

FUNDAMENTAL TRANSFORMATION AND CONTRACTUAL REFERENCE POINTS IN A SHAPIRO-STIGLITZ WORLD

VIVIAN CARSTENSEN *

* Bielefeld University ASC, Campus Bielefeld,
Interaktion 1, D-33619 Bielefeld, Tel: +49521.106.3742,
Email: vivian.carstensen@fh-bielefeld.de;
Leibniz University Hannover, Email: carstensen@mik.uni-hannover.de

Motivated by evidence of resilient labor markets and common characteristics of industries hit hardest by the Great Recession, this paper develops a rationale for smoothed disposable income in long-term employment relations. Through the lens of repeated moral hazard it provides a testable explanation for a cooperative lock-in of behavior and contributes to the twofold-role-of-wages literature with a third role—the role of aligning entitlement perceptions. Refining the discipline setting in Shapiro-Stiglitz's landmark model, it shows that incentive compatibility imposes Williamson's fundamental transformation from ex-ante competitive setting to ex-post bilateral dependency, justifying to integrate the Hart-Moore (2008) model of contract-contents-as-reference-points: Quality consistent efficiency wages determine employees' perceptions, equivalently constituting a contractual reference point. The third role of wages then predicts non-pecuniary shock absorption, correspondingly cushioning jobs and maintaining critical product quality. Following testable predictions derive from the sequential contract game: (1) Binding quality norms in production fundamentally transform competitive labor contracts into long-term employment relations and release reciprocal reference points as contract enforcement device, considerably protecting (i) employees' remuneration from economic shocks and (ii) product quality from productivity shocks. (2) Corresponding labor market segments are characterized by sine-qua-non quality standards and fairly smoothed equilibrium unemployment (rates). Reputation denotes an important success factor, in turn imposing a severe negative impact on individual firms suffering from reputation loss, e.g. resulting from shading in response to CRP violation, with likely industry-wide spillovers. (3) Quality and incentive compliant shock adjustment of labor involves safeguarding of jobs with transmission channels at the intensive margin, eventually leading to labor market resilience (in terms of OECD (2012), where the model uses the two dimensions formalization with (absorbing) a) changes in total earnings and b) changes in the unemployment rate. *JEL*
Codes: D86, D23, E24, J41.

Keywords: labor market resilience, efficiency wages, fundamental transformation, reference points, equilibrium unemployment, great recession

I. INTRODUCTION

This paper provides a theory for answering questions related to resilience of labor markets, with resilience operationalized as *alleviated transmission of shocks to remuneration and employment (extensive margin)*. Why do firms voluntarily practice labor hoarding? Why do employees earn fairly stable incomes despite varying labor productivity? What establishes long-term employment relationships with locked-in wages? Well-received studies on the impact of initial labor market conditions and micro-level institutions on declining fluidity, worker retention patterns and general adjustment capability of labor markets—particularly in the Great Recession (GR)—underline the relevance of these questions (Molloy et al. 2016, Daly and Hobijn 2015; Burda and Hunt 2011; OECD 2012, 2014; and European Commission 2015, 2016).¹

¹ Prior to the Great Recession, e.g., Auer and Cazes (2000) interpret evidence of long-term employment relations that govern consistent combinations of job stability and intra-firm worker mobility in context of resilience. Work related to business volatility and reallocation points to co-moving decline in job destruction and unemployment inflows (e.g., the steady-state framing in Davis et al. 2010). Nevertheless, previous work also identifies challenges attributable to jobless growth and erosion of employee tenure in the decade before the Great Recession (for an overview see the special issue “Changes in Job Stability and Job Security” of the Journal of Labor Economics (1999, edited by Neumark); Neumark 2000, and Farber 2010).

Studies in the wake of the Great Recession report country- and gender-heterogeneity and mixed results. Weakened labor markets and massive job destruction are observed as is muted job reallocation accompanied by wage rigidity and stable employment relations, coherent shock adaption menus, and cushioning of disposable income during recession. (cf. Elsby et al. 2013; and the 2016 special issue “Labor Markets in the Aftermath of the Great Recession” (JOLE 34, S1, guest-edited by Card and Mas) for a comprehensive collection).

Given the export-oriented—technology-dependent—nature of firms hit hardest by the severe drop in demand during the GR (outside both the finance sector and building and construction industry; Möller 2010, 2012), my model integrates an immutable quality norm as a sine-qua-non restriction and is set up as a sequential game under repeated moral hazard. Refining the discipline setting of the Shapiro-Stiglitz shirking model, the analysis integrates insights from institutional and organizational economics and behavioral contract theory (Shapiro and Stiglitz 1984; Williamson 1985, 2002; Tadelis and Williamson 2012; and Hart and Moore 2008). Given that the success of a firm repeatedly critically depends on matching a well-defined standard, such as a predetermined product characteristic or environmental impact requirement, the overall message of the subsequent analysis is that appropriate contracts have a threefold function of wages.

In addition to the well-established functions of allocating resources (Walrasian perspective) and incentivizing under asymmetric information (no-shirking perspective), the third function aims at mitigating ex post conflicts between contract parties (behavioral perspective). The conflict mitigating objective is founded on behavioral contract theory and adds

Studies concerned with firm-level decision making recognize a central role of institutionalized wage setting procedures and company-level institutions aiming at muting reverse employment effects (e.g., Möller 2010; Gal et al. 2013). Moreover, some conclusion has been reached that ex ante contracted internal labor flexibility at zero cost along the hours margin—institutionalized in working time accounts—may play a significant role in the resilience landscape, with likely benefits for both firms and workers (Bellmann and Hübler 2015; Burda and Hunt 2011; Carstensen 2001, 2013; Rinne and Zimmermann 2012). Related analysis of organizational flexibility and nonstandard work arrangements can be found in Kalleberg (2001, 2003) and Wenger and Kalleberg (2006).

aligning of entitlement perceptions of firm and worker as the third role of wages. Given the specific nature of the incentive problem with the immutable norm, parties contract on a specific (remuneration-appropriate performance)-schedule that fixes norm-compliant effort as one and norm-compliant wage as the other component in advance (immediately relating the model to Hart and Moore 2008 who introduce the contract option of fixing the price in advance in order to preventing ex post disagreement, apparently at the expense of the allocative function of prices). The wage setting process is such that the firm's entitlement is nested within the—frozen—employee's entitlement. Taking up their third role, wages then add an enforcement device; and the labor market projection of recurrent alignment of entitlement perceptions eventually adds to explaining the simultaneous safeguarding of jobs and disposable income.

Taking into consideration its constituting characteristics, the model will be denoted as FTRP_SHST—the fundamental transformation (FT) and contractual reference points (CRPs) refinement of the shirking model. It implements the behavioral concept of what determines an employee's reference point into an institutional and organizational economics framework with strictly quality-norm constrained production. Taken together, my analysis enriches existing work by showing how three influential approaches can be consistently integrated: (i) the shirking model of efficiency wages as baseline for FTRP_SHST (Shapiro and Stiglitz 1984—henceforth, SHST), (ii) the FT perspective of transactions (Williamson 1985, 2002; and Tadelis and Williamson 2012), and—leading

to the third role of wages—(iii) the contracts-as-reference-points approach (Hart and Moore 2008—henceforth, HM).

To be effective, the third role of wages requires existence of FT. Here, FTRP_SHST contributes with a rationale for FT. Not proving the existence of a competitive outset—i.e., ad hoc assuming FT (as the HM model does)—raises the question of how robust the major behavioral predictions of the contract-as-reference-model are to violations. Related experimental evidence reveals that pre-contract competition is, in fact, a critical assumption in HM, in the end being responsible for low impairment levels (Fehr et al. 2009, 2011). Therefore, deriving the rationale for FT adds to the literature, since what makes the difference between (a) a contract whose contents establish a reliable reference base for anchoring behavior—i.e., justifying to use HM’s findings on lock-in effects of reference points—, and (b) vulnerable contracts with respect to disagreement and renegeing, is whether FT has materialized. Here, FTRP_SHST shows that the no-shirking constraint exactly makes this difference, as its inherent threat erodes initial competition. Altogether, the quality-norm compliant labor discipline employment contract enacts contract regime (a), hence, specifies reliable reference elements (the CRPs package) that mutually commit contract parties and finally launch the third role of wages.

The third role of wages is embedded in contracts and is equal to the property of aligning well-defined and robust entitlement perceptions. Well-defined means that reciprocal entitlements are determined within quality and incentive consistent contracts. Robust means that they are not subject

to renegotiation (as the norm is immutable). Intuitively, the double impact of the firm's wage setting decision on both worker's reference wage and her effort behavior imposes FT, then implementing coincidence of CRPs and, further, locking in parties' perceptions in contracted entitlements—the latter given by the signed quality norm and payment. The third role is strongly related—but not limited—to the third introductory question (long-term employment relations entailing a behavioral lock-in). Furthermore, it contributes to explaining voluntary labor hoarding and resilient worker income (first and second question). It can be shown that, in the presence of transitory shocks, reciprocal reference points settled in employment contracts govern intertemporal smoothing of income and safeguarding of living standards. Shock adjustment in accordance with the third role of wages contributes to the resilience debate. From an implementation theory perspective of mechanism design, maintaining the third role of wages adds an appropriate mechanism, given the social objective of providing sustainable job slots and alleviated job destruction.

The paper is organized as follows. The next section refers to related literature and sets up this paper's definition of labor market resilience (LMR). Section III intuitively motivates the model, presents its setup, proposes the main results, and derives testable hypotheses. Section IV discusses key implications of the threefold role of wages approach, proposes a re-interpretation of the VW diesel scandal based on failure of the third role, and considers limitations. The final section concludes.

II. RELATION TO THE LITERATURE

Non-Walrasian wage setting procedures, corresponding labor market equilibria and, in particular, the employment-wage puzzle have been on the research agenda for some decades. Both static and dynamic models have been developed and calibrated to uncover equilibrium unemployment and simultaneity of rigid or sluggish wages and too volatile employment (for an overview see Weiss 2014).² Especially since the Great Recession (GR), another challenging phenomenon—jointly alleviated employment and income responses to output shocks—is increasingly recognized and subsumed under the issue of labor market resilience (LMR). While some consensus has been achieved that LMR is empirically relevant, related theoretical research is still at an early stage (e.g., Groshen 2016).

This paper intends to help filling this research gap with the threefold function of wages approach. It is related to existing work as follows. First, the concept of wage references and effort norms is also known from the gift exchange literature that, further, increasingly integrates worker utility from over-performance in terms of reciprocating payment levels that exceed some norm with co-moving effort levels (Akerlof 1982; and Danthine and Kurmann 2006, 2007). Moreover, fair wage effort models within the framework of stochastic dynamic general equilibrium models significantly add to resolving the employment-wage puzzle but are less

² Moreover, reluctance of firms to cut pay during recessions in order to maintain worker morale is well documented (e.g., Bewley 1999).

suitable within the resilience context (Collard and de la Croix 2000). Contrary to the rent-sharing or shifting-norm mechanism that is inherent in the gift exchange literature, the fundamental transformation and contractual reference point refinement of the shirking model starts with an immutable effort norm, resulting in a frozen wage norm. Moreover, parties contract on a well-specified reference points package that comprises appropriate effort as one element (of entitlement perception).

Second, the third role of wages relies on the identifying property of the norm compliant contract of initializing the package of mutual entitlement perceptions. In this vein, it points to a specific variant of status quo bias, where, departing from previous work, the robust and reliable status quo is determined and signed in advance (cf. Kahneman and Tversky 1979; Samuelson and Zeckhauser 1988; or Tversky and Kahneman 1991). As a result, the model admits an *iron link* between a worker's entitlement perception and employment slot, likely encouraging employees to committing to, e.g., mortgage payments, finally reinforcing the status quo.

Third, following the internal logic of the resilience explanation proposed by FTRP_SHST derives two intermediate results, namely the transition from competitive outset to lock-in in bilateral dependency (FT) and, further, the implementation of the package of entitlement perceptions (CRPs package). FT of contracts from (a sequence of) competitive spot auctions to bilateral monopoly is introduced by Williamson (1979) in the

asset specificity context of transaction cost economics.³ Hence, the proof of FT in this paper clearly deviates from the specificity approach. In particular, it is based upon quality-norm constrained incentive premiums and the fact that such premiums embody crucial elements of the other contract party's objective function, ultimately establishing a reciprocal lock-in of behavior. Having provided the rationale for FT then justifies to build on insights from Hart and Moore (2008) who derive contracts as reference points that ex ante fix the price as renegotiation proof content.⁴ FTRP_SHST refines Hart and Moore's analysis in the sense that the transition from ex ante competition to ex post bilateral dependency relation, which is essential for the CRPs package property, does not enter as a critical assumption but is derived along the wage determination process. Technically speaking, the incentive constraint initially erodes competition, while the immutable quality norm finally imposes FT.

Through the lens of stylized facts this paper is motivated by post GFEC evidence of mitigated transmission of output shocks to labor markets and

³ See Williamson et al. (1975) for the "insider's first-mover advantage over outsiders" as predecessor of the term "fundamental transformation". Subsequent work directly addressing FT includes Williamson (1985, 2002); Tadelis and Williamson (2012); Caballero and Hammour (1996); and Nicita and Vatterio (2014).

⁴ The broad intuition behind contract contents to become reference points is as follows. By reducing the large a priori set of outcome possibilities to a small collection of contracted outcomes, contract parties' perceptions of what being entitled to during contract execution are determined. At the extreme, a contract permits exactly one outcome by fixing it in advance, i.e., determining an entitlement. If during execution, however, a party feels not adequately treated in comparison to the entitlement, that party refines one's contribution from appropriate performance to inferior performance.

focuses on the phenomenon that has become known as labor market resilience (LMR). Existing work shows considerable consensus on the intuition of LMR, notwithstanding the lack of a formal definition of resilience (recently, Martin and Sunley 2015 survey and clarify concepts of regional economic resilience). Given this paper's objective of deriving a rationale for smoothed disposable income in stable employment relationships, we adopt the working definition of LMR suggested by OECD: "defined as the extent to which labor markets weather economic downturns with limited social costs" (OECD 2012: 53) and, further, "defined in terms of worker welfare rather than productive efficiency ... since stable consumption paths are associated with higher welfare than more volatile consumption paths that follow the same long-term trend" (OECD 2012: 57). Moreover, the benchmark report of the INSPIRES project⁵ draws specific attention on LMR's capacity of alleviating the impact of adverse shocks on employment and wealth (Bigos et al. 2014).

In this vein, the FTPR_SHST model takes the stable-disposable-income-and-living-standard perspective of LMR as point of departure. Strictly speaking, the model's definition of LMR comprises following two constituting dimensions:

⁵ INSPIRES stands for Innovative Social Policies for Inclusive and Resilient Labour Markets in Europe, a joint research project of thirteen universities in eleven European Union countries, financed by the European Community's Seventh Framework Programme (Socio-economic Sciences and Humanities: FP7-SSH-106759). Project description is available at EC CORDIS site: http://cordis.europa.eu/project/rcn/106759_en.html.

- (absorbing) changes in total earnings, and
- (absorbing) changes in the unemployment rate.

Hence, FTRP_SHST formalizes LMR as coincidence of wage rigidity and sluggishness of unemployment rates (at least at industry level), and proposes an explanation of the, to a certain extent, unprecedented phenomenon. The model does not include cycle sensitive policies of unemployment insurance or benefits; and total earnings are fully paid by the firm. So the three-roles-of-wages approach of this paper devises a stand-alone institution of incentive and shock management at the company level, irrespective of government action.

Related empirical post GFEC literature is threefold. First, work addressing Okun's Law tentatively points to generally muted transmission of GDP shocks to employment when controlling for institutions and country-heterogeneity but also reveals considerable sensitivity to revisions of federal data (Ball et al. 2013; Cazes et al. 2013; Herzog 2013; Daly et al. 2014). Moreover, OECD employment outlook series illustrates that the resilience phenomenon is not unique to one or two specific economies (OECD 2012, 2010; Gal et al. 2013). Second, the literature on job reallocation and worker reallocation has studied job creation and destruction as well as worker flows in detail. While data prior to the 2001 recession suggest countercyclical movement of separation and rather stable hiring rates (cf. Davis et al. 1998; Davis and Haltiwanger 1999), more recent work reveals generally muted reallocation and a long-lasting process

of decline in labor market volatility (Molloy et al. 2016; Davis et al. 2012; Foster et al. 2016; and Davis and Haltiwanger 2014). Similar findings with respect to ins and outs of unemployment can be found in Davis et al. (2010) who also point out that the steady state unemployment rate might have generally dropped. Third, studies of external vs. internal adjustment strategies of labor address the interplay of internal flexibility, labor productivity, and willingness to maintain employment relationships (e.g., Islam and Verick 2011; ILO 2011; Elsby et al. 2010). In sum, the literature suggests that the drop in fluidity and evidence of muted shock transmission deserve theoretical analysis at the micro-level, paying particular attention to the decision making units and their renegotiation opportunities.

Stepping back to core characteristics of the GFEC (collapse in international trade, especially in the automotive industry, cf. Levchenko et al. 2010; and IMF 2011), our basic setup integrates a technological constraint, formalized as sine-qua non product quality norm (indirectly relating FTRP_SHST to the wage curve literature, see Blanchflower and Oswald 1994, 1995). Taken together, the employment contract in FTRP_SHST balances the trade-off that is inherent in the threefold function of wages approach: (1) factor allocation, (2) incentive provision following a labor discipline efficiency wage approach, and (3) the objective of aligning entitlement perceptions. The property that contracts bilaterally lock in entitlements and job stability is the key to the resilience explanation this paper aims at.

Against this background, my approach is firmly linked to Shapiro and Stiglitz (1984) and to Hart and Moore (2008). Addressing a crucial question not solved in Hart and Moore, this paper adds with a proof of FT, ultimately justifying the FT lens of contracts, through which the model then uses behavioral concepts to better understand the role of norm embedded incentives for reshaping quasi supply functions of labor. FTRP_SHST logically splits the dynamic programming steady state layout of the shirking model into a sequential contract game setting. While SHST work with a greenfield perspective of a profit maximizing firm (choosing the optimal hiring decision, given workers' shirking strategies), and then study aggregate labor market effects, the sequential game perspective formalizes spells of repeated execution to examine contract partners behavior and consistent handling of temporary shocks along that timeline.

III. THE MODEL

III.A General Objective

The analysis of contract design, signing and repeated execution follows the labor discipline type of efficiency wages. Within a repeated moral hazard framing, it integrates quality constrained incentive setting, with an exactly to match norm. Given the nature of that quality constraint, firms and workers will explicitly contract on the norm, unambiguously entering bilateral dependency relations (launching FT). Integrating the Hart-Moore theory of contracts as reference points and performance habits further

shows that a norm consistent efficiency wage contract initializes a package of mutual entitlement perceptions (contractual reference points, CRPs). Aligning them refers to the important third function of wages, with an embodied norm enforcing device. The model derives testable hypotheses regarding behavioral lock-in and adjustment channels in long-term employment relations.

III.B Timing of the Contract Game and Basic Assumptions

Departing from the greenfield perspective in SHST, FTRP_SHST views through the lens of repeated moral hazard. The timing of the sequential contract game is as follows (see Figure I). Initially, firms face a competitive labor supply pool (stage 0), and design their profit maximizing efficiency wage contract offer at stage 1, subject to workers' preferences and technological constraints (including the quality norm). The distinguishing feature of the model is that technology imposes a norm target that directly translates into feasibility properties of contracts in terms of a quality-norm consistent no-shirking constraint.

[Insert Figure I Here]

Stage 2 then covers a labor supply pool member's decision to accept or reject. The worker joins the firm and the perspective shifts from choice to contract, thereby launching a FT from an ex-ante competitive labor market setting that merely accounts for workers' outside options to a bilateral dependency relation between employer and employee. In stage 3 the rigid

contract initializes a package of reciprocal CRPs, with (i) effort standard according to the immutable norm (firm's reference point) and (ii) quality-norm consistent payment level (employee's reference point).⁶ Together, stages 2 and 3 constitute the *from lens of choice to lens of contract* phase, in the end providing Propositions 1 and 2.

Contract execution stage 4 (first ex-post stage in FT notation) addresses the alignment of CRPs at the micro level, where the parties' reciprocally contribute quality consistent effort and contract conform remuneration (HM denote such behavior as performance in the spirit of the contract). In terms of the impact of the quality consistent no-shirking wage gap at the macro-level, stage 5 identifies equilibrium unemployment on the labor market, where flows into unemployment follow an expected rate and realize through separation (shocks). Finally, stage 6 covers CRP consistent shock transmission under repeated execution.

FTRP_SHST essentially maintains the Shapiro-Stiglitz world, involving the representative principal and agent setting in a stylized general equilibrium model with competitive product market, (initially) competitive labor supply, and absence of matching frictions between worker and job characteristics.

The model assumptions are:

⁶ The one-to-one relation between an employer and a single employee easily extends to a setting with many employees within a given firm and also to a multi firm setting.

- [A1] Decisions are made by firms and workers. Firms demand labor and design wage-effort schedules (w, e) to attract employees. Workers supply labor and choose effort $e \geq 0$, including accepting or rejecting a contract offer. Employed workers earn income w . Any unemployed receives unemployment benefit and exerts zero effort (workers' outside option). Reservation utility from outside option is w_{ub} .
- [A2] Suppose a single product technology $Q = Q(L; A, K_A)$, with labor L as the only variable input in the short run, given equipment K_A and level of technology A . Let $Q_L > 0$, and $Q_{LL} \leq 0$, with L denoting employees working in an individual firm (efficiency units notation). Output is sold on a competitive product market at unit price p , provided that Q meets the immutable quality norm qtc. To implementing qtc, critical effort standard e_{qtc} immediately derives.
- [A3] Effort e imposes convex disutility $c(e) \geq 0$, with $c(0) = 0$, $c'(e) > 0$, and $c''(e) \geq 0$. Suppose $e \in [e_{min}, e_{max}]$ and normalize $e_{min} = 0$. Denote $e = 0$ as shirking and $e = e_{qtc}$ as exerting quality consistent performance (i.e., appropriate effort), with $0 < e_{qtc} \leq e_{max}$. Fix inferior quality effort $e_{qti} > 0$, not consistent with the quality norm but with $c(e_{qti}) = c(e_{qtc})$.⁷
- [A4] Information about effort is incomplete and asymmetrically distributed. The firm can engage in costly monitoring technology m , imposing probability $q(m) < 1$ to detect whether an employee shirks with zero effort $e = 0$. For

⁷ Using a pre-booked catering service that chooses to deliver food of minor quality as example, HM illustrate the idea of inferior effort. Design and implementation of a dual-program of NO_x emission control with a sophisticated algorithm to identifying whether a vehicle is tested under laboratory conditions but otherwise systematically violating U.S. emission standards probably denotes another example. We will come back to the latter in the Implications section.

an employee, being caught shirking means being dismissed and entering the pool of unemployed workers. Monitoring costs are not affected by the number of employees.

[A5] Interest rate r measures discounting.

[A6] Labor market is given by the aggregate of representative firms and workers (e.g., at the sectoral level). Assume an exogenous rate s of being separated from the current firm. Supposing a steady state equilibrium with constant labor force participation and no job-to-job transition, outflows from unemployment $f \cdot U$ equal inflows to unemployment $s \cdot E$, with the size of the unemployment pool $U = N - E$, transition rate f from unemployment to employment, $E = \sum_{j=1}^M L_j$ as total number of employed persons in all M firms, and N as the (sector's) working population.

Notice that $f \cdot U = s \cdot E$ implies the steady state unemployment rate $u_{st} = s \cdot (s + f)^{-1}$, which increases with s .

[A7] Any representative firm maximize its individual profit. Any representative workers maximizes individual utility (separable into utility from remuneration/consumption and disutility from exerting effort).

Assumptions [A7], [A1] and [A5] are rather standard, with w_{ub} as outside option and r reflecting intertemporal preferences. While not unique to our analysis, the quality norm in [A2] crucially affects subsequent results (cf. Blanchflower and Oswald 1995, page 161 who denote effort, constrained by production technology, as “a fixed number determined by technology”). Assumption [A3] on effort classification within the no-shirking regime relates to reference point driven performance adaption. The distinction between quality-norm consistent effort e_{qtc} and inferior quality

effort e_{qti} covers HM's distinction between consummate performance in the spirit of the contract and perfunctory performance.⁸ We maintain HM's presumption that any mistreatment being perceived by an employee in terms of a shortfall of compensation will be immediately neutralized by a well-defined withholding-of-effort penalty. Notice that the zero disutility-differential $c(e_{qti}) - c(e_{qtc}) = 0$ reflects the credibility of retaliation.

Shirking detection technology is addressed in [A4]. Assuming monitoring costs as independent from the number of employees simplifies normalizing workforce and output in terms of efficiency units. Assumption [A6] relates to the steady state notion of equilibrium unemployment and facilitates equilibrium analyses in the unemployment-remuneration notion of the labor market.

III.C Fundamental Transformation and Contractual Reference Points

By solving stages 0 to 4 step by step, the model derives FT (Proposition 1) and CRPs (Proposition 2) in the Shapiro-Stiglitz world and develops the third role of wages (Definition 1), finally achieving cooperative lock-in of contract parties in long term employment relationships (Hypotheses 1 to 4).

⁸ The term consummate cooperation in contrast to perfunctory cooperation traces back to Williamson et al. (1975). While consummate performance/cooperation means exerting appropriate effort and satisfying the quality standards, perfunctory performance/cooperation fails such standards despite meeting the crude output level. Notice that only the latter is third party enforceable.

Our point of departure is the initial stage of a labor market with a labor supply pool that takes wages as given. In the contract design stage, a firm considers the individual participation constraint (PC) of a worker. In addition to PC, firm's contract offer includes the incentive constraint (IC). Respectively aggregated over the population of firms and workers, PC and IC add up to the steady state no-shirking condition (NSC). Next, recall that selling the product critically depends on matching immutable norm q_{tc} ([A2]). Therefore, (1) PC, (2) IC, and (3) NSC need further specification in the sense that the quality norm imposes e_{qtc} as a sine-qua-non condition on effort, defining three embodied correspondences: (1*) quality consistent participation constraint EPC, (2*) quality consistent incentive constraint EIC, and (3*) quality consistent no-shirking condition ENSC. While equations (1*) to (3*) are unique to the fundamental transformation and contracts as reference points extension of the shirking model, equations (1) to (3) trace back to the original Shapiro-Stiglitz approach.

Stage 0: Initial Setting.—Participation constraint PC corresponds to a family of competitive labor supply functions, where the different effort levels specify the y-translation parameter. PC defines the payment necessary to motivate an arbitrary worker to be willing to enter the firm and is given by

$$(1) \quad w_{pc} = w_{ub} + c(e) \quad \text{PC ,}$$

with effort e governed by the level of w_{pc} , while generally remaining at discretion of the worker. The right panel of Figure IIa plots of the upward sloping individual wage-effort offer curve $w_{pc} = w_{ub} + c(e)$. The hollow circles depict two specific wage-effort combinations that satisfy equation (1): First, workers' outside option is marked in the dark gray circle and, second, the stone colored circle indicates the quality consistent outcome at effort $e = e_{qtc}$.

[Insert Figure IIa Here]

At any given effort level, aggregating over individual participation decisions yields competitive labor supply, correspondingly characterizing the family of competitive labor supply functions $\mathcal{X} := \{LS_j: j \in e\}$, with LS_j associated to effort $e = j$, $j \in [0, e_{max}]$. For the before mentioned subset $\mathcal{S} = \{LS_0, LS_{e_{qtc}}\}$ the left panel of Figure IIa plots the competitive labor market setting—for example, at the sector level.. LS_0 denotes labor supply at zero effort choice, while $LS_{e_{qtc}}$ represents competitive labor supply that would be in accordance with the product quality standard qtc.⁹

Stage 1: Contract Design.—The immutable norm rules out effort levels in conflict with qtc. Substituting the sine-qua-non constraint $e = e_{qtc}$ into the effort cost function $c(e_{qtc})$ in equation (1) then specifies:

⁹ Recall that the number of employable persons is given by N , yielding the kink in labor supply.

$$(1^*) \quad w_{pc^*} = w_{ub} + c(e_{qtc}) =: \overline{w_{pqt}} \quad \text{EPC} .$$

With given unemployment benefit w_{ub} , EPC defines a fixed payment $\overline{w_{pqt}}$ that compensates for outside option w_{ub} (worker's leisure at upper bound) plus quality constrained disutility $\overline{c_{qtc}} := c(e_{qtc})$.

While stone colored function LS_{qtc} refers to employees' participation decision under quality-norm consistent effort cost and the labor market still faces competitive supply, one has to notice that paying a worker exactly $\overline{w_{pqt}}$ would be inappropriate for incentive reasons. In order to motivate an employee to choose appropriate effort e_{qtc} , repeated moral hazard requires a supplement on top of $\overline{w_{pqt}}$.

Calculation of the supplement is straightforward by applying an asset value design over regimes of expected lifetime utility (ELU). Analogously to SHST—i.e., designing the contract such that ELU from shirking ($ELU_{e=0}$) appears sufficiently unattractive in relation to not shirking ($ELU_{e>0}$)—equation (2) solves for the disembodied wage supplement w_{ic} and yields incentive constraint IC:

$$(2) \quad w_{ic} \left| \frac{ELU((w,e); e>0)}{\text{not shirking}} \geq \frac{ELU((w,e); e=0)}{\text{shirking}} \right. = \frac{s+f+r}{q(m)} \cdot c(e) \quad \text{IC} .$$

Next, the quality norm is implemented:

$$(2^*) \quad w_{ic^*} = \frac{s+f+r}{q(m)} \cdot c(e_{qtc}) \quad \text{EIC} .$$

As the quality consistent—embodied—incentive constraint EIC in equation (2*) shows, a representative employee in the firm has a sufficient

incentive to provide appropriate effort e_{qtc} if the firm compensates her for norm constrained disutility $\overline{c}_{qtc} := c(e_{qtc})$ and takes care of the fact that the profit maximizing wage supplement rises with job turbulence and discounting at the date of contracting ($s + f + r$). Moreover, incomplete monitoring imposes probability $q(m) < 1$ of shirking detection, accordingly shifting upwards the incentive premium scheme.

Figure IIb captures the contract design scenario and plots wages as an increasing function of effort. Here, the left panel depicts the competitive origin and refers to participation (individual supply w_{pc} from equation (1)), while—recognizing moral hazard issues—the right panel refers to motivation (individual incentive premium w_{ic} from equation (2)).

[Insert Figure IIb Here]

The hollow circles depict quality consistent outcomes, thereby indicating the separate contribution of participation and motivation to pay, namely norm-compliant sub-schedules $EPC = (w_{pc*}, e_{qtc})$ and $EIC = (w_{ic*}, e_{qtc})$. Altogether, the firm chooses wage-effort schedule $(w, e)_{qtc} = (\overline{w}_{pqtc} + \frac{s+f+r}{q(m)} \cdot \overline{c}_{qtc}, e_{qtc})$ as the appropriate contract offer, with profit maximizing payment $\overline{w}_{qtc} = w_{pc*} + w_{ic*}$.

Stage 2: Fundamental Transformation.—Once the worker accepts and the parties sign $(w, e)_{qtc}$, the perspective of analysis shifts from choice to contract, with transition from an initially competitive labor market to

fundamentally transformed bilateral dependency relations between firms and workers (*BDR*): The restriction that wage premium w_{ic} imposes for any given effort target on the individual labor supply function induces a transition from competitive supply to incentive constrained supply that, in the sequel, will be denoted as restricted labor supply. Ultimately accounting for norm embedded incentives, the quality constrained incentive premium further narrows restricted supply to a relation that we specify as quasi supply (QLS). Hence, incentive constraint IC initiates erosion of the competitive labor market setting, while its quality consistent companion EIC enacts the target specific bilateral relation, equivalently launching FT. Notice that competition in the product market is not affected.

Labor supply side's acceptance decisions is easily formulated by using equations (1) and (2). Aggregating over the populations of firms and workers yields steady state no-shirking condition NSC, altogether pointing to restricted supply of labor:

$$(3) \quad w_{nsc} = w_{pc} + \frac{s+f+r}{q(m)} \cdot c(e) \quad \text{NSC .}$$

Given the (population of) appropriate contract offers, no-shirking condition ENSC embodies the bilateral dependency, consequently pointing to quasi supply of labor:

$$(3^*) \quad w_{nsc*} = w_{pc*} + w_{ic*} = \overline{w_{qtc}}$$

$$= \overline{w_{pqt}} + \frac{s+f+r}{q(m)} \cdot \overline{c_{qt}} \quad \text{ENSC}$$

While NSC in equation (3) rather reconsiders the aggregate no-shirking constraint from SHST, embodied counterpart ENSC applies for quality-norm constrained firms in a Shapiro-Stiglitz world, finally resulting in bilateral dependency relations between demand- and supply-side of labor.

Figure III illustrates the mechanism behind the transition from competitive labor supply (aggregate of individual wage-effort offer curves w_{pc}) to restricted supply (aggregating wage-effort offer curves w_{nsc}) and, further, to the fundamentally transformed relationship at w_{nsc^*} and e_{qt} (ENSC-consistent employment contract $(w, e)_{qt}$, marked in hollow circle). Horizontal reference line at w_{pc^*} points to the norm-compliant competitive outcome, while reference line w_{nsc^*} adds norm-compliant incentives. Their vertical difference $w_{ic^*} = w_{nsc^*} - w_{pc^*}$ measures the efficiency wage gap that is imposed by the immutable quality norm.

[Insert Figure III Here]

Adequate incentive design at the critical effort target imposes the transition to ENSC, thereby providing the rationale for FT in the definition of Williamson:

PROPOSITION 1: *Fundamental Transformation (FT) in a Shapiro-Stiglitz World.*

Fix a Shapiro-Stiglitz world of repeated moral hazard between representative workers and firms. Let production be strictly constrained by immutable quality norm q_{tc} . Then the following statements hold:

- (i) Suppose worker and firm sign the ENSC-consistent employment contract. Then q_{tc} in production implements effort norm $e_{q_{tc}}$ that establishes FT from an ex-ante competitive labor supply pool to an ex-post unambiguous bilateral dependency relation BDR between employer and employee.*
- (ii) With signing of the ENSC-consistent employment contract FT occurs from a pre-contract competitive labor market setting comprising a rich variety of available incentive alternatives to a post-contract limited set of employment relations, exhibiting reciprocal dependency and mutual retaliation opportunities, and with transaction value “quality-norm compliant performance”.*

The proof of Proposition 1 is immediate. Erosion of competition follows from IC in equation (2); the unambiguous bilateral dependency relation BDR is implemented by norm consistent incentive premium w_{ic^*} . Hence, production technology has critically shaped feasible profit maximizing contracts, implementing well-defined norms into employment contract.

Stage 3: Initializing Reciprocal CRPs.—Specifying remuneration in advance is essential for FT and, moreover, initiates individual entitlement perceptions. Using the terminology of HM and related experimental validation (Fehr et al., 2009, 2011), the rigid content of the contract leaves very “little room” (HM: 2) for ex-post shading resulting from disagreement on entitlements, since $\overline{w}_{\text{qtc}}$ and e_{qtc} , with effective date t_s , strictly fix the price in advance, thereby providing objectivity and reliability, ultimately locking in perceptions at $w_{\text{nsc}^*;t_s}$ and $c^{-1}(e_{\text{qtc}})$.

Proposition 2 addresses the associated mutual lock-in and implements the contracts-as-reference-point extension into the Shapiro-Stiglitz world.

PROPOSITION 2: *Contractual Reference Points in a Shapiro-Stiglitz World*

As a key outcome of FT on date t_s , the quality-norm and incentive consistent employment contract $(w, e)_{\text{qtc}} = (w_{\text{nsc}^}, e_{\text{qtc}})$ unambiguously determines parties’ entitlement perceptions, equivalently initializing well-defined reference points (CRPs) for future exchange behavior. This CRPs package locks in reciprocal perceptions of what being entitled to receive during repeated contract execution and is not subject to renegotiation:*

(i) **EMPLOYEE’S REFERENCE POINT— E_{RP} :**

- E_{RP} is equivalent to the quality-norm and incentive consistent wage that has been signed in t_s :

$$E_{RP} = w_{nsc*;t_s} = w_{ub;t_s} + \overline{c(e_{qtc})} \left(1 + \left[\frac{s+f+r}{q(m)} \right]_{;t_s} \right) = \overline{w_{qtc}}.$$

(ii) *FIRM'S REFERENCE POINT— F_{RP} :*

- *Conditional on technology, F_{RP} is given by appropriate*

$$\text{effort } e_{qtc}: F_{RP} = e_{qtc} = \overline{c^{-1}(e_{qtc})}.$$

Proof of Proposition 2 with the CRPs package property of the signed contract directly uses the mechanism of *fixing the price in advance* that reliably commits parties to what has been signed in the contract and rules out ex post disagreement on that price. In sum, this mechanism freezes the price as reference point (HM: 15-16). Thus, if both $\overline{c^{-1}(e_{qtc})}$ and $\overline{w_{qtc}} = w_{nsc*;t_s}$ strictly realize the mechanism, the norm consistent contract (cf. Proposition 1) initializes the CRPs package. Notice that it is sufficient to show that $\overline{w_{qtc}}$ satisfies the mechanism, as $\overline{c^{-1}(e_{qtc})}$ is embodied in $\overline{w_{qtc}}$. From equation (3*) it is evident that the price is fixed at E_{RP} and is not supposed to change over time (immutable norm-compliance). Common knowledge of qtc provided, the design of any appropriate contract is such that E_{RP} embodies F_{RP} , finally implementing the mechanism of fixing the price in advance and associated properties.

Thus, through the perception-of-adequate-treatment lens, $w_{nsc*;t_s}$ is initialized as employee's CRP, at the same time integrating quality consistent performance e_{qtc} as firm's CRP. The term contractual reflects the

fact that the CRPs package is stipulated in the written contract. The contract ex ante mitigates conflict of interest in the parties' reciprocal perception of what to expect and what will be expected by the other party during execution, since $w_{nsc*;t_s}$ applies for the entire contract duration.

In terms of reciprocal duties, $(w, e)_{qtc}$ defines payment E_{RP} as firm's duty and performance F_{RP} as employee's duty. Any payment below E_{RP} would violate an employee's expectation of what she will be entitled to earn, inevitably resulting in deterioration of output quality. Likewise—with the simplifying assumption of a deterministic relation between exerting appropriate effort and achieving the target quality—, missing the quality norm would violate F_{RP} , then triggering retaliation by the firm. The mutual threat inherent in the CRPs package mitigates reverse effects from insufficient enforceability and encourages a cooperative lock-in of behavior. Figure IV visualizes the point.

[Insert Figure IV Here]

Employee's CRP appears as the horizontal line at E_{RP} , whereas the firm's CRP appears as vertical line through F_{RP} . Locked-in at the intersection (hollow circle), contract $(w, e)_{qtc}$, signed in t_s , aligns both parties' reference points and, thus, perceptions. This property leads to a new role of wages.

Stage 4: Contract Execution (Aligning Reference Points at the Micro-Level).—The well-defined mechanism of ex ante circumventing ex post

disagreement by aligning entitlement perceptions, obviously at the expense of wage flexibility, leads to a new role of wages.

DEFINITION 1: *The Third Role of Wages*

Suppose a labor discipline device and quality-norm consistent employment contract with following properties:

- *Compensation of an employee is determined in advance as a fixed payment \overline{w}_{qtc} to be provided by the employer.*
- *The duty of an employee is fixed in advance as providing the appropriate effort e_{qtc} in order to achieving the critical quality standard of the product.*

Then, the function of wages is threefold: (i) matching firm and worker, (ii) incentivizing an employee, and (iii) aligning employer's and employee's perceptions with respect to entitlement and duty.

The third role of wages is equivalent to mutually aligning the CRPs—as they have been stipulated in the employment contract on date of signing.

Projected onto the wage-effort space, the third role of wages implements

$$E_{RP} = F_{RP}.$$

In words, in their third role, wages enforce both norm compliant payment and production. Congruent entitlement perceptions mitigate conflict of interests, ultimately discouraging parties from cheating and shading. Paying $w_{nsc*;t_s}$ as an alignment device is robust to, e.g., temporary

fluctuations in product demand or productivity. Equivalently, incentives for deteriorating the product quality standard are mitigated.

Fundamental transformation, contractual reference points and the third role of wages contribute following testable hypotheses:

HYPOTHESIS 1: Mutually beneficial long-term employment relations

The reciprocal CRPs package strongly promotes the existence of long-term employment relations and employee tenure.

HYPOTHESIS 2: Quality and incentive compliant income and labor productivity

If a firm's production critically depends on achieving a well-defined quality norm, employment contracts fix payment ex ante, providing stable income, rather invulnerable to shocks in labor productivity.

HYPOTHESIS 3: Third role of wages and contract enforcement

In their third role, wages also operate as contract enforcing device, where contract partners perceive their compensation as appropriate. Resulting effort/payment response will be in the spirit of the contract, equivalently precluding sentiments of unfairness. Aligned CRPs strongly encourage behavioral lock-in in mutual cooperation.

HYPOTHESIS 4: Equilibrium coexistence—likelihood of cooperative solution

Following disjoint outcomes of the behavioral contract game might coexist, where propensity of joint commitment exceeds propensity of joint deviation due to the contract enforcing power of the third role of wages:

- (i) joint commitment with appropriate performance of both contract parties (cooperative outcome under mutual alignment of CRPs),*
- (ii) joint deviation with bilateral shading (opportunistic outcome, misaligned CRPs).*

Hypotheses 1-3 are clear from the propositions and refer to the introductory questions of labor hoarding, the resilience of disposable income, and sustainability of mutually beneficial long-term employment relations. Notwithstanding the fact that the third role of wages predicts reciprocity with substantially lower likelihood of mutual shading, Hypothesis 4 refers to the fact that shading is not ruled out a priori. Based on, e.g., misleading communication, either contract party might perceive mistreatment, resulting in misaligned CRPs, finally launching a chain of retaliation/shading—eventually putting the entire transaction at risk.

III.D Labor Market Impact of the Third Role of Wages

Aligning employers' and employees' perceptions with respect to entitlement and duty has an important impact on both the quality and incentive constrained labor market equilibrium (stage 5) and consistent channels of shock transmission (stage 6), eventually resulting in resilience.

Given the constituting formalization of LMR, the labor market will be formulated in the wage-unemployment space.

Stage 5: Quality and Incentive Consistent Labor Market.—The quasi supply function of labor is the aggregate of individual wage-unemployment schedules satisfying equation (3*). In terms of labor demand, suppose the simplifying assumption of a Cobb-Douglas technology with constant returns to scale. The third role of wages enters as the CRPs alignment constraint. Equilibrium unemployment rate is then derived as follows.

First, rearranging the quasi labor supply function with respect to (steady state) unemployment rate u_{st} yields a downward sloping relation between pay level and unemployment rate, very similar to the wage curve framework suggested by Blanchflower and Oswald (1994, 1995):

$$(4) \quad w = \lambda + \mu \cdot u^{-1},$$

with $\lambda = \overline{w_{pqt}} + \left(\frac{\overline{c_{qt}}}{q(m)}\right) r$ and $\mu = \left(\frac{\overline{c_{qt}}}{q(m)}\right) s$.

Further, by equating wage payment w and marginal revenue product pQ_L the corresponding labor demand function implements profit maximization. Given a standard Cobb-Douglas with labor elasticity $\alpha < 1$, this writes as:

$$(5) \quad w = p\alpha \cdot \frac{Q(L;A,K_A)}{L},$$

with labor L , given equipment K_A and state of technology A (cf. [A2]). Let us, for simplicity, normalize p in equation (5) at $p = 1$. Aggregating over

firms and again rearranging as a function of unemployment rate u translates the downward sloping demand curve into an upward sloping relation:

$$(6) \quad w = \gamma \alpha \cdot \delta^{-(1-\alpha)} \cdot \left(\frac{1}{1-u} \right)^{1-\alpha},$$

with $\gamma = A \cdot K_A^{1-\alpha}$ and $\delta = N/M$, where δ captures the number L_j^{FE} of employees per firm in a hypothetical full employment reference.

Solving equations (4) and (6) for u_{st} yields quality and incentive consistent equilibrium unemployment rate u^* and wage level \overline{w}_{qtc} .

[Insert Figure V Here]

Figure V displays the labor market equilibrium at the threefold intersection of quasi labor supply QLS, labor demand LD and enforcing device CRP. With wages plotted against unemployment, equilibrium is given by $E_{RP} = w_{nsc^*;t_s}$ and profit maximizing unemployment rate u^* , while enforcement of the equilibrium requires the CRP alignment constraint. There are, as for the behavioral lock-in at the micro level, no incentives to deviating from the solution. Employees receive what they feel entitled to and will be happy to provide norm-compliant performance. Employers anticipate negative incentive effects with declining product quality that violating E_{RP} would trigger and, therefore, voluntarily pay the contracted compensation.

Hypothesis 5 addresses the key characteristics of labor markets under quality and incentive constrained production and wage setting.

HYPOTHESIS 5: High-quality segment production and the labor market

(a) Industries facing a quality norm are expected to show a non-trivial sectoral unemployment rate, accompanied by rather stable firm payrolls.

(b) An employee's tenure in quality-norm constrained sectors is expected to ceteris paribus exceed tenure in comparison industries, where quality is only one among several output characteristics.

(c) A company's reputation in the high quality segment is a key success factor. In turn, it is expected that severe negative impact results from reputation loss due to a lack of quality or norm-failure, with likely spillover effects affecting the entire industry.

Stage 6: Consistent Channels of Shock Transmission.—In a deterministic context the third role of wages is satisfied by construction (as it results from optimal contract design); it becomes essential as a binding restriction for enforcement if it comes to repeated contract execution in a stochastic world, consequently limiting ex-post adjustment options. Technically speaking, maintaining the third role of wages points to (behavioral) mechanism design, particularly to implementation theory (for a brief introduction cf. Maskin 2008; Myerson 2008).¹⁰

Fix a reverse shock, e.g. a temporary cutback in output demand. Such a situation is displayed in Figure VI (notice the right shift of LD). For hypothetical entrants, appropriate adjustment of employment contracts

¹⁰ While the mechanism design perspective of CRP alignment is well beyond the current scope of the paper, subsequent results suggest a strong relationship between implementing third role compliant shock transmission and the “(absorbing) changes in the unemployment rate” constituting dimension of LMR (recently stated as a social goal, cf. section II).

along QLS predicts outcome I , with wage level $w_I < E_{RP}$ and equilibrium unemployment rate $u_I \geq u^*$. From an employed insider's perspective, however, transition to I would clearly violate the third role of wages, thereby undermining its enforcing device property, hence, triggering inferior quality effort, finally eliminating I from the menu of adequate adjustment outcomes.

[Insert Figure VI Here]

To maintain its contract enforcing power, the third role of wages requires adjusting an existing employment relation along the CRP alignment constraint, thereby imposing strict wage rigidity at binding payment standard $w_{nsc^*;t_s}$, i.e., matching the first dimension of LMR. Taking this insight as an intermediate result, solution C emerges as a candidate for an alignment-of-perceptions preserving adjustment. Associated rise in unemployment, however, misaligns CRPs of then redundant workers, respectively discouraging them and causing future third role failure. Further, confidence of remaining employees will be at least diluted, likely harming the quality objective, putting the firm's reputation at risk.

Taken together, the third role of wages adheres feasible shock adjustment channels to both the CRP-line and the LMR2-tunnel, hence, to the ε -environment of the quality and incentive consistent equilibrium, correspondingly ruling out C as adjustment outcome. In words, in addition to preserving disposable income, continuously aligning entitlement

perceptions in a stochastic world involves safeguarding of an employment relation per se.

III.E Shock Neutralizing Perspective of the Third Role: A Stochastic Link

At the company level, third role consistent channels of shock transmission can be thought of as a series of shock neutralizing shifts in factors neither affecting payment nor the continuation of the employment relation itself. This subsection shows how maintaining the third role of wages implies a stochastic link between well-defined shock-offsetting patterns of labor utilization and shock absorption. Given this, the third role is responsible for a characteristic interplay between commitment (preserving salaries and employment) and flexibility (adjusting along the hours margin rather than providing financial flexibility for the firm and iterated allocative efficiency). While shock neutralizing transmission along the intensive margin ensures sustainably high product quality, it comes at the price of muted job reallocation and impedes contract flexibility with respect to labor costs.

Practically speaking, intertemporally equalizing changes in labor utilization—such as corridors of longer and less hours—can be deployed to offsetting demand shocks, in the end absorbing deviations from LMR2 (reference employment) and from CRP (reference pay) within well-specified limits.

The idea of the shock neutralizing perspective of the third role is the following. Imagine a series of shocks, with (1) a negative shock with

hypothetical post-shock unemployment rate u_r and (2) a positive shock with hypothetical post-shock unemployment rate u_e —together specifying well-defined interval $\mathcal{J} = [u_e, u_r]$. Expressed in integrals, the shock neutralizing shift to lock in unemployment at u^* and earnings at E_{RP} writes as:

$$(7) \quad \int_{u_e}^{u_r} (\lambda + \mu \cdot u^{-1}) du = (u_r - u_e) \cdot \left(\lambda + \frac{\mu}{u^*} \right),$$

with $\lambda = \overline{w}_{pqt} + \left(\frac{c_{qt}}{q(m)} \right) r$, $\mu = \left(\frac{c_{qt}}{q(m)} \right) s$, and $\lambda + \frac{\mu}{u^*} = E_{RP}$.

Figure VII visualizes equation (7) and the essence of the stochastic link. Determined by the third role of wages, consistent adjustment over interval $[u_e, u_r]$ releases a—in this case—two-stage process of neutralizing adaptations of probability mass to offset associated areas under the QLS curve and CRP-line. With the third role effective, *to offset* means to collapse the shaded areas enclosed by CRP and LMR2 onto (u^*, E_{RP}) , i.e., projecting pay and employment preserving shifts of labor utilization mass onto the pay-unemployment reference equilibrium spot, finally establishing a stochastic link between the third role and labor utilization.

[Insert Figure VII Here]

In company practice, such shifts might be operationalized by equalizing internal channels of flexibility like well-designed systems of varying work hours at zero adjustment cost. Shock driven intertemporal change in work hours then circumvents both harmful violation of employees' entitlement perception (times of negative shocks) and costly wage premiums (times of

positive shocks), finally enforcing a cooperative lock-in of behavior in long term employment relations with “tenured” coincidence of bilateral entitlement perceptions.¹¹

In accordance with the third role of wages and adding to discussion of wage sluggishness and declining labor market fluidity, well-defined adjustment patterns at the micro-level that transform shock determined changes in the number of employees into changes in the number of work hours—with no additional compensation of longer hours and no pay cut when working fewer hours—contribute to the resilience phenomenon. Hence, labor productivity immediately varies with the change, while initial equilibrium unemployment rate remains.

¹¹ Recall that within the logic of the model the terms wage, payment, and remuneration best correspond to compensation such as monthly salary. In words, $\overline{w_{qt}}_c$ does not denote an hourly wage. Of course, if hypothetically calculated as hourly pay, the resulting measure reversely varies with the value shock that shifts labor demand. In this simple version of shock neutralization, we supposed that shocks are distributed with zero mean and did not account for factor-biased progress or growth. Future generalization will include systematic developments and non-symmetric shock distributions.

Operating a rigid employment contract that conditionally enables ex-post revision in terms of equalizing shifts in labor utilization indirectly relates third role consistent adjustment in this paper to recent experimental results on robustness of contracts as reference points with built-in revision processes (Fehr et al. 2015). But the way in which my paper enables the flexibility channel is clearly different. While Fehr et al. (2015) include ex-post revision of the beforehand contracted price in order to re-enable mutually beneficial execution in (high-cost) states that would otherwise have launched the no-trade outcome and then distinguish between mutually beneficial and opportunistic revision, the stochastic link developed in this paper, a priori, excludes the reference point from potential disagreement and revision. Instead, the access point for ex-post flexibility is labor utilization with intertemporally verifiable usage patterns (co-moving with the state of buyer’s value).

Final Hypotheses 6 and 7 address the relation between labor market resilience, the third role of wages and adjusting intra-firm utilization of labor in line with the mechanism outlined in equation (7).

HYPOTHESIS 6: Intertemporally equalizing hours flexibility as a third role of wages consistent adjustment institution

Shock transmission to worker flows and income is alleviated by using internal channels of shock absorption that are operated as company-level institutions of flexibility to govern neutralizing changes in labor utilization.

This provides a grid for maintaining the third role of wages under shock exposure and a well-designed institution of resilience supportive shock response.

HYPOTHESIS 7: Shock neutralizing impact of the third role: LMR

Sequences of aligned CRPs reinforce the third role of wages and foster resilience in employment relations with tenured employees and stable remuneration paths, encouraging LMR at the sectoral level.

If a social planner had determined LMR as social goal, an available mechanism to generating this outcome might involve sine-qua-non product and environment standards or strict legislation on overtime/short-time compensation.

Stepping back to HM who reflect the interplay between rigidity and flexibility under the heading of fixing the “price and allow the employer to

choose the task” (HM: 4), one can see that internal flexibility within fundamentally transformed employment relations under CRP alignment works rather similar. In particular, temporarily adjusting intra-firm utilization of labor, i.e. “choosing the number of work hours” corresponds to HM’s “choose the task” (or “choose the composer”, HM: 23), while rigid wages and quality capture the fixed price.

IV. IMPLICATIONS AND LIMITATIONS

This section discusses key implications of the approach, draws attention to the diesel scandal through the lens of third role failure, discusses selected comparative statics, and points out limitations. Most relevant, the model shows that, in quality constrained employment contracts, incentive compatible wages unambiguously determine CRPs packages. Therefore, in addition to their twofold role as allocation and incentive device, wages are responsible for aligning entitlement perceptions. We defined the property of aligning employer’s and employee’s perceptions with respect to entitlement and duty as the third role of wages, with some important implications for lock-in of behavior and resilience on labor markets.

- In a moral hazard setting, binding quality norms in production fundamentally transform competitive labor contracts into long-term employment relations and release reciprocal reference points, considerably protecting (i) employees’ remuneration from economic shocks and (ii) product quality from productivity shocks (Hypotheses 1 and 2).

- Associated wage-rigid labor markets include sine-qua-non quality standards and fairly smoothed equilibrium unemployment (rates). With firm reputation as important success factor, violations of the third role of wages within firms trigger severe losses of quality and reputation, very likely releasing industry-wide spillovers (Hypothesis 3 and 5).
- Third role compliant shock adjustment of labor involves safeguarding of jobs with transmission channels at the intensive margin, achieving labor market resilience, similar to recent OECD-notion (Hypothesis 6 and 7).¹² Taking LMR as social goal, future research perspectives include an implementation approach of mechanism design to the third role of wages.
- Failure of the third role of wages undermines shock protection and triggers, in behavioral terms, the opportunistic outcome. While being less likely, it is not ruled out per se (Hypothesis 3 and 4).

Regarding the last item, the Volkswagen diesel scandal being discovered in the United States can be considered as a prominent example for third role failure (e.g., Schiermeier 2015 for a scientific introduction of the VW case).¹³ Through the lens of FTRP_SHST, behavior of VW engineers to

¹² Cf. OECD (2012). The FTRP_SHST model uses the two-dimensional formalization with (absorbing) a) changes in total earnings and b) changes in the unemployment rate.

¹³ On September 18, 2015, U.S. Environmental Protection Agency (EPA) issued a notice of violation (NOV) accusing Volkswagen AG, Audi AG, and Volkswagen Group of America of operating illegal defeat devices in light-duty diesel vehicles: “Specifically, VW manufactured and installed software in the electronic control module (ECM) that sensed ... whether the vehicle is being tested or not based on various inputs These inputs

develop, install and refine illegal software aiming at cheating emission rules can be characterized as an effort re-balancing counteraction that corresponds to inferior quality effort—resulting in “window dressing” but, in the end, establishing non-compliance of normal-operation emissions with U.S. environmental laws. In this regard, federal and state emission standards define quality norm qtc. Unlike to what has been revealed, appropriate effort—the firm’s CRP—would have required full commitment by concerned employees in drive-and-emissions-control-technologies department, i.e., developing engines that strictly comply with EPA standards. In turn, the position an engineer attained on VW’s salary scale—including collectively agreed grandfathering on remuneration and status attributes—determines her CRP.

Given the purpose of satisfying the third role of wages, it should have been crucial for VW executives in their role as employer to keep remuneration in line with the individual’s CRP, at the same time credibly

precisely track the parameters of the federal test procedure used for emission testing for EPA certification purposes. During EPA emission testing, the vehicles’ ECM ran software which produced compliant emission results At all other times during normal vehicle operation, the “switch” was activated and As a result, emissions of NOx increased by a factor of 10 to 40 times above the EPA compliant levels, depending on type of drive cycle (e.g., city, highway)”.

On the same day, the California Air Resources Board (CARB) issued an In-use Compliance Letter, and a NOV on January 12, 2016 (Reference No. UIC-2015-007, IUC-2016-001), saying that “Volkswagen made a decision to cheat on emission tests and then tried to cover it up”. Documents available at: http://www.arb.ca.gov/msprog/vw_info/vw-diesel-info/vw-diesel-info.htm, <http://www.epa.gov/vw>,

committing to tenure.¹⁴ As an open secret, however, newspapers recurrently report a latently distressing atmosphere, irrespective of signed contract contents, with employees mentioning concerns about downgrading and even job loss (e.g., Cremer and Bergin 2015).

Cautiously interpreted, fear of job loss might indicate a lack of compliance with employees' CRP, leading to misaligned entitlement perceptions (Hypothesis 3). Resulting from third role failure, Hypothesis 4 then predicts reciprocity in non-compliance, finally implementing a joint-deviation equilibrium. From Hypothesis 5, severe effects due to quality disclosure are expected, with reputation loss and spillovers to competitors within the same market segment. Supportive evidence of the latter can be, in fact, found in more recent diesel sales by German carmakers Daimler and BMW in the United States.

From a comparative statics and also a mechanism design perspective, the third role of wages goes hand in hand with a well-defined form of working hours flexibility that, interestingly, involves gift exchange in terms of hours debts and credits. Third role conform adjustment of an expansionary shock is associated to labor supply side's voluntary contribution to LMR—equivalent to triangular-shaped area between quasi supply of labor and the

¹⁴ Notice that employment contracts at Volkswagen include jobs safeguarding. For example, the current agreement (www.volkswagenag.com/content/vwcorp/info_center/en/news/2015/03/pay.html, ~/2016/05/IG_Metall_Tarifunde.html) is based on the “Zukunftstarifvertrag”, i.e., the collective agreement package on pay and job security that has been in place since 3 November 2004 (for a brief description of the agreement cf. Dribbusch 2004).

CRP alignment line in Figure VII. On the other hand, a negative shock releases a voluntary contribution of the labor demand side, in turn, equivalent to the mainsail-shaped area enclosed by the CRP alignment line and quasi supply of labor. The gift embodied in the third role redundantizes overtime pay and costly temporary job creation, on the one hand, and circumvents drawbacks from temporary cutback of jobs, formal work sharing, and short-time work, on the other hand, while preserving high quality.

A significant drawback of the model is that it presumes homogeneous, highly qualified workers being perfectly matched to job slots with according task profiles. For example, workers belonging to vulnerable groups are usually exposed to higher unemployment risks with more volatile consumption paths (such as less qualified, youth, long-term unemployed, or workers who are covered by atypical employment contracts). Similarly, the impact of reference point heterogeneity on the third role and potential interplay with collective bargaining need to and will be addressed in future research.

Last not least, the shock adjustment approach of the third role of wages is framed in a collective trust environment. If, for example, workers are convinced that the employer will free-ride on the arithmetically reduced hourly pay (positive shock) but nonetheless cut pay or even dismiss in the less favorable state (negative shock), then resilience consistent adjustment is not possible. In this vein, important insights are expected from future

research on inter-cultural differences on impact and applicability of the third role of wages.

Keeping in mind this critique, the significance of FTRP_SHST lies in its contribution to research on heterogeneity of unemployment dynamics and wage flexibility, as it provides—in an environment of exceptional quality standards, where reputation critically matter—a behavioral contract theoretic explanation for muted labor market fluctuation and internal shock absorption mechanisms.

V. CONCLUSIONS

My analysis provides three contributions to understanding of labor market resilience. First, it presents an approach of optimal labor contracts using a repeated moral hazard setup, resulting in strict wage rigidity and cooperative lock-in of behavior. The benefit of this approach is that it not merely addresses the contract design stage but covers repeated execution. A key implication for adjustment of employment relations is that incentive and quality compliant shock adaption leads to muted job reallocation and intertemporal smoothing of income and welfare.

The second—core—contribution is to derive the third role of wages. In addition to the allocation and incentive provision roles of wages, the third role constitutes a contract enforcing device that aligns well-defined and robust entitlement perceptions (i.e., contractual reference points: CRPs) of contract partners. As existence of CRPs critically relies on prior transition

of contractual arrangements from a competitive outset to a bilateral dependency relation,¹⁵ the analysis started with developing a rationale for fundamental transformation in a labor discipline setting, building on the shirking model (Shapiro and Stiglitz 1984) and the notion of fundamental transformation by Williamson (1979, 1985). An important benefit of the fundamental transformation extension of the shirking model is that it justifies to integrate entitlement perceptions as important criteria for decision making.¹⁶ The third role of wages also embeds the threat of equalizing retaliation, finally establishing a stable incentive and quality consistent employment relation between employer and employee in their roles as principal and agent.

The final contribution is based on shock adjustment properties attributed to the third role of wages. Here, “FT and CRPs in a Shapiro-Stiglitz world” adds with a well-defined measure of gift exchange—i.e., voluntary contribution of hours changes that co-move with shocks and will be recorded in a time banking system. During expansion employees provide an hours gift, exempting employers from additional expenditures, while during recession the gift is on the employers’ side in terms of fully paying employees, although the latter withdraw spare hours (or accumulate deficit

¹⁵ From experimental literature it is known that the contract enforcing power of CRPs, such as triggering mutually conform behavior, crucially depends on the existence of a competitive outset, succeeded by erosion of competition towards bilateral dependency (Fehr et al. 2011).

¹⁶ This proof also helps filling the research gap remaining in Hart and Moore (2008).

hours, respectively)—ultimately maintaining cooperative lock-in of contract parties in long term relationships.

Turning back to evidence of alleviated shock transmission and, eventually, resilience on labor markets as our point of departure, the model implies a mutual insurance device, rather similar to annualized hours schedules and working time accounts approaches (cf. Carstensen, 2001, 2013).

Interesting results are expected from future research that will examine the hypotheses and predictions devised in sections III.C and III.D, respectively addressing the company-level, the industry-level, and, if appropriate, specific markets or key products. The theoretical framework will be refined as well, inter alia addressing collective bargaining and job-to-job transition. Further, influences of (factor biased) progress and growth on resilience will be inspected. Resilience based interplay of time banking systems, flexible task vectors, and blurring firm boundaries is another open issue for further analysis.

Two other important future perspectives are related to analyses of (i) third role failure with opportunistic lock-in of behavior and (ii) intercultural differences towards reference points. Although unlikely, it is not ruled out that a contract party neglects behavioral threats of reference point violation. Analysis of associated equilibrium characteristics is expected to reveal important insights on corporate culture and to highlight transition possibilities to a recommended equilibrium.

REFERENCES

- Akerlof, George A. 1982. "Labor Contracts as Partial Gift Exchange." *The Quarterly Journal of Economics* 97 (4): 543–69.
doi:10.2307/1885099.
- Ball, Laurence M., Daniel Leigh, and Prakash Loungani. 2013. "Okun's Law: Fit at Fifty?" National Bureau of Economic Research Working Paper 18668. <http://www.nber.org/papers/w18668.pdf>.
- Bellmann, Lutz, and Olaf Hübler. 2015. "Are Working Time Accounts Beneficial for German Establishments?" IZA Discussion Papers No. 9583. <http://ftp.iza.org/dp9583.pdf>.
- Bigos, Magdalena, Weys Qaran, Menno Fenger, Ferry Koster, Peter Mascini, and Romke van der Veen. 2014. "Labour Market Resilience in Europe: INSPIRES Benchmark Report." INSPIRES Publications. http://www.inspires-research.eu/userfiles/D1_3_Benchmark_Report_on_Labour_market_resilience.pdf.
- Burda, Michael C., and Jennifer Hunt. 2011. "What Explains the German Labor Market Miracle in the Great Recession?" *Brookings Papers on Economic Activity* 42 (1): 273–319. doi:10.1353/eca.2011.0004.
- Caballero, Ricardo J., and Mohamad L. Hammour. 1996. "The "Fundamental Transformation" in Macroeconomics." *American Economic Review* 86 (2): 181–86. <http://www.jstor.org/stable/2118119>.
- Card, David, and Alexandre Mas, eds. 2016. "Labor Markets in the Aftermath of the Great Recession." Special issue, *Journal of Labor Economics* 34, no. S1.
<http://www.journals.uchicago.edu/toc/jole/2016/34/S1>.

- Carstensen, Vivian. 2001. "Job Security and Working Hours Accounts." ZEW International Workshop 3 - Wages, Working Hours and Employment. <http://ftp.zew.de/pub/zew-docs/div/wwheworkshop/carstensen.pdf>.
- . 2013. "The German Labor Market Miracle Revisited: Risk Elimination in Working Time Accounts." *Eurasian Journal of Social Sciences* 1 (1): 19–38. <http://dx.doi.org/10.15604/ejss>.
- Cazes, Sandrine, Sher Verick, and Fares A. Hussami. 2013. "Why did unemployment respond so differently to the global financial crisis across countries? Insights from Okun's Law." *IZA Journal of Labor Policy* 2 (1): 10. doi:10.1186/2193-9004-2-10.
- Collard, Fabrice, and David de La Croix. 2000. "Gift Exchange and the Business Cycle: The Fair Wage Strikes Back." *Review of Economic Dynamics* 3 (1): 166–93. doi:10.1006/redy.1999.0075.
- Cremer, Andreas, and Tom Bergin. 2015. "Fear and respect - Volkswagen's culture under Winterkorn." Accessed March 14, 2016. <http://uk.reuters.com/article/uk-volkswagen-emissions-culture-idUKKCN0S40MN20151010>.
- Daly, Mary C., John G. Fernald, Oscar Jorda, and Fernanda Nechio. 2014. "Interpreting deviations from Okun's Law." *FRBSF Economic Letter* (12). <https://ideas.repec.org/a/fip/fedfel/00014.html>.
- Daly, Mary C., and Bart Hobijn. 2015. "Why is wage growth so slow?" *FRBSF Economic Letter* (1). <https://ideas.repec.org/a/fip/fedfel/00041.html>.
- Danthine, Jean-Pierre, and André Kurmann. 2006. "Efficiency wages revisited: The internal reference perspective." *Economics Letters* 90 (2): 278–84. doi:10.1016/j.econlet.2005.08.015.
- Danthine, Jean-Pierre, and André Kurmann. 2007. "The Macroeconomic Consequences of Reciprocity in Labor Relations." *The Scandinavian*

Journal of Economics 109 (4): 857–81. doi:10.1111/j.1467-9442.2007.00518.x.

Davis, Steven J., R. J. Faberman, and John Haltiwanger. 2012. “Labor market flows in the cross section and over time.” *Journal of Monetary Economics* 59 (1): 1–18. doi:10.1016/j.jmoneco.2011.10.001.

Davis, Steven J., and John Haltiwanger. 2014. “Labor Market Fluidity and Economic Performance.” National Bureau of Economic Research Working Paper 20479. <http://www.nber.org/papers/w20479>.

Davis, Steven J., John C. Haltiwanger, and Scott Schuh. 1998. *Job creation and destruction*. Cambridge, Mass., London: MIT.

Dribbusch, Heiner. 2004. “Agreements on cost-cutting and job security signed at Volkswagen.” *EurWORK articles*. <http://www.eurofound.europa.eu/observatories/eurwork/articles/agreements-on-cost-cutting-and-job-security-signed-at-volkswagen>. Accessed March 03, 2016.

Elsby, Michael W. L., Bart Hobijn, and Ayşegül Şahin. 2010. “The Labor Market in the Great Recession.” *Brookings Papers on Economic Activity* 41 (1): 1–69. 10.1353/eca.2010.0001.

———. 2013. “Unemployment Dynamics in the OECD.” *Review of Economics and Statistics* 95 (2): 530–48. doi:10.1162/REST_a_00277.

European Commission. 2015. “Labour Market and Wage Developments in Europe 2015.” Accessed December 30, 2016. ec.europa.eu/social/BlobServlet?docId=14290&langId=en.

———. 2016. “Labour Market and Wage Developments in Europe - Annual Review 2016.” Accessed December 30, 2016. ec.europa.eu/social/BlobServlet?docId=16423&langId=en.

Fehr, Ernst, Oliver Hart, and Christian Zehnder. 2009. “Contracts, Reference Points, and Competition—Behavioral Effects of The

- Fundamental Transformation.” *Journal of the European Economic Association* 7 (2-3): 561–72. doi:10.1162/JEEA.2009.7.2-3.561.
- . 2011. “Contracts as Reference Points—Experimental Evidence.” *American Economic Review* 101 (2): 493–525. doi:10.1257/aer.101.2.493.
- . 2015. “How Do Informal Agreements and Revision Shape Contractual Reference Points?” *Journal of the European Economic Association* 13 (1): 1–28. doi:10.1111/jeea.12098.
- Foster, Lucia, Cheryl Grim, and John Haltiwanger. 2016. “Reallocation in the Great Recession: Cleansing or Not?” *Journal of Labor Economics* 34 (S1): S293-S331. doi:10.1086/682397.
- Gal, Peter N., Alexander Hijzen, and Zoltan Wolf. 2013. “The Role of Institutions and Firm Heterogeneity for Labour Market Adjustment: Cross-Country Firm-Level Evidence.” IZA Discussion Papers No. 7404. <http://ftp.iza.org/dp7404.pdf>.
- Gibbons, Robert, and John Roberts, eds. 2012. *The Handbook of Organizational Economics*: Princeton University Press.
- Groshen, Erica L. 2016. “Comment on: Understanding Declining Fluidity in the U.S. Labor Market.” *Brookings Papers on Economic Activity* 52: 238–40. <https://www.brookings.edu/wp-content/uploads/2016/03/molloytextspring16bpea.pdf>.
- Hart, Oliver, and John Moore. 2008. “Contracts as Reference Points.” *Quarterly Journal of Economics* 123 (1): 1–48. doi:10.1162/qjec.2008.123.1.1.
- Herzog, Ryan W. 2013. “Using state level employment thresholds to explain Okun’s Law.” *IZA Journal of Labor Policy* 2 (1): 17. doi:10.1186/2193-9004-2-17.
- ILO. 2011. *Global employment trends 2011: The challenge of a jobs recovery*. Geneva: International Labour Office.

- Islam, Iyanatul, and Sher Verick, eds. 2011. *From the Great Recession to Labour Market Recovery: Issues, Evidence and Policy Options*. Houndmills: Palgrave Macmillan.
- Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* 47 (2): 263. doi:10.2307/1914185.
- Kalleberg, A. L. 2003. "Flexible Firms and Labor Market Segmentation: Effects of Workplace Restructuring on Jobs and Workers." *Work and Occupations* 30 (2): 154–75. doi:10.1177/0730888403251683.
- Kalleberg, Arne L. 2001. "Organizing Flexibility: The Flexible Firm in a New Century." *Br J Industrial Relations* 39 (4): 479–504. doi:10.1111/1467-8543.00211.
- Levchenko, Andrei A., Logan T. Lewis, and Linda L. Tesar. 2010. "The Collapse of International Trade during the 2008–09 Crisis: In Search of the Smoking Gun." *IMF Economic Review* 58 (2): 214–53. doi:10.1057/imfer.2010.11.
- Martin, Ron, and Peter Sunley. 2015. "On the notion of regional economic resilience: conceptualization and explanation." *J Econ Geogr* 15 (1): 1–42. doi:10.1093/jeg/lbu015.
- Maskin, Eric S. 2008. "Mechanism Design: How to Implement Social Goals." *American Economic Review* 98 (3): 567–76. doi:10.1257/aer.98.3.567.
- Möller, Joachim. 2010. "The German labor market response in the world recession – de-mystifying a miracle." *Zeitschrift für ArbeitsmarktForschung* 42 (4): 325–36. doi:10.1007/s12651-009-0026-6.
- . 2012. "From a Bulwark of Eurosclerosis to a Flexibility Champion? Why Did the German Economy and the Labour Market Do

- So Well During and After the Recession?” *CESifo DICE Report* 10 (2): 14–19. <http://www.cesifo-group.de/DocDL/dicereport212-forum3.pdf>.
- Molloy, Raven S., Christopher L. Smith, Riccardo Trezzi, and Abigail Wozniak. 2016. “Understanding Declining Fluidity in the U.S. Labor Market.” *Brookings Papers on Economic Activity* 52: 183–237. <https://www.brookings.edu/wp-content/uploads/2016/03/molloytextspring16bpea.pdf>.
- Myerson, Roger B. 2008. “Perspectives on Mechanism Design in Economic Theory.” *American Economic Review* 98 (3): 586–603. doi:10.1257/aer.98.3.586.
- Nicita, Antonio, and Massimiliano Vatiello. 2014. “Dixit versus Williamson: the ‘fundamental transformation’ reconsidered.” *European Journal of Law and Economics* 37 (3): 439–53. doi:10.1007/s10657-012-9299-2.
- OECD. 2010. *OECD Employment Outlook 2010: Moving beyond the Jobs Crisis*. OECD Employment Outlook. Paris: OECD Publishing.
- . 2012. *OECD Employment Outlook 2012*. OECD Employment Outlook. Paris: OECD Publishing.
- . 2014. *OECD Employment Outlook 2014*. OECD Employment Outlook. Paris: OECD Publishing.
- Rinne, Ulf, and Klaus F. Zimmermann. 2012. “Another economic miracle? The German labor market and the Great Recession.” *IZA Journal of Labor Policy* 1 (1): 3. doi:10.1186/2193-9004-1-3.
- Samuelson, William, and Richard Zeckhauser. “Status Quo Bias in Decision Making.” *J Risk Uncertainty* 1 (1): 7–59. doi:10.1007/BF00055564.
- Schiermeier, Quirin. 2015. “The science behind the Volkswagen emissions scandal.” *Nature*. doi:10.1038/nature.2015.18426.

- Steven Tadelis, Oliver E. Williamson. 2012. "Transaction Cost Economics." In *The Handbook of Organizational Economics*, edited by Robert Gibbons and John Roberts, 159–90: Princeton University Press. <http://www.jstor.org/stable/j.ctt1r2ggg.8>.
- Tversky, Amos, and Daniel Kahneman. 1991. "Loss Aversion in Riskless Choice: A Reference-Dependent Model." *Quarterly Journal of Economics* 106 (4): 1039–61. doi:10.2307/2937956.
- Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York, NY: Free Press.
- . 2002. "The Lens of Contract: Private Ordering." *American Economic Review* 92 (2): 438–43. doi:10.1257/000282802320191769.
- Williamson, Oliver E., Michael L. Wachter, and Jeffrey E. Harris. 1975. "Understanding the Employment Relation: The Analysis of Idiosyncratic Exchange." *The Bell Journal of Economics* 6 (1): 250. doi:10.2307/3003224.

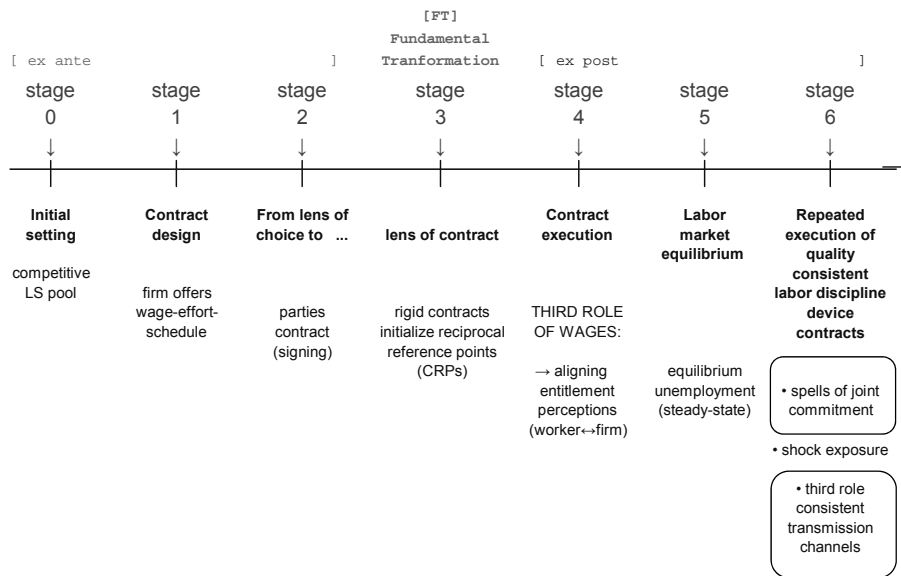


FIGURE I

Timing of Fundamental Transformation and Contractual
Reference Points in the Shapiro-Stiglitz World

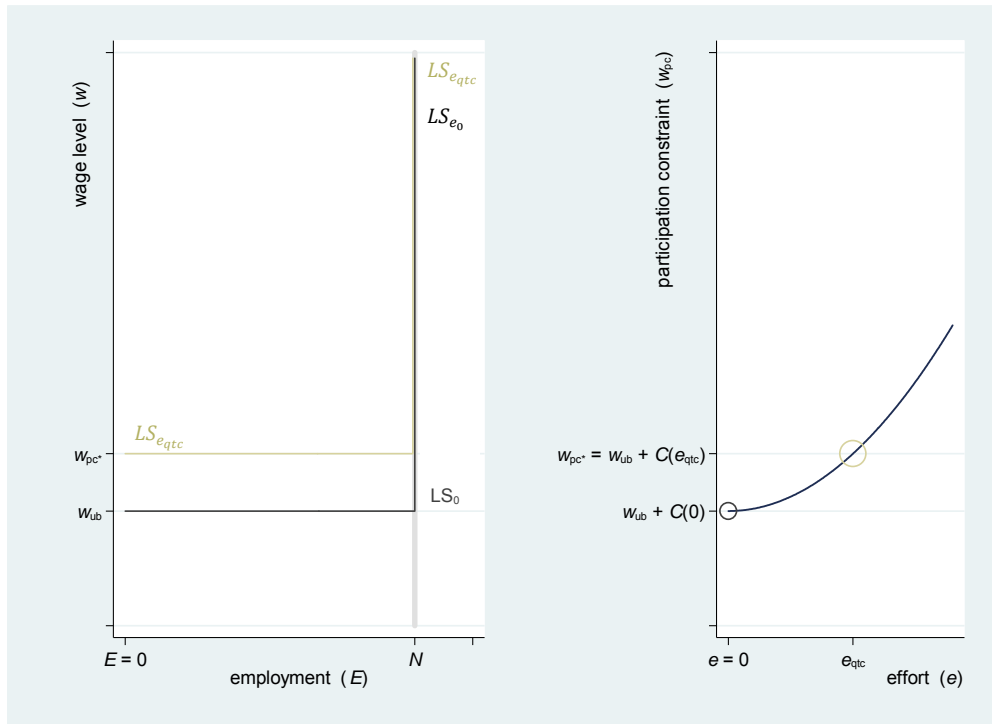


FIGURE IIA

Competitive Outset: Subfamilies of Labor Supply Functions at Initial Stage (left panel) and Individual Wage-Effort Offer Curve PC (right panel).

Note: Specified values indicate offer curve value and labor supply at outside option with $e = 0$ and quality consistent effort choice with $e = e_{qtc}$, respectively.

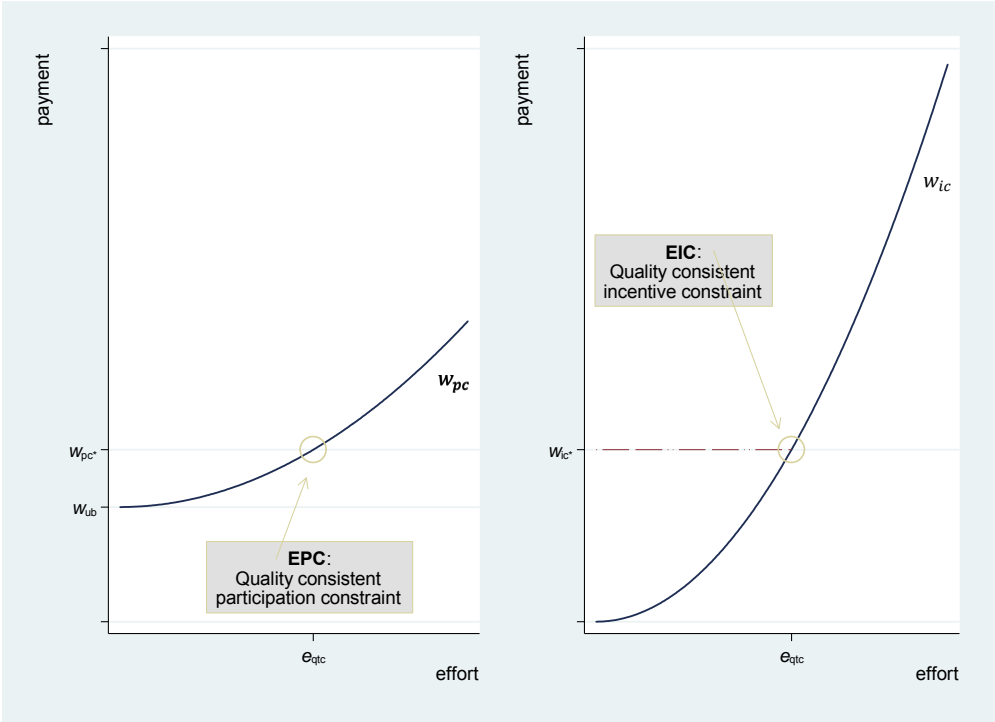


FIGURE IIB

Quality Consistent Contract Design

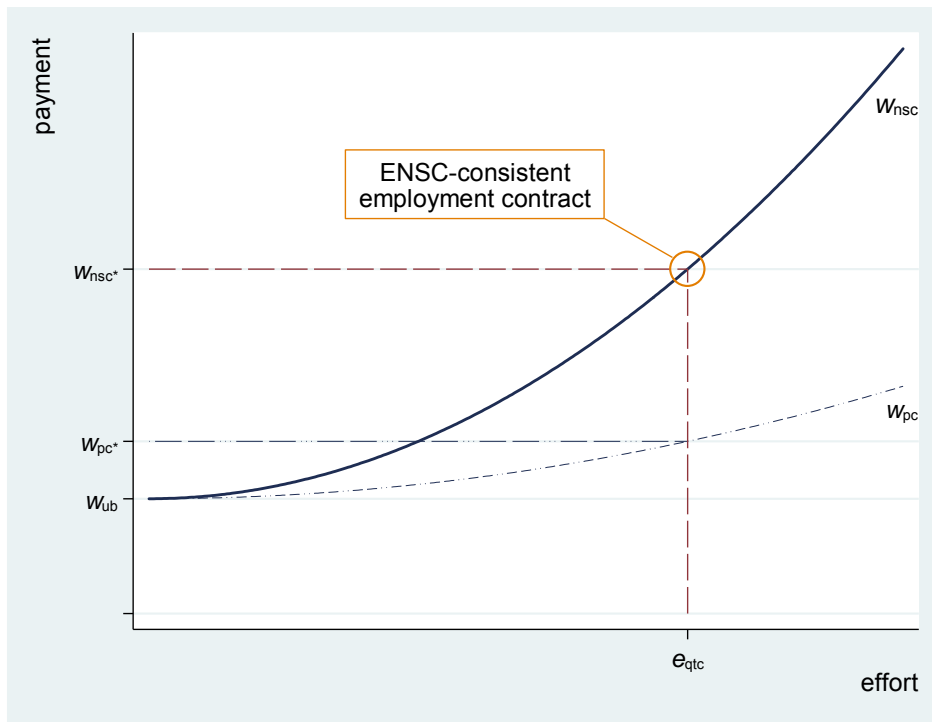


FIGURE III

Fundamental Transformation in a Shapiro-Stiglitz World: Transition from Competitive to Incentive-Restricted Wage-Effort Offer Curve to Quality Consistent Employment Contract

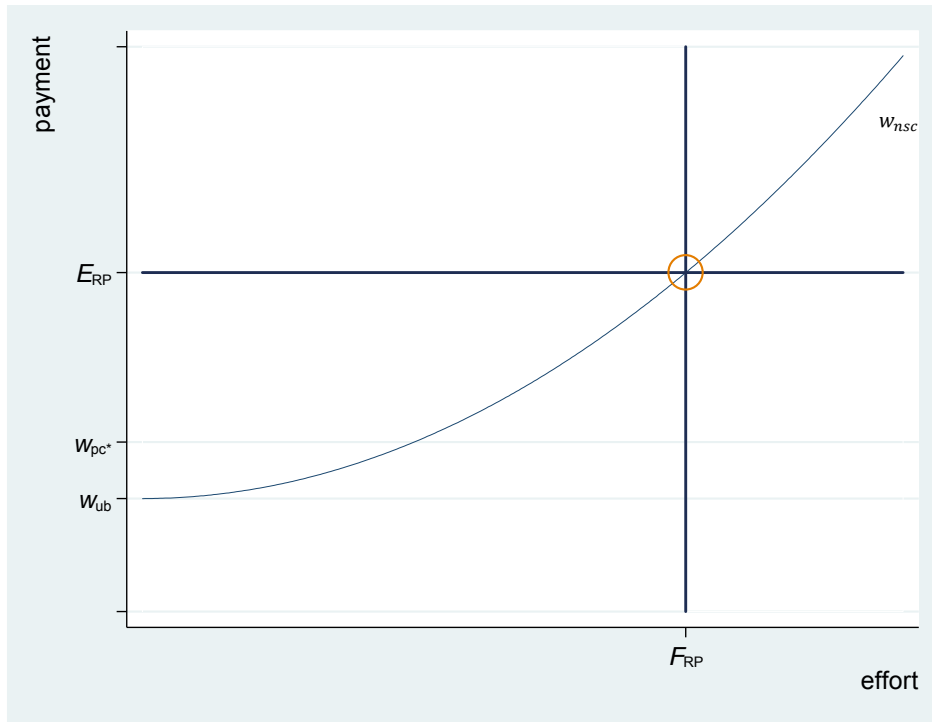


FIGURE IV

Contractual Reference Points E_{RP} and F_{RP} in a Shapiro-Stiglitz World

Note: E_{RP} denotes the employee's CRP and measures her (perception of) entitlement to remuneration, provided the contract has been signed. Any payment level below E_{RP} indicates violation of employee's CRP (corresponding to the area under the horizontal line), in turn triggering shading by that employee. F_{RP} is initialized as firm's CRP. Violation of firm's entitlement perception occurs for any effort level below F_{RP} (corresponding to the area left to the vertical line), immediately failing technological constraint qtc. At the intersection, the two CRPs are mutually aligned (orange hollow circle).

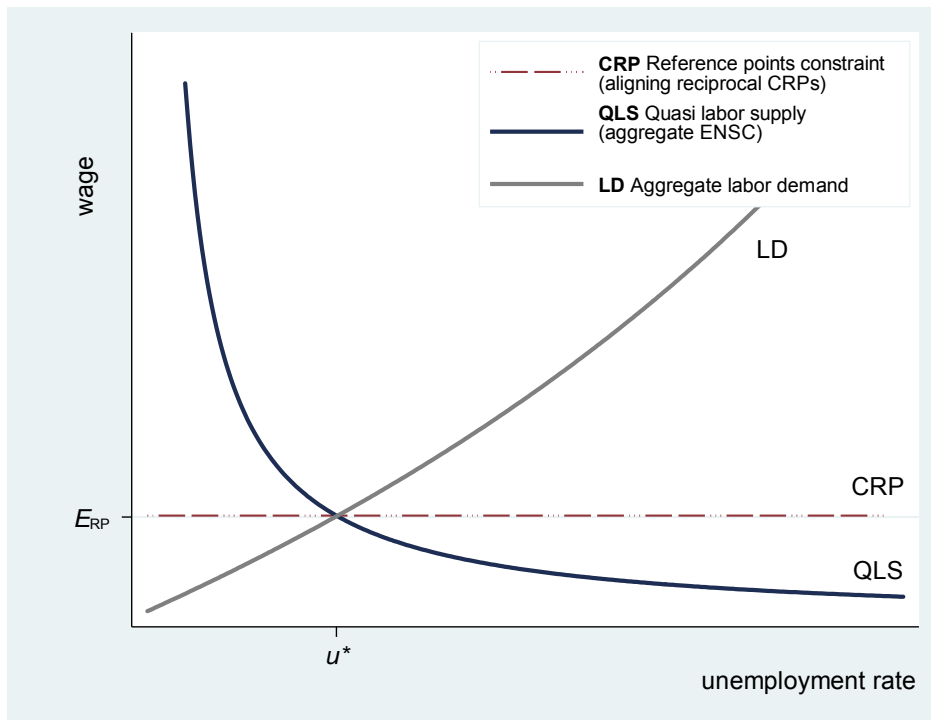


FIGURE V

Labor Market Equilibrium with the Three Roles of Wages Effective

Notes: Without loss of generality, the figure works with following parameter values: $\overline{w_{pqt}} = 10$ —worker's outside option, $\overline{c_{qt}}/q(m) = 5$ —assuming a given monitoring technology, $r = 0.04$ and $s = 0.12$ —roughly imposing recent estimates by Davis and Haltiwanger (2014), Davis et al. (2010) and OECD statistics on separation rates.

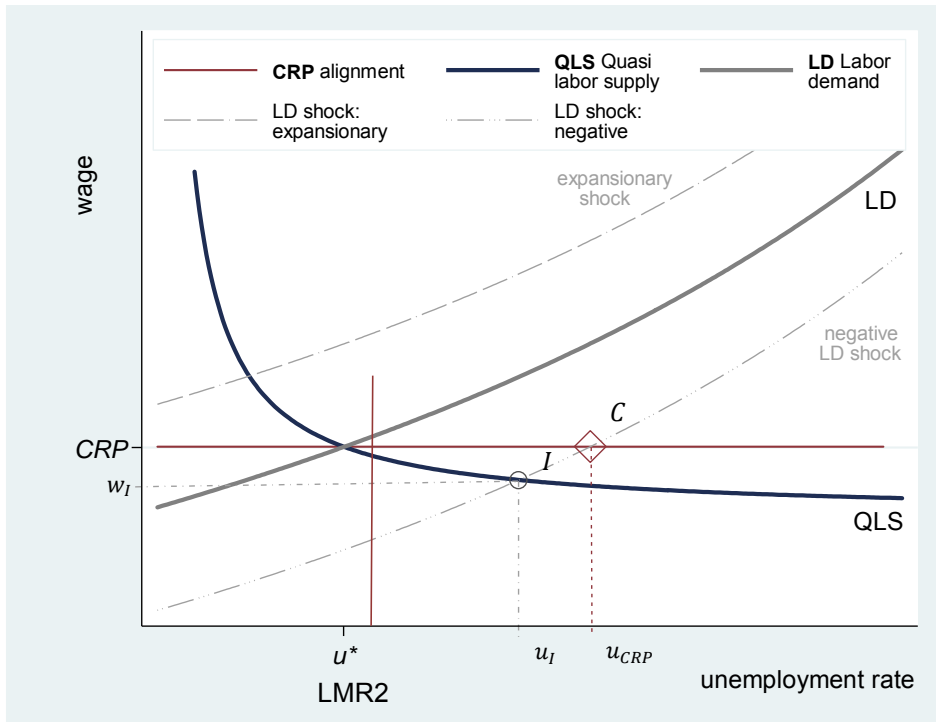


FIGURE VI

Repeated Execution of Employment Relations and Shock Exposure under CRP Alignment

Notes: Supposing a negative demand shock, adjustment outcome *I* is in conflict with the third role of wages, whereas *C* contradicts the second dimension of LMR, including employee tenure evidence.

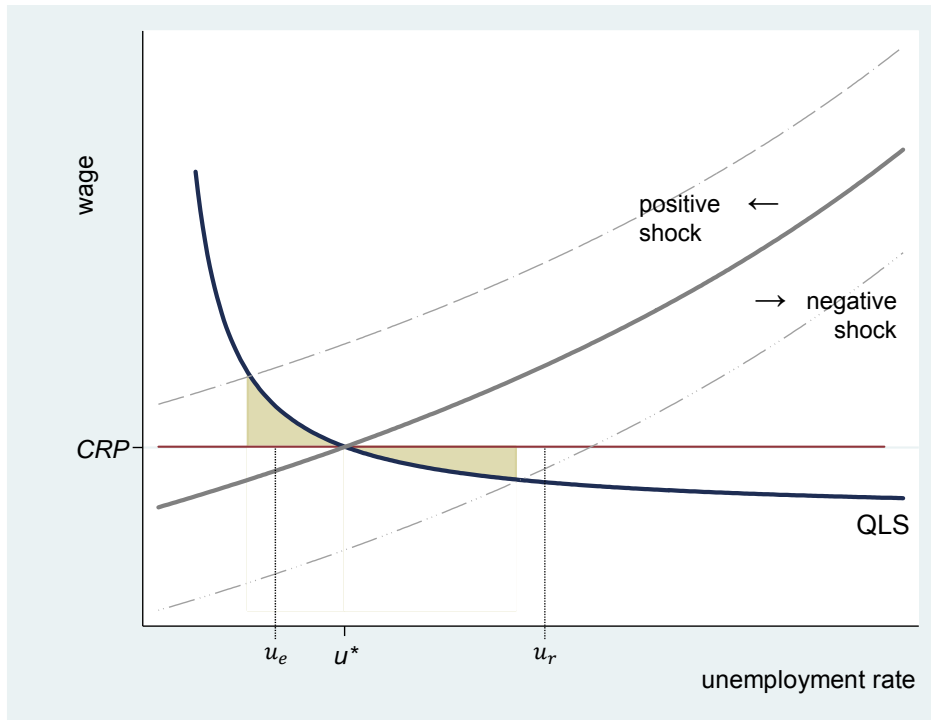


FIGURE VII

Mutually Beneficial Resilience on Labor Markets: Third Role of Wages and
Worker Welfare Consistent Adjustment under Repeated Shocks

Notes: Internal flexibility of firms at the micro-level establishes resilience (absorbing deviation from CRP and equilibrium unemployment rate). The shaded areas capture the corresponding gift exchange by contract parties, with LS side's gift coming along with an expansionary shock and LD side's gift coming along with negative shocks.