Many European countries feature numerous labor market regulations including

- employment protection legislation that restrict dismissals
- constraints on wage levels and changes in the form of
  - mandated downward rigidity of wages with tenure in a firm
  - schedules of minimum wages or “wage floors”

That is, unlike in countries with a national minimum wage (NMW) like US and UK

- in Austria, Denmark, Finland, Iceland, Italy, Sweden, Norway, Germany
- multiple sectoral wage floors exist: vary w/ worker’s age, tenure in firm or occupation

In Italy wage floors specifically depend on

- worker’s level in firm hierarchy of positions or occupations: “institutional job ladder”
- worker’s years in a job level: “seniority”
Motivation

- Models of European labor markets, though, abstract from most of these regulations
  - in particular from wage floors

- This paper first to explicitly incorporate wage floors (and regulations described)
  - within an equilibrium model of labor market

- We then apply this model to Italy and use it to analyze and quantify
  - efficiency and distributional implications of these regulations
  - using unique data originally collected on all main regulations since 1980
Common approach: descriptively document importance of NMW by measuring, e.g.,
- fraction of workers paid minimum, ratio of median or mean wage to min wage

MWs (especially regulations mentioned) have broader impact on wages/employment than
- on workers directly affected: dynamic feedback current decisions/future regulations

On one hand, since firms anticipate possibility of these regulations binding in future
- regulations influence employment and wage decisions by firms
- also about workers not immediately impacted by regulations (e.g. “inframarginal”)

On other hand, since current employment decisions affect future constraints by design
- response to constraints key to understand determinants of employment-wage profiles
Purpose of Paper

- Examine how these regulations affect
  - labor market outcomes: individual careers dynamics, aggregate employment-wages
  - efficiency and distributional properties

- Address question in the context of competitive equilibrium model of labor market
  - wages and matching of workers to jobs are subject to regulations described
  - fully accounts for forward-looking behavior by workers and firms
  - incorporates process of worker assignment to jobs within in addition to b/w firms

- Use framework to measure impact of these regulations based on unique data merging
  - matched employer-employee information: Work Histories Italian Panel, with
  - direct information on regulations from collective national labor agreements
Main Findings (So Far)

- Model reproduces data well even without search frictions (preliminary)
  - so regulations important to account for salient features of careers and labor market

- Substantial misallocations occur within firms
  - intuition: since wage floors depend on job levels, affect their relative profitability
  - firms try to mitigate their impact by choosing suboptimal assignments for workers

- Lead to large output distortions w/ significant effects on wage dynamics and earnings
  - wage floors compress PDV of life-cycle earnings by up to 50%

- Most output and earnings losses not due to presence of wage floors per se
  - but to high degree of conditionality on worker’s labor market history
  - makes efficiency-equity trade-off more severe from life-cycle viewpoint
Plan of Talk

- Present details of main labor market regulations in Italy
  - with special emphasis on wage floors

- Analyze simple equilibrium model of Italian labor market
  - that incorporates wage floors and other regulations mentioned
  - so as to illustrate their effects

- Quantitative exercise: counterfactually assess impact of wage floors
  - output, dynamics of wages, life-cycle earnings and aggregate wage distribution
Regulations In Italy
Regulations of Employment Relationship in Italy

- Most aspects disciplined by civil code and collective national labor agreements (CNAs)
  - CNAs: b/w trade unions and representative employers’ associations at sector level

- Civil code determines general principles regarding
  - workplace safety, length of workday, hiring, firing, layoffs, demotions and pay

- CNAs contain specific provisions concerning
  - implementation of general principles set by the civil code, especially wage floors

- CNAs, renewed every 2-4 years, apply to all employed in a sector regardless of union status
  - even to employees of firms not belonging to any signing employers’ association
  - compliance ensured by trade unions’ supervision (primarily) and labor tribunals
Example of How Wage Floors Work: Insurance Sector in 2002

- Regulations relatively simpler and well-understood
  - we collected data for all major sectors in Italy from 1980 onward

- Leading CNA for the sector specifies different wage floor schedules
  - depending on a worker’s “line of work” (job content or task)
  - distinguishes workers as “sales” (marketing of insurance products) and “non-sales”

- For each level CNA prescribes wage floor worker is entitled to as function of seniority
  - “sales worker”: sets 5-level occupational hierarchy w/ levels 1 to 4 + managers
  - “non-sales worker”: sets 8-level occupational hierarchy w/ levels 1 to 7 + managers
Example of Wage Floors: Insurance Sector Sales Workers 2002

Wage floors increase with level, seniority in a level and are ranked across levels by seniority.

Wage floors increase with level, seniority in a level and are ranked across levels by seniority. Wage floor at low seniority in one level can be smaller than wage floors at lower level.
Overlap of schedules across levels common, pronounced and key to job assignment and wages

Next: turn to framework we use to evaluate impact of these regulations
Model
Model: Market

- Competitive labor market populated by large number of infinitely-lived firms
  - each is endowed with a multi-job technology to produce common output
  - output at each level affine function of a worker’s skill

- Today: identical firms to focus on intensive margin of job assignment at firm level
  - directly affected by regulations (discuss heterogeneous firm case at end of talk)

- Workers in this market are finitely-lived and belong to overlapping generations
  - are endowed with heterogeneous skills at entry in the market
  - acquire human capital through employment
  - in any period can be employed or unemployed
Model: Firms

- All firms in market subject to constraints described (perfect enforcement)
  - seniority-dependent wage floors
  - downward wage and level rigidity with tenure: no wage decrease or demotion

- Firms Bertrand-compete for workers
  - by simultaneously offering period by period employment contracts
  - contracts prescribe wage, $w$, and job level, $l$, for current period
  - can be thought of long-term contracts renegotiated each period

- Firms can hire workers from unemployed and employed pools (can “poach”)
  - but must pay fixed cost at hiring
  - as well as fixed cost upon termination of employment relationship as in data
Problem of firm currently employing a worker, “incumbent”, as follows

If firm wishes to retain worker, it must make an offer such that

- offered wage larger than seniority-dependent wage floor at level and previous wage
- offered level not lower than previous level
- offer implies PDV of future income at least as high as that implied by competitor’s offer

Note employment problem of competitor same as that of incumbent except for

- “resetting” of tenure upon worker’s transition to competitor
- at hiring: offered wage and level can be smaller than worker’s previous wage and level
To Understand Impact of Regulations

- Consider first a simple example where
  - wage floors only regulations in place and are constant w/ seniority in a level
  - each firm has just two job levels
  - worker’s skills are fixed over time: no skill accumulation

- In this case solving for equilibrium w/ or w/o wage floors
  - reduces to solving a (sequence of identical) static problem(s)
  - that determine whether a worker is employed and, if so, at which level and wage

- To illustrate these points: consider worker’s output at each firm’s level
Firm Technology with Two Job Levels

Output produced by a worker with skills $h'$ at level 1 and 2 respectively

Output produced by a worker with skills $h''$ at level 1 and 2 respectively

Output at each level function of a worker’s skills as depicted: complementarity skills/jobs
No Regulations: Efficient Output At Each Level

In this setting: efficient output given by upper envelope of the output lines for two levels.
Assignment policy efficient and leads to “natural” ranking of skills across levels: low at 1 and high at 2,
No Regulations: Summary

- Note all workers are assigned to efficient level given their skills
- Are paid their one-period output at assigned level
- So equilibrium leads to efficient allocation of workers to levels within (and b/w) firms
- Generates no wage or job dynamics (and no separation for infinitesimal moving cost)
Introducing Wage Floors

- What happens when wage floors are introduced?

- Suppose first wage floors are independent of seniority

- So can be represented by two straight lines as in following figure
Wage Floors

In figure: green (resp., blue) line represents wage floor at level 1 (resp., 2)

To make case interesting: floor at 2 higher than output at 2 for low to intermediate skills
Workers w/ lowest skills are now unemployed

Some workers w/ intermediate skills at 1 despite output at 2 higher since lower than floor
Wage Floors: Distortion in Assignment Generates Output Loss

Output loss: displayed in figure by the shaded gray areas
Wage Floors: Loss Neither Uniform Nor Monotone Across Workers

Workers with low and medium-high skills experience welfare loss: neither uniform nor monotone with worker’s skills.

Output loss, Wage loss, Welfare loss (per period)

Skills $h$

w/o wage floors: Employed at 1 Employed at 2

with wage floors: Not Employed Employed at 1 Employed at 2

Output loss does not necessarily become smaller as worker’s skills at entry increase.
Wage Floors Independent of Seniority: Summary

- In terms of efficiency impact: overall wage floors have
  - standard “extensive” margin effect: low-skilled workers no longer employable
  - novel “intensive” margin effect: medium to high-skilled workers are misallocated

- In terms of distributional impact: as standard, wage floors imply
  - low-skilled workers, unemployed, are worse off but highest-skilled are unaffected

- A novel distributional effect arises from interaction skills, floors and job levels
  - i.e.: medium-skilled workers may be unaffected or worse off due to wage floors
  - floors magnitude determines range(s) of skills such that either effect obtains
  - if loss arises its size depends on worker’s productivity difference across levels
Introducing Wage Floors Increasing With Seniority

- When wage floors depend on seniority a potentially efficiency-enhancing effect arises
  - increase in wage floors w/ seniority may induce a firm to promote worker
  - who would have been retained at lower level w/ floors independent of seniority
  - despite worker more productive at higher level (as in example)

- Reason: by promoting worker, firm avoids paying the seniority premium in wage floors
  - this effect can then decrease size of misallocation generated by wage floors

- Also wage floors increasing w/ seniority induce wages to deviate from output
  - this effect emerges in presence of firing costs
Wage Floors Increasing with Seniority

In this example: for same seniority at each level, wage floor at 2 higher than floor at 1
But past seniority $s'$ at 1, a worker assigned to 2 faces lower floor than if retained at 1
Consider a worker with skills $h$ whose efficient assignment is level 2.
Wage Floors Increasing with Seniority: Inefficient Assignment

In presence of wage floors and firing costs: no longer assigned to efficient level each period.

Worker is assigned to 1 until $s'$ then promoted to 2 despite output at 2 smaller than floor.
Wage Floors Increasing with Seniority: Intuition

Since $y_2(h)$ exceeds $m_2(0)$: worker cannot be always employed at level 2

But given $y_1(h)$ larger than $m_1(0)$: worker can be profitably employed at level 1 until $s'$

After $s'$ at 1: worker retained at 2 as firm incurs smaller loss by retaining than by firing
Wage Floors Increasing with Seniority: Output Loss

Legend:
- Worker’s output at assigned level

Note output loss smaller than if floors were independent of seniority
So ambiguous efficiency effect relative to just sectoral wage floors
Any worker employed at level 2 after s’ years at firm at level 1 is paid more than output
So worker must be paid less than output earlier in tenure since firm’s profits are zero
Indeed wages differ from output (smaller/higher) and difference depends on size of floors. As a result wages and output increase over life-cycle despite skills constant.
Wage Floors Increasing with Seniority: Impact on Wages

Legend:
- **Worker’s output at assigned level**
- **Worker’s wage at assigned level (# indicates the level)**

Similar argument for workers with output difference across levels bracketed by floor difference.

All such workers paid floor at 2 at some point so spike in wages at floor w/ firing cost not w/o.
Quantitative Exercise
Building Quantitative Model

- Assume firms have as many job levels as in data and workers live for 30 years.

- Specify distribution of worker’s skills at entry in market to be log-normal.

- Also allow workers to accumulate more skills over time: law of motion parametrized
  - to produce same percentage increase in skills w/ seniority as in wage floors in data.

- Calibrate this augmented model based on data from WHIP targeting
  - distribution of workers across levels in the insurance sector in 2002
  - variance of sectoral wage distribution so as to pin down variance of initial skills.
Quantitative Model: Fit

- Calibrated model matches well distribution of workers across levels

- For sales workers in the insurance sector in 2002 (≈ 2,900 of 36,000 workers)
  - observed fractions at levels 1 to 4: 0.151, 0.458, 0.379 and 0.012
  - predicted fractions at levels 1 to 4: 0.180, 0.450, 0.347 and 0.022

- Model also reproduces fairly accurately
  - skewness and kurtosis of aggregate wage distribution
  - distribution of workers by employment status and seniority
Implications for Output and Earnings

- Our model implies wage floors lead to distortions in employment and assignment
  - associated w/ potentially significant life-cycle output and earnings losses

- Output/earnings loss relative to an economy w/o regulations is due to distortions
  - to **extensive** margin of assignment: workers unemployed
  - to **intensive** margin of assignment: employed workers assigned to inefficient levels

- In computing loss we adopt normalization
  - output unit equals annualized average monthly wage floor across levels/seniority
Percentage Loss in PDV of Output By Initial Skills

Much greater for low to intermediate initial skills: no distortion for skills above median
For first group: loss is greater due to both extensive and intensive margin distortion
As discussed: loss non-monotone across skills especially for those w/intermediate skills
More severe for younger workers: ↓ over life-cycle due to compensating effect of skill increase
Impact of Output Loss on Life-Cycle Earnings

Loss affects disproportionately more workers with low initial skills: greatest drop in earnings
To Understand Mechanism Underlying Earnings Loss for Low Skills

- Consider dynamics of individual wages: wages grow on average with experience.

- Yet this wage growth is characterized by large dispersion in rates across workers.

<table>
<thead>
<tr>
<th>Cumulative Growth</th>
<th>Mean</th>
<th>St. Dev.</th>
<th>Lowest</th>
<th>25th p.</th>
<th>75th p.</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>20.53%</td>
<td>9.33</td>
<td>0.00%</td>
<td>13.92%</td>
<td>26.93%</td>
<td>40.18%</td>
</tr>
<tr>
<td>Competitive</td>
<td>17.37%</td>
<td>4.59</td>
<td>2.24%</td>
<td>14.56%</td>
<td>19.87%</td>
<td>27.11%</td>
</tr>
</tbody>
</table>

- Workers with low initial skills experience lower wage growth than w/o regulations.
  - despite wage floors contributing 15.39% to 16.29% (skill accumulation: 72.07%)
  - generate higher earnings mobility primarily for intermediate to high skills workers.
In Italy, as discussed, wage floors depend on seniority at level.

How important is this dependence for output and earnings?

Does this dependence alleviate or compound distortions caused by wage floors?
Removing Seniority Dependence: Impact on Output By Initial Skills

Removing dependence reduces output loss relative to competitive economy by 50%
Unlike in example induces underpromotion of skilled workers more productive at higher levels
Removing seniority dependence: loss smaller except for end of life-cycle
So for highest-skilled workers seniority has efficiency-enhancing effect as in example
Removing Seniority Dependence: Impact on Earnings

All benefit w/o dependence but most gain accrues to workers w/ low to intermediate skills
Removing Seniority Dependence: Impact on Earnings

For these workers: gain due to reduction in extensive margin distortion + no intensive one

Removing intensive margin distortion to assignment has large positive extensive margin effect
Source of Increase in Earnings: Greater Employment

Individuals work for greater fraction of life-cycle when floors do not depend on seniority
Individuals produce more conditional upon working: fewer misallocations (and higher skills)
Impact of Seniority Dependent Wage Floors on Inequality

- Wage floors motivated by distributional considerations: what is impact on inequality?

- Aggregate wage distribution more equal w/ floors independent of seniority (↓ CV)

<table>
<thead>
<tr>
<th>Aggregate Wages</th>
<th>Mean</th>
<th>St. Dev.</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>W/ Seniority</td>
<td>1.04</td>
<td>0.46</td>
<td>0.442</td>
</tr>
<tr>
<td>W/o Seniority</td>
<td>1.02</td>
<td>0.45</td>
<td>0.441</td>
</tr>
<tr>
<td>Competitive</td>
<td>1.11</td>
<td>0.37</td>
<td>0.333</td>
</tr>
</tbody>
</table>

- Also life-cycle efficiency-equity trade-off less severe w/ floors independent of seniority
  - recall PDV (for all) higher and CV of PDV distribution lower

- Why? Dependence on seniority favors primarily workers with intermediate/high skills
  - their higher earnings associated w/ substantial loss to workers w/ lower skills
Extensions of Baseline Model in Progress

- Incorporate firm heterogeneity and full details of main existing regulations
  - payroll taxes
  - firing cost: function of worker’s labor market history
  - unemployment benefits

- Allow for frictional labor market search
  - to explore how wage floors influence surplus sharing between firms and workers
  - do wage floors affect distribution of employment gains b/w firms and workers?

- Introduce uncertainty in skill accumulation including firm-specific component
  - do wage floors promote or hinder skill acquisition?

Augmented model estimated on rich cross-section/panel data displaying *exogenous* variation
Example of Wage Floors: Insurance Sector Sales Workers 2002-4

Wage floor schedules have changed over time and differ across sectors.

This variation provides key dimension for purpose of model identification and validation.
Debate on Minimum Wage Policy and Employment Protection

- Can use this framework to address debate on usefulness of minimum wage policy.

- As well as questions at heart of policy discussion on labor market deregulation.

- What would happen in Italy if a national minimum wage was introduced instead?
  - Model offers rich measurement tool to explore distributional effects of such reform.

- What is the impact of employment protection under different minimum wage policies?
  - When are fixed-term employment contracts preferable to open-ended ones?
Conclusions

- Propose model that incorporates key labor market regulations
  - so far unexplored in literature: sectoral level- and seniority-specific minimum wages
  - in order to analyze impact on individual and aggregate outcomes

- Model (so far) well captures
  - aggregate distributions of employment and wages
  - salient features of employment and wage dynamics

- Policy constraints largely account for observed labor market outcomes
  - have quantitatively important efficiency and distributional effects
Work Histories Italian Panel

- Large administrative matched employer-employee dataset from social security archives
  - sample at ratio 1:90 of entire Italian (native and foreign) working population
  - contain observations on all employed in private sector at any point over 1985-2004

- All main events of individual careers are recorded in data
  - employment spells covered by permanent employment contracts
  - spells covered by “atypical” contracts (fixed-term employment)
  - self-employment spells of small entrepreneurs (e.g., artisans)
  - retirement spells
  - non-working spells upon receiving social (unemployment or mobility) benefits

- Excluded workers: public sector or covered by special SS fund (e.g. lawyers, notaries)

- Info on worker occupation identifies job level in institutional job ladder for minima