Functionally flexible?

Legal Rigidity in Task Reassignment and Technology Adoption

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Labor market rigidities

- Technological change is modifying the demand of firms for workers
- Thus, adoption of new technologies will interact with labor market rigidities
  - If it is costly to fire a worker, I may not want to adopt new technologies if that adoption replaces existing workers
  - I may also want to adopt more technology so that I do not need to hire workers and thus never need to pay the penalty
- Often, we think that reconversion is a better solution than firing when adopting new technologies
  - What if there are rigidities in the capacity to reconvert a worker?
- Chile's very strict labor code in terms of switching the functions of a hired worker allows us to study this
- Unique dataset to study the content of labor contracts enables us to look in detail at the functions

Research Question

Central question

Does legal rigidity around unilateral reassignment of job functions discourage technology adoption by Chilean firms?

- In this project
  - How much does the **specificity** with which contracts define worker functions vary across firms, sectors, occupations, and skill levels?
  - Does the specificity of the contract influence the outcome of the relationship?
  - Does the adoption of new technology correlates with the probability of the firm to sign a specific work contract?
  - Does that contractual specificity predict lower technology adoption (spending on AI software, automation/robotics)?
- Future quantitative endeavor
  - How much does this friction reduce technology adoption/aggregate productivity?

Chilean context

- The Chilean Labor Code (Art. 12) limits the employer's ability to unilaterally modify a worker's functions (*ius variandi*): changes are only allowed to **similar** duties, in the **same location**, and **without detriment** to the worker.
- No changes has been made to the law but its application has been determined by rulings
  - ORD. N°1722 de 25.06.2021 and ORD. N°1320 de 05.08.2022: introduces the concept of "certainty" for workers as a limit to the multifunctionality of contracts
  - ORD. N°1370 de 09.11.2023: workers cannot be rotating between different areas and sectors of the business
  - ORD. N°587 de 01.09.2025: tasks that are not alternative or complementary to the main tasks cannot be included in a contract
  - N°107 de 06.02.2026: reaffirms the previous ruling
- Jurisprudence was strengthened by a ruling of the court in favor of Walmart unions against the contract for "store operators"

Ius Variandi: Article 12 of the Labor Code

The employer's power to unilaterally alter contract conditions is subject to strict limits:

(i) Altering the **nature of the services** or the **work site** $\Rightarrow$ similar duties + same location/city + no detriment.

(ii) Altering the **distribution of the workday** $\Rightarrow$ up to 60 minutes, with 30 days' notice.

The operative limit is **detriment** (*menoscabo*, financial or moral). Fines of 9–60UTM ($\approx$ 650 to 4375 dollars) depending on severity and firm size; union leaders are excluded from *ius variandi* except in cases of *force majeure*.

Administrative case law: illustrative cases

Case	Criterion
Falabella (cashiers)	Taking on Customer Service functions is lawful only if the new function is similar in nature and does not entail a quantitative detriment.
AFP Provida (executives)	Moving from front-desk service to sales is a *different* function: requires a signed contract addendum.
Call center (return from nursery leave)	Reverting to rotating shifts exceeds Art. 12, which only allows shifting start time by up to 60 min.

Chilean idiosyncrasy? – Germany

- *Nachweisgesetz*: the contract must include a brief characterization or description of the work to be performed. Listing a broad or multifaceted set of duties is legal, as long as it is specific enough to avoid complete ambiguity
- *Weisungsrecht*: employers can unilaterally assign new or varying tasks, but only if they are covered by the existing scope of the employment contract.
- If an employer assigns multiple or shifting duties, the tasks must be of equivalent value and cannot result in a demotion in responsibility, position, or compensation.

Chilean idiosyncrasy?– France

- An employment contract (such as a CDI or CDD) typically outlines the main duties and the employee's job title. Employers can include polyvalence (versatility) or secondary tasks, provided these tasks correspond to the employee's professional category or qualification defined in the applicable Collective Bargaining Agreement (*Convention Collective*).
- If an employer assigns new tasks that radically alter the core nature of the job or lower the status/qualification, it is considered a modification of the employment contract (*modification du contrat de travail*), which requires the employee's explicit consent.

Chilean idiosyncrasy?–Spain

- Under Royal Decree 723/2026, employers must provide clear, written information detailing the essential terms of employment, including the job description and the main conditions under which the work is performed.
- *Modificación Sustancial*: If an employer tries to assign completely unrelated tasks outside of the worker's professional group or qualification level, it may be classified as an illegal functional modification or a breach of contract, which the employee can challenge in labor court.

Chilean idiosyncrasy?–Brazil

- A standard employment contract should clearly outline the primary position and core duties, though minor or related tasks can be included.
- *Jus Variandi*: if an employee is hired for a specific job description, the employer can assign tasks that are compatible and consistent with their personal condition and general role without extra pay.
- *Acúmulo de Função*: If a contract assigns a secondary, distinct set of tasks that belong to a completely different professional category or demand significantly greater responsibility/effort alongside the main role, the employee may be legally entitled to a salary increase (*plusum salarial*).

Labor rigidities, firing costs, and technical change

- **Diamond (1982); Pissarides (1985); Mortensen–Pissarides (1994)**: search frictions ⇒ persistent unemployment, wage rigidity.
- **Hopenhayn–Rogerson (1993)**: firing costs act as a tax on job destruction ⇒ lower employment and productivity.
- **Samaniego (2006, 2008)**: employment protection is *more* costly in industries with fast technical change.
- **Poschke (2009); Da-Rocha et al. (2019); Hopenhayn (2014)**: distort reallocation and can reverse the productivity ranking across firms.
- **Petit (2023); Mukoyama–Osotimehin (2019)**: quantify aggregate effects with endogenous firm-level productivity growth.

Our starting point: **Petit (2023)**, a firing-cost model with heterogeneous firms.

Functional flexibility is correlated with innovation

- Outside of economics, tasks flexibility has been associated with more technological adoption
  - **Arvanitis (2005)** finds that functional flexiblity (but not in schedule) is positively correlated with labor productivity and process innovation
  - **Goudswaard (2004)** finds that functional flexibility is positively correlated with skills development and involvement in decision-making but can also lead to overload.
  - **Preenen et al (2017)** shows that internal labor flexibility measures are positively correlated with labor productivity and company innovation.
  - **Zhou et al. (2011)** indicate that high functional flexibility enhances new product sales and radical innovation performance.

A structural model of task reassignment costs

- We build on **Petit (2023)**: heterogeneous firms (Hopenhayn–Rogerson, 1993) choose how much to invest in productivity-enhancing innovation, subject to a firing cost f_c per worker.
- Petit's key result: firing costs make innovation riskier, so firms respond by choosing **less dispersed, lower-expected-return** innovation — they innovate more conservatively, not just less.
- We extend this to speak to our question: split labor by **tasks** — workers performing **Task 1** (substitutable by technology) and **Task 2**.
- The firm chooses how much to invest in **directed** technology (d) raising only the productivity of Task 2 labor (the complement to what technology replaces).
- CES production:

$$y = A\, e^{z} \left[\alpha\, n_1^{\rho} + (1-\alpha) \left(e^{d} n_2 \right)^{\rho} \right]^{\gamma/\rho}$$

Firing costs, reassignment, and technology adoption

- Maximization problem (given previous employment n_1 and n_2):

$$Max_{n_1', n_2'} \quad y - w_1 n_1' - w_2 n_2' - w_1 f_c \max(n_1 - n_1', 0) - w_2 f_c \max(n_2 - n_2', 0)$$

- Hiring is free; costs of transforming Task 1 worker into a Task 2 one is $f_c \cdot w_1$ per worker, the quantitative analogue of the legal rigidity we measure in the contract data. We can so far assume infinite firing cost such that the firm never wishes to fire a Task 1 worker to then hire a Task 2 one.
- Each period the firm chooses whether to invest in **directed** technology d (cost $\kappa_d(d)$) or not.
- Directed technology raises Task 2 productivity (the task technology does *not* replace), so adopting it makes it optimal to shift the labor mix toward Task 2 — exactly the margin f_c taxes.
- f_c makes adjustment costlier *after* innovating
- It can also distort *which kind* of technology firms adopt if we extend the model.

Mapping the model to the empirics

- If one writes the contract in such a way that one can switch the worker from Task 1 to Task 2, then f_c is null
- This makes the adoption of technology less costly to the firm and leads to increased investment
- And if I plan on making investments that will require a switch of tasks, I would attempt to make f_c as small as possible
- This is what we will try to measure in the data and what we would eventually calibrate in the model.

Data

- We exploit a rich data set which includes all contracts registered with the Directorate of Labor between 2021-2025.
  - No data on previous contracts but contract modifications and annexes in those years are included
- We use a LLM to "read" the contract and extract information regarding the tasks performed by the worker
- Match this dataset to information about the worker (educational attainment, age), about the firm (technology adoption, industry, fraction unionized) and their relationship (duration of the contract, occupation, wages, subsequent changes to the contract, etc)

Classification pipeline (two sequential prompts)

Prompt 1 — Legibility (on *all* contracts)

- `lg`: is the function clause legible and does it describe a function? (1/0)

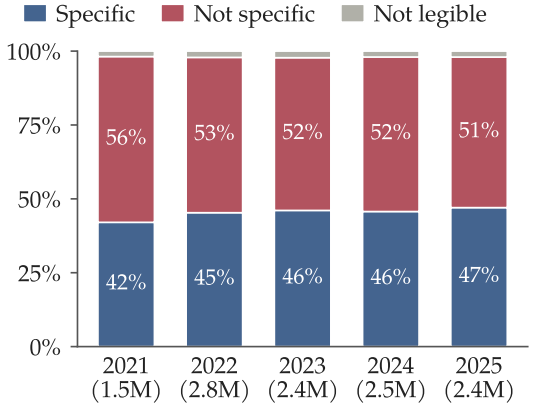
Prompt 2 — Characteristics (only on `lg`=1)

- `ec` (concrete): 1 if it describes specific, precise tasks; 0 if generic (e.g. "do whatever the supervisor instructs" / "follow the internal rules").
- Only among the **concrete** ones:
  - `na`: number of distinct activities/functions.
  - `af` (adaptable): yes/no — is the function defined **broadly** (adaptable) or **very specifically** (rigid)?
  - `al` (location adaptable): yes/no — is the work location defined broadly or specifically?

Everything is analyzed by sector, year (2021–2025), firm-size stratum, occupation, education level, and sex.

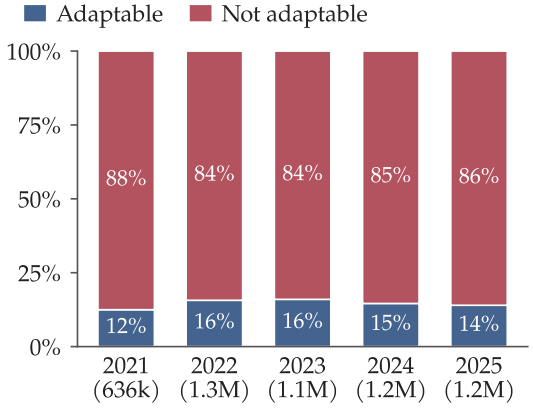
Stylized facts

- A small fraction of contracts could not be read by the algorithm (gray)
- A substantial fraction of contracts are not concrete (red) so there might be attempts to be very generic in the contract

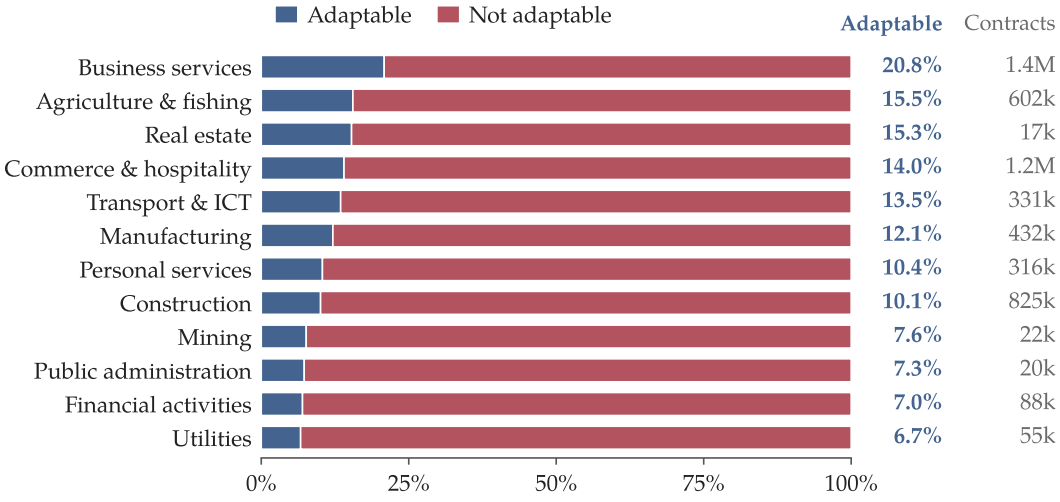


Stylized facts 2

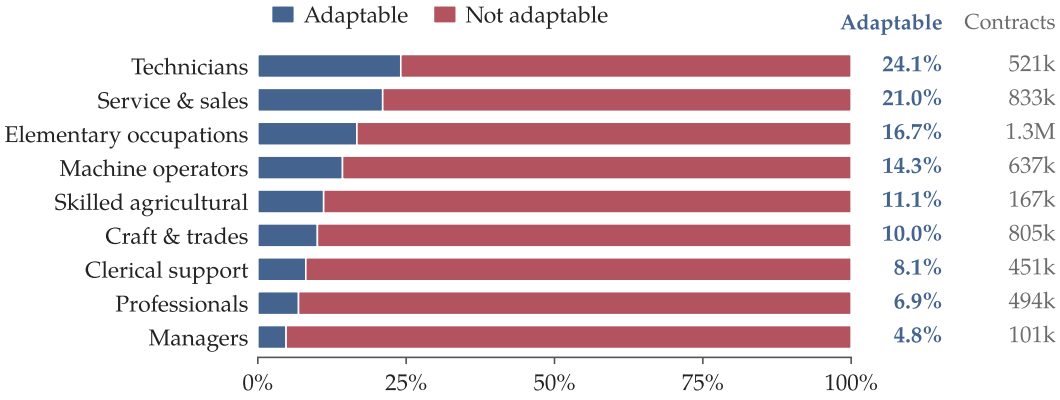
- Of concrete contracts, a large majority (red) is not adaptable and defines functions very rigidly
- No time trend despite the application of the law getting more rigid



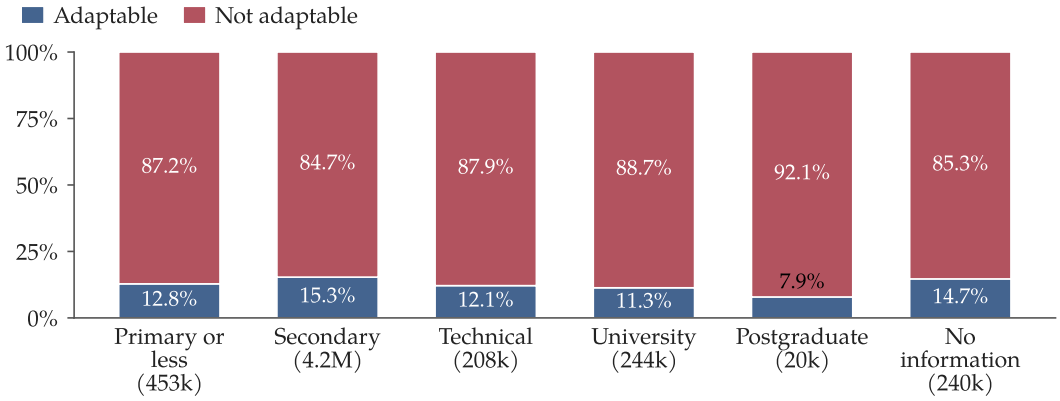
Function rigidity — by sector



Function rigidity — by occupation



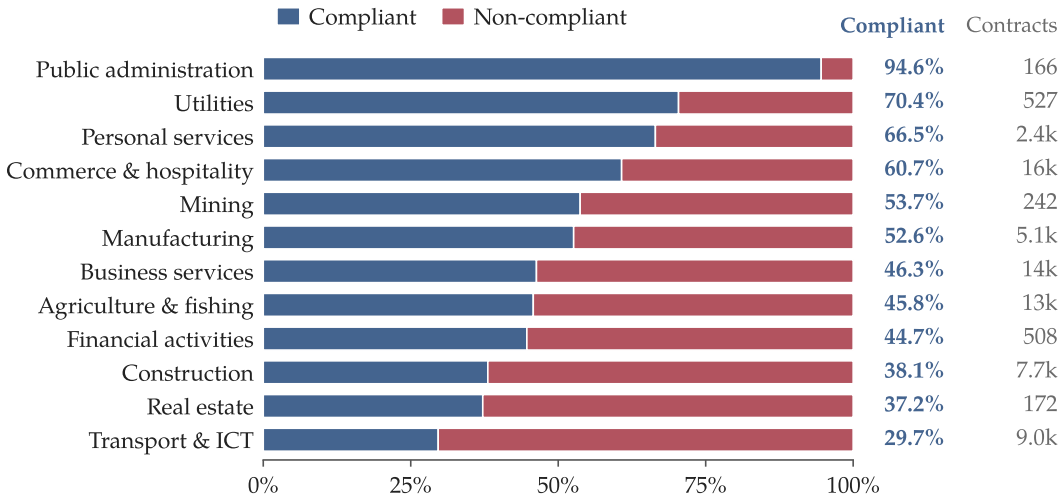
Function rigidity — by education



Other facts

- Only 48.3 percent of contracts are flexible in location
- Much more than for functional but still imply that the majority of contracts cannot ask for a different location from their workers

Location rigidity — by sector



The sectoral pattern: two distinct dimensions

Sector	**Rigid in function** (% does NOT meet adapt.)	**Rigid in location** (% does NOT meet alt.)
Financial activities	**94.9%**	46.9%
Utilities (elec./gas/water)	**94.3%**	41.8%
Mining	92.0%	**59.2%**
Construction	89.2%	**59.5%**
Agriculture & fishing	85.7%	**71.7%**
Commerce	85.3%	46.5%

Empirical strategy 1

- Correlate the rigidity of a contract of a worker i in a relationship with firm j in moment t to the outcomes of that relationship.

$$y_{ijt'} = \alpha + \beta flex_{ijt} + \mu_j + \eta_t + \gamma_i + \varepsilon_{ijt'}$$

- $flex_{ijt}$ include non-specific and adaptable contracts.
- Allow for firm fixed effects, time fixed effects.
- Outcomes: probability that the contract ends in future periods, time until the relationship ends, number of annexes to the contract added and whether those involved a job description change.

Flexibility reduces the probability of ever renegotiating

Contract with annexes (dummy)	(1) Original	(2) Duration	(3) Non-linear
Adaptable	-0.011***	-0.008***	-0.008***
	(0.000)	(0.000)	(0.000)
Log duration of contract		0.080***	0.142***
		(0.000)	(0.000)
Log duration squared			-0.016***
			(0.000)
Obs.	9,991,801	9,991,801	9,991,801
Mean	0.17	0.17	0.17
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Also reduces the number of times the contract is renegotiated

Log number of annexes (+ 0.1)	(1) Original	(2) Duration	(3) Non-linear
Adaptable	-0.030***	-0.022***	-0.021***
	(0.001)	(0.001)	(0.001)
Log duration of contract		0.251***	0.398***
		(0.000)	(0.001)
Log duration squared			-0.039***
			(0.000)
Obs.	9,991,801	9,991,801	9,991,801
Mean	0.45	0.45	0.45
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Also reduces the number of times the contract is renegotiated (PPML)

N of annexes	(1) PPML	(2) Duration	(3) Non-linear
Adaptable	-0.056***	-0.050***	-0.048***
	(0.002)	(0.002)	(0.002)
Log duration of contract		0.733***	1.460***
		(0.001)	(0.003)
Log duration squared			-0.169***
			(0.001)
Obs.	8,292,200	8,292,200	8,292,200
Mean	0.45	0.45	0.45
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Particularly of renegotiation of tasks

N of annexes with changes (log + 0.1)	(1) Original	(2) Duration	(3) Non-linear
Adaptable	-0.067***	-0.059***	-0.058***
	(0.001)	(0.001)	(0.001)
Duration of contract		0.239***	0.379***
		(0.000)	(0.001)
Log duration squared			-0.037***
			(0.000)
Obs.	9,991,801	9,991,801	9,991,801
Mean	-1.85	-1.85	-1.85
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Particularly of renegotiation of tasks (PPML)

N of annexes with changes	(1) PPML	(2) Duration	(3) Non-linear
Adaptable	-0.133***	-0.125***	-0.124***
	(0.002)	(0.002)	(0.002)
Log duration of contract		0.736***	1.473***
		(0.001)	(0.003)
Log duration squared			-0.171***
			(0.001)
Obs.	8,177,836	8,177,836	8,177,836
Mean	0.370	0.370	0.370
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Leading to fewer instances of task changes

Total task changes (log + 0.1)	(1) Original	(2) Duration	(3) Non-linear
Adaptable	-0.146***	-0.144***	-0.142***
	(0.001)	(0.001)	(0.001)
Log duration of contract		0.062***	0.204***
		(0.001)	(0.001)
Log duration squared			-0.038***
			(0.000)
Obs.	9,991,801	9,991,801	9,991,801
Mean	-1.749	-1.749	-1.749
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Leading to fewer instances of task changes (PPML)

Total task changes	(1) PPML	(2) Duration	(3) Non-linear
Adaptable	-0.672***	-0.650***	-0.650***
	(0.003)	(0.004)	(0.004)
Log duration of contract		0.661***	1.376***
		(0.005)	(0.007)
Log duration squared			-0.169***
			(0.001)
Obs.	8,177,836	8,177,836	8,177,836
Mean	0.95	0.95	0.95
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

No difference in wage growth

Log difference of wages (3-month avg.)	(1) Original	(2) Duration	(3) Non-linear
Adaptable	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)
Log duration of contract		0.035***	-0.081***
		(0.001)	(0.001)
Log duration squared			0.034***
			(0.000)
Obs.	1,107,494	699,209	699,209
Mean	0.068	0.021	0.021
Firm FE	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes

Standard errors in parentheses. Heteroskedasticity-robust standard errors.

Note: Wage growth is measured as the log difference between average wages in the last and first three months of the employment relationship.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Adaptable contracts are less likely to end involuntarily when in occupations exposed to technological change

Involuntary termination (all contracts)	(1) QUIN	(2) QUIN CL	(3) FREY	(4) LSO IA
Adaptable × Exposure index	-0.008***	0.011***	-0.011***	-0.019***
	(0.003)	(0.002)	(0.001)	(0.002)
Obs.	8,713,833	8,611,655	7,404,156	8,381,915
Mean	0.138	0.137	0.133	0.137
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

And more likely to last longer (except Frey)

Duration of permanent contracts (months)	(1) QUIN	(2) QUIN CL	(3) FREY	(4) LSO IA
Adaptable × Index exposure	0.095***	0.080***	-0.024***	0.464***
	(0.027)	(0.014)	(0.006)	(0.014)
Obs.	368,329	364,752	329,787	348,757
Mean	17.73	17.73	17.71	17.76
Firm FE	No	No	No	No
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Weibull AFT: TR (time ratio)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Empirical strategy 2

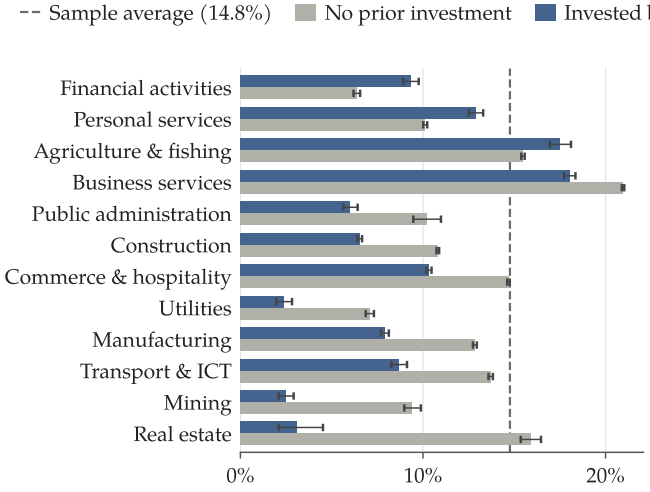
- Is the adoption of technology by a firm correlated with a change in the type of contract it signs?
- Contract between a worker i with firm j for a work in occupation o at moment t is more likely to be flexible as a function of whether the firm j has adopted technology in period $t-1$

$$flex_{iojt} = \alpha + \beta occupautom_o * techadop_{jt-1} + \mu_o + \eta_j + \gamma_t + \varepsilon_{iojt}$$

- include fixed effects by occupation, by firm and by time period (by jt as an alternative)
- Firm would try to provide itself with more flexibility in the definition of tasks when it adopts technology particularly for workers who are likely to be impacted by its adoption.
- Four different ways to measure the exposure of the occupation to technological change (automatization from 3 sources, IA)

Preliminary evidence

Firm-level variables available: spending on **machinery/equipment** and on **digital services** (a proxy for automation/AI adoption).



	No prior	Invested	Diff. (pp)
Financial activities	6.4%	9.3%	+3.0
Personal services	10.1%	12.9%	+2.8
Agriculture & fishing	15.5%	17.5%	+2.0
Business services	21.0%	18.0%	-2.9
Public administration	10.2%	6.0%	-4.2
Construction	10.8%	6.5%	-4.3
Commerce & hospitality	14.7%	10.3%	-4.4
Utilities	7.1%	2.4%	-4.7
Manufacturing	12.8%	7.9%	-4.9
Transport & ICT	13.7%	8.7%	-5.0
Mining	9.4%	2.5%	-6.9
Real estate	15.9%	3.1%	-12.8

Firms that invest more in digital services write contracts that are more flexible

Adaptability (dummy)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Log investment × Exposure index	0.002***	0.001***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	9,251,587	9,146,371	7,888,337	8,905,670
Mean	0.60	0.60	0.59	0.60
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

Investment in digital services.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

▸ Clustered

Firms that invest more in automation write contracts that are more flexible

Adaptability (dummy)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Log investment × Exposure index	0.002***	0.002***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	9,251,587	9,146,371	7,888,337	8,905,670
Mean	0.60	0.60	0.59	0.60
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

Investment in automation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

▸ Clustered

Less clear for other types of investments

Adaptability (dummy)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Log investment × Exposure index	-0.001***	-0.005***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	9,251,587	9,146,371	7,888,337	8,905,670
Mean	0.60	0.60	0.59	0.60
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

No automation investment.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

▸ Clustered

Empirical strategy 3

- Having more inflexible contracts lead to less adoption of technology?
- We do not have technology adoption at the level of a firm-worker relationship

$$\begin{aligned} tech_adop_{jt+1} = \alpha + \beta flexcontracts_{jt} * automindex_{jt} \\ + \delta flexcontracts_{jt} + \gamma automindex_{jt} + \mu_j + \eta_t + \varepsilon_{jt} \end{aligned}$$

$$\text{automindex}_{jt} = \frac{\sum_o n_{ojt} \cdot \text{occupautom}_o}{\sum_o n_{ojt}}$$

- We could also explore using variation across industries based on exposure to technological change.

Investment in digital services is higher when you have more flexible contracts and your occupation mix is more exposed to automatization (but not AI)

Log investment (+ 1)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Interaction	0.020	0.042***	0.041***	-0.043***
	(0.019)	(0.015)	(0.007)	(0.012)
Exposure index	0.097***	0.033**	-0.001	0.024**
	(0.018)	(0.013)	(0.006)	(0.011)
Share of adaptable contracts	-0.026**	-0.038***	-0.043***	-0.004
	(0.011)	(0.008)	(0.005)	(0.004)
Obs.	6,605,267	6,565,614	6,290,611	6,533,341
Mean	0.079	0.080	0.082	0.080
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors.

▸ Clustered

Investment in technological adoption is higher when you have more flexible contracts and your occupation mix is more exposed to automatization (but not AI)

Log investment (+ 1)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Interaction	0.029	0.053***	0.043***	-0.055***
	(0.021)	(0.016)	(0.007)	(0.013)
Exposure index	0.084***	0.017	-0.003	0.032***
	(0.019)	(0.014)	(0.006)	(0.012)
Share of adaptable contracts	-0.033***	-0.046***	-0.047***	-0.004
	(0.012)	(0.009)	(0.005)	(0.004)
Obs.	6,605,267	6,565,614	6,290,611	6,533,341
Mean	0.090	0.090	0.093	0.090
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors.

▸ Clustered

Not the same for non-technological investments

Log investment (+ 1)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Interaction	-0.025	-0.009	0.084***	-0.078
	(0.080)	(0.063)	(0.028)	(0.052)
Exposure index	0.683***	0.476***	-0.079***	-0.427***
	(0.073)	(0.056)	(0.024)	(0.046)
Share of adaptable contracts	-0.095**	-0.105***	-0.170***	-0.083***
	(0.043)	(0.034)	(0.019)	(0.016)
Obs.	6,605,267	6,565,614	6,290,611	6,533,341
Mean	12.782	12.784	12.800	12.787
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Heteroskedasticity-robust standard errors.

No automation investment.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

▸ Clustered

Conclusions

- We study whether the difficulty to change a worker of tasks can reduce adoption of technology by firms
- We construct a very detailed dataset and harness the power of LLM to classify them as flexible or not
- There are many differences by sector, occupational categories and educational groups in how flexible contracts are
- Find evidence that flexible contracts are less likely to go through renegotiation, are less likely to end involuntarily and last longer when permanent
- Positive correlation between contract flexibility and technology adoption
- How much does this friction matter?

Appendix 1: Firms that invest more in digital services write contracts that are more flexible (clustered at firm level)

Adaptability (dummy)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Log investment × Exposure index	0.002	0.001	0.001	0.002
	(0.002)	(0.002)	(0.001)	(0.002)
Obs.	9,251,587	9,146,371	7,888,337	8,905,670
Mean	0.60	0.60	0.59	0.60
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Standard errors are clustered at the employer level.

Investment in digital services.

$^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

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Appendix 2: Firms that invest more in automation write contracts that are more flexible (clustered at firm level

Adaptability (dummy)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Log investment × Exposure index	0.002	0.002	0.001	0.002
	(0.002)	(0.001)	(0.001)	(0.002)
Obs.	9,251,587	9,146,371	7,888,337	8,905,670
Mean	0.60	0.60	0.59	0.60
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Standard errors are clustered at the employer level.

Investment in automation.

$^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

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Appendix 3: Less clear for other types of investments (clustered at firm level

Adaptability (dummy)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Log investment × Exposure index	-0.001	-0.005***	0.002***	0.002
	(0.002)	(0.001)	(0.001)	(0.002)
Obs.	9,251,587	9,146,371	7,888,337	8,905,670
Mean	0.60	0.60	0.59	0.60
Firm FE	Yes	Yes	Yes	Yes
Start-month FE	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Standard errors are clustered at the employer level.

No automation investment.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Appendix 4: Investment in digital services is higher when you have more flexible contracts and your occupation mix is more exposed to automatization (but not AI)

Log investment (+ 1)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Interaction	0.020	0.042	0.041*	-0.043
	(0.066)	(0.050)	(0.022)	(0.040)
Exposure index	0.097	0.033	-0.001	0.024
	(0.062)	(0.046)	(0.020)	(0.036)
Share of adaptable contracts	-0.026	-0.038	-0.043***	-0.004
	(0.037)	(0.028)	(0.017)	(0.013)
Obs.	6,605,267	6,565,614	6,290,611	6,533,341
Mean	0.079	0.080	0.082	0.080
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Standard errors are clustered at the employer level.

Investment in digital services.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Appendix 5: Investment in technological adoption is higher when you have more flexible contracts and your occupation mix is more exposed to automatization (but not AI)

Log investment (+ 1)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Interaction	0.029	0.053	0.043*	-0.055
	(0.067)	(0.051)	(0.023)	(0.041)
Exposure index	0.084	0.017	-0.003	0.032
	(0.063)	(0.046)	(0.021)	(0.037)
Share of adaptable contracts	-0.033	-0.046	-0.047***	-0.004
	(0.037)	(0.029)	(0.017)	(0.013)
Obs.	6,605,267	6,565,614	6,290,611	6,533,341
Mean	0.090	0.090	0.093	0.090
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Standard errors are clustered at the employer level.

Investment in automation.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Appendix 6: Not the same for non-technological investments

Log investment (+ 1)	(1) QUIN	(2) QUIN-CL	(3) FREY	(4) IA
Interaction	-0.025	-0.009	0.084	-0.078
	(0.222)	(0.170)	(0.074)	(0.141)
Exposure index	0.683***	0.476***	-0.079	-0.427***
	(0.207)	(0.153)	(0.066)	(0.128)
Share of adaptable contracts	-0.095	-0.105	-0.170***	-0.083*
	(0.120)	(0.092)	(0.051)	(0.044)
Obs.	6,605,267	6,565,614	6,290,611	6,533,341
Mean	12.782	12.784	12.800	12.787
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

Standard errors are clustered at the employer level.

No automation investment.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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