro modeling. More recently, the principal alternative view (supply-driven fluctuations) has been vigorously espoused by RBC and, perhaps a bit less enthusiastically, other New Neoclassical theorists. Given meaningful wage rigidity, fluctuations are broadly and correctly understood to be largely demand driven; but the MWR Channel has no coherent place in single-venue thinking. The resulting dilemma has consumed generations of theorists. The demand-centric thesis fits the evidence but is not SVGE-coherent, while the supply thesis is SVGE-coherent but flunks the test of the data. (Recall Box 10.7.) The shifting upper-hand in the fundamental debate has provoked century-long periodic swings in the academy's view of the usable macro core.

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[44] See Chapter 6. While growth theory is obviously important, it is not the focus of this book.

BOX 10.9: WOODFORD AND KEY STABILIZATION QUESTIONS

After the publication of Michael Woodford's Interest and Prices: Foundations of a Theory of Monetary Policy *(2003), a veteran macroeconomist at the Fed Board of Governors cheerfully explained to me why young economists in the Research Division often seem dispirited. "How can it not be discouraging when Woodford has answered all the important stabilization questions?"*

Interest and Prices is obviously a product of a fine intellect with a great command of the mainstream macro literature. Unlike some modern macroeconomists, Woodford cares about practical policymaking. That said, the proper question, provided weight by the 2007-09 Great Recession, about his substantial book is opposite from the senior Fed staffer: Why does Woodford fail to answer, or even address, so many important stabilization questions? Given the context provided by the generalization of exchange, the answer does not surprise. His ambitions for stabilization relevancy were doomed by an early, probably little-considered decision, i.e., to construct *Interest and Prices* as close to the coherent SVGE model as possible. Deprived of a rational MWR Channel, his analysis is pushed outside the usable macro core. Woodford's limited guide for monetary policymaking was especially unhelpful, remaining on the shelf, when the Fed confronted the virulent demand contraction and associated huge job loss beginning in late 2008.

Much of *Interest and Prices* can be understood as a Ptolemaic dance choreographed to avoid confronting the Barro critique, repeatedly and cumulatively giving ground on the need to actively manage total spending and real-side instability. Woodford distinguishes his New Keynesian theory from RBC modeling by introducing familiar departures from perfect competition. Firms can be monopolistically competitive; they also are unable to promptly adjust their prices to current market conditions. Neither monopolistic competition nor menu-cost product pricing can rationally suppress labor-price recontracting and motivate involuntary job loss. It's the old story. Absent MWR derivation (never available in coherent SVGE modeling), Woodford's theory cannot both play by consensus SVGE rules and generate recognizable employment fluctuations.

Actively avoiding wage recontracting, *Interest and Prices* must duck many critical stabilization questions. Most notably, Woodford simply cites a preference for introducing, wherever needed, nominal stickiness via product prices, pushing aside wage rigidity. The damage to his capacity to deal effectively with job fluctuations is crudely addressed by eliminating employment from his now stylized models and simulation exercises. (Has a book claiming to be a comprehensive, stabilization-relevant treatment of macroeconomics ever before not listed "employment" in its index? Inflation-related entries occupy an entire page.) *Interest and Prices* ultimately stands or falls on its bet that labor-price rigidity and employment do not much matter to policymakers' understanding of macro stabilization. A decade after its publication, judgment on that wager has been unfavorably informed by the 2007-09 Great Recession. The new generation of macro scholars can cheer up; they still have a great deal to accomplish.

The third principle settles the longstanding debate. *The MWR channel exists in coherent macro modeling and is the keystone of the usable macro core*. Samuelson's Neoclassical-Synthesis assumptions are converted into fundamental, fully microfounded principles of specialized economies. With the generalized-exchange derivation of a robust channel through which adverse nominal disturbances induce involuntary job loss, the argument that fluctuations are predominately supply, not demand, driven becomes an artifact of arbitrarily restricting rational exchange to the marketplace.[45] The SVGE-fluctuations thesis is rejected, this time definitively. Exchange generalization has produced a clear-cut winner in the long-standing debate over how to specify a usable macro core in which we all can, and should, believe.

SVGE modeling and the practical macro core. Some parting thoughts on the limited SVGE model class reinforce the book's main argument. RBC theory pioneered by Prescott and Kydland is rightly celebrated as the literature's bedrock expression of coherent SVGE thinking, providing (stopgap) foundations for early 21st-century mainstream macro analysis in the academy. Fluctuations in equilibrium employment must be voluntary, and the various shocks and associated propagations inducing those variations are inherently nonmonetary. Despite its well-earned status as a major intellectual achievement, SVGE high theory has been, and always will be, in conflict with much of the most important evidence on the stability of specialized economies. It must exist outside the usable core of macroeconomics.

Conscientious New Keynesians, desiring stabilization relevance and the familiarity of single-venue general-equilibrium macrodynamics, have made a career bet that they can identify one or more SVGE-endogenous frictions capable of rationally suppressing wage recontracting. The will-o'-the-wisp Super Friction would enable reconciliation of significant elements of the usable macro core and coherent SVGE modeling, breaking down the classical dichotomy and generating forced job loss in response to adverse demand shifts. Such a friction would likely not fully correct the failure to explain stabilization in modern economies but would solve a range of associated problems, providing greatly improved analysis of garden-variety (SDD) cycles.

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[45] MWR existence also critically permits nonstationary demand disturbances, absent extraordinary, effective interventions from stabilization authorities, to influence (i.e., depress) the economy's macrodynamic trend.

The central difficulty with even such limited aspirations is that the New Keynesians, like the great Early Keynesians who founded separate-branch macroeconomics, have badly underestimated the commanding internal coherence of the SVGE model class. The sought-after Super Friction remains elusive simply because it does not exist. The inherent power of wage recontracting within the coherent SVGE framework enforces its nonexistence. New Keynesians must someday, hopefully sooner rather than later, accept that working wholly within the SVGE model class arbitrarily restricts the central-bank policy brief to focus on how monetary interventions affect product-price behavior, resulting in a deeply misleading emphasis on inflation. At the very least, theorists need to hedge their bets on the Super Friction's existence by seriously exploring plausible alternatives to the SVGE mainstream.

Advice from Lucas

Happily, rigor and relevancy can be reconciled. Robert Lucas (1981a, p.4) helped show the way when he altered the course of macro thinking, as well as mainstream access to the practical macro core, by working through some implications of rational choice in the labor market. He dismissed Keynesian business cycles and the institutions thought to produce them, arguing that such arrangements must be designed "precisely in order to aid in matching preferences and opportunities." Inspired by Lucas, this book has forsworn free parameters, which arbitrarily restrict the rational labor-choice set that engaged the anti-Keynesian insurgents. Exchange is now understood to be properly modeled in the workplace as well as the marketplace. Surely no serious scholar objects to removing arbitrary venue limits on self-interested behavior, especially when the expansion enables more complete analysis of rational employer-employee conduct and workplace mechanisms of optimizing exchange. A rich TVGE class of institutional arrangements is then identified that facilitates the heretofore badly incomplete matching of axiomatic preferences and opportunities, crucially producing involuntary job- and income-loss in the aftermath of adverse nominal disturbances. As has been emphasized, that stabilization-critical outcome is not available in the caricature of matched preferences and opportunities featured in SVGE theory.

BOX 10.10: DEEP VERSUS SURFACE STRUCTURES OF THEORIES

From Colander and Landreth (1996, p.13): "… it is useful to separate out a deep structure of a theory and what might be called a surface structure. The deep structure is the formal complex core of theory. The surface structure is the simple model or vision conveyed of that complex core to those who do not fully understand the complex theoretical core itself. Keynes's revolution was a surface revolution with an underdeveloped complex core. Classical economics had a much more developed complex [SVGE] core, but a simple surface structure. A number of classical economists recognized the simple surface structure of classical economics was misleading, but their efforts concentrated on modifying the complex core. Their reaction to Keynes's work is best seen in this light. It was a surface revolution that left many issues of the [SVGE] core untouched. Young economists had yet to be imbued with the complex core of classical economics; they were more interested in surface issues, and to them the Keynesian revolution was a true revolution."

The young Paul Samuelson, precocious in his comprehension of the deep-structure neoclassical SVGE model, initially resisted *The General Theory*, worrying about its absent microfoundations (especially for its use of wage rigidity). As described earlier, he was eventually won over by the non-microfounded Keynesian surface structure (corresponding to the "usable macro core" specified above) as a result of its much greater descriptive claim on actual economic instability and, therefore, its far superior macro-policy relevancy. Economic performance and stabilization policymakers benefitted from his and other Early Keynesians' interim decision to stop worrying about deep-structure labor-pricing. Their incoherent modeling was not expected to, and did not, endure. The surface-structure nature of Samuelson's Neoclassical Synthesis ultimately led (in an uglier transition than anticipated) to its demise as an important macroeconomic theory.

In that context, this book draws attention to the profound irresponsibility implicit in the academy's continued pushing aside the generalization of price-mediated exchange. The innovation in itself must be a good thing, eliminating arbitrary, powerful restrictions on the matching of preferences and opportunities. More critically, however, exchange generalization fundamentally advances development of stabilization-relevant theory by reconciling coherent deep-structure modeling and much of the Early Keynesian practical core. During much of the post-WWII period, the surface-structure message of Samuelson's Neoclassical-Synthesis does a relatively good job explaining fluctuations actually observed in modern economies. Given the importance and rocky history of macroeconomics, that Keynesian achievement matters.

The TVGE modeling has been introductory and consequently compact. The theory can, and should in appropriate circumstances, be extended to continuous-equilibrium intra-corporate product pricing, investment finance, product development, and a more comprehensive look at employer/employee arrangements that have been identified in the research agendas of new institutionalists (pioneered by Oliver Williamson), organizational theorists (Herbert Simon), personnel economics (Lazear), modern finance, workplace labor economists, and Okun's intra-firm modeling. Many of the extensions of intra-corporate rational choice will have consequences for macroeconomics and stabilization policymaking, although none will prove as influential as TVGE model of labor pricing and use.

The hard message is that coherent single-venue modeling cannot be stabilization relevant in modern economies. Over the past century-plus, SVGE modeling has increasingly got a great deal of labor-related activities wrong, a persistent error set rooted in the for-convenience suppression of workplace exchange.[46] Labor-related problems have been accumulating and long ago became debilitating, implicated in a large portion of the contemporary predictive and explanatory failures of mainstream macro theory. Textbook aggregate supply, still featuring the universality of Keynes's Second Classical Postulate, must be recognized as fundamentally misspecified.

Labor matters too much in the full range of economic activities for macro theorists to continue to ignore worker behavior. Yet a willful ignorance continues to be the norm, as little in consensus theory pays attention to what has been learned from a hundred years of investigating what goes on inside the LEV workplace. The evidence supports neither technologically fixed OJB nor endowing employees with a dominant preference to shirk. In their indifference to the facts and rejection of proper axioms upon which to build their models, mainstream theorists are not arguing that practitioners, in their unanimity, are wrong. That would be pretty stupid. Instead, most macroeconomists believe, conveniently, that practitioner knowledge is an unnecessary complication to an already robust market-centric theory.

The unnecessary-complication belief is the nub of the stabilization problem that beleaguers mainstream theory. Incorporating dynamic-equilibrium workplace behavior (no matter how compatible with the evidence) into consensus price-mediated market exchange disturbs the *status quo*. Departing from convention is difficult, no matter how badly the break is needed.[47] It is not

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[46] The shoe is now on the other foot. SVGE modeling, given its arbitrary restrictions on "matching preferences and opportunities" in modern economies, must be rejected in favor of the less-arbitrary TVGE approach. Generalized exchange also provides a compelling alternative to the impulse among many economists to see the employer-employee relationship as a problem best modeled as a noncooperative game. The game-theoretic approach is inherently weak, hampered by multiple, fragile (highly sensitive to small changes in assumptions) equilibria. It is also disassociated from what is known about intra-firm behavior, leaving too much information on the table.

[47] More than a century ago, when John Bates Clark, Alfred Marshall, and other great theorists were developing marginal analytics and the neoclassical method, many economists rejected their efforts. To them, it was simply axiomatic that wages, for example, were determined in competitive markets by the relative supplies of labor and capital. More analytic rigor was an unnecessary complication. The satisfaction of early 21st century theorists with the absence of plausible analyses of worker behavior suggests a complacency not unlike mainstream scholars who

1:1 hours-output mapping or inherent laziness that motivates real-world employment relationships. Macro theorists must think through why human-resource departments, both large and ubiquitous, exist. HR specialists design and implement institutional arrangements that govern a significant portion of the alignment of preferences and opportunities in modern economies. Well-read economists must know that their SVGE models badly capture actual "matching preferences and opportunities" but, too frequently, do not care.[48] Let well enough alone.

Unfortunately, well enough has turned out to be pretty bad.[49] The maintenance of the *status quo* with respect to workplace behavior has had outsized opportunity costs. Recently, the Fed never provided its aggressive policymaking, which was remarkably successful in taming the total-spending propagation of the 2008-09 financial crisis, useful microfoundations. As a result, the central-bank actions have lacked mainstream academic support, especially on the existence of the rational MWR Channel through which nominal demand disturbances uniquely induce involuntary job- and income-loss. A better-informed consensus among macroeconomists would have helped contain the damaging, ill-informed criticism that followed the Fed's virtuoso performance as well as helped foster Congressional and investor/lender belief in the stabilization credibility of the central bank's expanded toolkit.

Modern Theory of Wages

Labor pricing. Exchange generalization has enabled construction, long overdue, of the first modern theory of wage determination in more than one hundred years, finally moving our

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rejected marginalist thinking. Joseph Persky (2000, p.102) described those views: "All the talk of marginal productivity only complicated matters, turning economics into an arcane and speculative discipline."

[48] Or theorists are so thoroughly captive within the boundaries of the SVGE model class that they are simply unable to imagine breaking out. David Laidler's (1986, p.34) early critique of New Classical modeling class is illustrative: "As a matter of simple logic, it cannot be denied that, if rigorous connections between maximizing premises and ultimate conclusions is regarded as the be all and end all of economic analysis, then new classical [SVGE] macroeconomics is indeed the only game worth playing." TVGE macroeconomics is a game well worth playing.

[49] Constructing policy-relevant macro theory, absent meaningful wage rigidities, is like attempting to put a suit on backwards and, once accomplishing the difficult task, wearing the backward suit out in the world. While the ingenuity and persistence required may in some way be admirable, the result must be understood as a failure to adequately accomplish the task of getting dressed. The failure is not much mitigated by any satisfaction derived from having acquired the relatively unique knowledge on how to put on a suit in such a complicated way.

understanding of employee pay out of the 19th century. While finally having a useful explanation of labor pricing is broadly important throughout economics, its most profound effect is on how to properly do macroeconomics. Especially significant is its implication that rational behavior confined to the marketplace cannot adequately inform monetary policymaking.[50] Serious theorists in search of a coherent, stabilization-relevant monetary model of production have no choice. They must reject the mainstream SVGE model class.

The replacement theory is motivated by the first chapter's Two-Venue Theorem, identifying the fundamental need for the generalization of price-mediated exchange. Research agendas must be reoriented around construction of the continuous-equilibrium theory of workplace behavior. Second-venue labor pricing and use, as well as their rational interaction with the well-developed modeling of marketplace exchange, must be carefully worked out and widely disseminated.

It is helpful that TVGE macro analysis solves most of the stabilization-relevancy problems of the New Neoclassical Synthesis while allowing most of the SVGE framework to remain in place. The essential content of workplace modeling can be packaged as a compact insert, featuring the dominant MWR Channel, to the familiar SVGE infrastructure of modern macroeconomics. Adverse nominal disturbances then induce a recognizably broad range of market failure that can be ameliorated by the effective management of total spending.[51] Rational MWR-rooted meta-externalities imply the rejection of activist stabilization policy is restricted to demonstrating that monetary authorities are unable to design and implement proper demand interventions.

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[50] In his recent essay on monetary policy and unemployment, Jodi Galí (2011, p.488) acknowledged the general problem: "The existence of involuntary unemployment has long been recognized as one of the main ills of modern industrialized economies…. Despite the central role of unemployment in the policy debate, that variable has been – at least until recently [with the increased work on the S/M/B model class] – conspicuously absent from the new generation of models that have become the workhorse for the analysis of monetary policy, inflation, and the business cycle, and which are generally referred to as New Keynesian." The small recent literature cited by Galí combines S/M/B labor-market mechanisms with wage rigidities that are either too tiny to affect labor-price recontracting (e.g., Hall (2005b)) or, in the recurring reversion of New to Early Keynesianism, are arbitrarily endowed with the capacity to suppress wage cuts in lieu of job loss. The first class cannot generate involuntary job loss, and the second is inconsistent with coherent DSGME (aka SVGE) modeling, a fundamental violation of the NNS compact upon which the modern macro consensus is constructed. Free parameters used in conjunction with S/M/B modeling do not morph into something more than free parameters.

[51] That the market failure produced by the interaction of the generalization of exchange and nominal disturbances includes involuntary job loss and unemployment, making it recognizable, is critically important to the TVGE model's stabilization relevancy. From Lucas (1987, p.31): "If we are serious about obtaining a theory of unemployment, we want a theory of unemployed *people*, not unemployed 'hours of labor services'; about people who look for jobs, hold them, lose them, people with all the attendant feelings that go along with these events."

An exhortation. Generalized-exchange macroeconomics can help deliver mainstream thinking in the academy from the comfort it provides to the dismayingly significant number of policymakers seeking to limit, or even dismantle, the innovative tools used by the Federal Reserve to halt and reverse the collapse in aggregate demand associated with the 2008-09 financial crisis.[52] Promises made by serious candidates for high office, notably during the 2012 Republican Presidential primaries, to fire Ben Bernanke for cause became commonplace in the aftermath of his extraordinarily successful handling of the crisis. The breakdown in informed political discourse on the proper functioning of the central bank has been, in no small part, enabled by the reluctance of many of our most honored macro theorists, a number of whom know better but are made timid by the broad commitment to coherent SVGE thinking, to establish consensus boundaries of basic reasonableness, consistent with the evidence, for ongoing debates about the proper government response to economic instability.

The contemporary absence of such boundaries is flat-out dangerous. Responsible macro theorists, and many exist, should get serious about stabilization-relevant modeling. Especially necessary, as argued throughout this book, are coherent models capable of identifying and accommodating the channel through which adverse demand shifts rationally induce involuntary job- and income-loss. Can there really be much doubt that the most crucial research agenda in economics requires the derivation, not the setting aside, of meaningful wage rigidity? The detachment of leading macro theorists from the actual functioning of specialized economies, rooted not in the rigor of the formal method but instead in the comfort of familiar SVGE modeling, is not acceptable. Such irresponsibility cannot be consistent with the nation's or the profession's best interests. Macroeconomists can, and must, do better.

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[52] The Fall 2011 issue of *The Cato Journal* provides an interesting collection of criticism, rooted in SVGE thinking, of Fed behavior leading up to, during, and immediately after the 2008-09 crisis. For example, John Taylor (2011) calls for legislating a monetary-policy rule in order to protect the economy from a repeat of the Federal Reserve's aggressive use of its balance sheet to stabilize total spending in the 2007-09 recession. Taylor's criticism that those actions were problematically short-term reflects the inability of SVGE thinking to accommodate the SDD→NDD problem class, despite its huge welfare cost. From the perspective provided by TVGE analysis, Federal Reserve policymaking in 2008-09 is easily understood to have been addressing a brewing NDD disaster that cannot in any meaningful way be understood as short-term. More disappointing than the drumbeat of attacks from a particular segment of the New Neoclassical Synthesis is the absence of a broad-based, substantial response from another (New Keynesian) segment. The imbalance may reflect gathering discouragement by many New Keynesians, resulting from not having much of a NNS story to tell about the greatest crisis of their professional careers.

BOX 10.11: CLOSING ARGUMENT

The 30-year macro war, in which the New Classical/RBC insurgents defeated the Early Keynesians, was fought over how properly to do macroeconomics. To be acceptable in the modern academy, macro methodology must be rooted in the coherent modeling of optimizing market exchange organized around continuous general equilibrium. That is, except for a specific feature, an admirable outcome. What is not admirable, indeed is downright embarrassing, is the docile acceptance of consensus theorists of their inability to accommodate the readily observable crucial fact about stability in specialized economies: broad, costly market failures, featuring involuntary job loss, that result from sufficiently adverse nominal demand disturbances. Many critics, emboldened by the 2007-09 Great Recession, believe that the analytic suppression of forced job separation and consequent stabilization irrelevancy are inherent, unacceptable costs of using the formal economic method. It is a foolhardy exercise in hubris for mainstream theorists who wish to preserve the FEM to ignore today's ubiquitous challenge to consensus macro modeling.

Generations of Keynesian theorists, seeking to reconcile the formal economic method and stabilization relevancy, have worked on identifying a coherent SVGE Super Friction that suppresses wage recontracting. It is time to accept what we already know. The dogged research program has instead demonstrated the nonexistence of the crucial SVGE-consistent market friction. Ignoring that conclusion has come at great cost. The absence of meaningful wage rigidity has forced mainstream macroeconomics to become more and more Ptolemaic, increasingly compromising the profession's credibility. That unhappy drift is illustrated by the huge investment in the bizarre – there is no better word – effort to make the voluntary unemployment featured in the Search/Match/Bargain model class account for actual employment instability.

Fortunately, a second, much more effective reconciliation strategy is available: the generalization of rational exchange from the marketplace to the workplace. The TVGE model class, derived from axiomatic preferences and technological constraints, easily generates recognizable employment instability that is induced by nominal-demand disturbances and consistent with continuous general decision-rule equilibrium. The academy's dominant New Neoclassical macro scholars would do well to heed a fundamental message of the TVGE analysis. The generalization of exchange is necessary for the preservation of the formal economic method. The stakes are high. Policymakers need a consensus theory capable of explaining the origin and consequences of the SDD→NDD metamorphosis that was spontaneously organizing itself in the United States during late 2008 and early 2009. Mainstream macroeconomists need renewed credibility as worthwhile advisers in stabilization policymaking. Serious macro theorists need to get serious about modeling costly instability that, in its various manifestations, characterizes real-world market economies.

Oliver Williamson (1975, p.249) provides an intuitive conclusion for this closing argument: "It is widely agreed that if mechanism B, not mechanism A, is thought to be generating the phenomena of interest, the intellectually respectable thing to do is to build theory B."