GEM
Generalized Exchange Macroeconomics

Chapter Four

LABOR PRICING AND SUPPLY

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The consensus single-venue general-market-equilibrium (SVGE) model that has long dominated modern macro thinking is an elegant, coherent description of price-mediated exchange and resource allocation. Like many beautiful theories, however, it carries seeds of its own demise as a general theory. Those seeds hint at even deeper, more universal models to come. A tip-off with respect to the future of stabilization-relevant macroeconomics was provided by Keynes's shrewd rejection of his Second Classical Postulate. That pillar of neoclassical thought turns out to be, in highly specialized market economies, the Achilles Heel of mainstream analysis.

In the context of ubiquitous large bureaucratic corporations, the symmetric, cost-effective workplace information that enables the Second Postulate's equality of the wage paid and marginal disutility of work is an obviously untenable assumption. Add to the mix workers' axiomatic preference for fair treatment by management, and there is room for a powerful revolution in the treatment of rational labor pricing and supply. In the generalized-exchange model class, the instrument of change is the nonconvex Workplace Exchange Relation derived from model primitives in Chapter 2 and captured in its baseline form by Figure 2.1. The WER governs labor input ($E=\acute{Z}H$) that demonstrates 1:1 correspondence with production, motivating the most serious exercise in writing down labor-supply functions since the Second Industrial Revolution. The essential WER, present in the macro literature since Annable (1977, 1980), is best understood as a heretofore unappreciated law of modern macroeconomics, uniquely empowering aggregate theory that is both coherent and stabilization relevant.[1] Once chronic labor rents rationally push a substantial share of workers off their market labor-supply schedule, continuous-equilibrium macro modeling can answer important, previously unanswerable, questions and explain significant, previously inexplicable, evidence.

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[1] Lucas (2001, p.18, emphasis his) has described his famous *JPE* (1969b) article with Leonard Rapping, which effectively fired the first shot in the anti-Keynesian New Classical revolution by reorienting cutting-edge study of employment dynamics from income to substitution effects, as "writing down a labor supply curve and taking it seriously!"

The chapter has six parts. The first summarizes the GEM theory of wages and labor supply microfounded in the preceding three chapters. The second provides a very brief overview of the vast literature on the Phillips curve, which is the most controversial reduced-form equation in macroeconomics. Next is a path-breaking analysis of the most contentious aspect of the Phillips debate, the adjustment of nominal wages for price inflation. The fourth section melds large- and small-establishment labor pricing, providing a powerful description of wage determination in highly specialized economies. In the fifth, generalized-exchange modeling is used to elucidate the stagflation decade, an extraordinary episode of broad market failure that has long been misunderstood by mainstream economists. Finally, there is a conclusion.

I. MODERN LABOR PRICING AND SUPPLY

Modern Wage Theory

Textbook wage theory is little changed from its construction by the great 19th century marginalists. Its staying power is a puzzle. Over the past 100-plus years, during which the global economic landscape has been radically altered, the model has been increasingly unable to explain the actual behavior of labor pricing. Chapter 1 identified the problem to be the consensus market-centric SVGE model's inherent suppression of rational nonmarket labor-pricing that occurs in large, specialized firms. The mainstream inability to coherently restrict wage recontracting prevents any causal link from adverse nominal disturbances to involuntary job loss.

Coase pioneered rigorous thinking about the boundaries between the market and the firm around the time Keynes was writing the *General Theory*. Decades later, Simon and Williamson along with other organization and new-institution scholars instructively modeled rational behavior inside large corporations. Moreover, throughout the middle 20th century, Kerr, Dunlop, and other on-site labor economists were carefully documenting the objectives, constraints, and transaction mechanisms governing large-establishment employee-employer exchange. It turns out to be deeply problematic that all those scholars and their colleagues never gained much traction in mainstream macro thinking.

Notwithstanding macroeconomists' inattention, firm size-heterogeneity has been deeply intertwined with macro performance since the Second Industrial Revolution. Generalized exchange draws on the profound transformation of the production landscape to bifurcate labor pricing, one branch located in the marketplace and the other in the large workplace. The result is the first coherent, stabilization-relevant theory of wages in a more than a hundred years.

In the small-establishment venue (SEV), cost-effective employee oversight allows market-centric SVGE modeling to satisfactorily explain labor pricing. Employer profit-seeking and employee utility-maximization combine to produce the fundamental equality among the nominal wage paid, the value of labor's marginal product, and labor's marginal disutility of work: $W_K = VMPL_K = VMRS_K = W^m$. Firms and workers can do no better than being market-price takers.

The large-establishment venue (LEV) differs greatly from that familiar story. Employers and employees confront greater institutional complexity, largely because worker oversight is restricted by costly, asymmetric information. Labor input (E_J), in 1:1 technical correspondence with production, cannot be measured or priced in the marketplace. Firms must construct their own labor-pricing apparatus. Moreover, the evolution of best-practices compensation systems soon made it clear that workers' preference for equitable treatment by management, suppressed in competitive-market exchange, significantly influences on-the-job behavior (OJB) and must, as a result, be carefully factored into rational workplace exchange.

LEV management of labor is separable into two parts. The crucial step is sufficient identification of the Workplace Exchange Relation (WER) to enable labor pricing consistent with unit-cost-minimizing employee behavior: $W_J = W^n{}_J = \max (\acute{Z}_J/W_J) \geq W^m$ and $\acute{Z}_J = \acute{Z}^n{}_J = (E_J/H_J)^n$. The derivation in Chapter 2 of the robust nonconvex WER class illustrated in Figure 2.1 microfounds the equality of the wage paid, the employer's efficiency wage, and the employees' reference wage, which locates the critical unit-cost-minimizing WER discontinuity: $W_J = W^n{}_J = \max (\acute{Z}_J/W_J) = W^{\acute{n}}{}_J = \sup \mathbb{K}_J > W^m$, where $\mathbb{K}_J$ denotes employee equity-based reference standards. Keynes's Second Classical Postulate is eliminated and replaced by the workplace optimization of cooperative labor behavior ($\acute{Z}_J = E_J/H_J$), a practitioner-recognizable process that yields chronic labor rents and, over

the business cycle, downward nominal wage inflexibility. The baseline model is made dynamic in Chapter 3.

The second objective of LEV management is to assure an adequately sized workforce, which has become relatively easy task. Continuous-equilibrium labor pricing ($W_J=W^n{}_J=W^{\hat{n}}{}_J>W^m{}_J$) combines with the substantial pool of SEV employees to produce an elastic market-supply schedule for the large establishment. Firms identify production schedules (with levels of labor hours, capital services, and material input) that are increasing in expected product demand. The optimization process is consistent with the GEM reorientation of macro theory to feature Keynesian causation from nominal demand to employment/output. Say's Law is happily scrapped.

We all know that the cost-effective, symmetric workplace information needed for the SVGE equality between the wage paid and marginal disutility of work is an unacceptable blanket assumption in economies featuring large corporations and routinized jobs. Add workers' axiomatic preference for fair treatment, and the stage has long been set for a useful reworking of labor price modeling. The GEM result is the first modern theory of wages in more than a century. The next section, summarizing the companion labor-supply theory, rounds out the analytic renovation. Taken together, the two theories provide a stabilization-relevant, coherent answer for the central macroeconomic question: How and why does money matter?

<u>Modern Labor Supply</u>

Any plausible model of macro instability, necessarily including the 1930s depression, the 1970s stagflation, and the 2007-09 Great Recession, must break the beautiful $W=VMP=VMRS$ analytic stranglehold imposed by the estimable 19th century marginalists. Some different continuous-equilibrium arrangement is needed for a large part of the labor force. The famous difficulty here, persisting into the 21st century, is that Keynes and Keynesians of all vintages failed to rationally suppress wage recontracting, never microfounding $W=VMP>VMRS$. Keynesian policy conclusions, as a result, were never properly derived. The rejection of Keynes's Second Classical Postulate must be justified. How can a rational worker prefer job loss to a wage cut if the latter violates neither market opportunity costs nor the disutility of labor?

The GEM model class has, at last, solved Barro's recontracting conundrum. In so doing, the analysis reworks textbook labor supply. The macro exercise was long overdue. The three-panel chart presented below illustrates the fundamental generalized-exchange labor-supply innovation. The first reproduces the central Workplace Exchange Relation, representing rational on-the-job labor behavior in the productivity-wage space. The WER, characteristic of complex workplaces featuring costly, asymmetric information and routinized jobs, was derived in Chapter 2 from axiomatic model primitives consistent with profit- and utility-maximization. It charts the labor-input schedule relevant to large, specialized firms. The second panel transposes WER labor supply to a more typically configured two-dimensional space, i.e., labor price is on the Y-axis. The strange-looking figure is instructive, powerfully capturing essential features of a hundred years of labor-management experience in the new corporate forms that enabled the Second Industrial Revolution. The third panel is more familiar, illustrating the textbook market labor-supply schedule in the wage-hours space. In the well-known SVGE narrative, individual firms can purchase effectively unlimited labor input of constant productivity at the market wage. The remainder of this summary of modern labor-supply theory compares panels B and C.

Panel A
Wage Exchange Relation (WER)

Panel B
Labor Supply in Large Firms

Panel C
Market Exchange
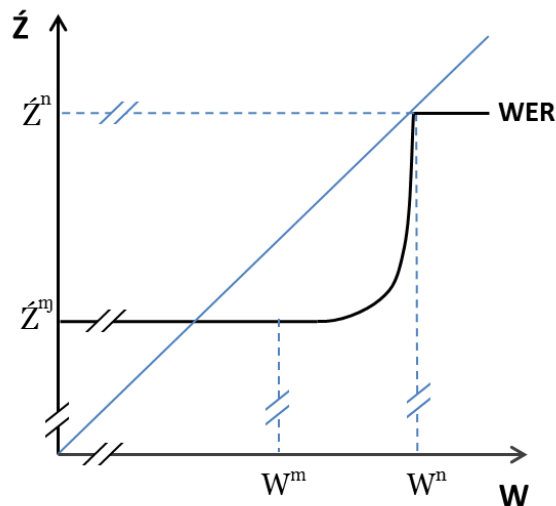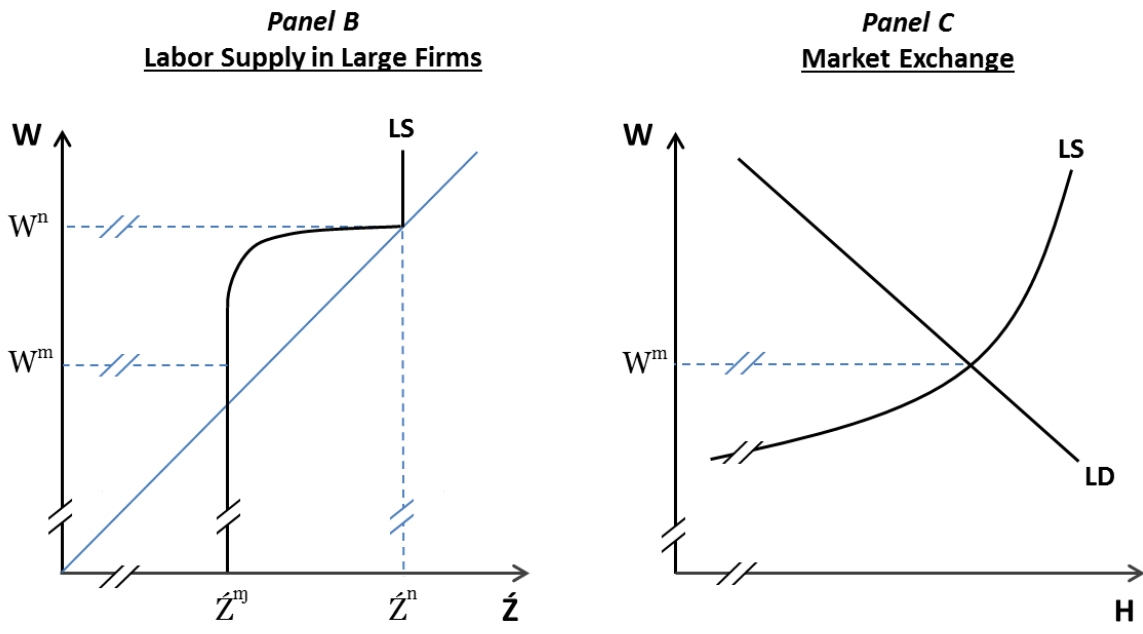
X-axis. The X-axis measures labor-input productivity ($\acute{Z}_J$) in Panel B and labor hours (H_K) in Panel C. The difference is central to how coherent macroeconomics should be done in modern, highly specialized economies. Large establishments in Panel B cannot simply manage worker hours. The hours and productivity components of labor input (E_J, which, by definition, equals $\acute{Z}_J H_J$ and is always in 1-1 technical correspondence with output) must be separately managed in firms' simultaneous pursuit of minimized unit costs and production targets. Separation is needed to accommodate costly, asymmetric workplace information and routinized jobs in coherent modeling. The third panel's use of hours alone is understood to require cost-effective employee supervision, a circumstance that is almost always restricted to the small, owner-managed firms that populate macro textbooks. (For elaboration on the economics of the rational management of large, complex firms, see Chapter 8.)

Determinant wage. Labor supply in Panel C requires interaction with labor demand in order to yield a determinant wage. The resulting SVGE equilibrium satisfies Keynes's First and Second Classical Postulates ($W=W^m=VMP=MRS$). By contrast, the TVGE supply schedule in Panel B determines the baseline LEV optimal wage on its own. Generalized-exchange modeling equilibrates the employers' efficiency wage, minimizing unit labor cost, and employees'

reference wage, satisfying their axiomatic preference for equitable treatment by management. Panel B equilibrium captures essential properties broadly understood to govern rational labor management in large establishments. (For elaboration, see Chapter 8.) Demand-independent labor pricing produces, over the business cycle, rational downward rigidity of nominal wages. It also allows firms' rational expectations of product demand to play, as described above, a direct role in determining the level of employment. Panel B's supply-schedule discontinuity at the unit-cost-minimizing feasible wage notably orients baseline labor-pricing dynamics around preventing *cuts* from the efficiency/reference wage. That perspective differs substantially from Panel C's familiar two-way, flexible wage adjustments.

Labor pricing produced by supply-demand interaction in Panel C is the market wage, reflecting the rational payment of workers' opportunity costs. In Panel B, employee compensation produced by equilibrating the efficiency and reference wages (W^n and $W^{\hat{n}}$) reduces the role of market opportunity cost to providing the lower bound on wage range (from W^m to W^n) featured in the firm's WER schedule. Large establishments optimally pay chronic wage rents, pushing a substantial share of the labor force in specialized economies off their market-supply schedule.

Closing points. In the GEM model class, the small-establishment wage is functionally equivalent to the labor-pricing of Panel C. Coexisting venues of rational firms, one populated by large establishments paying time-varying wage rents and the other by small firms paying market-opportunity costs, greatly enrich macro theory. The TVGE model class features rationed "good" (rent-paying) jobs and plentiful "bad" (no-rent) jobs, with inter-sector flows governed by under-appreciated Harris-Todaro mechanics introduced in the previous chapter. Continuous-equilibrium forced job loss, both temporary layoffs and permanent job downsizing, results from adverse demand disturbances. It is notable here that downsizing plays an important role in the analysis of longer-term joblessness, motivating extensive labor-market price discovery during the difficult transition from rent-paying to market-paying employment. Finally, the simple fact that large corporations are recognized in coherent generalized-exchange macroeconomics should be emphasized. Over the past hundred years, such firms have grown to dominate modern economies, today accounting for a substantial share of total world output, an even greater share of global trade, almost all high-productivity routinized jobs, and almost all involuntarily lost

jobs. The production landscape of the 19th century was very different from the economies that we are attempting to model today. Beautiful marginalist labor-supply modeling has, for a long time, badly misled modern theorists.

II. THE INFAMOUS PHILLIPS CURVE

Generalized exchange provides a rigorous, intuitive platform for melding inconsistent labor pricing, which is an empirical fact of modern economies. Since well before the 1930s depression and the establishment of macro theory as a distinct field of study, mainstream aggregate labor modeling has been conducted wholly within the SVGE framework that, if coherent, suppresses inconsistent wages. Working uncomfortably within that model class, Modigliani (1944) focused postwar macro thinking on nominal labor-price rigidity, which he simply assumed. Early Keynesians subsequently detached their analysis from that crude restriction by augmenting Phillips' 1958 equation relating money wage change and joblessness with catch-up to product-price inflation that had already occurred.

The inflation-augmented Phillips curve, providing a good fit to the available data, was tasked to distinguish Keynesian market-centric macro theory from its classical SVGE precursor:

$$(4.1) \qquad w(t) = \alpha_o + \alpha_1 U(t) + \alpha_2 p_k(t),$$

where lower-case variables denote rates of change, U is the jobless rate, and p the product-price inflation rate over the catch-up period (k) at time t. The empirical fact of slowly adjusting nominal wages became the keystone of Samuelson's Neoclassical Synthesis.[2]

Once attached to the SVGE model, equation 4.1 quickly became the single most controversial relationship in macro analysis. Theorists who relied on the Early-Keynesian inflation-augmented Phillips curve deprived SVGE analysis of its justifiably prized coherence, becoming especially inviting targets for reeducation during the New Classical counter-revolution that gathered irresistible momentum during the stagflation decade that began in the early 1970s.

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[2] Samuelson later called the early Neoclassical Synthesis "Model-T Keynesianism".

BOX 4.1: ADVICE FROM SOLOW, PART I

Bob Solow's 2000 assessment of the state of macro theory is insightful: "It seems to me that the original real business cycle theory project, to understand observed fluctuations as the efficient response of a well-functioning, intertemporally competitive economy to unforeseeable shocks to technology and tastes, has petered out after only minor gains. The main obstacles to success are probably the persistence of market imperfections in some sectors, especially the intrinsic implausibility of any attempt to represent labor-market outcomes as market-clearing, and the attempt to push forward-looking behaviors to a very distant horizon. To these I would add the suggestion that a commitment to representative agent models is a serious mistake. Many of the frictions and occasional flip-flops that characterize macro behavior seem to stem from the heterogeneity of agents...." (Solow (2000), p.155)

The marketplace-to-workplace generalization of price-mediated exchange, modeled in the preceding three chapters, is being offered as the seminal innovation that effectively answers Solow's familiar indictment of mainstream thinking and its insistence on coherence in macro theory. The TVGE perspective can be summarized in three points. First, the New Classical/RBC revolution has achieved critically important, hopefully enduring gains. Its theorists fundamentally and properly altered modern macro modeling by restoring the discipline, as well as the clarity and persuasive power, of the coherent economic method to consensus model-building. Generalized exchange adds stabilization-relevance to the reconstructed mainstream by deriving the continuous-equilibrium MWR Channel from model primitives, microfounding involuntary job loss (both layoffs and downsizing) and the discretionary management of nominal demand. The powerful two-venue class of macro modeling draws on axiomatic technological heterogeneities to complement, not set aside, the explanatory capacity of competitive markets.

Second, Solow's renowned intuition falters in his attempt to identify the most productive area for future research. In the SVGE framework, endogenous market imperfections have been, and will continue to be, inherently inadequate to the task of reconciling MWR with rational behavior. (In the TVGE framework, such imperfections are not needed to answer the big questions.) The problem here is that my co-founder of original EWT gave up too soon on workplace exchange.

Third, Solow's problem with representative agents is focused on the ubiquitous use of the representative, homogeneous firm to suppress complications arising from the evolving, complex modern production landscape. Recognizing that tractable theories must carefully husband their use of heterogeneity, the biggest model-building bet of GEM Project is: In the aftermath of the Second Industrial Revolution, the fundamental differences between large and small firms constitute an existential heterogeneity in coherent, stabilization-relevant macroeconomics.

The neoclassical reconstruction of nominal wage dynamics culminated in 1980s with the broad acceptance of the rational-expectations augmented Phillips curve, which is rooted in the seminal work of Lucas (1972) and has endured as a building block of mainstream analysis:

$$(4.2) \qquad w(t) = a_o + a_1(U^N(t) - U(t)) + E_t p(t+1).$$

U^N is the natural rate of unemployment and E_t the expectations operator conditional on information available at time t. Expectations are restricted to the cost-effective use of available information.[3] Central-bank behavior, of course, critically informs such expectations.

The remainder of this chapter demonstrates, from the vantage point of generalized price-mediated exchange, that the familiar expectations-augmented Phillips Curve is deeply flawed. The analysis has two parts.[4] The first closely investigates the periodic adjustment of wages for inflation, a surprisingly misunderstood process. Much of the early Phillips-curve controversy resulted from the inclusion of product prices as an explanatory variable, the specification of which has been used to govern the effects of nominal disturbances on employment and output. Careful modeling of wage-price dynamics recalibrates the significance of the famous Lucas critique. In particular, it falsifies his rejection of the rationality and structural nature of wage catch-up to product-price inflation that has already occurred. The second part investigates the Phillips issue that turns out to be much more consequential than rational inflation expectations, i.e., the relationship between wages and excess labor supply, paying close attention to Barro's wage-recontracting critique.[5]

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[3] The stronger Rational Expectations Hypothesis (REH) endows agents with full model information, providing them with perfect foresight. It is a mystery why the REH was ever understood as more than a Ptolemaic convenience.

[4] The book's principal innovations are generalized rational exchange and the constraints it imposes on labor pricing, optimizing decision rules, factor-income distribution, and the use of labor time. Building on that framework, endogenous pure profit becomes the critical determinant of the expected returns required to undertake new investment, influencing aggregate demand, capital accumulation, inter-venue labor transfer, and economic growth. (See Chapter 6.) The remainder of TVGE aggregate supply (most notably population and technology) is provided, along with the fundamental structure of aggregate demand, by existing (New Keynesian) macro textbooks. Notable examples include Bénassy (2012), Carlin and Soskice (2006), and Heidra and van der Ploeg (2002). The monetary-policy rule, the third part of the modern macro modeling, is considered in some detail in Chapter 10.

[5] The original Phillips problem was the nature of the relation between wage change and unemployment, the cyclical behavior of which is largely motivated by the incidence of involuntary job loss. Resolution of persistent, fundamental questions about that relationship informs our understanding of the discretionary management of total spending. Fellner (1976, pp. 51-52) got it right: "What is needed is a distinction between unemployment that can and

III. ADJUSTING WAGES FOR INFLATION

Two broad strategies exist for the design of wage-setting arrangements to account for changing product prices: (i) be forward-looking, adopting the expectations approach, or (ii) be backward-looking, adopting the catch-up approach. Once selected in firm j, the strategy is assumed to be executed within the context of relationship pricing, i.e., workplace-venue optimizing exchange featured in this book. Wages are set, for a fixed period, with the expectation that the exercise will be repeated with largely unchanged participants multiple times.[6] Such continuity motivates agents to seek efficient procedures to adjust labor pricing for inflation.

Economic theorists have, for some time, rejected catch-up, adopting the forward-looking strategy in modeling wage dynamics. Indeed, debate skipped over the choice of adjustment mechanism and focused, instead, on how workers and firms forecast inflation. In the contest between adaptive (based on the recent history of price inflation) and rational (based on all available, relevant information) expectations, victory was appropriately awarded to the latter. The use of rational expectations became a rule of engagement in the long-running dispute over the nature of, and the appropriate policy response to, business cycles. Given their broad acceptance, it is surprising that forward-looking labor-pricing arrangements have never been provided rational foundations.

This section models rational choice between the two strategies to adjust nominal compensation for price change. It is divided into two parts. The first posits that the inflation regime produced by the central bank is credibly stationary. The second permits trend inflation to shift.

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unemployment that cannot be reduced by expansionary demand policies over a reasonable time horizon." Issues associated with the specification of the natural rate of unemployment are postponed to Chapter 6.

[6] From Taylor (1999, p.1013): "For most workers in medium to large sized firms, wages (including benefits) are normally adjusted at rather long discrete intervals, most commonly once per year." Stable employer-employee relationships are the rational workplace arrangement in technological environments enabling management and workers to exploit the productivity gains inherent in task specialization and investment in firm-specific human capital, restricting the analysis to the large-establishment venue. Of course, in order for the fixed-period restriction to be characteristic of coherent general-equilibrium modeling, wage recontracting must be rationally suppressed. It is illustrative of the actual practice of wage setting in large corporations that, when I was Chief Economists for a large bank, I would once a year receive a telephone call from the human-resources department asking me the percent change in the CPI over the previous 12 months.

Stationary Inflation Regime

Labor is posited to be homogeneous until hired and trained, at which point the homogeneity becomes firm-specific. Also assume, initially, that employees and employers are superb forecasters (i.e., their inflation expectations always turn out to be correct) and that they share a constant discount rate (r), are risk-neutral, and operate in a closed economy with constant relative prices. For a single wage adjustment in firm j, worker gross nominal gain from using the expectations strategy instead of catch-up is:

$$(4.3) \qquad p_{kj}(t)W_j(t)H_j(t),$$

where p is the rate of price inflation over the catch-up period (k) at time t, W is the base wage rate, and H is hours on the job.[7]

Assuming that $p_k(t)$ has a stationary mean equal to p^T, the present value of employee gross returns from using the expectations strategy rather than catch-up is:

$$(4.4) \qquad \sum p^T W_j(t)H_j(t)(1+r)^{-t},$$

where the quantities are summed over the life of the work relationship.[8]

There are three types of employee costs involved in using the expectations strategy:

- First is the expense of gathering and processing the information necessary to produce a reasonable and timely rational forecast of price inflation. Such costs are separable into fixed investment in forecasting capacity (G_o) and the variable expense associated with each forecast exercise ($\check{G}(t)$).

- Next are the dissemination, persuasion and revision costs involved in achieving an effective consensus among relevant employees with respect to the inflation forecast, also separable into fixed and variable components ($\mathcal{C}_o$ and $\check{C}(t)$).

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[7] To simplify the notation, all rates of change are normalized to the length of the catch-up period, k.

[8] Intergenerational complications turn out to be unimportant.

- Finally, there are the fixed and variable costs of negotiating agreement with management on the inflation forecast (N_o and $\check{N}$(t)), complicated by the parties' differing wage objectives.

It is unsurprising that a process requiring forecasting, consensus-building, and successful negotiations between parties who inherently disagree is complex. By contrast, if the calculation of a consumer price index is a public good, the catch-up approach is simple, easily understood, and virtually costless. Rational agents cannot ignore that executing the expectations strategy incurs nontrivial costs, while implementing catch-up does not.

Workers must reject the catch-up strategy in favor of expectations if:

$$(4.5) \qquad \sum p^T W_j(t) H_j(t)(1+r)^{-t} \geq (G_{oj} + \c{C}_{oj} + N_{oj}) + \sum (\check{G}_j(t) + \check{C}_j(t) + \check{N}_j(t))(1+r)^{-t}.$$

It is feasible that the forward-looking strategy's costs could exceed its benefits, making its selection unoptimal. More significantly, there are two additional circumstances that decisively motivate rational agents to choose catch-up instead of expectations as their means of periodically adjusting wages for inflation.

First is the ubiquitous free-rider problem. If wage changes are paid to all employees, there is no individual incentive to provide the time and effort to formulate, disseminate, persuade, and negotiate consensus expectations and then do it again and again. Employees can never use the expectations strategy in relationship pricing absent a union or other arrangements providing payment for those who do the necessary work.[9]

Second is the clincher. Responding to the relatively high cost of executing an expectations strategy, workers and firms will rationally search for wage-setting arrangements that make catch-up more efficient (for both parties). The analysis suggests two procedures that reduce the

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[9] Having made the free-rider point, which tellingly supports the operational superiority of catch-up over expectations, the analysis now assumes it away. The remainder of the analysis (except for footnote 15) posits the existence of some costless mechanism to apportion the costs involved in implementing the expectations strategy.

differential gross returns between the two strategies: (i) shortening the catch-up lag (k) and (ii) paying a compensating wage premium.[10]

Catch-up lag. The catch-up lag (k) is shortened by more frequent wage adjustments, reducing the differential returns generated by the expectations strategy. The best-known application of this strategy is short-period automatic cost-of-living escalators.

The evidence shows, not surprisingly, that workers become most interested in shortening the catch-up lag when inflation is high. Cecchetti (1984), for example, examined wage-contracting arrangements in the union sector in the United States. In the 1950s and 1960s, when mean inflation was low, the average period between discretionary wage changes was seven quarters. By contrast, in the 1970s, when mean inflation was relatively high, the average dropped to four quarters. The incidence of indexing also increased in the 1970s.

A more vivid, albeit particular, illustration was provided by the Xerox Corporation, which announced the following rationale for a general wage increase on August 16, 1974: "Part of our basic philosophy as a corporation … is to pay our employees at a rate better than or equal to that which they would receive in other progressive companies for the same work. Over the years, we have accomplished this through liberal salaries and realistic merit increases. During 1973-1974, we continued to maintain this leadership position with respect to other companies. But, at the same time, inflation was hurting Xerox people from a financial point of view. It was an unusual situation that called for an unusual response. We have therefore declared a general increase to supplement our normal merit increases. The combination of the two means that Xerox has one of the most liberal total increase packages in all of the industry during 1974."[11]

August 1974 was an interesting time. In the United States, where Xerox was adjusting its wages, inflation had accelerated sharply, from 3.3% in 1972 to 8.4% in 1973 to 11.8% (annual rate)

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[10] In an open economy, the wage-setting arrangements can additionally include denominating part or all of the wage in foreign currency.

[11] Weeks (1976), p.23. Tentative microfoundations for the Xerox wage policymaking can be found in the early (moral-centric) efficiency-wage models. See Solow (1979), Annable (1977, 1984, 1988), Akerlof (1982), and Wood (1978).

during the first half of 1974. The Federal Reserve responded by restraining money growth, pushing up the overnight interbank lending rate from 4.7% in 1972:Q3 to 10.5% in 1973:Q3 to 12.1% in 1974:Q3. The Fed's goal was a recession deep enough to reduce the extraordinarily high inflation. The cyclical downturn began in late 1973 and continued through early 1975, pushing the jobless rate up from 4.8% to 8.2%. The 1973-75 recession became the most severe U.S. contraction since the 1930s.

Xerox was not confronting a difficult signal-extraction problem in the summer of 1974. Its leadership surely knew that credit was being aggressively tightened, that economic activity was contracting, and that unemployment was rising. High inflation presaged worsening economic conditions, not robust demand. A forward-looking, rational-expectations strategy for nominal wage adjustment would have been clear. It is equally clear that such an approach was not adopted. The strategy used by Xerox to adjust wages to price change was catch-up to inflation that had already occurred, not expectations of the future. By declaring an extraordinary wage increase to supplement already scheduled "merit" raises, management acted to shorten the adjustment period (k) in order to enhance the effectiveness of its catch-up strategy in an altered (higher inflation) environment.

Wage premium.   Firms and workers most effectively reduce the differential return to the expectations strategy by combining inflation catch-up with the payment of a premium over the base wage that compensates for the adjustment lag (k):[12]

$$(4.6) \qquad W_{Pj}(t)=W_j(t)(1+p^T).$$

The difference between the premium and base wages ($W_{Pj}(t)-W_j(t)$) becomes an additional worker cost of using the expectations strategy instead of catch-up: [13]

$$(4.7) \qquad \sum p^T W_j(t)H_j(t)(1+r)^{-t} \geq (G_{oj}+Ç_{oj}+N_{oj})+\sum((\breve{G}_j(t)+\check{C}_j(t)+\check{N}_j(t))$$
$$+(W_{Pj}(t)-W_j(t))H_j(t)))(1+r)^{-t}.$$

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[12] Recall that, for analytic convenience, mean stationary inflation (p^M) is measured over the adjustment period k.

[13] The wage premium ($W_{Pj}(t)-W^n(t)$) combines with wage rent ($W^n_j(t)-W^m(t)$) to explain the rational dynamic deviation of LEV labor pricing from market-opportunity cost.

Rearranging identifies the necessary condition, given the inflation regime, for employees to prefer expectations to catch-up:

$$(4.8) \qquad (\mathcal{G}_{oj}+\mathcal{C}_{oj}+\mathcal{N}_{oj})+ \sum(\check{G}_j(t)+\check{C}_j(t)+\check{N}_j(t))(1+r)^{-t}\leq 0.$$

Workers can rationally choose the expectations strategy only if it is costless to implement.[14] Zero cost of implementation, however, is not feasible.

For management, wage-setting arrangements that pay W_P and use catch-up produces, over time, labor compensation equal to using the rational expectations strategy. Consequently, the firm must also reject the forward-looking approach. It yields no relative benefits and must be more costly to implement than catch-up. Indeed, in the world of wage administration, expectations-strategy costs are judged to be substantial. The most significant problem is that using forecasts is more complex than catch-up, increasing the difficulty employees have understanding the compensation plan and the incentives the firm wishes to promote. For wage policymakers, simple trumps complex. The following from a wage administration text is illustrative of the general view: "The [wage] plan must be kept simple. The plan must be kept as free as possible of intricate involvements which would prevent the employee from understanding it. He must be able to calculate his earnings for himself with little difficulty. Complex plans should be avoided because employees distrust those which they cannot understand." (Brennan, p.204)

Sharing a characteristic with effective wage plans, the analysis so far has not been complex. It demonstrates that, in the aftermath of a one-time monetary shock, catch-up is rationally used to adjust wages; forward-looking expectations are not. Outside economics, none of this is new. Backward-looking adjustments for inflation have been characteristic of wage administration since the beginning of wage administration, while there is scant evidence of the use of forward-looking adjustments. (See Chapter 10.)

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[14] Condition (4.6) makes clear that conducting the optimization exercise in inflation-adjusted, rather than nominal, terms would make no difference in the results.

Nonstationary Inflation Regime

Stationary mean inflation is a reasonable assumption guiding employer-employee behavior after a one-time monetary shock. But, in other circumstances, the inflation regime does change; and self-interested workers and firms must pay attention. In this section, the wage-arrangements model allows the monetary authority's inflation regime (p^N) to vary, increasing its explanatory power without altering the conclusions derived above.

For ease of presentation, assume that the wage-adjustment period (k) remains constant. Also posit that the monetary authority has at time t a target inflation regime ($p^N(t)$), which it can implement immediately:[15]

$$(4.9) \qquad p^T(t) = p^N(t).$$

Wage adjustment for inflation is now analytically separable into two parts: (a) the influence of price change given the inflation regime and (b) the influence of changes in the inflation regime.

For the first channel of influence, the use of expectations has been shown to be suboptimal. It is relatively costly, with no corresponding benefits, to produce and implement inflation forecasts in support of regularly scheduled compensation adjustments. Catch-up to past inflation is the superior strategy. For the second channel, the efficient recalibration of wage-setting arrangements (W_P) requires a rationally constructed forecast of changes in the inflation regime, necessarily playing close attention to credible monetary policy. Here, the costs of the expectations approach are mitigated by the relatively low frequency of regime shifts and, when they do occur, the degree to which the central bank provides credible forewarning.

A consistent LEV nominal wage-dynamics model (U continues to denote the jobless rate, U^N the natural rate, and E_t the expectations operator conditional on information available at time t) is:[16]

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[15] After this section, the relationship is relaxed to p^N representing a credible central-bank restriction on actual trend price inflation (p^T), for some purposes still allowing p^N and p^T to be used interchangeably.

[16] The Phillips formulation in equation 4.8 is provisional. GWET will be used later in this chapter to derive a two-venue version that is consistent with optimizing employer-employee behavior organized around continuous economic equilibrium while imposing tight structure on estimating-equation coefficients. It should be also be noted

(4.10) $w_j(t)=a_o+a_1(U^N(t)-U(t)) +p_k(t)+E_t p^N(t+1)-E_{t-1}p^N(t),$

where lowercase variables denote rates of change and U^N is defined more carefully in Chapter 6. Three distinct expectations configurations comprise the model's wage-setting environment. In the first, the inflation regime remains credibly unchanged, $E_t p^N(t+1)-E_{t-1}p^N(t)=0$, implying simple labor-price dynamics reminiscent of Early Keynesian thinking:

(4.11) $w_j(t)=a_o+a_1(U^N(t)-U(t))+p_k(t).$

The influence of expectations is eliminated; wage-price dynamics are motivated wholly by catch-up to inflation that has already occurred. This is the definitional case in the aftermath of a one-time monetary shock, consistent with the conclusion derived above. Catch-up crowds out expectations whenever the existing inflation regime is credibly unchanged.

Second, a credible change in the inflation regime, $\Delta p^N(t)=E_t p^N(t+1)-E_{t-1}p^N(t)\neq0$, implies:

(4.12) $w_j(t)=a_o+a_1(U^N(t)-U(t))+p_k(t)+\Delta p^N(t).$

Rational wage-setting procedures still assign a central role to catch-up. Expectations are activated but return to being dormant after a one-time W_P recalibration ($\Delta W_P=\Delta p^N$).

Finally, there are continuing errors in agent forecasts of the inflation regime, $\varepsilon_j(t)=\Delta p^N(t)(E_t p^N(t+1)-E_{t-1}p^N(t))\neq0$, implying:

(4.13) $w_j(t)=a_o+a_1(U^N(t)-U(t))+p_k(t)+\Delta p^N(t)-\varepsilon_j(t).$

Stubbornly incorrect regime forecasts do not alter the structural role of catch-up, which is embedded in efficient wage-setting arrangements. They do, however, change the role of expectations, which become more active. As long as forecast errors persist, agents keep searching for the appropriate calibration of the wage premium. Rationally constructed

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here that wage determination conducted in discrete time requires some care in interpreting model time parameters. The dependent variable ($w(t)$) denotes the wage-adjustment decision taken at time t that governs the change in nominal compensation from t to $t+1$. When calculating the real-wage ($w^R(t)$), given satisfied expectations, $p(t+1)$ is the appropriate deflator. Interesting earlier analyses of wage stickiness include the "relative contracting model" of Fuhrer and Moore (1995) as well as models by Blanchard and Katz (1999) and Holden and Driscoll (2003).

expectations, however, prevent the errors from being serially correlated and imply that the more active influence of expectations in the aftermath of a misunderstood inflation-regime change produces no systematic effect on the dynamic path of labor pricing or use.[17] When wage setting is properly restricted to be rational, inflation-expectations plays a much more modest role than in mainstream models.

Exhausted theorists. It is unsurprising that using optimal wage-setting arrangements to revisit inflation as an explanatory variable in labor-price macrodynamics receives a strained welcome from mainstream theorists, who are (let's face it) exhausted after the 30-year microfoundations war. As a prominent macroeconomist recently, and incorrectly, concluded, "… the debate [over expectations versus catch-up] has to move to the data and can only be settled through empirical work."[18] Similarly, David Romer (2001, p.251) has offered a free-parameter version of nominal wage dynamics as the "natural compromise" between the catch-up and expectations:

$$(4.14) \qquad w(t) = a_o + a_1(U^N - U(t)) + (1 - \psi)p_k(t) + \psi E_t p(t+1) + \varepsilon(t),$$

for which $\psi \in [0,1]$ governs the relative contribution of expectations to aggregate nominal wage change. The critical ψ is understood to be theoretically indeterminate. It is not surprising that Romer's guesswork fails to capture the TVGE Phillips curve, which is instead rationally derived from axiomatic model primitives.[19] (See below.)

However, it is surprising that relying on empirical analysis to specify ψ (and, therefore, the policy-relevant nature of wage-price dynamics) has become acceptable in the aftermath of the vigorous rejection of the Early Keynesian use of free parameters to suppress wage recontracting.

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[17] It is noteworthy that a continuing (as opposed to latent) role for expectations in wage-setting arrangements usually occurs when inflation regimes are difficult to forecast, implying economic instability and poor central-bank credibility. In such circumstances, the more active use of expectations in compensation adjustments is little help to a monetary authority wishing to reduce disinflation costs. Note also that wage-setting mechanics are influenced by whether or not workers are organized. With organization, persistent difficulty identifying the inflation regime implies that the union and management need to reach a series of agreements with respect to mean inflation. (See Chapter 7.) As has been noted, absent a union, wage-setting arrangements are complicated by the free-rider problem, forcing the firm to invest in managing its employees' perceptions with respect to changes in the inflation regime.

[18] Correspondence (2007) from Olivier Blanchard to the author.

[19] Rudd and Whelan (2005) tested the "natural compromise" hybrid approach, finding little support for an important role played by forward-looking adjustments.

After the 1970s stagflation dramatically demonstrated the sensitivity of contemporaneous Phillips-curve estimates to particular time periods (indicating model misspecification), that rejection became a rallying cry for the rigorous reconstruction of macro theory. In the spirit of explicit microfoundations, the just-completed rational-arrangements formulation has usefully sorted out the optimal roles of catch-up and expectations, making a fundamental contribution to the theoretical infrastructure supporting macroeconometric modeling. It will be embedded in the continuous-equilibrium Phillips relation to be constructed in the next section.[20] More generally, it must be embedded in any monetary-policy-relevant model of wage-price dynamics that purports to be motivated by rational behavior.

Further indication of economist exhaustion with labor pricing is that wage-price dynamics have been largely replaced in the modern literature by less difficult price-price dynamics, for which a coherent framework has been provided by SVGE-consistent menu-cost market frictions that have been combined with the original Calvo (1983) model of random product-price changes.[21] The replacement strategy, of course, is not without problems. Ignoring the fundamental differences between product and labor pricing, however convenient, inevitably damages the capacity of macro modeling to explain and predict important phenomena. Most notably, only meaningful wage rigidities, not product-price frictions, can suppress labor-price recontracting and generate involuntary job loss. The hard fact is that, in the SVGE model class, the choice between expectations and catch-up does not influence the existence of involuntary job loss, which is the empirical engine of unemployment variation. Relying wholly on menu-cost macrodynamics must be rejected by theorists who aspire to be policy-relevant.

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[20] Not using the rational-arrangements model to guide and interpret empirical analysis has had substantial costs. In an important example, modern theorists have been prevented from adequately understanding the causes and consequences of the stagflation decade that began in the middle 1970s – an episode that ranks only behind the 1930s depression in macroeconomic significance in the 20th century. (See below.)

[21] Menu-cost models are the best-known microfounded description of endogenous lagged timing of product-price changes, putting some rational decision-making content in the staggered price-setting of the simple Calvo model. (See, for example, Mankiw (1985)). Some economists, as noted in Chapter 1, remain reasonably skeptical whether the menu-cost class is sufficiently robust to be useful in the applied analysis of quantity adjustments that include involuntary job loss. See also Woodford (2003), p.142.

Summing up. Given sufficient firm-specific human capital to make worker turnover costly, optimizing labor-pricing arrangements mandate that catch-up always be an integral part of periodic wage adjustment, while expectations are restricted to a more latent role.[22] During credibly anticipated shifts in inflation regimes, the two strategies must be used in combination. Catch-up continues to link wage adjustments to past inflation while expectations recalibrate the size of the wage premium or the length of the adjustment period in response to the new regime, largely ratifying the intuition of the Early Keynesians. Throughout, the analysis remains rooted in the formal economic method rightly prized by modern theorists.

The implications of restricting real Phillips-curve effects from central-bank credibility to the particular circumstances of expected regime change deserve emphasis. Operationally, central banks have typically attempted to establish credibility by committing to an inflation target. A credible transition to such a regime produces a one-time effect on wages, via a change in W_P. After wage-setting arrangements have been recalibrated, expectations again become dormant in labor pricing. Indeed, an important benefit to effectively committing to a price objective is short-circuiting the influence of inflation expectations on labor compensation. Price inflation will vary around the targeted mean, and central banks want such deviations to trigger only catch-up, not more destabilizing incorrect anticipations of an altered price regime.

Most significant, however, is the point that New Keynesians ignore. Coherent SVGE modeling, with its inherent wage recontracting, demonstrates the necessity of meaningful labor-price rigidity for the Phillips curve to produce interesting results. Catch-up by itself helps confines inflation expectations to a latent role and explains wage-price inertia, not MWR. Catch-up is rational in both SVGE and TVGE model classes and, absent MWR, easily accommodates the nominal labor-price reductions required by recontracting (given, for example, an adverse disturbance in nominal demand). There is no avoiding the Two-Venue Theorem.

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[22] The rational role of inflation catch-up in periodic wage determination is badly understood, even by New Keynesians. From Carlin and Soskice (2006, p.160): "The key point to highlight is that although the inertial or backward-looking Phillips curve matches the empirical evidence concerning inflation persistence, it has a major shortcoming. Because it rests on *ad hoc* assumptions – in particular about the inflation process – rather than being derived from an optimizing micro model of wage or price setters' behaviour, it does not allow a role for 'credibility' in the way monetary policy affects outcomes."

IV. TWO-VENUE LABOR PRICING

Early Keynesian short-term aggregate supply, featuring expedient grafting of a simple (empirically motivated) sticky-wage Phillips curve on an aggregate-demand edifice largely rooted in the *General Theory*, was well understood to be a makeshift affair,.[23] Despite its incoherence, the Keynesian SVGE analytic framework had, during the early postwar period, remarkable success. Okun (1981, p.4) described the patched-together Neoclassical Synthesis as a "workable set of macroeconomic tools that gave the right answers to the big questions of practical relevance." Okun's valid assessment is, but should not be, ignored in the academy today. Attention is confined to the eventual stumbling, badly, of Early Keynesian aggregate supply, a failure that provides an especially important message about inherent limitations on the use of free parameters. The modern explanation for the Keynesian breakdown is the then-mainstream model's inability to anticipate and explain stagflation. Moreover, the Early-Keynesian fix, i.e., adding a set of worker terms-of-trade variables to the labor-price equation without providing a plausible story about the apparent increase in labor's wage-setting power, was a transparently insufficient response.[24]

Wage Market-Independence

TVGE aggregate supply features two classes of wage market-independence:

- LEV labor pricing is independent both from contemporaneous variations in product-price inflation and, given a credible inflation regime, from price expectations; and

- LEV wages are independent from (a) cyclical layoffs and (b) a significant portion of non-cyclical job destruction. Chapter 3 demonstrates that temporary layoffs do not affect large-establishment labor pricing. Permanent job downsizing does eventually force wage

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[23] To reiterate, wage stickiness was typically rooted in catch-up to inflation that had already occurred, which Early Keynesians misleadingly named *adaptive expectations*. In coherent SVGE modeling, inflation catch-up (despite being rationally motivated in Part I) cannot suppress wage recontracting and, consequently, cannot induce involuntary job loss and policy-relevant business cycles.

[24] The great Early Keynesians were not naïve. They were deeply unhappy with relying on free parameters to specify necessary wage rigidity. They understood that their Neoclassical Synthesis could never be more than a stopgap explanation of instability. Coherent theory is not optional, a fact that Samuelson (1986, p.163) readily acknowledged: "… you can't be a pure empiricist; you've got to have a systematic way of thinking about things."

givebacks but requires substantial time, resulting from the inherently long lags the continuous-equilibrium process needs to induce employees to rationally recalibrate $Ҡ_j$.

The first class of independence was derived above. Monetary disturbances induce a varying timepath of LEV real wages consistent with both dynamic decision-rule equilibrium and wage-price inertia. The second class is the more consequential market independence, generating more consequential meta-externalities. It short-circuits the LEV labor-pricing response to involuntary job loss that is both central to Barro's recontracting critique and required in SVGE modeling. The suppression of high-frequency downward wage flexibility and the tenacious maintenance of wage rents are continuous-equilibrium outcomes of the simultaneous large workplace optimization of employer labor pricing and employee on-the-job behavior.

Profit-seeking firms confronting sufficiently unbundled WERs rationally choose job, rather than wage, reductions in response to adverse high-frequency shifts in nominal demand in order to avoid costs associated with a uncooperative workforce. That is, indeed, how large employers explain their wage policies in cyclical downturns. (See the evidence review in Chapter 10.) Meanwhile, for workers who remain employed, their resistance to wage cuts helps maintain both their current consumption and established equity-based reference standards.

Two-Venue Synthesis [25]

Small-establishment venue. Firms characterized by effective direct supervision of worker on-the-job behavior, i.e., $Ź_k=Ź^m{}_k$, populate the small-establishment venue. Given bundled $Ź$, rational worker choice is restricted to the marketplace; and profit-seeking firms must price labor hours to equal employees' market opportunity costs.

The market-wage-taking venue recalls Lloyd Fisher's "structureless labor markets", to which he assigned four characteristics. There are no unions; there are no formal or informal work rules;

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[25] In the remainder of this section and the next, the large- and small-establishment venues are posited to be effectively aggregated. The assumption anticipates the macro aggregation analysis of Chapter 5.

workers tend to be unskilled; and relatively little capital or machinery is employed.[26] Clark Kerr (1977, p.24) described wage policies of firms operating in Fisher's structureless environment: "The employer prefers one worker to another only if he accepts a lower … rate. Rates vary greatly over time, but at any moment of time are uniform over space. There are no structural barriers to the mobility of workers and to the fluidity of rates. The only nexus is cash."[27]

In small, nonunion establishments, worker behavior beyond quitting is little affected by variations in the wage received. That insensitivity does not result from the employees' inherent disinterest in fair treatment (which in generalized-exchange modeling is properly understood as an axiomatic worker preference). Rather, it is rooted in nature of the production process, which places a much smaller premium on the close coordination of work tasks, generates relatively little firm-specific human capital, and makes direct supervision or piece rates cost-effective means of preventing employee dissatisfaction from adversely affecting productivity on the job. Those characteristics are reinforced by predictably high labor turnover (in workplaces with little specific human capital) that hinders the building of stable interpersonal and intertemporal reference standards; $\mathbb{K}_k$ collapses to employees' market opportunity cost ($\mathbb{K}_k=\{W^a\}$).

For the kth small firm, characterized by cost-effective workplace supervision and diminishing returns, rational labor-price dynamics are familiar from textbook SVGE treatments of nominal wage optimization in competitive markets:

$$(4.15) \qquad w^m{}_k(t)=r^m{}_k(t)+p^m{}_k(t),$$

where w^m is the growth rate of the market wage, r^m denotes the growth in firm marginal labor productivity, and p^m is the firm's product-price inflation.[28] Management decision-making is

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[26] See Kerr (1977), p.24. Recall that bundled $\acute{Z}_j$ occurs in two types of workplaces: those offering class-II jobs and those offering class-I jobs in small, nonunion establishments.

[27] The frequently employed analogy is spot markets for commodities. See Lucas and Rapping (1969) for an early attempt to orient macro theory around spot-market labor pricing.

[28] The supply-demand mechanics of competitive labor market are well understood by economists and do not need elaboration here. Recall that the compact TVGE model posits that labor is homogeneous until hired and trained, at which point the homogeneity becomes firm-specific; that workers cannot borrow or save; that employees and employers are risk-neutral. Firms maximize expected profits; workers maximize expected utility rooted in stable, well-motivated preferences that include a desire for (subjective) fair treatment by management; and both form

restricted to adjusting the firm's labor hours (influencing r^m). There is no endogenous firm influence on w^m, which reflects employees' market opportunity costs.

The TVGE model posits coherent price-discovery frictions, introduces government constraints, and tractably aggregates SEV labor pricing in the small-establishment venue (see Chapter 5):

$$(4.16) \qquad w^m_K(t) = \gamma^m_K(t) + p^m_K(t) + a_1(U^N - U(t)) + a_2 \Delta \mu_t, \text{ such that } a_1 > 0, a_2 > 0,$$

where w is the growth rate in the nominal wage, γ^m denotes marginal labor-productivity growth ($\gamma^m_K(t) = r^m_K(t)$), p^m is the rate of change of the Kth-sector's product price, U is the jobless rate, U^N denotes the natural rate, and $\Delta\mu$ represents change in government labor-market intervention.[29]

Variations in unemployment are associated with incidence and propagation of real and nominal disturbances, as wages respond quickly but not immediately to changes in labor-market conditions.[30] In the labor-pricing literature, short wage-response lags are typically attributed to various price-discovery costs, rooted in costly, asymmetric information or administrative charges. The model also implies familiar real-wage dynamics (adjusted for small-firm producer prices):

$$(4.17) \qquad w^m_{\check{R}K}(t) = \gamma^m_K(t) + a_1(U^N - U(t)) + a_2 \Delta \mu(t).$$

Large-establishment venue. Workplace-equilibrium innovations in labor pricing are concentrated in large, specialized establishments offering Class-I jobs. In those circumstances, employer-employee rational behavior unbundles $\acute{Z}_j$, mandating wages that variably exceed labor's market opportunity costs. The LEV is home to optimizing labor-pricing decision rules,

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expectations rationally. Technology is fixed, with useful heterogeneity introduced via a bimodal division. One class of homogeneous establishments is characterized by large scale and input specificities that generate workplace information asymmetries and imperfect worker monitoring. The other homogeneous class demonstrates small scale, the absence of specificities, and cost-effective labor supervision.

[29] More specifically, $\Delta\mu > 0$ denotes government action that puts upward pressure on wages paid in the small-firm venue (most likely, an increased statutory minimum); $\Delta\mu < 0$ exerts a negative influence.

[30] If the market price-discovery costs are consistent with SVGE decision-rule equilibrium, none of the unemployment can result from involuntary job loss. Such employment loss is never meaningful in SVGE circumstances, as employees who desire to remain in the labor force would always accept wage cuts that do not violate their opportunity costs in order to retain their jobs.

constraints, and mechanisms of exchange that differ fundamentally from the rules, constraints, and exchange mechanisms that govern choice in the marketplace. Practitioners learned long ago that employees resent being treated as a commodity governed by the arbitrary interaction of supply and demand and want, instead, to be taken out of the market. LEV workers have sufficient on-the-job latitude to enforce that preference.

Large establishments offering routinized jobs lack the capacity to measure individual employee's unbundled labor input, $\acute{Z}_{ij}$. As a result, profit-seeking firms play the averages and invest in the indirect management of workplace exchange. The following chapter demonstrates the tractable aggregation of such firms into a venue that was anticipated by Clark Kerr's (1954) "structured" labor markets, which he argued embody a variety of institutional constraints. Somewhat later, John Dunlop coined the term "internal labor markets".

In the structured environment, firm boundaries relative to the market are more broadly drawn, making its employees a noncompeting group. Outsider access to jobs within the establishment is typically limited to specific ports of entry, often the least desirable positions; existing employees have first claim on better jobs via promotion or transfer. Significant training occurs on the job as part of the general process of workplace socialization, featuring the acquisition of formal and informal firm-specific human capital and increasing the cost of labor turnover to the firm. Due-process rules, governing the on-the-job interaction between employees and management, are characteristic of structured workplaces and "effectuate standards of equity that a competitive market cannot or does not respect."[31] Kerr emphasized that his "structured" and "unstructured" wage-determination processes describe fundamentally different activity sets.

The so-called American model of labor management further restricts the workplace exchange with narrow job classifications, labor pricing attached to those classifications, and substantial firm latitude (subject to seniority) to lay off employees. The Japanese model, by contrast, features broad job classifications with wages attached to individuals (paying close attention to age profiles), enhanced (although still incomplete) job security, and more flexible rules

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[31] Doeringer and Piore (1971), p.29. For elaboration in the context of TVGE modeling, see Chapter 8.

governing labor deployment. A variety of rent-paying workplace organizations, as long as they are constructed on limited ports of entry and designed to encourage acceptance of management objectives, can be accommodated by the large-establishment venue in the general-workplace-equilibrium model.

Baseline (durable-$\mathbb{K}$) continuous-equilibrium LEV analysis is consistent with the following discrete-time wage dynamics in tractably aggregated (see the next chapter) large establishments offering class-I jobs:

(4.18) $w^n_J(t) = r^n_J + p^c_{\breve{k}}(t) + E_t p^N(t+1) - E_{t-1} p^N(t)$; and

(4.19) $w^n_{\breve{R}J}(t) = r^n_J + (p^c_{\breve{k}}(t) - p^c(t)) + E_t p^N(t+1) - E_{t-1} p^N(t)$.[32]

The growth rate of the nominal reference wage (W^n) is denoted by w^n; $w^n_{\breve{R}}$ denotes its inflation-adjusted version; r^n is the real-wage growth rate consistent with $\mathbb{K}_j$ dynamics; p^c is consumer price inflation; and J denotes the aggregated workplace venue; p^N is used instead of the equivalent p^T to emphasize the Lucas point that rationality requires attention be paid to monetary policy. The price-adjustment portion of the LEV baseline wage equations ($\rho_j(t) = p^c_{\breve{k}}(t) + E_t p^N(t+1) - E_{t-1} p^N(t)$) was derived in Part I of this chapter.

Meaningful wage rigidity is consistent with the absence of labor-market variables in LEV wage determination. The noncyclical dynamic path of the real (consumer-prices) efficiency wage is motivated by r^n, which is governed by $\mathbb{K}_j$. Nominal cyclical dynamics are rooted in the lagged (catch-up) adjustment for (consumer) price inflation, denoted by $p^c_{\breve{k}}(t)$. Money wages are flexible in response to anticipated changes in the inflation regime. Accurate expectations facilitate real adjustments to inflation-regime shocks, indicative of the role of central-bank credibility.

Equations 4.18 and 4.19 describe the high-wage sector. To better utilize the TVGE aggregate-supply model's capacity to introduce structure into wage determination and the propagation of macro shocks, further define price inflation: $p(t) = \beta p^D(t) + (1-\beta) p^I(t)$, where D represents the

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[32] Real wages that inform rational large-establishment decision-making are deflated by consumer prices. General LEV wage dynamics simply substitute endogenous $r^n(t)$ for baseline (exogenous) r^n in both the nominal and real intertemporal wage equations.

prices of domestically produced goods and services, I is imports, and β is the relative weight of domestic products in the index of total consumer prices; and $p^D(t)=\sigma p^n(t)+(1-\sigma)p^m(t)$, where σ denotes the relative weight of specialized-venue product prices in overall domestic prices. For ease of presentation, p will also represent consumer prices.[33] Similarly, define the sectoral composition of trend productivity growth: $\gamma(t)=\Phi(t)\gamma^n_T(t)+(1-\Phi(t))\gamma^m_T(t)$, where Φ represents the relative size of the large-establishment venue.

Combining the definitions yields descriptions of nominal and real wage dynamics, given a credibly unchanged inflation regime, in the specialized sector:[34]

(4.20) $w^n_J(t)=r^n_J+\beta\sigma p^n_{kJ}(t)+\beta(1-\sigma)p^m_{kK}(t)+(1-\beta)p^I_k(t)$; and

(4.21) $w^n_{\check{R}J}(t)=r^n_J-p^n_J(t)+\beta\sigma p^n_{kJ}(t)+\beta(1-\sigma)p^m_{kK}(t)+(1-\beta)p^I_k(t)$.

The behavior represented in 4.20 and 4.21 is a critical building block for policy-useful macroeconomic theory, helping to microfound meaningful wage rigidity and involuntary job loss that play central roles in the propagation of monetary and nonmonetary shocks.

Two-Venue Single-Equation Modeling

Single-equation modeling. Melding LEV and SEV labor pricing provides a powerful, integrated version of the flex- and fix-price aggregate-supply modeling of John Hicks. Using the great 20th-century theorist's macro analysis to provide literature roots for TVGE theory is more than a presentational convenience. Hicks (1974, p.66) explicitly motivated his fix-price sector with an intuitive workplace exchange relation (WER): "Employers were reluctant to raise wages, simply because of labor scarcity; for to offer higher wages to particular grades of labor that had become scarce would upset established differentials. They were reluctant to cut wages, simply because of unemployment; for if they did so they would alienate those whom they continued to employ. The 'stickiness' is not a matter of money illusion; it is a matter of continuity."

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[33] It additionally facilitates the (shorter-term) analysis to hold the various composition weights constant.

[34] Recall that the dependent variable ($w(t)$) denotes the wage-adjustment decision taken at time t that governs the change in nominal compensation from t to $t+1$. Calculating the real wage decision, given satisfied expectations, p_{t+1} is the appropriate timeframe of the deflator

Combining labor pricing in large- and small-establishment venues identifies the respective determinants of baseline (unchanging K_J) real and nominal compensation growth:[35]

(4.22) $w_{\check{R}}(t) = \Phi(t)(r^n_J - p^n_J(t)) + \Phi(t)\beta\sigma p^n_{kJ}(t)$

$+ \Phi(t)\beta(1-\sigma)p^m_{kK}(t) + \Phi(t)(1-\beta)p^I_k(t)$

$+ \Phi(t)(E_t p^N(t+1) - E_{t-1}p^N(t)) + (1-\Phi(t))\gamma^m_K(t)$

$+ (1-\Phi(t))a_1(U^N(t) - U(t)) + (1-\Phi(t))a_2\Delta\mu(t).$

and:

(4.23) $w(t) = \Phi(t)r^n_J + \Phi(t)\beta\sigma p^n_{kJ}(t)$

$+ \Phi(t)\beta(1-\sigma)p^m_{kK}(t) + \Phi(t)(1-\beta)p^I_J(t)$

$+ \Phi(t)(E_t p^N(t+1) - E_{t-1}p^N(t))$

$+ (1-\Phi(t))(\gamma^m_K(t) + p^m(t))$

$+ (1-\Phi(t))(a_1(U^N(t) - U(t)) + (1-\Phi(t))a_2\Delta\mu(t).$

Endogenous K_J requires some small rewriting of the real and nominal macro wage equations:

(4.24) $w_{\check{R}}(t) = \Phi(t)(r^n_J(t) - p^n_J(t)) + \Phi(t)\beta\sigma p^n_{kJ}(t)$

$+ \Phi(t)\beta(1-\sigma)p^m_{kK}(t) + \Phi(t)(1-\beta)p^I_k(t)$

$+ \Phi(t)(E_t p^N(t+1) - E_{t-1}p^N(t)) + (1-\Phi(t))\gamma^m_K(t)$

$+ (1-\Phi(t))a_1(U^N(t) - U(t)) + (1-\Phi(t))a_2\Delta\mu(t).$

and:

(4.25) $w(t) = \Phi(t)r^n_J(t) + \Phi(t)\beta\sigma p^n_{kJ}(t)$

$+ \Phi(t)\beta(1-\sigma)p^m_k(t) + \Phi(t)(1-\beta)p^I_k(t)$

$+ \Phi(t)(E_t p^N(t+1) - E_{t-1}p^N(t)) + (1-\Phi(t))(\gamma^m_K(t) + p^m(t))$

$+ (1-\Phi(t))(a_1(U^N(t) - U(t)) + (1-\Phi(t))a_2\Delta\mu(t).$

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[35] Rational firms adjust employment such that the real wage equals labor's marginal product. Relative sector size is defined in terms of relative labor income: $WH = W^n H^n + W^m H^m$ and $W^n H^n = \Phi(WH)$, where W stands for the aggregate wage rate, H denotes aggregate labor hours worked, and $1 \geq \Phi \geq 0$. It is additionally assumed that the continuous-time labor-pricing behavior in the nonspecialized venue is synchronized with the discrete wage adjustments in the specialized venue.

In TVGE modeling, the relationship between labor pricing and market unemployment is more subtle than in SVGE theory. In the former, mediating (weighted) influences include catch-up to consumer price inflation, venue differences in product-price inflation, shifts in labor's terms of trade, expectations about the inflation regime, the relative size of LEV employment, the implicit long-lagged recalibration of LEV wage rent (ultimately in response to weak profitability), SEV labor productivity, and government intervention. The substantial complexity implies that the literature's empirical estimates of simplified Phillips relationships must be interpreted with care.

New Phillips curve. TVGE aggregate supply microfounds a continuous-equilibrium entrant, named the *generalized-exchange Phillips curve*, to the huge literature on reduced-form wage equations. For baseline equation 4.23, which is confined to stationary disturbances and thereby characterized by $\mathbb{K}$ durability, posit that the terms of trade remain unchanged ($p^n=p^m=p^I$), as do small-firm trend labor-productivity growth ($\Delta\gamma^m(t)=0$), relative sector size ($\Delta\Phi(t)=0$), the natural rate of unemployment ($\Delta U^N(t)=0$), and government intervention ($\Delta\mu(t)=0$). The simplified baseline equation is the central TVGE variant of the Phillips relation:

$$(4.26) \qquad w(t)=b_o+b_1(U^N-U(t))+b_2 p_{\mathbb{L}}(t)+b_3(E_t p^N(t+1)-E_{t-1}p^N(t))+\varepsilon(t),$$

where $\mathbb{L}$ represents the price-inflation lag structure (t-$\mathbb{k}$ to t) and ε is an error term.

Labor-market conditions occupy a significant, albeit diminished, place in the reformulated Phillips relation. More notably, price expectations recede to a largely latent role, activated only during broadly anticipated changes in the central bank's inflation regime. Efficient wage-setting arrangements mandate that catch-up to past inflation is much more important in the periodic adjustment of nominal wages. The number and nature of the restrictive assumptions, including confining the simple version of the generalized-exchange Phillips curve to the analysis of stationary disturbances, indicate that the reduced-form wage equation should be cautiously used.

Improved Phillips dynamics, uniquely accommodating continuous-equilibrium involuntary job loss, satisfy two conditions that help reconcile New Classical and Keynesian thinking:

- *The stable-inflation-regime condition*. In circumstances of credible stability of the central bank's inflation regime, money cannot be neutral. Nominal shocks interact with

continuous-equilibrium meaningful wage rigidity, identified in the restrictions on the generalized-exchange Phillips curve and producing same-direction effects on employment and production.

- *The variable-inflation-regime condition*. Anticipated changes in the central-bank inflation regime produce wage adjustments consistent with money neutrality.[36] In the TVGE model class, ever-faster money growth cannot hold unemployment below its natural rate.

The generalized-exchange Phillips curve is constructed on (i) preferences and technology that are invariant with respect to the conduct of monetary policy and (ii) employer-employee decision-rule outcomes that are rationally informed by central-bank policies.[37] The model happily replaces the time-separation arbitrarily used by Early Keynesians to meld money neutrality and non-neutrality in the Neoclassical Synthesis: a short-term real-nominal tradeoff coexisting with the longer-term elimination of that tradeoff in SVGE growth theory. Moreover, given a reasonable specification of the other branch of the wage-price nexus ($\Delta p(t)/\Delta w(t)>0$), generalized exchange is consistent with inflation persistence: $(\Delta p(t)/\Delta w(t))(\Delta w(t)/\Delta p_L(t))=\Delta p(t)/\Delta p_L(t)>0$. (See Chapter 6 for more on TVGE product pricing.) Inertial product-price inflation is compatible with the evidence and is relevant to the design and implementation of stabilization policies.[38]

Other properties of the wage model.   Relative to market-centric (SVGE) Phillips curves, generalized-exchange equation 4.26 imposes a tight structure b_i. The constant term ($b_o=\Phi r^n+$

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[36] Meanwhile, the absence of central-bank credibility, i.e., characterized by persistent errors in agent inflation-regime expectations, implies nonsystematic money non-neutrality. The absence of credibility is almost always characteristic of a rising inflation regime. Moreover, in another TVGE-consistent friction, workers are at a disadvantage in interpreting central-bank regime changes, producing inertia in wage dynamics.

[37] Lucas and Sargent (1978, p.70) have argued that equilibrium business cycle theory "directs attention to the necessity of thinking of policy as the choice of stable 'rules of the game,' well understood by economic agents." The generalized-exchange Phillips curve implies that the central bank should move quickly to temper nominal shocks within the context of providing credible, stable rules of the game.

[38] Moreover, in the new Phillips version, anticipated regime changes weaken persistence, as wage-setting arrangements are recalibrated to the expected new monetary circumstances. In their examination of actual hyper- and high inflations, Fischer, Sahay and Vegh (2002, p.877) concluded: "Inflation inertia – defined either as the mean lag length or the median lag length of an autoregressive process – falls as the level of inflation rises. The evidence supports the notion that nominal rigidities are weakened as inflation reaches higher levels." They additionally elaborate on the nature of the weakening of nominal rigidities: "The main reason is that, as inflation increases, the length of contracts becomes shorter and/or more contracts and prices are denominated in foreign currency." (p.859)

$(1-\Phi)\gamma^m)$ reflects the interaction of trend LEV real wage growth (r^n_J, embedded in $\mathbb{K}_j$), small-firm trend productivity growth, and relative venue size. To the extent that any of those factors change in an estimation period, b_o will be unstable. The most critical source of destabilization is $\mathbb{K}$ recalibration, which has been shown not to occur over stationary business cycles – the usual context for Phillips-Curve analysis. Also, the employment coefficient ($b_1=(1-\Phi(t))a_1$) helps explain the typically small estimated influence of measured joblessness on aggregate wage behavior.[39]

The specification of inflation catch-up ($p_L(t)=\Phi(t)\beta\sigma p^n_k(t) \backslash+\Phi(t)\beta(1-\sigma)p^m_k(t)+\Phi(t)(1-\beta)p^I_k(t)$) and LEV terms-of-trade dynamics ($b_L(t)=\beta\sigma p^n_k(t)-\Phi\beta(1-\sigma)p^m_k(t)-(1-\beta)p^I_k(t)$) provide interesting restrictions on the generalized-exchange Phillips relation. Domestic or international shifts in labor's terms of trade make b_2 unstable. As a result, the compact Phillips curve, with its simplifying assumptions, could never have explained or predicted the stagflation that made monetary policymaking so difficult in the 1970s and early 1980s.[40] As has been emphasized, the TVGE Phillips specification also restricts the proper interpretation of price expectations, which are now limited to anticipated shifts in the central bank's inflation regime and only affect large-establishment labor pricing ($b_3=\Phi(t)$).[41] Well-specified models of wage dynamics must include both inflation-regime expectations and catch-up. Arbitrary hybrid models, the use of which has typically provided superior explanatory power, are more consistent (albeit imperfectly) with optimizing behavior than the mainstream expectations-augmented Phillips relation.

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[39] It should also be noted here that a breakdown in $\mathbb{K}_j$ durability, which in the GWET occurs in response to inadequate firm-specific residual rents and consequent job destruction, implies b_i instability during periods of significant downsizing.

[40] If the quantitative macro models had been built "bottom up" from optimizing workplace equilibrium, their capacity to explain both the existence and absence of stagflation would have been substantially improved. Combining the large- and small-establishment wage dynamics consistent with general workplace equilibrium in the context of a substantial oil-price shock and a relatively compact wage structure would generate, via rational catch-up, substantial wage-price inertia at high unemployment that characterized the 1970s stagflation. Furthermore, as wage rents increased during the decade that followed the original shock and the wage structure became more dispersed, pushing down large-firm residual rents, job destruction (downsizing) increased and $\mathbb{K}_j$ recalibrations (wage givebacks) eventually occurred. In the sharply more dispersed wage structure of the mid-1980s to the present in the United States, an upward oil-price shock is no longer sufficient to support stagflation. Instead, the worker-adverse terms of trade shift will, in such circumstances, generally depress real wages. For elaboration, see below.

[41] Also note that, in an estimating equation, price inflation specified to be contemporaneous with the dependent variable (wage growth), typically used as the first term in lagged inflation, is identified as the weighted rate of change in SEV product prices.

Finally, generalized-exchange Phillips dynamics underscores the significance of the implicit interaction between the rates of growth in large-firm nonstationary productivity (γ^n_T) and the real wage (r^n). In the TVGE model, $\Delta\gamma^n_T > \Delta r^n$ exerts upward pressure on LEV profit (Π_J), increasing common equity, capital investment, and aggregate spending and income, reinforcing 𝕂 durability. If $\Delta\gamma^n_T < \Delta r^n$, there is downward pressure on profit, equity valuation, investment, income, and spending. Such circumstances eventually induce job downsizing and 𝕂 recalibration.[42]

Interpreting the Phillips Curve

Early Keynesians as well as the New Classical, RBC, and New Keynesian theorists who replaced them in the macro mainstream all worked and continue to work within the market-centric SVGE analytic framework. They have been, as a result, unable to provide a coherent interpretation of Phillips-relation estimations. Keynesians have always relied on arbitrary labor-price stickiness, tolerating deeply inadequate guesswork about wage determination in specialized economies. Early on, they misleadingly interpreted lagged inflation as "adaptive expectations", positing that $\Delta p^e(t) = \lambda(p(t) - p^e(t))$, $0 < \lambda < 1$. Their formulation, famously failing to make full use of available information, cannot be rational.[43] From a generalized-exchange perspective, it is unsurprising that the 1970s, with its substantial labor-adverse shifts in the terms of trade, produced increased inflation *and* unemployment; but stagflation discredited gerrymandered Early-Keynesianism. The founders of macroeconomics put up an ineffective defense against the New Classical reassertion of SVGE wage recontracting that obliterated activist real-side stabilization theorems.

It is interesting that New Classical interpretation of Phillips-curve empirics also lacked stabilization relevancy. Wage recontracting can be made consistent with periods of rising job

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[42] Given initially unchanged productivity growth, an increase in wage rents (e.g., resulting from adverse terms-of-trade shifts) will reduce residual rents, depressing investment and research/development, and eventually slow γ^n_T. The GWET asserts that, in the circumstances of the 1970s in the U.S., the relatively rapid commodity price inflation would lead to greater dispersion in the wage structure, stagflation, and a slowdown in productivity.

[43] Part I demonstrated that inflation catch-up itself, not as a proxy for expectations, is a rational determinant of periodic nominal wage adjustment. In early postwar Phillips empirical work, where "adaptive expectations" were proxied by actual lagged inflation, catch-up fit the data exceptionally well.

separation. But any unemployment that results must be the outcome of voluntary employee choice, indicative of a shift in labor preference for leisure over consumption, a deterioration in the labor market's capacity to match available workers and available jobs, or Lucas-style money illusion. The SVGE explanations badly conflict with contemporaneous accounts and statistical measurement of the stagflation decade or any other period of macro instability for more than 100 years. It cannot rise above being a Ptolemaic contribution to otherwise serious debate.

Modern New Keynesian Phillips curves almost always problematically continue both the Early-Keynesian reliance on free-parameter guesswork and the New-Classical suppression of rational wage-setting arrangements. They cannot, as a result, provide a coherent explanation of wage rigidity and badly misinterpret the relative roles of inflation expectations and catch-up. Practitioners identify the former to be largely dormant in periodic wage adjustments, while the latter are always an active influence. New Keynesians especially fail to understand the true nexus between nominal wages and unemployment. Market-centric SVGE modeling of labor pricing and use has been continuously challenged by incremental evidence, the response to which has produced increasingly convoluted modeling.

Generalized exchange has enabled construction of a much improved Phillips curve. Excess labor in the marketplace directly affects only SEV wage determination, helping to explain the relatively weak unemployment effect on overall labor pricing in the evidence. Also consistent with the data, lagged inflation is always an active determinant of nominal wages, while rational expectations of inflation are dormant whenever the central-bank inflation regime is credible.

Anticipating the next section, generalized exchange also introduces a powerful price-wage-price nexus into the stagflation narrative. The enriched 1970s story features sharply increased U.S. interindustry wage dispersion, associates that movement with labor-adverse shifts in the terms of trade, and uses the much higher wage rents to motivate the substantial good-job downsizing and $\mathK_J$ recalibration (with wage givebacks) that became endemic in the 1980s. Stagflation, job downsizing, and wage givebacks will be shown to be neighboring, interrelated macro disruptions that are easily accommodated in the TVGE model class. Its SVGE counterpart does not have a prayer of accommodating such a rich range of macroeconomic facts.

V. THE STAGFLATION DECADE

The stagflation decade that began in the early 1970s proved to be the second great stabilization challenge, after the 1930s depression, of the 20th century. Like the Great Depression, it fundamentally altered how macroeconomics is done. Then-mainstream thinking, organized by the Early-Keynesian Neoclassical Synthesis, was implicated in the apparent macro-policy breakdown and was, in relatively short order, crushed.[44] Keynesian hegemony was replaced by coherent SVGE modeling that evolved into the modern consensus embodied in the New Neoclassical Synthesis. (For elaboration, see Chapter 6.) With guidance from the reeducated academy, central banks around the world adopted a single objective that committed to low inflation. (See Chapter 10.) Satisfactory employment was thought to follow from the successful pursuit of the primary inflation goal. With the Great Depression stubbornly resistant to formal single-venue modeling and therefore dismissed in the academy as an aberration, the revived coherent SVGE theory badly needed to provide a broadly accepted analysis of stagflation. Any theory aspiring to be policy-relevant must actually explain some big problem.

Farmer (2010b, p.60) has succinctly summarized the durable mainstream explanation of the stagnation decade: "During the 1970s, the U.S. economy experienced high inflation and high unemployment at the same time and the data did not lie anywhere near the [original Keynesian] Phillips curve…. The Phillips curve broke down because firms and workers began to increase wages and prices in an inflationary spiral. Wages went up because workers believed that prices would rise. Prices went up because higher wages were passed on to consumers." Macroeconomists today broadly accept that the engine of the 1970s stagflation was the unanchoring of workers' anticipations of inflation. Those expectations, if rational, must have been informed by central-bank behavior. Modern theorists then conclude that the root cause of the wage-price spiral and high unemployment was a less-than-credible monetary-authority commitment to low inflation. The remarkably bold message is that robust central-bank nominal credibility would have prevented the welfare loss that resulted from stagflation-decade instability.

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[44] The virulent price-wage-price spiral, insensitive to high unemployment, made the for-convenience assumptions of the Neoclassical Synthesis about the nature of nominal wage rigidity badly out of step with real-time concerns of stabilization policymakers.

BOX 4.2: ABBA LERNER'S SHORT DESCRIPTION OF STAGFLATION

In a 1970s interview (transcribed in Colander and Landreth (1996)), Abba Lerner described the basic mechanics of stagflation. Lerner's story was accepted by most contemporary applied macroeconomists, notably those at the Fed, and is uniquely microfounded by TVGE modeling.

"You have unemployment and you have inflation at the same time. If you have unemployment, it means you don't have too much spending and therefore I t can't be true that the inflation is due to too much spending…. That is to say that, since the inflation is not caused by too much spending, it must be caused by something else. It is really due, not to people trying to buy more than is available, but to the various contributors to production, trying to get or demanding as their share for work, or for capital, its profit, more than 100 per cent of the total product. Of course, they can't succeed in that either, and so you have a pressure; what you must do to deal with this pressure is more difficult. It is not a market but is an institution problem of the power of labor to raise wages and businesses to raise prices, each blaming the other, perhaps quite honestly, for having to do it, and the government increasing the amount of money or spending so that this doesn't lead to too catastrophic a depression. So we are stuck with some inflation and some unemployment and recession not depression." (Colander and Landreth (1996), p.103.)

The mainstream SVGE narrative is misleading and, as advice to stabilization policymakers, reckless. The consensus story is badly inconsistent with the decade's relevant facts, which indicate that central-bank credibility played no more than a modest role in the welfare loss associated with stagflation macrodynamics. More important determinants are found elsewhere. Putting the pieces together, one of the most extraordinary outcomes of the stagflation decade is the durability of a mainstream explanation that is, upon examination, wrong.

Stagflation Facts

An important albeit typically ignored combination of facts, beyond the simultaneity of high inflation and unemployment, provides insight into the stagflation decade. The evidence is organized into three interrelated groups: labor-adverse shifts in the terms of trade, the price-wage-price spiral that induced substantially greater dispersion in the inter-industry wage

structure, and the nature of joblessness. Robust explanation of the stagflation crisis must accommodate, not ignore, the facts that accumulated during the prolonged episode of macro market failure.

Terms-of-trade shift. There was, in the early 1970s, a powerful confluence of terms-of-trade shifts against labor. Contemporaneous stagflation analysis assigned an important causal role to those real disturbances in initiating the destructive macrodynamic process:

- The quadrupling of oil prices, associated with the OPEC embargo, in 1973 was the largest single shock. By the end of the stagflation decade, the cartel had helped engineer more than a fifteen-fold price increase. During this period, energy costs directly accounted for a tenth of the total consumer price index.

- Food prices more than doubled in the early 1970s. The 1972 Russian crop failure put substantial pressure on world grain markets. Meanwhile, there was a mysterious collapse in the anchovy catch off Peru; and meat prices jumped as animal-feed (produced from grain or fishmeal) costs rose sharply.

- The over-valued dollar became unsustainable, and the subsequent depreciation and higher import prices further pressured real wages. The gold window was closed in mid-1971 as a prelude to the Smithsonian agreement, which realigned rates of dollar exchange. That change was followed, in 1973, by two additional dollar devaluations.

As has been noted, almost all the economists who contemporaneously worked on the stagflation problem assigned great significance to the terms-of-trade shifts. Somewhat later, theorists began dismissing their relevance. Mainstream thinking today simply assumes dismissal to be correct.

Price-wage-price spiral. The virulent price-wage-price spiral, demonstrating sustained breadth and power of nominal feedback never before experienced in the United States, is at the heart of stagflation mechanics. Any theorist assembling a policy-relevant explanation of the disruptive, costly 1970s and 1980s, cannot ignore the existence and implications of that extraordinary spiral. Annable (1984), in the most careful empirical analysis of interacting wages and prices during the stagflation decade, identified three associated facts. First, roughly half of all nonfarm

nonsupervisory workers were able to defend their real wages against the labor-adverse terms-of-trade shifts. Second, those employees were concentrated in large establishments or smaller unionized firms.[45] Third, the inter-industry wage structure came apart, demonstrating sharply increased dispersion, during the stagflation decade. The sharp jump in energy and food prices is easily identified as the critical causal factor in the wage-structure shift.[46]

Nature of unemployment.   The workhorse Table 1.1 demonstrates that, in the stagflation recessions of 1974-75, 1980, and 1981-82, involuntary job loss was the overwhelming engine of rising unemployment. Job-losers incidence rose by 16.0, 7.4, and 11.2 points respectively during the three contractions, which is roughly in line with the 2007-09 experience when three-quarters of the increase in overall unemployment was attributable to the upsurge in forced job separation.[47]

Mainstream SVGE Analysis

The SVGE model class cannot coherently accommodate the class of market failure indicated by the evidence to have occurred during the stagflation decade. The episode featured simultaneous high unemployment and a powerful, particular price-wage spiral that broke apart what had been a remarkably stable inter-industry wage structure. Involuntary job loss was the clear engine of rising unemployment in the stagflation recessions of 1974-75, 1980, and 1981-82. But, given that forced job loss does not exist in coherent SVGE modeling, the consensus story must understandably ignore the actual labor behavior that accompanied the persisting instability. It is

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[45] The latter were in turn concentrated in construction where the craft unions controlled employment.

[46] The merchandise import deflator was additionally shown to have a significant, but less important, effect on inter-industry wage dispersion. Higher unemployment played no discernible role.

[47] Other political and economic shifts relevant to labor and product pricing around the period of the great stagflation should be noted. Wage-price controls were imposed in the United States 1971, changing the time distribution of inflation. Global recession also encouraged the spread of protectionist measures. In the U.S., there was a brief surcharge on imported autos, trigger prices on Japanese and European steel, and voluntary quotas imposed on the import of shoes, textiles, and television sets. Moreover, labor productivity gains decelerated significantly from the immediate postwar period. Average annual (nonfarm) productivity growth was 1.3% from 1973 to 1989, half the 2.6% annual average from 1950 to 1973. And, finally, the highest reaches of monetary policy in the United States were not wholly cognizant of the true nature of the wage-price processes at work during much of the 1970s, contributing to *ad hoc* central-bank decision-making.

the familiar macro conundrum presented by market-centric thinking. Wage recontracting must be, but cannot be, rationally suppressed. Playing by the coherency rules governing the New Neoclassical Synthesis, modern mainstream theorists have always had less capacity than discredited Early Keynesians to elucidate, albeit imperfectly, the unemployment part of the stagflation story.

The other central element of the stagflation process, the consequential price-wage-price spiral, is also difficult for consensus thinking. The atypically careful modeling, earlier in this chapter, of periodic LEV wage adjustments for inflation microfounds an important result. Rational behavior mandates the use of catch-up to price change that has already occurred, providing part of the mechanics for stagflation's characteristic nominal spiral.[48] Those mechanics, and the nominal persistence they enable, are not available to modern theorists who restrict wage adjustments for inflation to anticipated future price change. Exclusive reliance on rationally-formed expectations is irreconcilable with rational behavior, forcing a blind eye to how labor is actually priced.

More fundamentally, SVGE employees have no means of inducing LEV employers to increase wages in the context of unemployment that exceeds its natural rate.[49] Wage recontracting in the pursuit of profit prevents labor pricing in excess of market-opportunity costs. The stagflation decade's price-wage-price spiral, the nature of which has been richly documented by Annable (1984), cannot exist in coherent SVGE modeling. As a result, modern mainstream analysis must disregard that only half of all nonfarm nonsupervisory workers were able to defend their real wages against the adverse shifts in their terms of trade, that those workers were concentrated in large establishments or small unionized firms, and that the dispersion of the inter-industry wage structure, notably stable during the previous two decades, increased sharply.

Statistical analysis identifying the energy-price shock as the most important determinant of the changing wage structure has no place in the SVGE explanation of stagflation. Mainstream

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[48] Recall that always-rational catch-up is combined with the conditional use of inflation expectations.

[49] Such circumstances must instead push down labor prices. Macroeconomists who properly respect SVGE coherence will find themselves in the awkward position of arguing that the natural rate of unemployment in the early 1980s exceeded 10%. Positing a rational matching process to be that slow lacks any shred of plausibility.

theorists, if they respect SVGE coherence, must deny a role for the confluence of labor-adverse terms-of-trade shocks, most notably oil, in the stagflation debacle. Robert Lucas, perhaps the most admired innovator among the anti-Keynesian insurgents, is quoted on that issue in Snowdon and Vane (2005, p.279): "The direct effect of the OPEC shock was minor in my opinion." The role of terms-of-trade shifts and their effect on the inter-industry wage structure provide a defining difference between the SVGE and TVGE analyses of the stagflation decade.[50]

Putting the pieces together, SVGE modeling is not adequate to the task of explaining stagflation. It does not come close. In the mainstream story, relative increases in energy and food prices cannot show up in higher wages; but they clearly did. SVGE transmission of damaged central-bank inflation credibility to higher wages cannot coherently result in involuntary job loss, but the jumps in forced employment separation measured in the millions. Rational expectations of price inflation, by their nature, cannot systematically distort the inter-industry wage structure; yet dispersion clearly went up a lot.[51] The mainstream identification of stagflation's causal role to be the lack of central-bank credibility is more than wrong; it is, as suggested earlier, a reckless, Ptolemaic guide for monetary intervention.

Proper analysis of the stagflation decade deeply damages the logic of and empirical support for the mainstream consensus that credibly low inflation must be the single stabilization objective of central banks. In a world characterized by generalized exchange, simply establishing and maintaining low inflation does not imply satisfactory employment stabilization. The inadequacy of a single, low-inflation objective was vividly illustrated by the virulent 2007-09 instability. In that crisis, effective action required a direct policymaker focus on real-side objectives, the determinants of which were deteriorating dramatically. Working indirectly through a focus on inflation would have provided woefully insufficient information to be a useful, let alone exclusive, guideline to welfare-enhancing central-bank action. (For elaboration, see Chapter 10.)

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[50] Adequate theories do cannot pick and choose what evidence to recognize; inconvenient facts cannot be simply dismissed. That principle, it should be noted, is surprisingly controversial. For example, prominent SVGE theorists Chari, Kehoe, and McGrattan (2009, p.243) have argued: "The tradition favored by many neoclassicals (including us) is to keep a macro model simple, keep the number of parameters small and well motivated by micro facts, and put up with the reality that no model can, or should, fit most aspects of the data."

[51] Do SVGE theorists believe that half the work force perceived a credible inflation regime while half did not?

TVGE Analysis

Coherent TVGE modeling easily explains the salient features of the stagflation decade, achieving consistency with the available evidence far beyond the reach of SVGE thinking.[52] The narrative begins, as it should, with the substantial shift in the terms of trade caused by outsized commodity-price increases that greatly disturbed the early 1970s economy: $\Delta p_{Ł}(t)<0$. The generalized-exchange model, via its keystone MWR Channel, translates easily that shock into a virulent price-wage spiral that eventually produced two classes of involuntary job loss: $\Delta\acute{\omega}_j^V>0$, i.e., temporary layoffs resulting from the adverse phases of high-frequency nominal demand fluctuations; and $\Delta\acute{\omega}_j^T>0$, i.e., permanent job downsizing resulting from real wage-rent increases. Both effects work through weakening profits, over the business cycle for the former and via nonstationary expectations for the latter. (Recall Chapter 3.)

In the TVGE stagflation story, layoffs are the consequence of the interaction of the MWR Channel and slowdowns in total spending. Weakened demand resulted in part from intermittent central-bank tightening of credit conditions, as it attempted to contain high inflation. The elevated incidence of temporary job loss caused much of the relatively high joblessness during the 1970s and early 1980s – a period that experienced three recessions, two of which were among the most severe postwar downturns. Meanwhile, in the much more time-intensive process required by nonstationary $Ҝ_J$ recalibration modeled in Chapter 3, permanent job-downsizing was ultimately rooted in rising wage rents as LEV workers resisted the terms-of-trade shifts. To the extent that higher unit costs could not be passed on to purchasers of large-establishment goods and services, expectations of nonstationary profit were reduced and eventually became unable to support the existing level of productive capability in a range of industries. (See Chapter 6.) The most vulnerable rent-receiving jobs were eventually and rationally downsized, feeding into relatively high and long-duration unemployment.

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[52] It should be noted that in the 1970s the economists at the Federal Reserve Board of Governors were working on an improved model of labor pricing, which anticipated efficiency-wage theory and provided a robust explanations of stagflation and the subsequent downsizing of good jobs. See Annable (1980, 1984).

The stagflation-decade continuous-equilibrium employment and wage path produced by generalized-exchange model fits an extraordinarily broad array of evidence. By contrast, the mainstream explanation of stagflation, i.e., the absence of central-bank low-inflation credibility that unanchored expectations and nominal wages, accommodates almost none of the evidence and consequently makes no sense. The breakdown in central-bank anti-inflation commitment could not, and did not, induce the breakdown in LEV wage recontracting necessary to explain the many millions of involuntary job losers that were at the heart of the episode's welfare loss. The breakdown in central-bank anti-inflation commitment could not, and did not, induce the blowing apart of the wage structure that introduced a critical structural cost component into the necessary adjustment process. Given that most of the stagflation mechanics occur in the large-establishment venue, consensus market-centric SVGE modeling lacks the tools to successfully tackle the stagflation decade. Its explanation of that macro crisis is little more an empty slogan masquerading as a serious analytical conclusion.

Unlike its mainstream counterpart, the coherent generalized-exchange model has no need to suppress inconvenient evidence. If the TVGE model had existed at the time of the early-1970s terms-of-trade shifts, the subsequent stagflation would have been easily predictable.[53] Indeed, the two-venue analysis would have further demonstrated its power by also making sense out of the most under-appreciated part of the stagflation story: What happened next.

After the Stagflation Decade

The stagflation decade, viewed through the lens of generalized exchange, had a critical initial condition and a primary shock that are both ignored in mainstream thinking. The former is the

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[53] The rational generalized-exchange response to labor-adverse real shocks furthermore indicates the existence of a macroeconomic configuration that is the mirror image of stagflation, here named anti-stagflation. The combination of unusually low wage-price inflation and low joblessness is produced by the same class of chronic shocks, but in opposite directions, as stagflation: (a) $\Delta p_L(t)>0$, (b) $\Delta\gamma^n_T>\Delta r^n$, (c) $\Delta\mu<0$, and (d) $\Delta\Phi<0$. That set of chronic disturbances reduces wage rent without job destruction. Shrinking rents are consistent with both lower $U^N(t)$ and inflation as well as higher output, shifting the Phillips curve down and to the left. Diminished price inflation then feeds back into LEV wage determination, further contracting wage rent and favorably shifting the relation between wage growth and joblessness. The labor market becomes more efficient. Anti-stagflation effects, resulting from favorable (to workers) terms-of-trade shifts, more efficient government intervention, or an acceleration of labor-productivity growth, cannot persist indefinitely. Reference wages will eventually adjust upward, or offsetting shocks will occur. But the baseline phenomenon clearly can persist for a substantial period.

compact U.S. inter-industry wage structure (G), reflecting relatively modest LEV labor rents, that was sustained throughout the previous quarter-century.[54] The latter is the large nonstationary terms-of-trade disturbance, which today has little role in academy's stagflation narrative. It is particularly overlooked that the relative-price shock interacted with meaningful wage rigidity to exert downward pressure on trend LEV profits and investment.

By the 1980s, profit expectations ($\Delta H_j < 0$) had fallen below the level necessary to support the existing level of productive capability, inducing permanent job destruction ($\Delta \acute{\omega}_J^T > 0$) that was, after more delay, followed by $\mathbb{K}_J$ recalibration ($\Delta r^n < 0$) and wage givebacks. Rational retrenchment was further aggravated by deteriorating productivity growth ($\Delta \gamma^n_T < 0$), generated by inefficiencies inherent to downsizing as well as weaker investment. The economy experienced a prolonged period of interacting high price- and wage-inflation, elevated unemployment (initially largely attributable to layoffs and central-bank efforts to contain inflation), and an eventual rising incidence of both the downsizing of good jobs and labor-cost bankruptcy in important LEV industries. Difficult, long-lagged permanent job loss and $\mathbb{K}_J$ recalibration, for the most part occurring after the stagflation decade, eventually helped realign labor pricing to profit expectations that were more consistent with full employment.

As modeled in Chapter 3, continuous-equilibrium LEV wage rents remained elevated after the stagflation decade while time-intensive permanent job destruction ($\Delta \acute{\omega}_j^T > 0$) gradually eroded $\mathbb{K}_j$ durability. Many LEV industries sequentially entered a difficult period of cost rationalization, featuring the loss of good jobs and wage givebacks. Significant downsizing and concessions, most famously occurring in a "rust belt" of traditional heavy industries and aggravated by rising imports from Japan and Europe, had not been experienced since the early phase of the Great Depression. The reappearance of the painful downsizing phenomena, on a scale with which there was no postwar experience, excited a great deal of media and policymaker attention. Mainstream SVGE theorists, increasingly challenged to be coherent, looked the other way.

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[54] Annable (1984) has demonstrated that the U.S. inter-industry wage structure was relatively compact (i.e., wage rents were relatively low) at the end of the long 1950s-1960s virtuous cycle and its robust productivity growth. Rents could increase significantly before triggering permanent job loss sufficient to induce rational $\mathbb{K}_j$ recalibration.

BOX 4.3: DOWNSIZING GOOD JOBS

Downsizing is the second, less considered class of involuntary job loss. In coherent SVGE modeling, the phenomenon does not exist. In TVGE modeling, it is a critical macrodynamic adjustment, occurring as part of intermittent, rational, and painful recalibrations of worker reference standards Ʞ. Generalized exchange indicates that downsizing is permanent, affects only LEV Class-I employment, results in substantially reduced worker income, and is signaled by expectations of inadequate profit. The following is from The Downsizing of America *(1996, pp.IX-X), a New York Times book that is subtitled "Millions of Americans Are Losing Good Jobs". Note the imprecise use of the term "layoffs" to denote the very different downsizing phenomenon.*

"Back in the spring of 1995, we began to talk about making sense of what seemed a troubling and enigmatic period for the American worker…. The staggering waves of layoffs that began washing over the country in the late 1970s as corporations merged, downsized, and re-engineered had failed to retreat. And those waves seemed to be crashing over an ever-widening spectrum of Americans – no longer strictly the much battered blue-collar worker, but increasingly the once-impervious highly educated middle- and upper-class managers and professionals, people who never thought they would face want.

"Workers have always lost jobs in America to the churning cycles of the economy, and more jobs were being created than eliminated, but never before had layoffs persisted with such tenacity and in such magnitude in an expanding economy. The picture appeared even more discouraging than that. For two decades, people had seen their wages level off or decline, and now dispossessed were frequently finding that replacement jobs available to them paid appreciably less than their lost positions. Everywhere, people were working longer hours and feeling expendable. The aggregate effect seemed to be a deep-seated pessimism in many Americans, causing people to question what dreams of possibility were available to them and to succeeding generations. These developments were so broad and abstract that trying to picture them was like peering at the sky through a thick gauze pad….

"The picture we found is not a pretty one. To be sure, there are many chief executives and economists who argue that downsizing is for the national good, simply part of the ultimately salubrious forward march of capitalism. Let the efficient displace the inefficient. Take a good look at the improving economic indicators, they say, and you'll see we're doing quite well, thank you."

Summing Up

To economists working on the broad market failure that occurred during the stagflation decade, the confluence of labor-adverse terms-of-trade shifts produced a macroeconomic version of a

perfect storm, generating rising wage rents and a protracted period of painful LEV adjustment. Contemporaneous economic thinking is documented in a number of post-1973 stagflation studies in OECD countries.[55] Helliwell (1988) provided an overview of those studies that features convergence around a three-part stagflation process:

- Labor-adverse shifts in the terms of trade reduced the workers' real wage that is consistent with full employment.

- Actual real wages did not shift down by a corresponding amount.

- Wage rigidity necessitated a combination of increased inflation and unemployment to enable least-cost macrodynamic accommodation of the terms-of-trade shocks.

TVGE, but not SVGE, labor pricing usefully microfounds the contemporaneous stagflation analysis. Moreover, generalized exchange introduces an interesting fourth part of the process by linking rising unit labor costs to increasingly pessimistic LEV profit expectations, eventually leading to job destruction and Ҟ recalibration. Stagflation produced sharply higher LEV labor rents that in turn generated, with significant, inherent lags, widespread employment downsizing, wage givebacks, and a relatively high incidence of labor-cost bankruptcies. In general, recalibrated Ҟ remained sufficiently sized and durable to continue to support cyclical downward wage rigidity and annual upward adjustments. But the new-found credibility of permanent job loss greatly damaged employees' capacity to resist, going forward, adverse terms-of-trade shifts.

There exists no level of aggregate demand that reconciles, on the one hand, the wage-structure dynamics that resulted from widespread LEV resistance to the 1970s shifts in labor's terms-of-trade and, on the other, profit expectations sufficient to support full employment. Altered relative wages is a real disturbance that has real consequences, a process that has nothing to do with inflation expectations. Forcing the necessary restructuring, featuring a perfect storm of collapsing trend-profit expectations, downsizing existing capacity, wage givebacks, and bankruptcies described as a continuous decision-rule equilibrium process in Chapter 3, to occur entirely in 1974-75 would have unacceptably risked the huge welfare cost of depression. (For an

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[55] See, for example, Sachs (1979), Malinvaud (1982), and Bruno and Sachs (1985).

elaboration, see the GEM Extreme Instability Model constructed in Chapters 6 and 10.) While job downsizing rationally, but with significant lags, stabilized real labor costs, monetary authorities properly accepted a period of simultaneously high unemployment and inflation.[56]

Great disruptions that episodically challenge stabilization policymakers are frequently linked over time. One sets the stage for the next. As described by TVGE macrodynamics, the global imbalance of production associated with World War II helped produce a productivity-led virtuous cycle in the United States. The postwar prosperity segued into the stagflation decade that began in the early 1970s, which was followed by the painful downsizing that especially characterized the 1980s. Downsizing produced outsized welfare loss, is as difficult as the 1930s depression for SVGE thinking to explain, and is embarrassingly ignored by macro theorists.

VI. CONCLUSION

In the most recent updating of the *Handbook of Monetary Economics*, Mankiw and Reis (2010, p.222) typically frame of the fundamental macro question of why money matters in a way that restricts, and ultimately defeats, an adequate answer: "Since the birth of business cycle theory, economists have struggled with one overarching question: What is the nature of the market imperfection, if any, that causes the economy to deviate in the short run from full employment and the optimal allocation of resources? Or, to put the question more concretely and more prosaically in terms of undergraduate macroeconomics: What friction causes the short-run aggregate supply curve to be upward sloping rather than vertical, giving a role to aggregate demand in explaining economic fluctuations?"

An adequate answer to why money matters turns out to be inconsistent with modern theorists' consensus assumption, illustrated by Mankiw-Reis, that optimizing exchange occurs wholly in the marketplace. That universal, unexamined, and ultimately untenable belief implies that the

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[56] Outside the United States, many governments exploited established institutional mechanisms to directly influence the recalibration of employee reference standards. A number of economists, largely European, have proposed the Corporatism Hypothesis that asserts the direct intervention of government into centralized collective bargaining, internalizing negative externalities in the formal wage bargaining process, improved national macro performance during the global stagflation crisis. See Chapter 7.

channel through which nominal disturbances induce deviations from full employment must be motivated by one or more model-coherent market frictions. Candidate frictions problematically confront, and are always overwhelmed by, rational employer offers to cut wages in lieu of job loss. If the reduction does not violate employee opportunity costs, it is rationally accepted.[57]

Wage recontracting provides a stonewall SVGE line of defense against the failure to realize gains from trade and cannot be ignored in coherent continuous-equilibrium macro modeling. Yet, it has become clear that recontracting, and consequently model coherence, must be ignored if rigorous market-centric thinking is to be stabilization relevant. That conundrum plagues formal modeling throughout the *Handbook of Monetary Economics* (2010). Meaningful wage rigidity is necessary for the existence of involuntary job loss but cannot itself exist in coherent SVGE thinking. The mainstream response to that macro muddle has been to construct and use models that push aside the rational treatment of wages. The discomfiting, ostrich strategy obscures, but cannot eliminate, the conundrum and its debilitating effects on modern efforts to derive operational stabilization theorems.[58]

The alternative to ignoring the most pressing problem in monetary theory is to get serious about modeling meaningful wage rigidity. It should be encouraging that the necessary content of any serious effort has been understood by practitioners for a long time. During the century and a half since the Second Industrial Revolution, rational workplace exchange has suppressed wage recontracting for an ever-increasing share of the global labor force. MWR, formally derived, implies that LEV labor-market opportunity costs are chronically and variably below labor's marginal value product. Chronic continuous-equilibrium wage rents have pushed workers off

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[57] If it does violate opportunity costs, the worker quits; and the job separation is voluntary.

[58] Gali (2010), burdened with a topic (monetary policy and unemployment) that affords little place to hide, provides the only modeling of nominal wage rigidity in the fifteen hundred pages of the 2010 *Handbook of Monetary Economics*. His SVGE treatment amounts to little more than drawing attention to the cyclical behavior squeezed out of voluntary joblessness by S/M/B theorists and positing implausible restrictions, usually of the Calvo (1983) variety, on the incidence of wage recontracting. Gali's S/M/B analysis cannot accommodate involuntary job loss, implying endogenous cyclicality must be sufficiently mild never to generate forced employment separation. Nor does he confront the requirement (in part to weed out convenient implausibilities) that continuous-equilibrium modeling derive significant restrictions from model primitives. His policy-relevancy results from free parameters that ultimately differ little from those used by the Early Keynesians. The critical assessment largely results from Gali having done his job. His inattention to the most critical issues of labor pricing accurately portrays the low status of wage rigidities, once recognized as the centerpiece of macro theory, in modern mainstream thinking.

their notional market-supply schedule, thwarting optimization at the leisure-consumption margin. In large, complex workplaces, employees instead optimize their discretionary OJB with respect to axiomatic preferences. Recognition of such conduct is today being forced into mainstream macro theory by behavioral economists.

MWR uniquely microfounds the macro channel that, when combined with sufficiently adverse shifts in nominal demand, induces recognizable recession-sized jumps in involuntary job loss. (Recall Table 1.1) Stepping back, it is easily seen that a distinguishing TVGE innovation has been to insist upon preferences and technological constraints that are truly axiomatic. Taking that central tenet of formal modeling seriously would enable mainstream theorists to identify wage recontracting as the overarching problem in modern stabilization-relevant monetary modeling. Moreover, mainstream economists must take care to understand that the reconstruction of labor supply to accommodate workplace exchange and its rational suppression of labor-price recontracting is rooted in rational behavior, consistent with accepted practice in modern economics. Rational choice powerfully organizes the model coherence that, along with stabilization-relevance, has been promised and delivered in the GEM Project.

Literature. Postwar macroeconomists' analysis of labor pricing, conducted within the mainstream SVGE framework, has featured two interrelated lines of inquiry,

- The existence and explanation of directional asymmetry in nominal wage change, i.e., that a significant share of money wages are upward, but not downward, flexible; and

- The determinants of nominal wage change, with emphasis on the proper role of labor-market conditions and product-price inflation.

Franco Modigliani (1944) identified the first problem set as the keystone of Keynesian analysis, motivating mainstream stabilization thinking in the early postwar period. It was, however, the second problem set that has generated the most fierce academic debate, sequentially motivated by the finding by A.W. Phillips (1958) of a relatively stable inverse relationship between unemployment and the rate of money-wage change for a century of U.K. data, the introduction by Edmund Phelps (1968) and Milton Friedman (1969) of the natural rate of unemployment into

the labor-pricing equation, and Robert Lucas's (1972) use of wage-price dynamics to demonstrate macro implications of the class of rational expectations hypothesized by John Muth. Over more than a half century, the capacity to accommodate fundamental macro innovations has made the Phillips curve the single most controversial relationship in macroeconomics.

The most consequential development, in that it destroyed the working consensus constructed around the Neoclassical Synthesis and eventually banished Early-Keynesian thinking from serious macro research, was the broad acceptance of Lucas's formulation of expectations. The new restriction on how to properly do macroeconomics rendered adaptive expectations unacceptable and scrapped the stop-gap Neoclassical Synthesis. But the new consensus came at significant cost. Once reworked to substitute full-information inflation expectations for catch-up to past price change, the Phillips relation became incapable of producing the sort of wage-price inertia evident in the data. Absent inertia, nominal shocks generate unrecognizably abrupt adjustments. Helping theorists climb out of the restrictive SVGE box, this chapter has shown that the New-Classical reworking of the Phillips model is fundamentally flawed. Generalized exchange informs a much superior version, formally rehabilitating wage catch-up to past inflation, reworking the influence of labor-market conditions on labor pricing in order to accommodate two heterogeneous venues of wage determination, and microfounding meaningful wage rigidity. The derivation of the MWR version of Modigliani's wage-rigidity keystone, not the rationality restriction on expectations, motivates the coherent, stabilization-relevant specification of Phillips wage dynamics produced in this chapter.

Workplace-Marketplace Synthesis. Early-Keynesian macroeconomics, organized by the stopgap Neoclassical Synthesis and always featuring some form of wage rigidity, was demonstrably useful to stabilization policymakers. But, given that the postwar theorists continued working wholly within a single-venue (marketplace) framework, meaningful labor-price rigidity could only be assumed, never derived. The Neoclassical Synthesis, as a result, was fundamentally flawed, depriving the Early Keynesians of the analytical anchor of model coherence. For many theorists of the generation that followed, incoherence was too high a price to pay for endogenous involuntary job loss.

Once stabilization irrelevance is also recognized as too-high a price to pay for the comfort of familiar SVGE modeling, the modern New Neoclassical Synthesis will be seen (like the original version) as a way-station rather than a final destination. The hard fact is that mainstream coherent modeling is inherently inadequate to the task of informing monetary authorities. Rigorous, stabilization-relevant modeling requires the generalization of exchange. Macro thinking must accommodate what is known about the management of complex enterprises, extending the formal economic method to optimizing, price-mediated workplace exchange anchored by intertemporal general equilibrium.

The necessary scope-of-exchange innovation will be resisted. The beautiful coherence of the SVGE model class makes it especially dear to macro theorists. But that intricate market-centric framework has become, in the aftermath of the Second Industrial Revolution, the enemy of stabilization relevancy. The huge welfare cost of recession, stagnation, and depression cannot properly explicated by continuous single-venue equilibrium. We must let go of the wonderful universal equality of the wage paid, the value of labor's marginal product, and the value of labor's time. Stabilization-useful theory cannot, with apologies to Lucas as well as the New Keynesians questing after the Super Friction, take neoclassical (SVGE) labor supply seriously.