Falling Labor Share and Rising Inequality: The Role of Wage Contracts.

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PRELIMINARY
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Abstract

I study trends in labor share and earnings inequality in the context of an on-the-job search model featuring heterogeneous wage contracts. In the model, a shift toward employment contracts with upwardly-re-negotiable wages implies a decrease in labor share and an increase in inequality. Using the German social security register, I assess the ability of this mechanism to account for trends in inequality and labor share observed in that country. I find a secular trend toward renegotiable wage contracts which accelerates in the late 1990's matching the observed series for inequality and labor share over the same horizon. Further, I find that industries in which the incidence of renegotiable contracts increases most also experience larger increases in inequality and larger declines in labor share.

JEL Classification: E25, J31, J41
Keywords: Labor Share, Inequality, Labor Contracts

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This study uses the weakly anonymous Sample of Integrated Labour Market Biographies (years 1975-2014) and the IAB Establishment Panel (years 1993-2014). Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) in Ann Arbor, MI; Cambridge, MA; Los Angeles, CA; and Princeton, NJ.; and remotely via JoSuA.

1 Introduction

Since the mid-1970s Germany and other developed countries have experienced a decreasing share of output paid as labor compensation (Karabarbounis and Neiman, 2014; Elsby et al., 2013) and an increasing income inequality (Card et al., 2013; Lemieux, 2008). This paper documents these trends in Germany and a coincident rise in the proportion of German workers employed in labor contracts for which there is evidence of renegotiable pay. I consider these empirical observations in the context of a job ladder model in which firms may elect to employ under a non-negotiable or a renegotiable wage contract. When the cost of a vacancy stipulating renegotiable wages exceeds that of a vacancy stipulating non-negotiable wages the equilibrium is segmented and only higher productivity employers renegotiate. I show that, in this model, as the share of firms electing to employ under renegotiable contracts increases labor share falls and inequality rises.[1] Returning to the data, I find that industries in which there is evidence of a larger increase in the probability of a renegotiable contract labor share has fallen and inequality has risen more rapidly.

The model's predictions for segmentation, labor share, and inequality stem from the difference in how the labor contracts respond to future competition: the non-negotiable contract preempts future competition, to the extent that this is optimal, with a high initial non-negotiable offer while the renegotiable contract is free to respond if an when future competition occurs. As a result, non-negotiable contracts typically yield rent to employees at hiring while renegotiable contracts do not. Further, wage adjustments in the face of competition enable the employee to extract greater rents from future employers, a feature which is priced into the renegotiable contract as an amenity. *Ceteris paribus* an employer using the renegotiable contract can employ the same workers at less cost than an employer using the non-negotiable contract.[2] Reducing the share of contracts that post wages increases

[1] The model is similar to that considered by Postel-Vinay and Robin (2004); Holzner (2011); Flinn et al. (2017) and a working paper by this author, Doniger (2015), all of which (can) produce segmented equilibria. However, only the case of continuous productivity and optimal posted wages, considered here and in Doniger (2015), is suitable for joint analysis of labor share, inequality, and the composition of contracts.

[2] Under random, balanced search – which is assumed in this paper – differential vacancy costs are invariant

firms ability to extract rents – reducing labor share – particularly from workers lowest on the job ladder – increasing inequality.

Using data from the EUKLEMS project and the German Federal Statistics Office, I document that industrial composition accounts for the decline in labor share from the 1980's to the mid-1990's after which composition plays little role and, instead, labor share falls within most industries. Using the Sample of Integrated Labour Market Biographies (SIAB) provided by the Research Data Centre of the German Federal Employment Agency at the Institute for Employment Research (IAB), I document wage inequality and pay changes that occur at idiosyncratic times.[3] Wage inequality, after accounting for worker characteristics and industry, rises over the period since 1984 and the pace of increases in the mid-1990's. Meanwhile, the incidence of idiosyncratically timed pay changes rises over the sample period. Again there is a marked increase in the pace since the mid-1990's.

I validate using the incidence of idiosyncratic pay change as a poxy for incidence of the renegotiable contract by demonstrating several evidence in the cross-section. First, in a 2011 survey firms report weather or not contracts are renegotiable (Brenzel et al., 2014). The reported incidence of renegotiation is strongly predicted by the incidence of idiosyncratic pay change. Second, job-stayers who experience idiosyncratic pay change systematically earn greater year-over-year pay gains than other job-stayers and pay gains are comparable in magnitude to those who move job-to-job. Third, for a broad range of proxies for employer rank incidence of job-to-job mobility decreases in quality (as has been documented in many other papers) while incidence of idiosyncratic pay-change increases.

Finally, I confirm the predictions of the model with respect to labor share and inequality by exploiting heterogeneity across industries in the trends in labor share, inequality, and incidence of pay change. Industries in which the incidence of a renegotiable contract have

to firm size and, thus, single crossing is straightforward to show.

[3]Re-registration at year-end is mandatory for continuing contracts and is typically associated with a pay-change. However, additional re-registrations occur mid-year. I call a pay-change idiosyncratic if it occurs mid-year and is not coincident with 10% of re-registrations in the industry that year. The 10% threshold is intended to clear the data of changes in sectorial agreements and statutorily mandated re-registrations.

increased most have experienced the greatest declines in labor share and the largest increases in inequality.

Changes in labor contracting provide a novel explanation for the aggregate shifts in labor share and inequality. Prominent alternative explanations are 1) decreasing unionization; 2) increasing import exposure (Autor et al., 2013; Elsby et al., 2013); and 3) increasing industry concentration (Autor et al., 2017; Loecker and Eeckhout, 2017). I test the power of each of theses hypothesise to explain the variation in the macro-aggregates and in the incidence of re-negotiable contracts. Variation in union density and import exposer operate through their affect on contract composition. The main finding is also robust to variation in match quality and labor market dynamism.

2 A Job Ladder with Heterogenous Wage Contracts

Many theories have been put forth to explain rising inequality and falling labor share, jointly or independently. In Section 5.1, I address several of these empirically. Here I present a complementary theory based on a frictional model of the labor market in which employers may choose to hire workers under a non-negotiable or a re-negotiable wage contract. I show that when the proportion of employers who select the re-negotiable contract is lower is labor share is lower and inequality is higher.

The model assumes the basic structure of a random-search job ladder model à la. Burdett and Mortensen (1998). Identical workers search on- and off-the-job for employers. Employers produce using a constant returns to labor technology, p, which is distributed across employers according to a differentiable distribution, $\Gamma(p)$. Search is random and balanced meaning that the probability of drawing a job offer from an employer with technology p is corresponds to its weight in the distribution $\Gamma(p)$. For workers, job offers arrive according to exogenous Poisson processes with hazards $\lambda_e < \lambda_u$ on- and off-the job. Separation also occurs according to an exogenous Poisson process with parameter δ. Employers may choose a non-negotiable

wage contract, as in the posted-wage model of Burdett and Mortensen (1998), or a contract that can be re-negotiated as the worker's outside option evolves through further search, as in the sequential Bertrand auction of Postel-Vinay and Robin (2002).

Proposition 1. *When the cost of maintaining a vacancy featuring a re-negotiable contracts exceeds that of a vacancy for a non-negotiable contract the equilibrium is* ***segmented*** *and only more productive employers re-negotiate.*

I derive the wage equations and employment distributions and present formal proof of segmentation in the Appendix. Here I provide intuition. Define the non-negotiable wage offered by a employer with labor productivity p as $w^n(p)$ and the re-negotiable wage as $w^r(p,q)$ where q is the labor productivity of the worker's best-to-date outside option. In the Appendix, I show that these have the following properties:

$$\text{(3.1)}\ \frac{dw^n(p)}{dp} > 0, \qquad \text{(3.2)}\ \frac{dw^r(q,p)}{dq} > 0,$$

$$\text{(3.3)}\ \frac{dw^r(q,p)}{dp} < 0, \text{ and} \qquad \text{(3.4)}\ w^r(p,q) < w^n(q)\ \forall\ q \leq \check{p} < p$$

where $\check{p}$ is the marginal product of labor such that the employer is indifferent between the two contract types given the relative costs of the associated vacancies.

Properties (3.1) and (3.2) are intuitive. The first, (3.1), states that under a non-negotiable contract wages are increasing in incumbent's productivity. Burdett and Mortensen (1998) and Bontemps et al. (2000) prove this in their wage-posting models, which are nested in the present model.[4] The intuition follows from noting that, conditional on selecting the nonnegotiable contract, a more productive employer is willing to pay more for an employee.[5] The second, (3.2), states that under a renegotiable contract wages are increasing in a worker's best-to-date outside option. Postel-Vinay and Robin (2002) prove this in their sequential

[4] An economy identical to that considered by Bontemps et al. (2000) is recovered when the relative cost of maintaining a renegotiable vacancy is sufficiently large.

[5] That this carries through to the segmented equilibrium follows from noting that labor flows are constrained efficient under segmentation. This is discussed in the Appendix.

Bertrand auction which is also nested in the present model.[6] The intuition follows by noting that a larger wage offer is required to beat out a more productive competing offer.

Property (3.3), which states that more productive employers employ workers at lower wages conditional on their best-to-date outside options, appears counterintuitive. However, by noting two things this can be made intuitive. First, the renegotiating employer offers a wage equal to the worker's current reservation given her current best-to-date outside offer. A lower wage offer would not be accepted and, since the employer can renegotiate wages, the prospect of future competition provides no incentive to offer a higher wage. Second, as in Postel-Vinay and Robin (2002), the option value of search is an amenity associated with the job offer and is thus priced into the wage contract. Since the option value stems from the expectation of future wages, and since a more productive employer will place higher wage bids in the future, employment in a high productivity employer now locks in a longer tail of the expected wage distribution. In other words, the option value of search is increasing in incumbent's productivity, whenever the incumbent employing under a renegotiable contract.

Finally, (3.4), which states that a employer which renegotiates can hire from a employer that does not at a wage cut, also appears counterintuitive. However, the logic also stems from comparing the option value of search in a nonnegotiable contract at a q-productivity employer to that in a renegotiable contract at a p-productivity employer. Since the renegotiating employer will increase the wage offer in an attempt to retain the worker the renegotiating employer offers a larger option value of search. As in the logic of (3.3) this is priced into the wage that induces transition from the q-productivity employer to the p-productivity employer and results in the noted wage cut.

Finally, noting that labor flows are constrained efficient under segmentation and that vacancy costs are independent of equilibrium firm size, properties (3.1)-(3.4) are all that is required to prove that segmentation is a Nash-equilibrium of the game. The Appendix also shows that when the job ladder is sufficiently short–the hazard of on-the-job offer arrival

[6] An economy identical to Postel-Vinay and Robin (2002) is recovered when the relative cost of maintaining a renegotiable contract falls below zero.

is not too much larger than that of separation–there is a one-to-one mapping between the relative cost of negotiable and non-negotiable vacancies and the share of employers that do not negotiate.

This model of contract heterogeneity has two aggregate implications important for the present project:

Proposition 2. *Increasing the share of employers offering the re-negotiable contract:*

1. *reduces labor share, and*

2. *increases lower tail inequality.*

Proofs can be found in the Appendix. Here I provide intuition.

To gain intuition for Proposition 2.1, note three forces that act upon the compensation of employees. First, some marginal employer switches from the non-negotiable contract to the renegotiable contract. From (3.4) we know that this employer reduces its average wage bill. Second, countervailing this force, wages necessary to higher from this marginal employer increase. These first two items offset perfectly, since it is exactly the promise of these wage increases that the marginal employer prices in as an amenity when it switches to the renegotiable contract. Third, renegotiating employers yield no rent at hiring, since they can adjust in the face of future competition, while non-negotiating employers offer wages above the history dependent reservation wage since they cannot adjust later to ward off future competition. Indeed, nonnegotiable wages are optimally set to balance the lost rent against the hazard of attrition (Burdett and Mortensen, 1998; Bontemps et al., 2000). As the share of re-negotiating employers rises the result is that the rent yielded at hiring falls.[7]

[7]Indeed, it falls to zero as the game Approaches Postel-Vinay and Robin (2002) making that game subject to the Diamond (1971) Paradox. Doniger (2015) discusses how contract heterogeneity serves to break the Diamond (1971) Paradox, restoring a relation between wage dispersion and search incentives among the unemployed. The problem of the Diamond (1971) Paradox could also be alleviated by introducing bargaining power on the part of workers as in Cahuc et al. (2006). As compared to Cahuc et al. (2006) which offers a reduced form incentive for search on the part of the unemployed, the present model provides a microfounded incentive that leaves observable tracks in the data: the incidence of raises relative to job-to-job transitions.

To gain intuition for Proposition 5 note that a worker currently unemployed or employed in a nonnegotiable contract captures rent only when she meets another employer who *does not* negotiate. Thus, the wage offer that a worker in such a position is willing to accept from an employer that *does* renegotiate is declining in the share of renegotiable employers. Further, in the Appendix I show that the decline is largest when the workers best-to-date outside option is worst. This gives the result.

2.1 Inferring the Share of Renegotiable Contracts from Microdata

Turning now to inference of the share of renegotiable contracts. The model makes clear predictions about the incidence of job-to-job mobility and on-the-job wage growth. Job-to-job mobility occurs whenever on-the-job search leads to an innovation in the best-to-date job offer. Thus, the likelihood that a job survives t periods and ends in job-to-job mobility is:

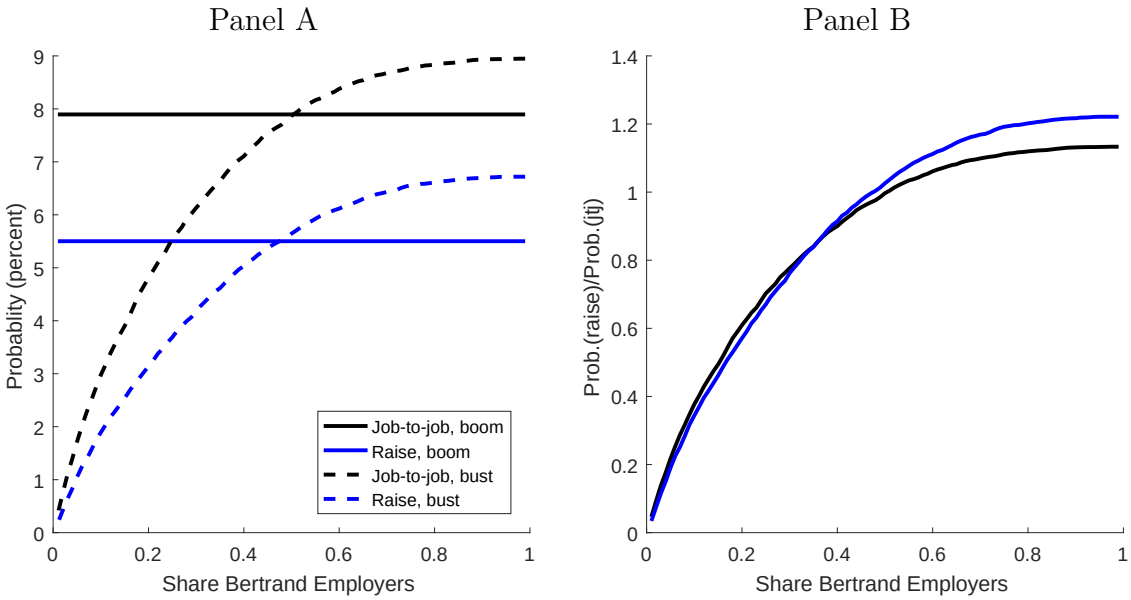
$$\int_{\underline{p}}^{\bar{p}} [\lambda_e[1 - F(p)]e^{-[\delta+\lambda_e[1-F(p)]]t}]dG(p) \tag{2.1}$$

Raises occur in a more specialized set of circumstances: whenever on-the-job search leads to 1) an innovation in the best-to-date outside option, 2) no inovation in the best-to-date job offer, *and* 3) the incumbent best-to-date job offer is at an employer who renegotiates. Thus, the likelihood that a wage survives t periods and ends in a raise is:

$$\int_{\tilde{p}}^{\bar{p}} \int_{\underline{q}}^{p} [\lambda_e[F(p) - F(q)]e^{-[\delta+\lambda_e[F(p)-F(q)]]t}]dG(q|p)dG(p) \tag{2.2}$$

Figure 1 Panel A illustrates the steady state probability of a job-to-job transition and a raise in the model as the share of firms utilizing the renegotiable contract rises from nil to unity. As discussed in the Appendix, the allocation of labor is constrained efficient under all compositions of contract types. Thus, the probability of observing a job to job transition (solid lines) depends only on the model hazards and is independent of the fraction of employers utilizing the renegotiable contract. In contrast the probability of observing a

Figure 1: Inference.



raise is increasing, not surprisingly, in the fraction of firms which renegotiate.

Panel A illustrates these hazards under a high probability of on-the-job offer arrival and low probability of separation as would be the case in an expansion (black) and a low probability of offer arrival and high probability of separation as would be the case in a contraction (blue). In the contraction simulation both job-to-job transition and raise probabilities fall short of the expansion. However, these scale approximately proportionately–a drop in the job-to-job transition probability of half coincides with a job in the raise probability of about half–when the share of firms that renegotiate is not too large. This is illustrated in Panel B. In the aggregate data presented in Section 4 the ratio fluctuates between 0.1 and 0.6, well within the region in which the mapping from the ratio of these to the share of firms which renegotiate is approximately acyclical.[8]

[8]In 2003 and 2010 the ratio rises to .75 and .9 respectively. These are still within the range of approximate acyclicality of the mapping. In what follows I test the robustness of conclusions to exclusion of these years.

3 Data

The following is being revised to reflect final output.

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The *Sample of Integrated Labor Market Biographies* (SIAB) is a two percent random sample of Germans workers made available by the Institute for Employment Research at the German Federal Employment Agency. I restrict the sample to workers with full time employment.[9] These data are based on mandatory, yearly employer reports of each employee subject to social security taxes. Reports contain the exact dates of employment and the average daily wages during the employment period. The data also contain basic demographics as well as and firm level characteristics such as industry, age, size, moments of the within-firm wage distribution, inflows and outflows.

Particularly important for this work, the data make it possible to track the workers's employment status to the exact day. Further, employers *must* make a report at least once each year, typically on new years. Thus the typical record records a sub-part of a multi-year employment relationship. Such a record reports start and end dates on January 1 and December 31, average daily wages over that year, and the aforementioned employee and employer characteristics. When employment relationships begin or end the exact start or end dates are recorded. This results in an employment record covering a sub-part of a year and enables the identification of separations to unemployment and job-to-job moves. Following the literature I define the later as occurring whenever a worker has records at two different employers 15 days or less elapsing between and the former occurring whenever more than 15 days elapse. For the sample of workers employed in the first two weeks of the year, job-to-job mobility occurs for about XX% of workers before year end. The analogous figure for separations is XX%.

These data also contain a small proportion of employees for whom the employer has

[9]The data also contain rich information on job seekers and those with officially regulated part time employment.

submit multiple contiguous reports within as single year.[10] I call a pair of continuous employment reports with a single employer within a year a "reregistration." The following sections explores what exactly a reregistration is and the information a reregistration potentially reveals.[11]

3.1 Legal basis for reregistrations

The notification procedure requires employers to rereregister an employee whenever there is a change in employment status.

> The notification procedure stipulates that changes in the employment status - e.g. when an apprentice is taken on by his/her training company after completing his/her vocational training - must be indicated by a new notification (cf. Deutsche BKK 2012, p. 31).
>
> The reasons for submitting employment notifications are encoded ac-cording to the regulations of the notification procedure which has been in effect since 1 January 1999 (in accordance with DEV).

Since January 1, 1999 records contain a "reason for notification", however incidents of reregistration occur before this date. WHAT ELSE DO I WANT TO SAY ABOUT THIS

3.2 Definitions

First, I define three nested sub-sets of reregistrations.

Idiosyncratic reregistrations: reregistrations which occur on days when fewer than 15% of the other employees within an industry simultaneously experience reregistration. This excludes reregistrations that occur as a result of broad changes nationally or within

[10] Analogous to job-to-job moves I define contiguous as two reports from the same employer with 15 days or less of non-employment elapsing between.

[11] There is limited administrative information regarding the reason for reregistration of employed persons starting from 1999 but it appears to be somewhat unreliable. See Appendix.

an industry that would require reregistration, such as articles of the Hartz reforms or a renegotiation of sectoral wage agreement.

Pay changes: idiosyncratic reregistrations which contain an on impact pay change.

Raises: idiosyncratic reregistrations which contain an on impact pay increase.

TIME SERIES PLOT

3.3 Earnings Outcomes after Mobility and Reregistration

Are outcomes for employees who experience reregistrations different from outcomes for other employees? To this end table 1 records the year-over-year pay changes conditional on the intervening labor market history and table **??** records subsequent mobility patterns.

Table 1 reveals that workers who experience idiosyncratic reregistrations experience greater year-over-year wage growth than other worker who do not change employers. The divergence is stronger for the subset who receive a idiosyncratic, mid-year pay-change and even stronger for those receive a idiosyncratic, mid-year raise. The table also documents the familiar fact that job-to-job movers fair better than job-stayers. Interestingly, wage growth for job-stayers with pay changes or with raises exceeds that of job-to-job movers.

3.4 When do Mobility and Raises Occur?

Histogram across starting wage.

Histogram across change date.

3.5 Mobility, Raises, the Life-Cycle and the Job-Cycle

The model described in the previous section exhibits a job-ladder. As such job-to-job transitions are predicted to decline as a job-cycle–the time since a worker's last unemployment spell–continues. Job-to-job transitions occur whenever a worker draws a new employer that is

Table 1: Year-over-year wage growth by intervening labor market history.

			% obs. such that Δ log wage ≤				
	Mean	Median	-0.1	-0.05	0	0.05	0.1
			1995-2004:				
Job-stayer	0.01	0.00	0.15	0.06	0.45	0.80	0.91
Idiosync. rereg.	0.04	0.03	0.19	0.11	0.38	0.60	0.76
Pay-change	0.07	0.06	0.12	0.06	0.26	0.47	0.69
Raise	0.10	0.07	0.06	0.03	0.16	0.38	0.63
Job-to-job Mover	0.06	0.04	0.21	0.14	0.36	0.54	0.67
			2005-2014:				
Job-stayer	0.01	0.01	0.14	0.06	0.45	0.77	0.90
Idiosync. rereg.	0.03	0.02	0.17	0.09	0.39	0.63	0.78
Pay-change	0.06	0.05	0.11	0.06	0.26	0.48	0.70
Raise	0.09	0.07	0.06	0.03	0.16	0.39	0.64
Job-to-job Mover	0.08	0.05	0.21	0.15	0.34	0.49	0.61

Table 2: Year before to year after wage growth by intervening labor market history.

			% obs. such that Δ log wage ≤				
	Mean	Median	-0.1	-0.05	0	0.05	0.1
			1995-2004:				
Job-stayer	0.02	0.02	0.16	0.08	0.39	0.69	0.84
Idiosync. rereg.	0.02	0.02	0.22	0.13	0.42	0.65	0.79
Pay-change	0.03	0.02	0.17	0.09	0.37	0.63	0.79
Raise	0.04	0.03	0.15	0.07	0.34	0.61	0.77
Job-to-job Mover	0.05	0.04	0.21	0.14	0.35	0.54	0.68
			2005-2014:				
Job-stayer	0.02	0.01	0.16	0.08	0.42	0.69	0.83
Idiosync. rereg.	0.03	0.02	0.20	0.12	0.41	0.63	0.77
Pay-change	0.03	0.02	0.17	0.09	0.40	0.65	0.80
Raise	0.04	0.02	0.15	0.07	0.37	0.63	0.78
Job-to-job Mover	0.07	0.05	0.21	0.14	0.35	0.51	0.63

Figure 2: Job-to-job transitions and Raises over the Life-Cycle and Job-Cycle.

Age	Experience
Job-Cycle	Tenure

better than any previously sampled during the job-cycle. The job-ladder similarly regulates the quality of a worker's best to date outside option.

The best-to-date outside option evolves according to the second best employer sampled during a job-cycle. Were all contracts renegotiable this would imply that the hazard of a raise be nearly identical to that of job-to-job transition. On the other hand, were all contracts to be non-negotiable the hazard of a raise would be nil regardless of duration of job-cycle. In the intermediate case, the hazard of a raise falls short of that of a job-to-job transition early in the job-cycle when many workers are employed in the less productive firms that do not renegotiate. As the job-cycle progresses, however, workers climb the ladder and the probability that an incumbent renegotiates rises toward one. Thus, the model predicts that the hazard of job-to-job transition and of a raise converge.

Figure 2 plots the empirical job-to-job transition hazard and idiosyncratic wage hazard against the same hazards implied by a loosely calibrated model in which 80 percent of firms do not renegotiate.[12] As predicted by the model the hazard of an idiosyncratic raise falls short of a job-to-job transition early in the job-cycle and the hazards converge over time.

- SEX
- Schooling

3.6 Covariation with Employer Characteristics

Finally, EXPLAIN Brenzel et al. (2014) and covariation with their measure.

[12]The on-the-job offer arrival hazard is set to 0.25 and the separation hazard to 0.07 implying just over seven job offers per employment cycle.

Figure 3: Job-to-job transitions and Raises and Employer Rank.

Size	Wages p(50)	Inflow
Age	Wages p(75)	Outflow

Dependent Variable:	Share Reporting Renegotiable Contracts
Share Bertrand	0.295*
	(0.154)
Match Quality	0.413*
	(0.213)
Constant	0.088
	(0.137)
R_squared	0.198
Observations	23

4 Institutional Changes and Aggregate Trends

The following is being revised to reflect final output.

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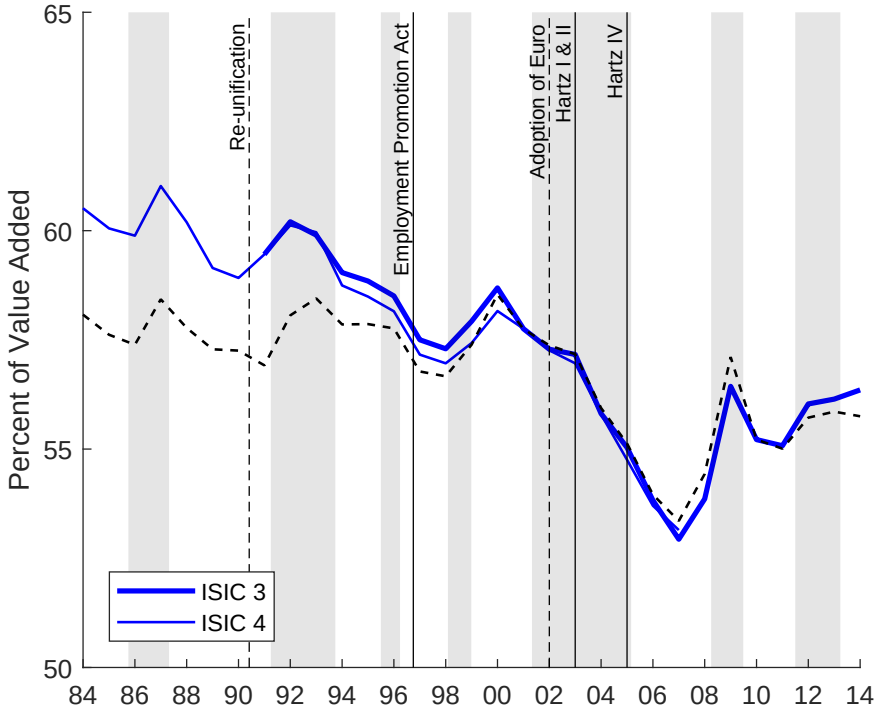
Critical geopolitical events–the collapse of the Soviet Union and reunification–lead to large scale immigration to West Germany following 1990. Immigration likely contributed to the rise in unemployment during this period as well. Unemployment, in turn, instigated large scale labor market reform starting with the Employment Promotion Act of October 1996 and culminating with the Hartz reforms 2003-2005. The aim of these reforms was stabilization of the labor market through promotion of employment. Of particular interest for the present work, the Employment Promotion Act reduced restrictions of fixed contract employment while Hartz II promoted part time employment. In addition, these reforms reduced the generosity of non-employment benefits. Reunification likely also contributed to the decline in unionization as the wage distribution in the East fell short, and continues to fall short, of that in the West. These discrepancies have prompted a reorganization of union structure from industrial to plant level which has contributed to union decline. Despite these radical changes in German labor market institutions, significant features of the trends

Figure 4: Trends in Labor Share 1984-2010.



Note: Compensation of employees (solid lines) and labor compensation inclusive of imputed proprietors wages (dotted lines) as a percent of value added. The dashed line plots implied payroll share holding industrial composition fixed at the 2010 realization. Data 1984-2007 come from EU KLEMS March 2011 release under the International Standard Industrial Classification (ISIC) revision 3. Labor compensation 1995-2014 comes from December 2016 release under ISIC revision 4. Compensation of employees 1991-2014 come from the Federal Statistics Office downloaded via Haver Analytics. Gray areas indicate OECD based monthly recession dates as reported by the Federal Reserve Bank of St. Louis FRED.

in labor share and inequality remain to be accounted for.

4.1 Falling Labor Share

Figure 4 plots the labor share and the payroll share from 1984 until 2010. The dash-dot lines represents the labor share: labor compensation inclusive of imputed proprietors wages as a percent of value added. The solid lines represent the payroll share: compensation of employees as a percent of value added. From 1984 until 2010 both payroll and labor share

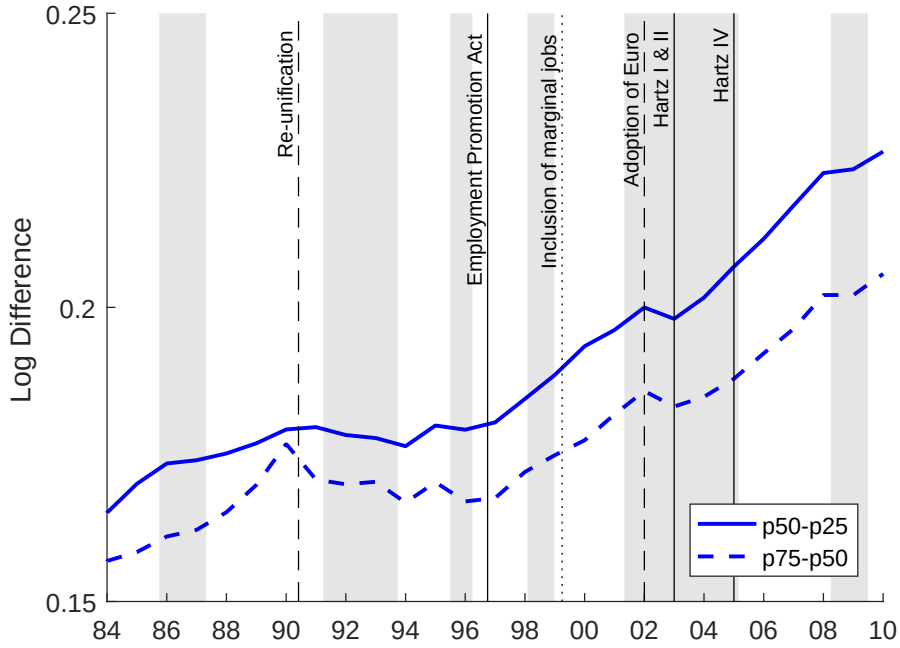
exhibit secular decline interrupted for the most part only during recessions, indicated by the gray areas. The payroll (labor) share fell 8.8 (8.3) percentage points from 1984 to 2008, likely in part due to severe economic distortions in the Euro area since the 2008 Great Recession, after which it has risen 3.4 (3.2) percentage points for a total change over the horizon of 4.2 (5.1) percentage points. Vertical bars in Figure 4 also plot key dates of geopolitical changes and reforms of labor market policy. Evolution of the labor share, however, seems to be largely independent of these.

In part this trend is due to sectoral changes that have resulted in industries with lower labor share accounting for a greater share of economic activity. The black dashed line plots the hypothetical payroll share that would have arisen if the industrial composition realized in 2010 pertained for the entire horizon. This reveals that the drop in payroll share in the early part of the data is largely accounted for by changes in industrial composition. By contrast, changes in payroll share *within* industries account for the decline in the later period.

4.2 Rising Inequality

In order to asses the evolution of inequality, I take earnings data come from the Sample of Integrated Labor Market Biographies (SIAB). The SIAB is a two percent random sample drawn from the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB) of the German Federal Employment Agency. IEB contains records of all individuals in Germany that have at least one of the following employment statuses: employed and subject to social security, marginal part-time employment, benefit receipt under German Social Code III or II, official registration as job-seeking at the German Federal Employment Agency, and planned participation in programs of active labor market policies. This data contains the exact beginning and ending date of each employment relationship, average daily wages during that relationship, basic job characteristics (occupation, industry, part-time or full-time status), and basic demographics (age, sex, education, German/non-German nationality). Importantly for the present work, the data also contain the exact starting and ending

Figure 5: Trends in Inequality 1975-2010.



Note: The solid line plots log difference between the 75^{th} and the 50^{th} percentile of imputed log wages while the dashed line plots the difference between the 50^{th} and the 25^{th} percentile. Vertical lines indicate important breaks in the data series, geopolitical events, and labor market reforms. Gray areas indicate OECD based monthly recession dates as reported by the Federal Reserve Bank of St. Louis FRED.

dates of each employment spell.

I focus on daily wages of full-time jobs of West German men age 21-60.I restrict to full-time workers to mitigate the impact that unobserved variation in hours worked might have on observed trends in inequality. I begin with the sample of full-time jobs in progress in the first week of January in each year 1984-2010. I aggregate multiple concurrent jobs with the same employer and broad occupation, taking the sum of daily wages for the concurrent period. From these data I record the average daily wage during an employment spell, characteristics of the employee (age, sex, education, occupation) and job (industry).

An important drawback of the SIAB data is censoring of earnings data at the social security maximum: between 8% and 12% of full-time male's wages are censored in each year. I follow Dustmann et al. (2009) and Card et al. (2013) and stochastically impute

the censored wages using a series of Tobit models fit separately by year, education level (five categories), age range (four 10-year ranges). I replace the censored wage values with a random draw from the upper tail of the appropriate conditional wage distribution using parameter values from these models.

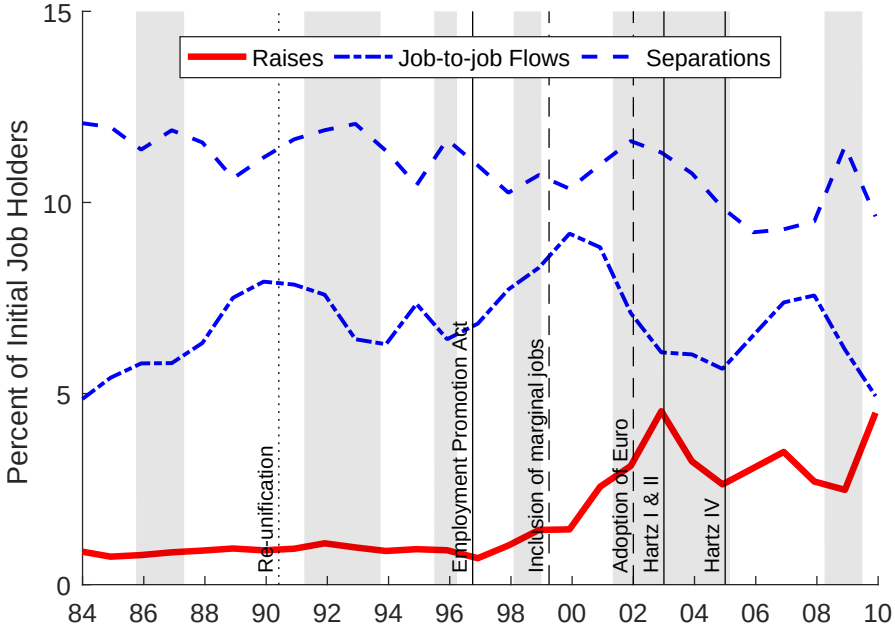
Figure 5 plots the evolution of the range between the 75^{th} and 50^{th} and 50^{th} and 25^{th} percentiles of imputed log wages. The solid line plots log difference between the 75^{th} and the 50^{th} percentile of imputed log wages while the dashed line plots the difference between the 50^{th} and the 25^{th} percentile. Inequality rises comparatively more quickly in the period after the implementation of the Employment Protection Act in 1996.

4.3 Rising Evidence of Renegotiable Pay

Using the afore described sample from the SIAB, I record the fraction workers whose initial employment spell ends in job loss or job-to-job transition and the fraction who experience an idiosyncratic mid-year raise. Measurement of job-to-job transitions and idiosyncratic mid-year raise requires some discussion. A typical worker is registered with her employer from January 1 to December 31 each year. A small minority of workers change employers and have two or more registered employment spells with different employers. These data include the starting and ending dates with each employer. I record a job-to-job transition if the start date of the new job exceeds the end date of the previous job by no more than 15 days.Another small minority *do not* change employers but are re-registered with an existing employer within one year, resulting in two or more registrations per year with the same employer. Focusing on idiosyncratic raises, I record a pay raise for each case in which the new registration is at nominal raise and which does not coincide with a re-registration of more than 15% workers within the same industry.

Figure 6 plots the yearly incidence of job-to-job mobility and re-registrations for each year 1984-2010. The rate of job-to-job transitions fluctuates around 6.5 percent; peaking around 2000; and declining since this date. However, over the whole horizon the rate is relatively

Figure 6: Separation, Job-to-Job, and Raises 1975-2010.



Note: Separations are measured as job-leavers who do not have subsequent employment within 15 days. Job-to-job Flows are measured as job-leavers who do have subsequent employment within 15 days. Raises are measured a mid-year nominal pay increase. Raises which are concurrent with more than 15% of employees within an industry are purged. Gray areas indicate indicate OECD based monthly recession dates as reported by the Federal Reserve Bank of St. Louis FRED.

stable if not increasing. Separations exhibit a mild decline. In contrast, idiosyncratic raises increase in frequency over the horizon, with a marked acceleration after the mid-1990's.

In the following Section, 2, I present a model through the lens of which the rise in the incidence of idiosyncratic raises relative to the stable trend in job-to-job flows indicates a rise in the propensity for firms to employ under renegotiable contracts. I also show that this model predicts a fall in labor share and an increase in inequality, especially in the lower tail, when the propensity for employment under a renegotiable contract rises. I then provide evidence, in Section **??**, that auxiliary predictions of the model regarding workers who receive raises are borne out in the data. Specifically, I detail the distribution of year-over-year pay gains for job stayers, workers with idiosyncratic raises, and job-to-job movers and the incidence of job-to-job transition and idiosyncratic raises over the job-cycle. These are

all in line with the predictions of the model. Having argued that the measured idiosyncratic raises are indeed indicative of the posited model containing renegotiable contracts, I exploit cross-industry variation on labor share, inequality, and incidence of raises to show that a rising propensity for renegotiable contracts does indeed correlate with falling labor share and rising inequality in Section 5. The finding is robust to a variety of other accounts for the labor share and inequality trends.

5 Exploiting Heterogeneity Across Industries

The following is being revised to reflect final output.

Do not cite.

Germany's declining labor share and rising inequality follow patterns similar to the United States, but at some delay. Similar to the findings of Elsby et al. (2013) the falling labor share in the earlier period is accounted for largely by sectoral composition. Indeed within sectors labor share is gowning. In the later period labor share falls in most industries, with the notable exception of "Professional and Business". The pattern in Germany lags the U.S. by about a decade. Similarly, as Dustmann et al. (2009) has already noted, inequality rose in the lower tail in the 1990's a decade after the corresponding pattern in the U.S.. For these reasons I restrict attention in this section to the post-1995 period.[13]

I now turn to exploiting heterogeneity across industries in order to explore the relationship between trends in the incidence of re-negotiable contracts and in labor share and inequality in the later period: 1995-2010. To test the hypothesis that an increase in the share of firms selecting renegotiable contracts implies a decrease in labor share and an increase in lower

[13]In addition, key covariances used to check robustness of the conclusions exist only for the post-1995 period.

tail inequality I run the following reduced form regression:

$$\begin{aligned} LHS_{i,t} = \beta_1\{share\, renegotiable_{i,t}\} \\ + \{competing\, theories_{i,t}\} \times \beta \\ + \beta_3\{\%\, employment\, in\, West\, Germany_t\} \\ + year\ fixed\, effects + industry\ fixed\, effects + \varepsilon_{i,t} \end{aligned}$$

where $LHS_{i,t} = \{Labor\ Share, ln(p50/p10)\}$ at the industry $\times$ year level, $\{share\, renegotiable_{i,t}\}$ is the ratio of idiosyncratic raises to job-to-job transitions in an industry $\times$ year, and $\{competing\ theories_{i,t}\}$ is a vector of measures related to the alternative hypotheses discussed below, also measured at the industry $\times$ year. Regressions are weighted according to the average value added over the period 1995-2014 when the left hand side is labor share and average employment at the industry level when the left hand side measures inequality. Regressions are clustered at the industry level. I consider the 33 broad industries in the ISIC4 classification. Data on labor share are taken from the Federal Statistics Office and downloaded via Haver Analytics.

Table 3 columns I and IV present the main result. An increase in the share of renegotiable contracts predicts a decrease the labor share and an increase in lower tail inequality. All else equal, if the share of renegotiable contracts rose from the level observed in 1995 to that observed in 2010 the labor share would have fallen by 1.3 percent; more than half of the within industry variation! Similarly, the change in the implied incidence of renegotiable contracts contributes 0.4 percentage points to the 9 percent increase in lower tail residual inequality.[14]

[14]Results are robust to the exclusion of Mining and Quarrying and to the exclusion of 2003 and 2010 which may have spurious idiosyncratic raise probabilities.

Table 3: Main Table.

Dependent Variable:	Labor Share[a]			p50-p10[b]		
	I	II	III	IV	V	VI
Share Renegotiable	-0.047**	-0.048***	-0.039**	0.015**	0.014**	-0.013**
	(0.020)	(0.016)	(0.017)	(0.005)	(0.006)	(0.005)
Union Density		0.235	0.231		-0.080	-0.082
		(0.164)	(0.167)		(0.063)	(0.069)
Import Exposure			-0.010			-0.024
			(0.166)			(0.098)
Cap.-Lab. Subs.			-0.000			-0.000
			(0.000)			(0.000)
Dynamism			-0.167*			0.014
			(0.091)			(0.056)
Match Quality			-0.005			-0.008
			(0.010)			(0.010)
FE (Year and Industry)	X	X	X	X	X	X
Observations	528	528	528	528	528	528
R-squared (within)	0.190	0.243	0.263	0.684	0.696	0.700

5.1 Robustness to Alternative Explanations

Are these correlations robust to competing explanations? Here I test against a host of competing theories. In sum, I find that inclusion of competing theories strengthens the main result.

Declining Unionization

The primary alternative hypotheses is declining unionization in Germany over this period: the fraction of workers employed outside of a sectoral agreement rose from 27 percent in 1995 to 44 percent in 2007 (Card et al., 2013). Unionization may increase workers' share of the surplus by increasing their bargaining power, for example **?** finds a 20 percent union wage premium in U.S. data. Unionization may also compress wage schedules workers bargain collectively (**?**). In the United States **?** finds a union wage premium around 20 percent.

In regressions II and V, I control for the share of employment in an industry which is governed by a union agreement. I obtain an estimate of this share using the IAB Establishment

Panel. These data are a representative employer survey at individual establishments conducted each year since 1993 in West Germany (and each year since 1996 in East Germany). From the survey questions weather or not a union exists at an establishment can be inferred along with the establishments total employment. These data can not be directly linked to the SIAB data even at the industry by year level; however, I impute The estimated share of employees in an industry employed in a unionized establishment as the best fit quadratic in time. Higher order time trends do not improve the fit substantially.

Columns II and V show that union density is not a significant predictor of labor share and inequality.[15]

Table A2 shows that while both the share renegotiable and unionization trend together over the sample period decreased unionization does not predict a decrease in the share of renegotiable contracts once a flexible time trend is accounted for: renegotiability is not simply a symptom of declining unionization.

Table 4: Renegotiability and Union Density.

Share Renegotiable		
Union Density	-2.340***	-0.142
	(0.211)	(0.941)
Year FE		X
Industry FE (Year and Industry)	X	X
Observations	528	528
R-squared (within)	0.380	0.725

Controlling for unionization in the mainline regression (II) hardly effects the coefficient on the share of renegotiable contracts. Meanwhile, while the coefficient on the share renegotiable becomes statistically indistinguishable from zero in specification (V) controlling for overall wage flexibility in the industry, as discussed below, in specification (VI) returns the mainline result.

[15] An inaccurate regression including the share of unionized establishments yield wildly different results. The key to understanding the divergence is to note that non-union establishments are predominantly and increasingly predominantly small. Thus, while the share of unionized establishments has declined rapidly (in some industries) the share of employment governed by union wage agreements has been comparatively stable.

Import Exposure

As suggested by Elsby et al. (2013), import penetration could depress labor's share of domestic value added if labor and imported intermediates are more substitutable than capital and imported intermediates. Evidence is more mixed regarding the impact of trade on inequality (**?**).

I construct import exposure using the annual input-output matrices available from the OECD Structural Analysis (STAN) database. These are available from 1995-2011. Following Elsby et al. (2013), import exposure is expressed as the percentage increase in value added need to satisfy German final demand if Germany would produce all its imports domestically.[16] In specifications (III) and (VI) import exposure appears to have no impact on labor share or inequality in Germany.

5.1.1 Capital Labor Substitutability

Alternatively, it is possible that industries which tend to invest in equipment types whose prices increase more slowly see more rapidly decreasing labor share and more rapidly increasing inequality. If the decline in labor share is due to workers being replaced by machines then one would expect larger declines in labor share in industries where equipment prices rise less rapidly. In the case of skill biased technical change we would expect lower equipment prices to displace workers performing routine jobs.

I compute the price of equipment and software in an ISIC 4 industry in each year from 1995-2010. Data on equipment price inflation are taken from the Haver Analytics series on Gross Fixed Capital Formation by Economic Sector. Haver reports these from the German Feral Statistics office. In specifications (III) and (VI) equipment price also appears to have no impact on labor share or inequality in Germany.

[16] In terms of input-output terminology and following Elsby et al. (2013), the measure of import exposer is the percentage difference between total domestic requirements and total requirements for an industry.

5.1.2 Match Quality and Declining Labor Market Fluidity

In a job ladder model worker's continued exposure to employment opportunities leads to increasingly good matches over time as workers reallocate toward better prospects. Davis and Haltiwanger (2014) observe that fluidity has declined in the United States and suggest that this may contribute to trending inequality and labor share. Figure 6 illustrates a relatively stable job-to-job mobility rate in Germany, thus this story is unlikely to fit for that country.

I measure labor market fluidity as the expected number of job offers per employment spell using data from the SIAB. In particular, I calculate the average number of job-to-job transitions[17] and the average number of job-to-nonemployment separations for workers who were employed starting from January first of each year. I proxy the expected number of job offers per employment spell as the ratio of job-to-job transitions to job-to-nonemployment transitions in each year.[18]. Again, in specifications (III) and (VI) labor market fluidity appears to have no impact on labor share or inequality in Germany.

5.1.3 Wage Flexibility

A hypotheses related to labor market fluidity relates to wage flexibility: perhaps labor share falls and inequality rises simply because firms have gained the power to offer more targeted wage contracts. These contracts could reward worker differentials more specifically and could respond to cyclical fluctuations more rapidly.

I measure wage flexibility as the ratio of the probability of an idiosyncratic pay *change* to the probability of a job-to-job transition both calculated in the SIAB data. Specifications (III) and (VI) show that wage flexibility has little predictive power for labor share and predicts an increase in inequality. Importantly, after controlling for overall wage flexibility the

[17] defined as moving from one employer to the next with an interviewing spell of non-employment lasting fewer than 15 days

[18] THIS IS BIASED I SHOULD ADJUST FOR THE FACT THAT SOME OFFERS MAY BE REJECTED AND THAT THIS MAY BE MORE LIKELY DURING AN EXPANSION or replace this with the Hagedorn and Manovskii (2013) measure.

share of renegotiable contracts is once again a statistically significant predictor of inequality: deunionization increases wage flexibility but does not predict increases in upward revisions.[19]

6 Conclusion

[19] I also test that the share renegotiable does not simply correlate with increasing value added at the industry level.

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A Structural Model

Definition 1. *An equilibrium of the on-the-job search model with heterogenous wage contracts consist of:*

1. *A steady state unemployment rate and distribution employers across employed workers.*
2. *A steady state distribution of wages within firms and in aggregate.*
3. *A composition of labor contracts.*

1. Unemployment rate and distribution of employers across employed workers.

Lemma 1. *In every segmented equilibrium such that more productive employers renegotiate labor flows are efficient.*

Proof Consider two employers that both Post: Burdett and Mortensen (1998) show that the more productive employer optimally posts a larger wage and hires the employee whenever such a meeting occurs. Consider two employers that both Bertand: Postel-Vinay and Robin (2002) show that the more productive employer can offer a weakly more valuable wage contract than the most valuable contract that can be offered by the less productive employer – wage equal to the less productive employer's marginal product at the less productive employer – and that it finds it optimal to do so. Thus the more productive employer hires the worker whenever such a meeting occurs. Consider two employers one Posting and one Bertrand: under the proposed segmented equilibrium the more productive employer must be the Bertrand employer. Postel-Vinay and Robin (2002) already showed that the Bertrand employer would find it optimal to offer a contract weakly more valuable than earning wages equal to the marginal product of the Posting firm at the posting firm. Further, Burdett and Mortensen (1998) show that the Posting employer posts wages weakly less than marginal product (strictly if the employer is not the least productive). Thus the Bertrand employer can and will hire from the Posting employer. □

With that established it is straightforward to show, using the method of mass balance, that the unemployment rate is

$$u = \frac{\delta}{\delta + \lambda_u}$$

and that the distribution of firm types across employed workers is

$$L(p) = \frac{\Gamma(p)}{1 + k_e \bar{\Gamma}(p)}$$

where $\bar{\Gamma}(p) = 1 - \Gamma(p)$ and $k_e = \lambda_e / \delta$ is the average number of jobs held during an employment spell.

2. Unemployment rate and distribution of employers across employed workers.

Noting that Bertrand employers offer the history-contingent reservation wage at all times it is also it is straightforward to derive wage schedules under each contract type:

$$\begin{aligned}
w^n(p) =& p - [1 + \kappa_1 \bar{\Gamma}(p)]^2 \int_{\underline{w}}^{p} [1 + \kappa_1 \bar{\Gamma}(x)]^{-2} dx && \text{for } p < \check{p} \\
w^r(q,p) =& w^n(q) - k_e \bar{\Gamma}(\check{p}) \big[\check{p} - w^n(q) - \int_{q}^{\check{p}} \tfrac{k_e[\Gamma(\check{p}) - \Gamma(x)]}{1 + k_e[\Gamma(\check{p}) - \Gamma(x)]} \tfrac{dw^n(x)}{dx} \big] - k_e \int_{\check{p}}^{p} \bar{\Gamma}(x) dx && \text{for } q \leq \check{p} \leq p \\
w^r(q,p) =& q - k_e \int_{q}^{p} \bar{\Gamma}(x) dx && \text{for } \check{p} < q \leq p.
\end{aligned}$$

where p is the incumbent employer's productivity, q is the productivity of the best-to-date outside offer, k_e is the ratio of the arrival rate of offers on-the-job to the separation rate, Γ is the distribution of employer types, $\underline{w}$ is the reservation wage of a worker to take employment in a non-negotiable contract, and $\check{p}$ is the least productive employer utilizing the re-negotiable contract. Comparative statics (3.1)-(3.4) follow.

Within a Posting firm the distribution of wages is a point mass at the posted wage.

Within a Bertrand firm the distribution of wages is

$$G(w|p) = \left(\frac{1 + k_e \bar{\Gamma}(p)}{1 + k_e \bar{\Gamma}(q(w,p))} \right)^2$$

. Existence of an insertable mapping $q(w,p)$ can be checked by noting that $w^r(q,p)$ is increasing in q for $q < \tilde{p}$ and $q > \tilde{p}$ and that $w^r(\tilde{p}^-,p) < w^r(\tilde{p}^+,p)$.

2. Composition of labor contracts: Proof of Proposition 1.

Existence

Current operating surplus from the proposed strategies exceed current operating surplus from each firm's best deviation.

Suppose WP is prescribed: A firm for which WP is prescribed must have $p < \check{p}$.

For the p-productivity firm, current operating surplus from playing optimal wage under the prescribed wage contract, WP, and the best deviation to SA can be written as

$$\pi^P(p) = [p - w_{PP}(p)]\ell(p)$$

and

$$\pi^{BD}(p) = [p - w_{PA}(\underline{p},p)]\ell(\underline{p}) + \int_{\underline{p}}^{\hat{p}} [p - w_{PA}(q,p)]d\ell(q) - c(\check{p})$$

where $\hat{p}$ is the productivity of the most productive firm that offers a posted wage less than p (e.g., the most productive firm that the p-type firm can outbid by switching to SA).

Simplifying,

$$\begin{aligned}\pi^{BD}(p) =&[p - w_{PP}(\check{p}) + \underbrace{w_{PA}(\underline{p}, \check{p}) - w_{PA}(\underline{p}, p)}_{<0, \text{ since } \frac{dw_{PA}(\underline{p},p)}{dp}<0}]\ell(\underline{p}) \\ &+ \int_{\underline{p}}^{\hat{p}} [p - w_{PP}(\check{p}) + \underbrace{w_{PA}(q, \check{p}) - w_{PA}(q, p)}_{<0, \text{ since } \frac{dw_{PA}(q,p)}{dp}<0}]d\ell(q) \\ &- \int_{p}^{\check{p}} [\underbrace{w_{PP}(\check{p}) - w_{PA}(q, \check{p})}_{\geq 0}]d\ell(q) \\ <&[p - w_{PP}(\check{p})]\ell(\hat{p}) \leq \pi^{P}(p).\end{aligned}$$

The last line follows from noting $w_{PP}(p)$ was the unique profit-maximizing posted wage choice for the p-type firm.

In other words, the WP firm could increase its labor supply by deviating to SA. However, the firm could also increase its labor supply by the same amount by deviating to a larger posted wage. Willingness to pay for the right to SA is then strictly less than the difference between the wage bill under the deviation to SA and the deviation to a higher posted wage, which in turn is strictly less than the cost of SA.

Suppose SA is prescribed: A firm for which SA is prescribed must have $\check{p} \leq p$. For the p-productivity firm, current operating surplus from playing the prescribed SA wage schedule and deviating to the best posted wage are

$$\begin{aligned}\pi^{A}(p) =&[p - w_{PA}(\underline{p}, p)]\ell(\underline{p}) + \int_{\underline{p}}^{\check{p}} [p - w_{PA}(q, p)]d\ell(q) \\ &+ \int_{\check{p}}^{p} [p - w_{AA}(q, p)]d\ell(q) - c(\check{p})\end{aligned}$$

and

$$\pi^{BD}(p) =[p - \grave{w}]\ell(\grave{w}).$$

Note that $\grave{w} \geq w_{PP}(\check{p})$ since $p \geq \check{p}$. Simplifying,

$$\begin{aligned}
\pi^{BD}(p) =& [p - \grave{w}]\ell(\underline{p}) + \int_{\underline{p}}^{\check{p}} [p - \grave{w}] d\ell(q) + \int_{\check{p}}^{\grave{w}} [p - \grave{w}] d\ell(q) \\
<& [p - \underbrace{w_{PP}(\check{p})}_{\leq \grave{w}}]\ell(\underline{p}) + \int_{\underline{p}}^{\check{p}} [p - \underbrace{w_{PP}(\check{p})}_{\leq \grave{w}}] d\ell(q) + \int_{\check{p}}^{\grave{w}} [p - \underbrace{w_{AA}(q,p)}_{< \grave{w}}] d\ell(q) \\
<& [p - w_{PA}(\underline{p}, p) - \underbrace{w_{PP}(\check{p}) + w_{PA}(\underline{p}, \check{p})}_{>0, \text{ since } \frac{dw_{PA}(\underline{p},p)}{dp} < 0}]\ell(\underline{p}) \\
&+ \int_{\underline{p}}^{\check{p}} [p - w_{PA}(q,p) - \underbrace{w_{PP}(\check{p}) + w_{PA}(q, \check{p})}_{>0, \text{ since } \frac{dw_{PA}(q,p)}{dp} < 0}] d\ell(q) \\
&+ \int_{\check{p}}^{p} [p - w_{AA}(q,p)] d\ell(q) < \pi^A(p).
\end{aligned}$$

The best deviation to WP involves a reduction in the SA firm's labor supply. I can find a bound on the minimum willingness to pay for the right to SA by considering only the labor supply that would arise under the *smallest possible* best deviation the SA firm might select: $w_{PP}(\check{p})$. Willingness to pay for the right to SA is then larger than the difference between the wage bill under the deviation to WP and the wage bill for these employees under the prescribed SA contract, which in turn is strictly greater than the cost of SA.

Since no firm wishes to unilaterally deviate, the pair $\{c, \check{p}\}$ form an equilibrium.

Uniqueness

The mapping between c and $\check{p}$ is one-to-one if $\frac{dc}{d\check{p}} > 0 \ \forall \check{p}$

$$\begin{aligned}
c =& \pi^A(\check{p}) - \pi^P(\check{p}) \\
=& \Big[[\check{p} - w_{PA}(\underline{p}, \check{p})]\ell(\underline{p}) + \int_{\underline{p}}^{\check{p}} [\check{p} - w_{PA}(q, \check{p})] d\ell(q)\Big] - [\check{p} - w_{PP}(\check{p})]\ell(\check{p}) \\
=& \big[k_e \bar{\Gamma}(\check{p})[\check{p} - w_{PP}(\check{p})]\big]\ell(\check{p}) + \int_{\underline{p}}^{\check{p}} \ell(q) \frac{1 + k_e \bar{\Gamma}(q)}{1 + k_e[\Gamma(\check{p}) - \Gamma(q)]} \frac{dw_{PP}(q)}{dq}
\end{aligned}$$

Since integrating by parts yields

$$\int_{\underline{p}}^{\check{p}} [\check{p} - w_{PA}(q,\check{p})d\ell(q) = [\check{p} - w_{PA}(\check{p},\check{p})]\ell(\check{p}) - [\check{p} - w_{PA}(\underline{p},\check{p})\ell(\underline{p})] + \int_{\underline{p}}^{\check{p}} \ell(q)\frac{1 + k_e\bar{\Gamma}(q)}{1 + k_e[\Gamma(\check{p}) - \Gamma(q)]}\frac{dw_{PP}(q)}{dq}$$

and noting that

$$w_{PP}(\check{p}) - w_{PA}(\check{p},\check{p}) = k_e\bar{\Gamma}(\check{p})[\check{p} - w_{PP}(\check{p})]$$

Differentiating gives the result:

$$\begin{aligned}
\frac{dc}{d\check{p}} =& \frac{d\ell(\check{p})}{d\check{p}}\big[k_e\bar{\Gamma}(\check{p})[\check{p} - w_{PP}(\check{p})]\big] + \ell(\check{p})\Big[k_e\bar{\Gamma}(\check{p})[1 - \frac{dw_{PP}(\check{p})}{d\check{p}}]\Big] - \ell(\check{p})\Big[k_e d\Gamma(\check{p})[\check{p} - w_{PP}(\check{p})]\Big] \\
&+ \ell(\check{p})(1 + k_e\bar{\Gamma}(\check{p}))\frac{dw_{PP}(\check{p})}{d\check{p}} - k_e d\Gamma(\check{p})\int_{\underline{p}}^{\check{p}} \ell(q)\frac{1 + k_e\bar{\Gamma}(q)}{(1 + k_e[\Gamma(\check{p}) - \Gamma(q)])^2}\frac{dw_{PP}(q)}{dq} \\
=& k_e\bar{\Gamma}(\check{p})\ell(\check{p}) + k_e d\Gamma(\check{p})\Big[\ell(\check{p})[\check{p} - w_{PP}(\check{p})] - \int_{\underline{p}}^{\check{p}} \frac{[q - w_{PP}(q)](1 + k_e\bar{\Gamma}(p))}{(1 + k_e[\Gamma(\check{p}) - \Gamma(q)])^2} d\ell(q)\Big] \\
=& k_e\bar{\Gamma}(\check{p})\ell(\check{p}) - k_e d\Gamma(\check{p})\Big[\ell(\check{p})[\check{p} - w_{PP}(\check{p})] + 2\int_{\underline{p}}^{\check{p}} \frac{\ell(q)}{1 + k_e[\Gamma(\check{p} - \Gamma(q)}dx\Big] \\
=& k_e\bar{\Gamma}(\check{p})\ell(\check{p}) + k_e d\Gamma(\check{p})\Big[\int_{\underline{p}}^{\check{p}} \ell(q)\frac{1 - k_e[\Gamma(\check{p} - \Gamma(q)]}{1 + k_e[\Gamma(\check{p} - \Gamma(q)]}dx\Big]
\end{aligned}$$

Noting that:

$$\begin{aligned}
\frac{d\ell(\check{q})}{d\check{q}} &= \ell(q)\frac{2k_e d\Gamma(q)}{1 + k_e\bar{\Gamma}(q)}, \text{ and} \\
\frac{dw_{PP}(q)}{dq} &= [q - w_{PP}(q)]\frac{2k_e d\Gamma(q)}{1 + k_e\bar{\Gamma}(q)}
\end{aligned}$$

So we have that $\frac{dc}{d\check{p}} > 0$ for sufficiently small k_e. How small depends on the distribution $\Gamma(p)$. As $\Gamma(p)$ approaches a point mass k_e must approach 1; however, for disperse $\Gamma(p)$, k_e

can be large. Insufficiently small k_e will result in non-monotonicity as $\check{p}$ approaches $\bar{p}$.

A.1 Proof: An Increase in the Share Renegotiable decreases Labor Share.

$$
\begin{aligned}
total\ wages = & \int_{\underline{p}}^{\check{p}} w^n(p)\ell(p)d\Gamma(p) \\
& + \int_{\check{p}}^{\bar{p}} \Big[w^r(\underline{p},p)\ell(\underline{p}) + \int_{\underline{p}}^{\check{p}} w^r(q,p)d\ell(q) + \int_{\check{p}}^{p} w^r(q,p)d\ell(q) \Big] d\Gamma(p) \\
= & \int_{\underline{p}}^{\check{p}} w^n(p)\ell(p)d\Gamma(p) \\
& + \int_{\check{p}}^{\bar{p}} \Big[w^r(\check{p},p)\ell(\check{p}) - \int_{\underline{p}}^{\check{p}} \ell(q)\frac{1+k_e\bar{\Gamma}(q)}{1+k_e[\Gamma(\check{p})-\Gamma(q)]}\frac{dw^n(q)}{dq} \\
& \qquad + p\ell(p) - w^r(\check{p},p)\ell(\check{p}) - \int_{\check{p}}^{p} \ell(q)(1+k_e\bar{\Gamma}(q))dx \Big] d\Gamma(p)
\end{aligned}
$$

Since integrating by parts yields:

$$
\int_{\underline{p}}^{\check{p}} w^r(q,p)d\ell(q) = w^r(\check{p},p)\ell(\check{p}) - w^r(\underline{p},p)\ell(p) - \int_{\underline{p}}^{\check{p}} \ell(q)\frac{1+k_e\bar{\Gamma}(q)}{1+k_e[\Gamma(\check{p})-\Gamma(q)]}\frac{dw^n(q)}{dq}, \text{ and}
$$

$$
\int_{\check{p}}^{p} w^r(q,p)d\ell(q) = p\ell(p) - w^r(\check{p},p)\ell(\check{p}) - \int_{\check{p}}^{p} \ell(q)(1+k_e\bar{\Gamma}(q))dx
$$

Differentiating:

$$\begin{aligned}
\frac{d(total\ wages)}{d\check{p}} =& \big[w^n(\check{p}) - w^r(\check{p},\check{p})\big]\ell(\check{p})d\Gamma(p) \\
&+ d\Gamma(\check{p})\int_{\underline{p}}^{checkp} \ell(q)\frac{1+k_e\bar{\Gamma(q)}}{1+k_e[\Gamma(\check{p})-\Gamma(q)]}\frac{dw^n(q)}{dq} \\
&+ \int_{\check{p}}^{\bar{p}} \Big[\frac{d\ell(\check{p})}{d\check{p}}\big[w^r(\check{p},p) - w^r(\check{p},p)\big] + \ell(q)\big[\frac{dw^r(\check{p},p)}{d\check{p}} - \frac{dw^r(\check{p},p)}{d\check{p}}\big] \\
&- (1+k_e\bar{\Gamma}(\check{p}))\ell(\check{p})\big[\frac{dw^n(\check{p})}{d\check{p}} - 1\big] \\
&+ k_e d\Gamma(\check{p})\int_{\bar{p}}^{\check{p}} \ell(q)\frac{1+k_e\bar{\Gamma}(q)}{(1+k_e[\Gamma(\check{p})-\Gamma(q)])^2}\frac{dw^n(q)}{dq}\Big]d\Gamma(p) \\
=&(1+k_e)d\Gamma(\check{p})\int_{\bar{p}}^{\check{p}} \frac{1}{(1+k_e[\Gamma(\check{p})-\Gamma(q)])^2}\frac{dw^n(q)}{dq} \\
>&0
\end{aligned}$$

Noting that:

$$w^r(\check{p},p) - w^r(\check{p},p) = (w^n(\check{p}) - \check{p})[1+k_e\bar{\Gamma}(\check{p})], \text{ and}$$
$$\frac{d\ell(\check{q})}{d\check{q}} = \ell(q)\frac{2k_e d\Gamma(q)}{1+k_e\bar{\Gamma}(q)}$$

A.2 Proof: An Increase in the Share Renegotiable increases Lower Tail Inequality.

First note that the lowest wage is paid by the most productive firm: $\underline{w} = w^r(\underline{p},\bar{p})$. Now note that $\frac{dw^r(q,p)}{d\hat{p}} < 0$ for all $q < \hat{p}$ and $\frac{dw^r(q,p)^2}{dqd\hat{p}} > 0$.

B Auxiliary Tables

Table A1: Shift-Share Analysis of Changes in Labor Share .

	Share of Value Added			Labor Share			Shift-share	
	1985	1995	change	1984	1995	change	shift	share
TOTAL	100.0	100.0	0.0	70.6	68.2	-2.4	1.4	-3.6
Agri., Forest., Fish.	2.1	1.3	-0.9	136.1	116.2	-19.9	-0.3	-1.1
Mining & Quarrying	1.4	0.6	-0.9	66.1	83.9	17.8	0.2	-0.6
Manufacturing	28.2	22.6	-5.5	76.1	80.3	4.2	1.1	-4.3
Utilities	2.8	2.2	-0.7	40.8	45.0	4.2	0.1	-0.3
Construction	6.5	6.8	0.3	82.3	80.3	-2.0	-0.1	0.2
Trade	10.2	10.9	0.7	86.8	84.9	-1.9	-0.2	0.6
Transport. & Storage	6.1	5.7	-0.5	72.2	70.6	-1.6	-0.1	-0.4
Leisure & Hospitality	1.3	1.4	0.1	113.6	126.8	13.2	0.2	0.1
Info. & Comm.	2.5	2.4	-0.1	52.1	50.7	-1.4	0.0	0.0
Fin. & Ins.	4.5	4.6	0.1	65.3	70.9	5.5	0.3	0.1
Real Estate	15.4	21.8	6.4	23.7	24.8	1.1	0.2	1.5
Pub. Admin.	7.3	6.7	-0.5	85.0	84.5	-0.5	0.0	-0.5
Education	4.5	4.3	-0.2	90.6	95.8	5.2	0.2	-0.2
Health & SocialWork	5.2	6.3	1.1	79.3	79.3	-0.1	0.0	0.8
Other Service	4.0	4.6	0.5	61.8	62.6	0.8	0.0	0.3
	1995	2010	change	1995	2010	change	shift	share
TOTAL	100.0	100.0	0.0	67.9	64.4	-3.5	-2.1	-1.3
Agri., Forest., Fish.	1.0	0.7	-0.3	131.5	97.7	-33.9	-0.3	-0.4
Mining & Quarrying	0.6	0.2	-0.3	82.3	78.2	-4.1	0.0	-0.3
Manufacturing	22.8	22.2	-0.6	73.3	65.6	-7.7	-1.7	-0.4
Utilities	2.8	3.4	0.7	48.0	32.2	-15.7	-0.5	0.3
Construction	6.8	4.3	-2.5	88.6	91.2	2.5	0.1	-2.3
Trade	10.3	9.9	-0.4	83.5	79.1	-4.4	-0.4	-0.3
Transport. & Storage	4.0	4.6	0.6	84.8	62.3	-22.5	-1.0	0.4
Leisure & Hospitality	1.5	1.4	-0.1	111.7	101.1	-10.6	-0.2	-0.1
Info. & Comm.	3.8	4.5	0.6	56.9	63.2	6.2	0.3	0.4
Fin. & Ins.	4.7	4.6	-0.1	75.0	71.4	-3.7	-0.2	-0.1
Real Estate	10.9	11.5	0.6	5.7	5.4	-0.3	0.0	0.0
Prof. & Business	9.6	10.6	1.0	45.2	65.6	20.4	2.1	0.6
Pub. Admin.	6.8	6.3	-0.5	81.8	81.3	-0.5	0.0	-0.4
Education	4.3	4.5	0.2	88.9	90.6	1.6	0.1	0.2
Health & SocialWork	5.9	7.1	1.2	89.7	84.5	-5.2	-0.3	1.0
Arts & Rec.	1.2	1.3	0.1	65.8	66.6	0.8	0.0	0.1
Other Service	2.6	2.6	-0.1	72.4	72.6	0.2	0.0	-0.1

Table A2: Unionization and renegotiation.

Dependent Variable:	Share renegotiable	
	I	II
Union Density	-2.34	-0.93
	(0.21)	(0.72)
Year FE		X
Industry FE	X	X
R-squared (between)	0.380	0.736