Who Profits from Training Subsidies? Evidence from a French Individual Learning Account

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Motivation

Training and subsidies

- **The welfare effect of subsidies depends on the price/quantity reaction**
  - Simplest theory: incidence falls on the less elastic side. Fits well some markets: Gibbons and Manning [2006], Fack [2006].
  - More complex situations: Fullerton and Metcalf [2002], Benzarti et al. [2020], Sallee [2011].

- **Governments support investment in on-the-job training, and subsidies are a typical policy tool.**
  - Training the workforce to secure careers and improve productivity, especially when the demand for skills is changing fast [OECD, 2020].
  - Markets may fail to supply adequate training [Bassanini et al., 2005]

- **Who benefits from training subsidies? How elastic are training supply and demand?**
  - Demand-side: private marginal returns are uncertain [Goux and Maurin, 2000, Görlitz and Tamm, 2016], relevant hidden marginal costs (effort and opportunity), spillovers, and other failures (e.g. myopia)
  - Supply-side: *Poaching externality*, asymmetric information [Becker, 1964, Acemoglu and Pischke, 1999, 2000]

Motivation

Individual Learning Accounts (ILA)

Individual Learning Accounts (ILA) "virtual, individual accounts in which training rights are accumulated over time"

International institutions increasingly discuss ILAs:

Action 9: Initiative on individual learning accounts
The Commission will assess how a possible European initiative on individual learning accounts can help close existing gaps in the access to training for working age adults and empower them to successfully manage labour market transitions. (EC, European Skills Agenda, 2020)

Individual learning schemes present attractive features. (...) Funding should be substantial if the scheme is expected to make a significant difference to training outcomes. (...) The training barriers faced by under-represented groups often go beyond a simple lack of finance. (...) Individuals face a strong asymmetry of information vis-à-vis suppliers (...). (OECD, 2020)

- Advantages
  - portability fits well more liquid labor market
  - "right based" approach increases political and economic salience
- Criticalities:
  - low bargaining power of the worker with training centers
  - by construction more suited for short trainings
  - non-monetary costs, missed target [Cahuc and Zylberberg, 2006]

This paper

We study the **incidence** of training subsidies, in the form of Individual Learning Accounts. Research questions:

- **Who benefits from ILA training subsidies?** We find that training subsidies are split between trainees and suppliers. On suppliers side, incidence eventually falls on providers of capital
- **What are demand and supply of training?** We find that both demand and supply have elasticities close to zero, making subsidies fail to increase quantities consumed. Silver lining: low efficiency cost
- **Is training market competitive?** We find evidence on the presence of rents in the training market

1 Motivation

2 Empirical setting
- Context: the CPF and its 2019 reform
- Data

3 Results
- Effect of subsidies on prices
- Effect on quantities and welfare
- Effect on profits and employment of suppliers

4 Discussion

Institutional context

We study the French *Compte Personnel de Formation (CPF)*.
Introduced in 2015, provides training credits for each worker of the private sector (also for the public sector since 2017, but not included in the data).

- **2015-2018 : CPF in hours**
  - 24 hours of training credited each year up to 120 (then 12 per year up to 150), twice if low-qualified
  - Workers submit applications for funding to their industry training financing agency, and the agency pays the training providers by converting CPF hours into euros, up to specific **subsidy caps**
  - If CPF hours were not sufficient, **disretionary additions** were possible or the worker can pay part of the training himself
  - Industry fiancing centers had incentives to be generous in subsidy caps
  - CPF in hours was under-used Graphs

Institutional context

- **From 2019: CPF in Euros**
  - 500 Euros credited yearly (up to 5000 Euros), twice for low-qualified workers.
  - **Past stocks of CPF hours are converted to CPF euros**, 15 euros per hour for all workers. $\Rightarrow$ Before: different subsidy for each industry. Now: 15 Euros per hour for all.
  - **Discretionary additions** are still possible

Detailed schemes of the system | Evolution of the number of CPF training episodes

Data

Main source

- **SI-CPF**
  - Unexploited administrative source which registers all CPF trainings *dossiers*.
  - Built by the public bank who manages CPF:
    - ⋆ in 2015-2019 it was receiving information by industry training agencies (who administer de-facto the accounts), based on which their rights/duties to redistribution was calculated
    - ⋆ from 2019 it is used to directly pay training providers.
  - Available from 2015 to 2019, but early years have mostly unemployed. Contains:
    - ⋆ personal characteritics of beneficiaries (sex, age, working status, diploma, CPF stock, etc.),
    - ⋆ data on the training (duration, speciality, name, training center, etc.),
    - ⋆ financial data (cost, financing center, amount financed by each financing center, etc.).

Data cleaning

Data

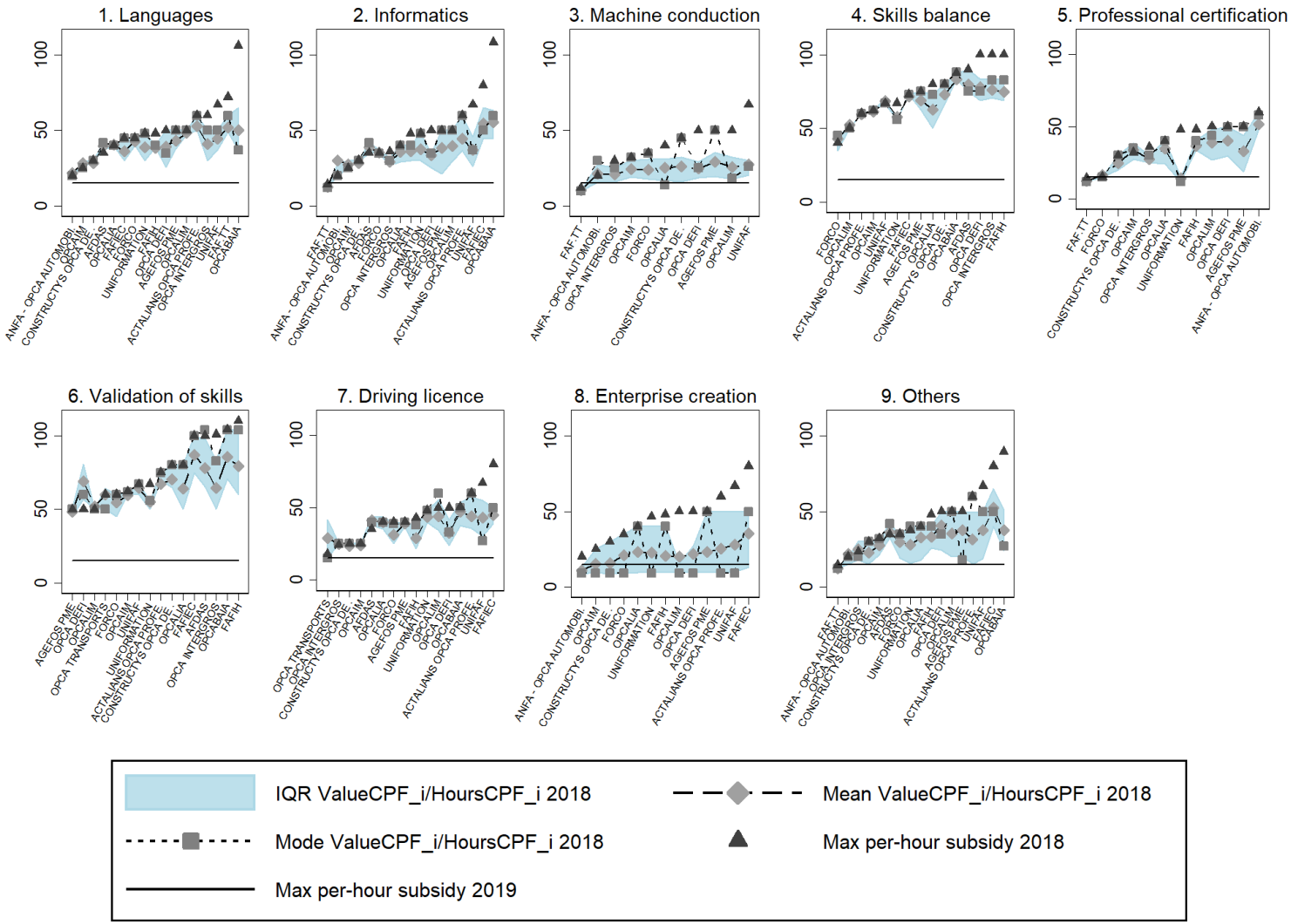
Other sources

- **Maximum subsidy caps by industry financing center**
  Small database, collected by the authors from official (FPSPP, CNEFOP) documentation (Example), and training agencies interviews, which gives the maximum subsidy cap by training agency.

- **BPF (bilans pédagogiques et financiers)**
  Administrative data on training centers balance sheets from the executive branch of the Ministry of Labor (DGEFP), from mandatory declarations by any training center receiving public support. Updated more quickly and available until 2019.

Our shock in the data

Per-hour subsidy caps, and actual per-hour subsidy (average, mode, and IQR), according to training kind class



Model

Setting

Why a model? Individual Learning Accounts (of which CPF is an example) don't behave like normal subsidies:

- **maximum number of hours eligible** $\overline{X^{ILA}}$
- **cap to the per-hour amount payable** c for each hour (which can be binding or not, depending on price p)
- **discretionary additions** to the per-our cap and to the maximum number of hours eligible depend from $p - c$

New model (details in the Appendix) on how ILAs affect demand and supply

Summary of results:

- relationship between prices and subsidies is likely non-linear (concave)
  Intuitively: when the subsidy is high, quantity demanded is larger than $\overline{x^{ILA}}$, so that the marginal hour is unsubsidized
- with discretionary additions, we need 2SLS. With assumptions on additions, one can recover the elasticities of demand and supply, η^d and η^s

Effect on prices

Identification

Unit of analysis is training kind q + financing center f + training establishment j + time t.

$$\tilde{c}_{q,f,t} = \beta^{FS} c_{q,f,t} + \gamma_{q,j,f} + \tau_t + \varepsilon_{q,j,f,t}$$

$$p_{q,j,f,t} = \beta^{RF}_{prices} c_{q,f,t} + \gamma_{q,j,f} + \tau_t + \varepsilon_{q,j,f,t} \quad \text{if} \quad t = 2018, 2019$$

$$p_{q,j,f,t} = \beta^{E}_{prices} c_{q,f,t} + \beta^{P}_{prices} c_{q,j,f,t+1} + \gamma_{q,j,f} + \tau_t + \varepsilon_{q,j,f,t} \quad \text{if} \quad t = 2017, 2018$$

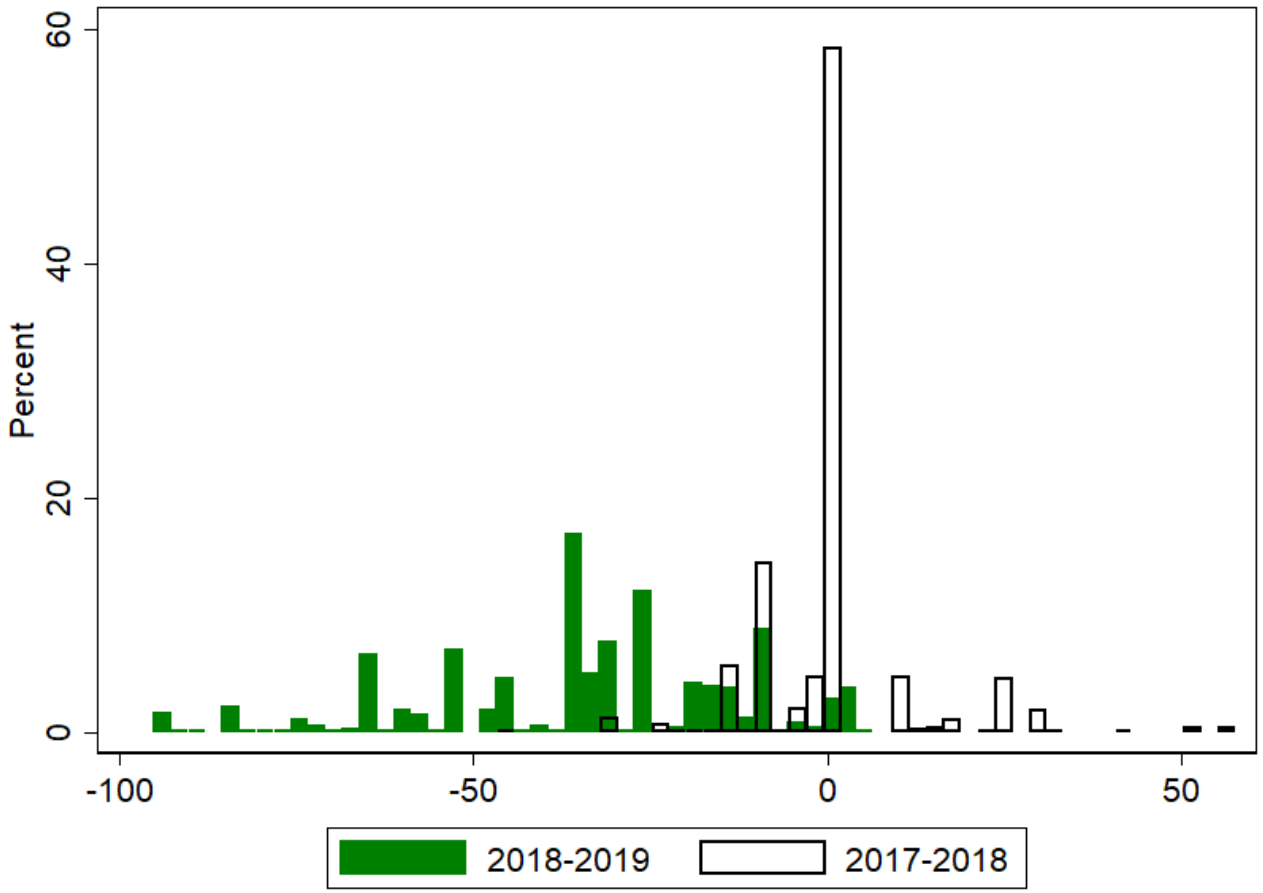
Where:

- $c_{q,f,t}$ is the subsidy cap allowed by financing agency f for training kind q between time $t-1$ and t, $\tilde{c}_{q,f,t}$ is the average effective subsidy observed, $p_{q,j,f,t}$ are per-hour prices
- τ_t and $\gamma_{q,j,f}$ are respectively time FE and training kind + training enstablishment + financing center FE.
- regressions are weighted by number of dossiers
- standard errors are clustered at training kind q-financing center f level
- we replicate the results with local labor market l instead of establishment j and aggregating by financing center f

Effect on prices

Identifying variation

Distribution of $\Delta c_{q,f,t}$



Effect on prices

Baseline results

VARIABLES	(1) $\tilde{c}_t$	(2) p_t	(3) p_t	(4) p_t
c_t	0.205***	0.119***	0.150***	0.141***
	(0.0255)	(0.0258)	(0.0260)	(0.0351)
c_{t+1}				-0.0131
				(0.0108)
Observations	48,665	48,665	40,937	24,347
R-squared	0.889	0.906	0.951	0.958
Years	2018-2019	2018-2019	2017-2018	2017-2018
η^d/η^s		1.37		

Notes:Data are collapsed at the level of training kind (training title +online/in presence) plus training firm and year. Regressions in panel A include include FE for training kind (training title +online/in presence) plus training firm FE, and year FE. Standard errors are clustered at the level of FE. In column 1 we report the first stage regression of total subsidy per-hour on the per-hour ILA subsidy (controlling for price levels); in column 2 the reduced form estimate; in column 3 the endogenous reduced form estimates in 2017-2018; and in column 4 the estimates of the placebo.

Effect on prices

Concave transformations

VARIABLES	(1) $\tilde{c}_t$	(2) p_t	(3) $\tilde{c}_t$	(4) p_t
c_t	0.205***		0.265***	0.250***
	(0.0255)		(0.0380)	(0.0336)
$\ln(c_t)$		4.568***		
		(0.843)		
$c_t * \mathbb{1}(p25 < c_{2018} \leq p50)$			-0.0106	-0.0970***
			(0.0311)	(0.0313)
$c_t * \mathbb{1}(p50 < c_{2018} \leq p75)$			-0.0147	-0.0895***
			(0.0315)	(0.0289)
$c_t * \mathbb{1}(c_{2018} > p75)$			-0.0540	-0.114***
			(0.0331)	(0.0298)
Observations	48,665	48,665	45,462	45,462
R-squared	0.889	0.905	0.882	0.899
Years	2018-2019	2018-2019	2018-2019	2018-2019
η^d/η^s at median		2.54		1.57

Notes: Data are collapsed at the level of training kind (training title +online/in presence) plus training firm and year. Regressions include include FE for training kind (training title +online/in presence) plus training firm FE, and year FE. Standard errors are clustered at the level of FE. In column 1 we report the first stage regression of total subsidy per-hour on the per-hour ILA subsidy (controlling for price levels); in column 2 the reduced form estimate; in column 3 the endogenous reduced form estimates in 2017-2018; and in column 4 the estimates of the placebo.

Effect on quantities

Identification

Let $\bar{x}_{q,j,f,t}$ be the average amount of hours consumed for training q, training supplier j, by individuals in financing center f, at time t. Consider:

$$\eta^s = \frac{dx_i^s}{dp_{q,j,f,t}} = \frac{d\bar{x}_{q,j,f,t}}{dc_{q,f,t}} \frac{1}{dp_{q,j,f,t}/dc_{q,f,t}} = \frac{\beta^{RF}_{quantities}}{\beta^{RF}_{prices}}$$

Where the estimate of $\beta^{RF}_{quantities}$ is obtained from the regression:

$$\bar{x}_{q,j,f,t} = \beta^{RF}_{quantities} c_{q,f,t} + \gamma_{q,j,f} + \tau_t + \varepsilon_{q,j,f,t}$$

Where one needs to use Poisson regression since $\bar{x}_{q,j,f,t}$ is Poisson distributed.

We can thus recover η^s and η^d.

Effect of subsidies on welfare

A sufficient statistic approach

Adapt Harberger [1964], Chetty [2009] approach:

$$W(c) = \sum_i \max_{x_i}[\phi'^{-1}(x_i) + m + \min(p_{q,f,t}, c_{q,f,t})x_i - p_{q,f,t}x_i)] +$$

$$+ \max_{x_i}[p_{q,f,t}x_i - COST(x_i)] - \min(p_{q,f,t}, c_{q,f,t})x_i$$

$$= \begin{cases} \sum_i \max_{x_i}[\phi'^{-1}(x_i) + m + c_{q,f,t}x_i - COST(x)] - c_{q,f,t}x_i & \text{if} \quad p_{q,f,t} \geq c_{q,f,t} \\ \sum_i \max_{x_i}[\phi'^{-1}(x_i) + m + p_{q,f,t}x_i - COST(x)] - p_{q,f,t}x_i & \text{if} \quad p_{q,f,t} < c_{q,f,t} \end{cases}$$

$$\frac{dW(c)}{dc} = \sum_{q,f,t} N_{q,f,t}\eta^d \min(p_{q,f,t}, c_{q,f,t})$$

With discrete changes Kleven [2020] is slightly different, but same intuition

Effect on quantities and welfare

VARIABLES	(1) $\bar{x}_t$	(2) $\bar{x}_t$	(3) $\bar{x}_t$	(4) $\bar{x}_t$
c_t	0.00257	0.0395***		
	(0.00493)	(0.0146)		
c_{t+1}		-0.00692		
		(0.00660)		
$\ln(c_t)$			0.227	1.835***
			(0.242)	(0.615)
$\ln(c_{t+1})$				-0.283
				(0.212)
Observations	45,462	22,862	45,462	22,862
Number of training_kind_financeur	22,731	11,431	22,731	11,431
Years	2018-2019	2017-2018	2018-2019	2017-2018
η^d	.03		.127	
η^s	.022		.05	
$\frac{\Delta W}{\Delta c}/N$	-.01		-.043	

Notes: Data are collapsed at the level of training kind (training title +online/in presence) plus training firm and year. Regressions include include FE for training kind (training title +online/in presence) plus training firm FE, and year FE. In column 1 we have the first stage regression of total subsidy per-hour on the per-hour ILA subsidy (controlling for price levels); in column 2 the reduced form estimate; in column 3 the endogenous reduced form estimates in 2017-2018; and in column 4 the estimates of the placebo.

Effect on profits and suppliers' employment

Identification

Let REV_j be the total revenues (CPF and not CPF) of training supplier, and let x^{OTH}, p^{OTH} be the price and quantities of non-CPF trainings. Consider:

$$REV_j = \sum_{i \in j} x_i p_i + x^{OTH} p^{OTH}$$

$$\frac{dREV_j}{REV_{j,t_0}} = 2 \frac{dp_i}{dc_i} \frac{\sum_{i \in j} x_{i,t_0} p_{i,t_0}}{REV_{j,t_0}} / p_{i,t_0} d\bar{c}_{jt} \tag{1}$$

Where $\bar{c}_{jt} = \sum_{i \in j} \frac{x_i p_{i,t_0}}{\sum_{i \in j} x_{i,t_0} p_{i,t_0}} c_i$ is the average conversion rate faced by a supplier, weighted by the share of CPF revenues that each training accounts for. Then, estimate $\beta^{RF}_{REV} = \frac{dREV_j / REV_{j,t_0}}{d\bar{c}_{jt}}$ with:

$$\ln y_{j,t} = \beta^{RF}_{REV} \bar{c}_{jt} + \gamma_j + \tau_t + \varepsilon_{j,t} \qquad \text{if} \quad t = 2018, 2019 \tag{2}$$

Analogously, we obtain equations for total costs $COST_j$, profits π_j, labor costs L_j and total labor N_j (measured as number of teachers).

Effect of subsidies on profits and suppliers' employment

Baseline results

VARIABLES	(1) ln REV_{jt}	(2) ln $COST_{jt}$	(3) ln π_{jt}	(4) ln L_{jt}	(5) ln N_{jt}
$\bar{c}_{jt}$	0.00127**	0.000406	0.000834*	-0.000470	0.000120
	(0.000593)	(0.000679)	(0.000476)	(0.000641)	(0.000646)
Observations	11,496	10,847	10,779	10,312	10,922
R-squared	0.977	0.973	0.870	0.966	0.967
Years	2018-2019	2018-2019	2018-2019	2018-2019	2018-2019

VARIABLES	(1) ln REV_{jt}	(2) ln $COST_{jt}$	(3) ln π_{jt}	(4) ln L_{jt}	(5) ln N_{jt}
ln $\bar{c}_{jt}$	0.0616***	0.0177	0.0411***	-0.0148	-0.00574
	(0.0170)	(0.0199)	(0.0141)	(0.0213)	(0.0203)
Observations	11,496	10,847	10,779	10,312	10,922
R-squared	0.977	0.973	0.870	0.966	0.967
Years	2018-2019	2018-2019	2018-2019	2018-2019	2018-2019

Notes: In Panel A data are collapsed at the level of training kind (training title +online/in presence) plus training firm and year. Regressions in panel A include include FE for training kind (training title +online/in presence) plus training firm FE, and year FE. In Panel B data are collapsed at the level of training kind (training title +online/in presence) plus Local Labor Market and year. Standard errors are clustered at the level of FE. Both panels report in column 1 the first stage regression of total subsidy per-hour on the per-hour ILA subsidy (controlling for price levels); in column 2 the reduced form estimate; in column 3 the endogenous reduced form estimates in 2017-2018; and in column 4 the estimates of the placebo.

Effect on profits and suppliers' employment

Baseline results

VARIABLES	(1) ln REV_{jt}
$c_t * \mathbb{1}(\frac{RevCPF}{TotRev_{jt_0}} < p20)$	-0.000383
	(0.000561)
$c_t * \mathbb{1}(p20 < \frac{RevCPF}{TotRev_{jt_0}} \leq p40)$	3.51e-05
	(0.000668)
$c_t * \mathbb{1}(p40 < \frac{RevCPF}{TotRev_{jt_0}} \leq p60)$	0.000922
	(0.000586)
$c_t * \mathbb{1}(p60 < \frac{RevCPF}{TotRev_{jt_0}} \leq p80)$	0.00117***
	(0.000434)
$c_t * \mathbb{1}(\frac{RevCPF}{TotRev_{jt_0}} > p80)$	0.00146**
	(0.000612)
Observations	11,496
R-squared	0.978
Years	2018-2019
dp/dc quintile #1	-1.062
dp/dc quintile #2	.023
dp/dc quintile #3	.238
dp/dc quintile #4	.128
dp/dc quintile #5	.056

VARIABLES	(1) ln REV_{jt}
$\ln c_t * \mathbb{1}(\frac{RevCPF}{TotRev_{jt_0}} < p20)$	-0.00643
	(0.0232)
$\ln c_t * \mathbb{1}(p20 < \frac{RevCPF}{TotRev_{jt_0}} \leq p40)$	0.00985
	(0.0258)
$\ln c_t * \mathbb{1}(p40 < \frac{RevCPF}{TotRev_{jt_0}} \leq p60)$	0.0320
	(0.0234)
$\ln c_t * \mathbb{1}(p60 < \frac{RevCPF}{TotRev_{jt_0}} \leq p80)$	0.0415**
	(0.0196)
$\ln c_t * \mathbb{1}(\frac{RevCPF}{TotRev_{jt_0}} > p80)$	0.0554**
	(0.0239)
Observations	11,496
R-squared	0.978
Years	2018-2019
$dp/d\ln c$ quintile #1	-17.817
$dp/d\ln c$ quintile #2	6.518
$dp/d\ln c$ quintile #3	8.241
$dp/d\ln c$ quintile #4	4.543
$dp/d\ln c$ quintile #5	2.128

Notes: In Panel A data are collapsed at the level of training kind (training title +online/in presence) plus training firm and year. Regressions in panel A include include FE for training kind (training title +online/in presence) plus training firm FE, and year FE. In Panel B data are collapsed at the level of training kind (training title +online/in presence) plus Local Labor Market and year. Standard errors are clustered at the level of FE. Both panels report in column 1 the first stage regression of total subsidy per-hour on the per-hour ILA subsidy (controlling for price levels); in column 2 the reduced form estimate; in column 3 the endogenous reduced form estimates in 2017-2018; and in column 4 the estimates of the placebo.

Effet on entry/exit | Effect on number of individuals per training class

Wrap up and discussion

A decrease of the CPF subsidy cap leads to a decrease in training hourly prices, but less than 1-1.

- This would suggest that the **incidence of subsidies is partially on suppliers** of training

A decrease of the CPF subsidy cap leads to no change in the quantity of training consumed.

- This is consistent with **both demand and supply being very inelastic**.

A decrease of the CPF subsidy cap leads to a significant decrease in revenues, but not to a decrease in costs, at least in the short run, hence to a decrease in profits. No effect on the workforce.

- For the supply share of incidence, **incidence of CPF training subsidy is eventually on capital owners of training suppliers**, at least in the short run. This might suggest the presence of frictions in entry/exit o firms in the market.

Discussion

Looks like **ILA training subsidy are a simple transfer to trainees and training providers** (specifically, to owners of training centers)

$\Rightarrow$ ILA training subsidies are perhaps not the first-best policy? might need to be better targeted? [Cahuc and Zylberberg, 2006]

- Why demand so inelastic? What can policy do?

  $\Rightarrow$ Possible role of opportunity/effort costs?

- Why supply so inelastic? What can policy do?

  $\Rightarrow$ Possible tradeoff between solutions to asymmetric information and market competition?

Thank you!

Cleaning of SI-CPF

Initial cleaning:

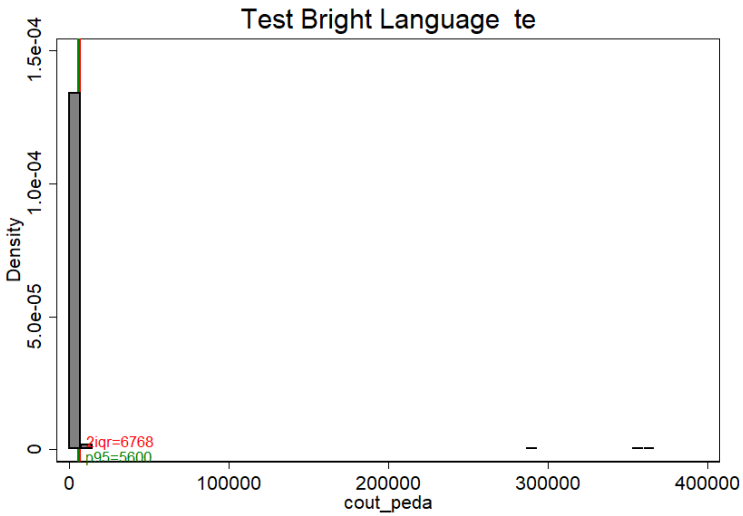
			nb of training episodes	
SI-CPF data (sept-2020)			5 309 119	
restriction to CPF data			4 123 472	
restriction to training which started			2 829 975	
restriction to years 2016 to 2019			2 129 073	
restriction to workers			1 195 601	
additional restrictions			1 098 487	
	2016	**2017**	**2018**	**2019**
sample broken down by year	176 983	251 032	359 990	310 483

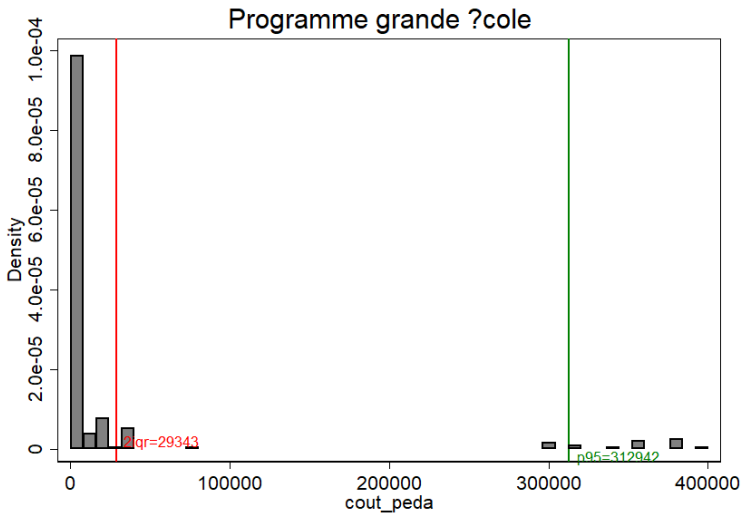
Some extra cleaning:

- Pre-2019 some operators inserted the total cost for the whole session instead of that for the individual: drop all *dossiers* with per-hour cost above Q3+3 IQR *and* above 95th pct within training kind (1.4% of the obs.). Examples
- I winsorize **extreme values** for program duration *or* prices as missing (3.1% of obs.).
- Drop training financed by employers, regions, and by job centers for unemployed (1.2% of the obs.)
- For two financing agencies the conversion policy is not defined pre-reform

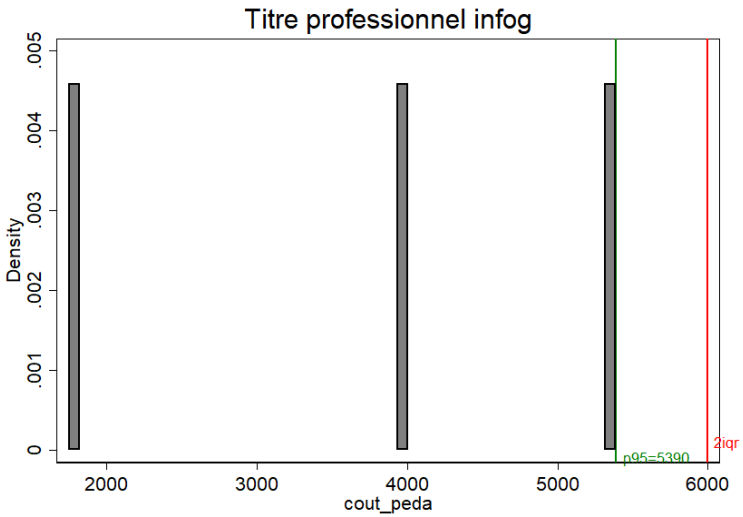
Outliers examples

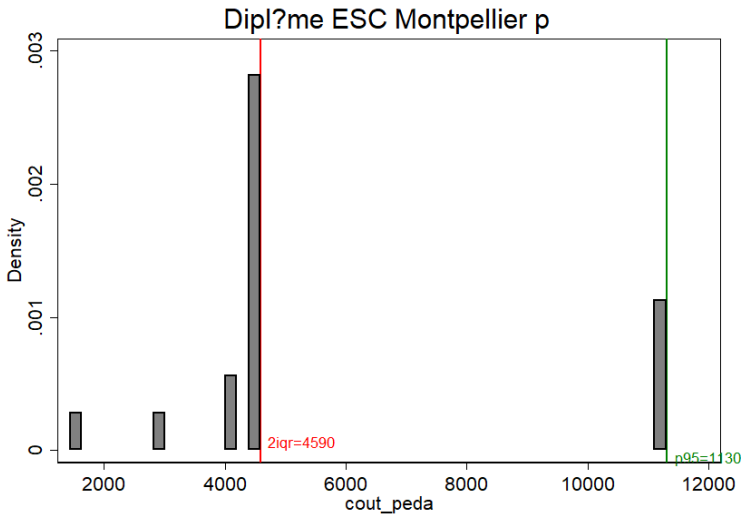
Dropping outliers





No outliers dropped





Back to data

Example of conversion tables

Example of conversion table

Critères de prise en charge OPCA sur le CPF

Identification OPCA

Raison Sociale OPCA : ACTALIANS
Branche (s) professionnelle(s) couverte(s) par l'OPCA [2] : Professions libérales, Hospitalisation Privée, Enseignement Privé
Numéro (s) CCN :
Et/ ou
Code(s) IDCC : 2264,2691,2101,1951,1996,1147,1619, 2564,1875,959,2543,1726,2332, 2205,1921,2785,2706,240,1000,1850,

I. Informations CPF sur site institutionnel de l'OPCA

Informations générales sur le CPF [3] : http://www.actalians.fr/employeurs/cpf.asp
Conditions de prise en charge du CPF : [3] http://www.actalians.fr/employeurs/iso_album/dpc_cpf_ref2452_version_web.pdf

II. Conditions de prise en charge des OPCA au titre de l'agrément du 0.2 % CPF

A. Coût pédagogiques au titre de l'agrément 0.2% CPF

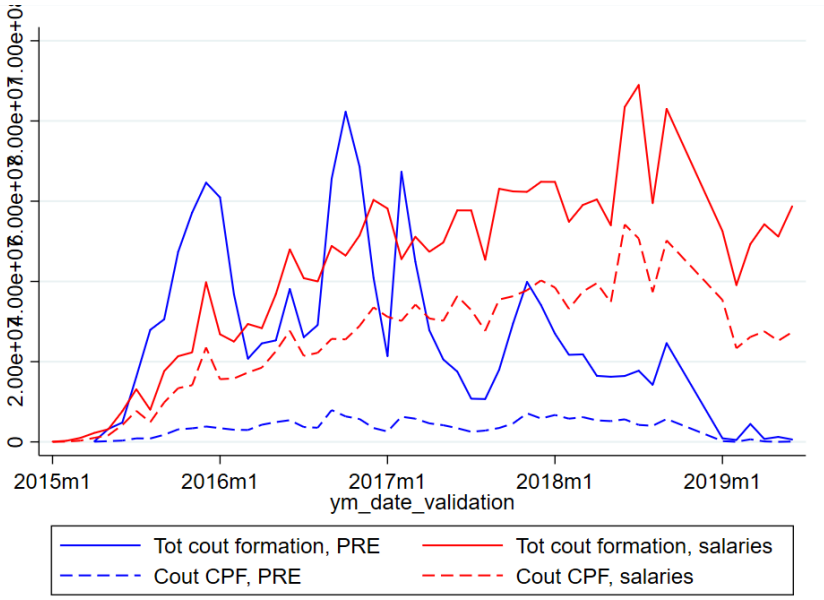
La prise en charge des coûts pédagogiques est-elle plafonnée ? : oui

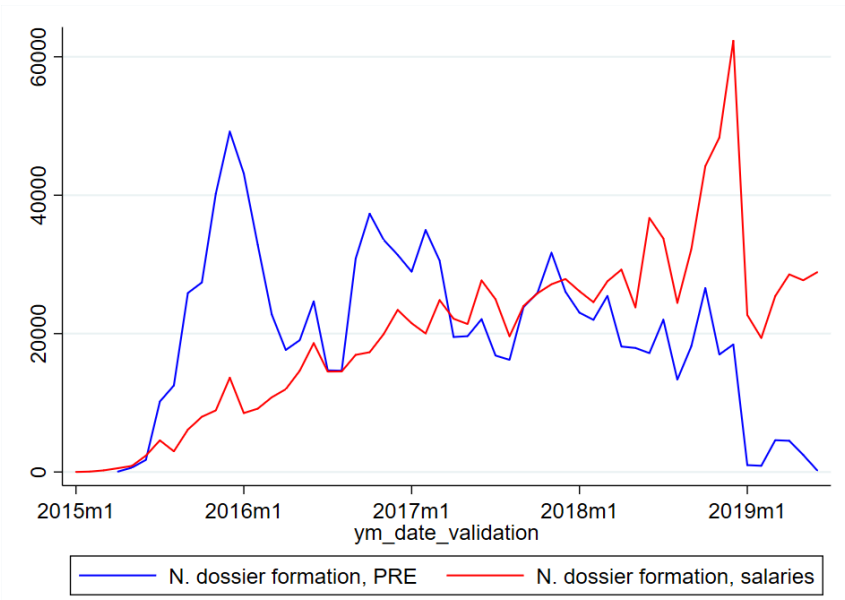
Si oui, quel est le montant plafonné de prise en charge du coût horaire pédagogique (en euros HT) ?

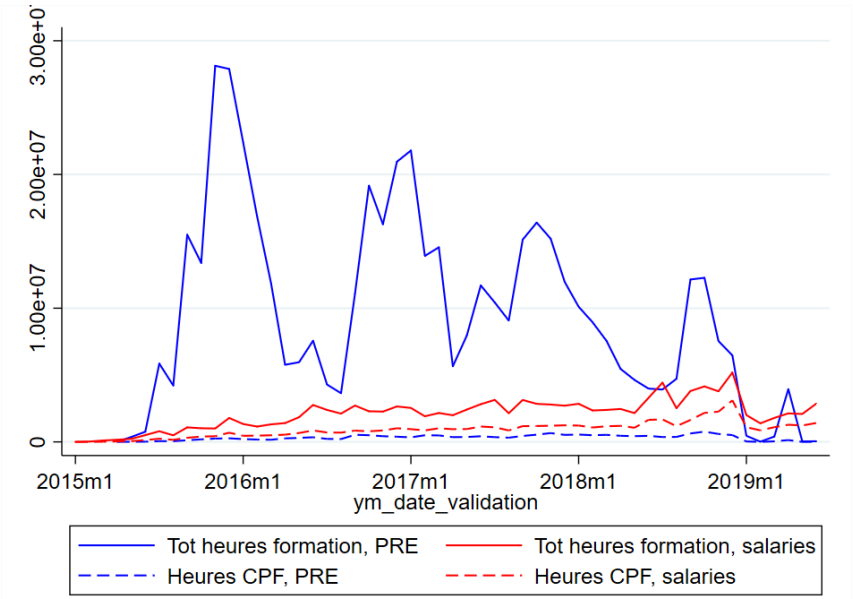
	Heures compteur CPF	
	Coût horaire plafonné	Plafond global [4]
Pour l'accompagnement VAE	75 euros	24 h
Pour les actions CléA	27 euros	150 h
Liste COPANEF	60 euros	150 h
Liste COPAREF		
Liste CPNE	60 euros	150 h
Liste CPNE avec CPF abondé		

Back to sources

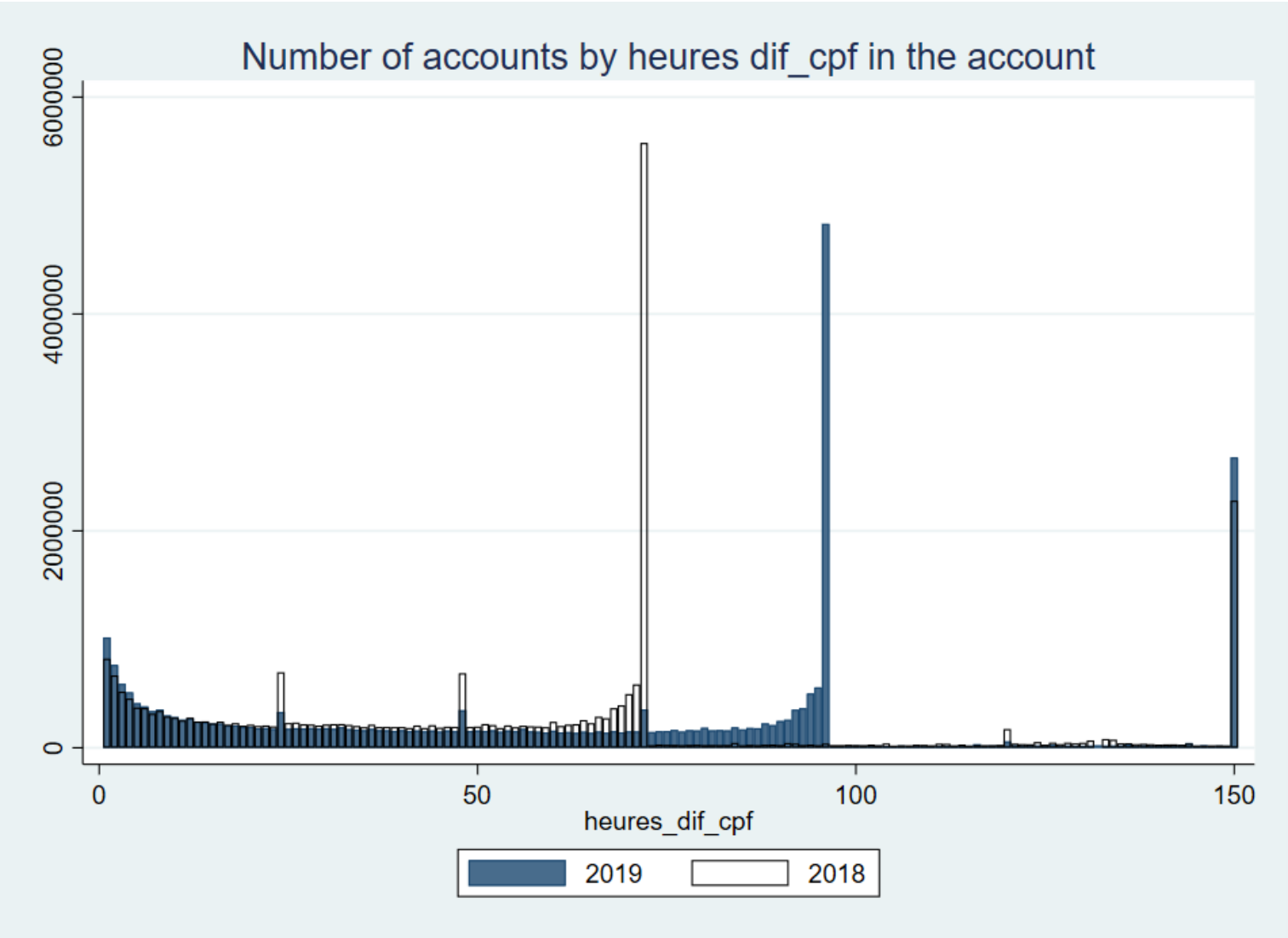
CPF use in the first years







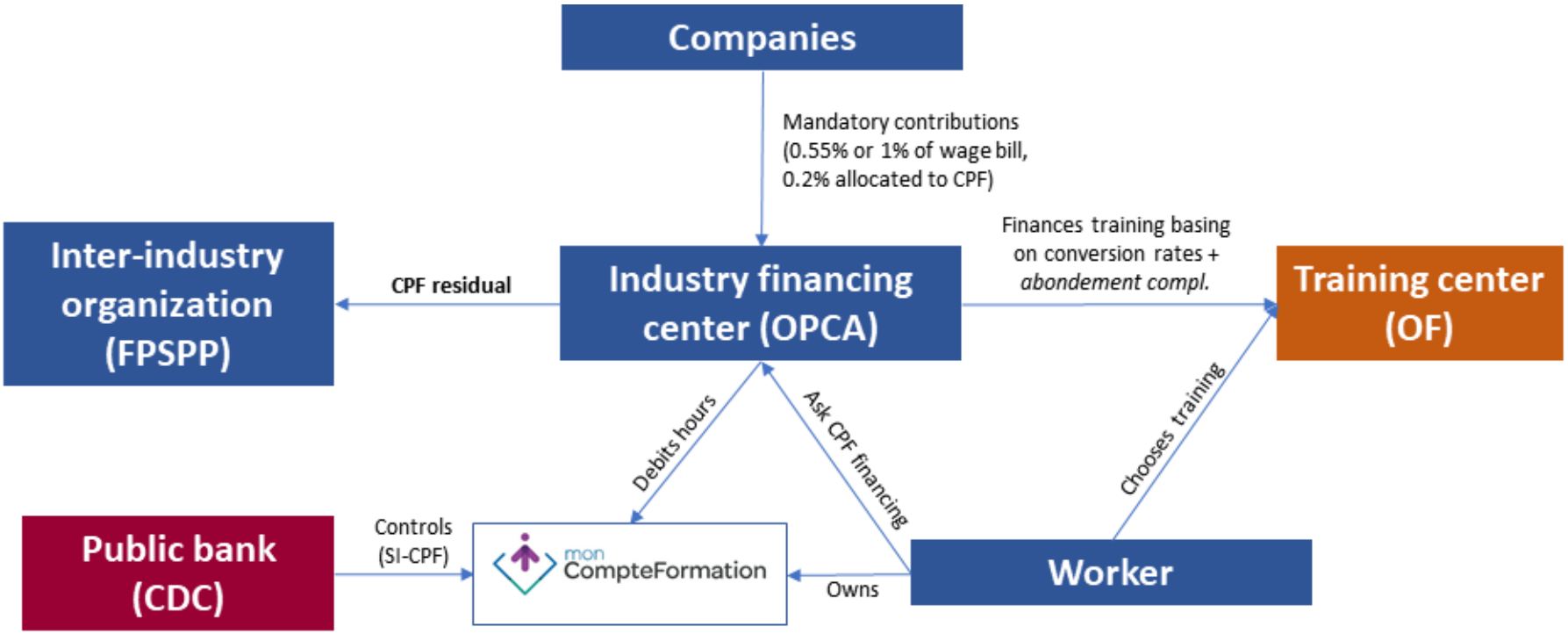
CPF use in the first years



Back to Institutional Context

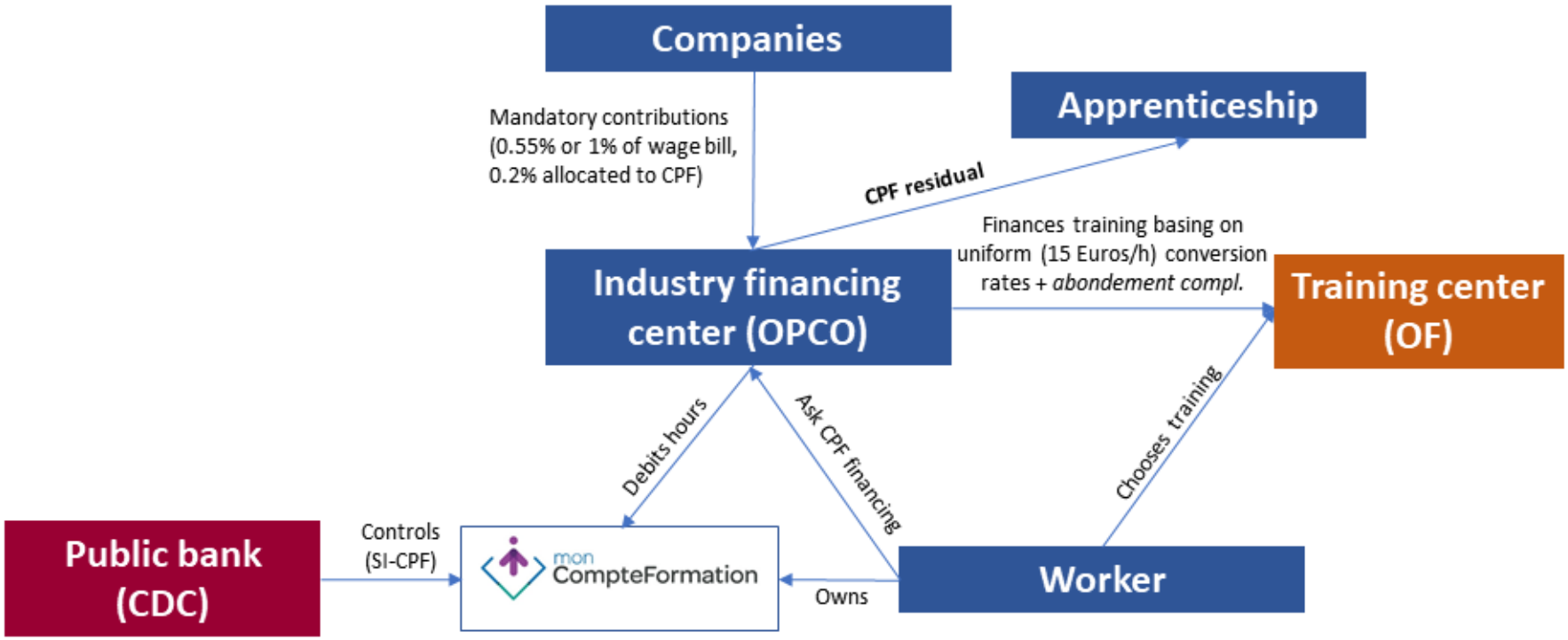
Institutional context

The old system before Jan 2019



Institutional context

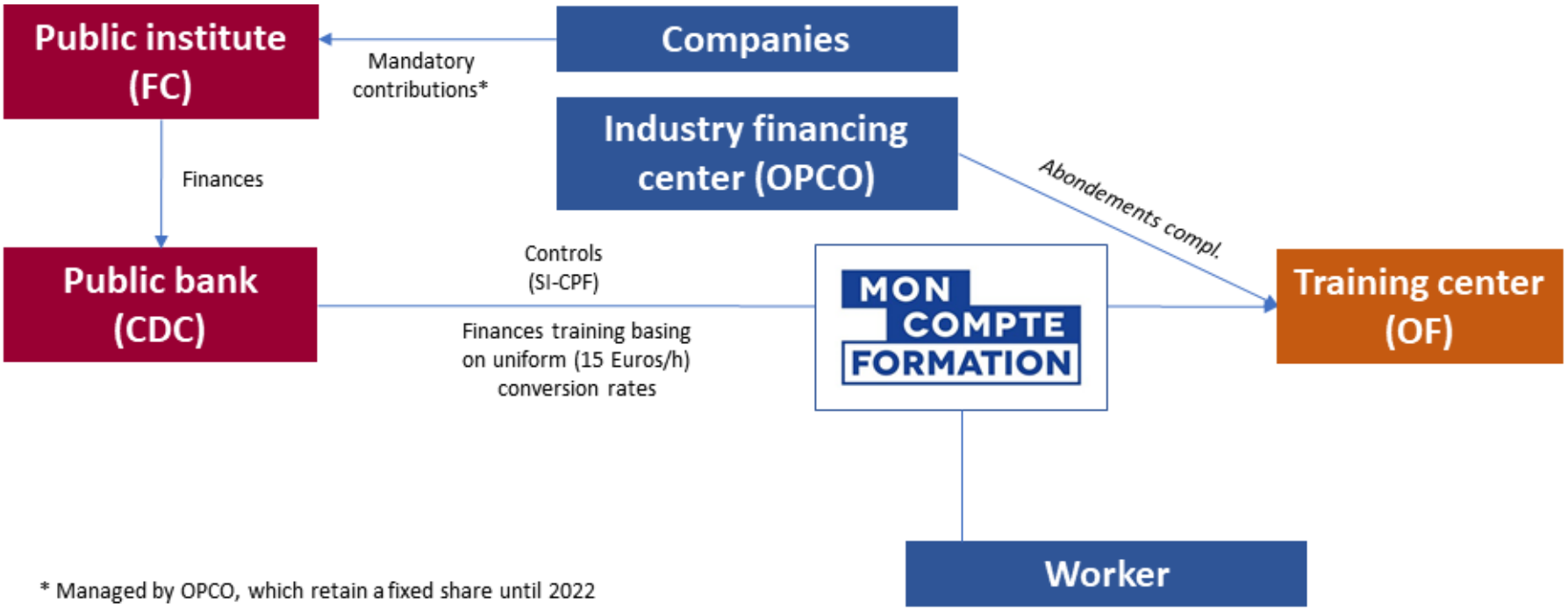
The transition period after Jan 2019, before mid Nov 2019



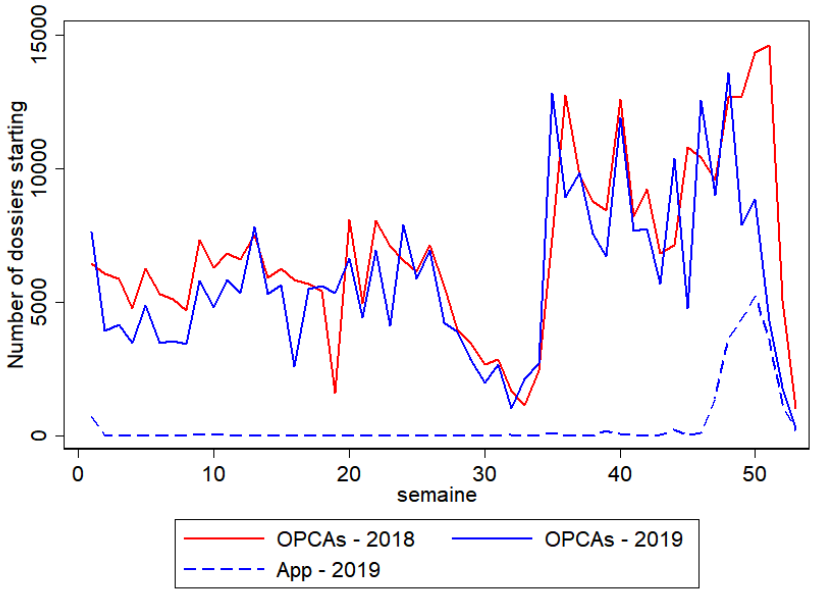
Institutional context

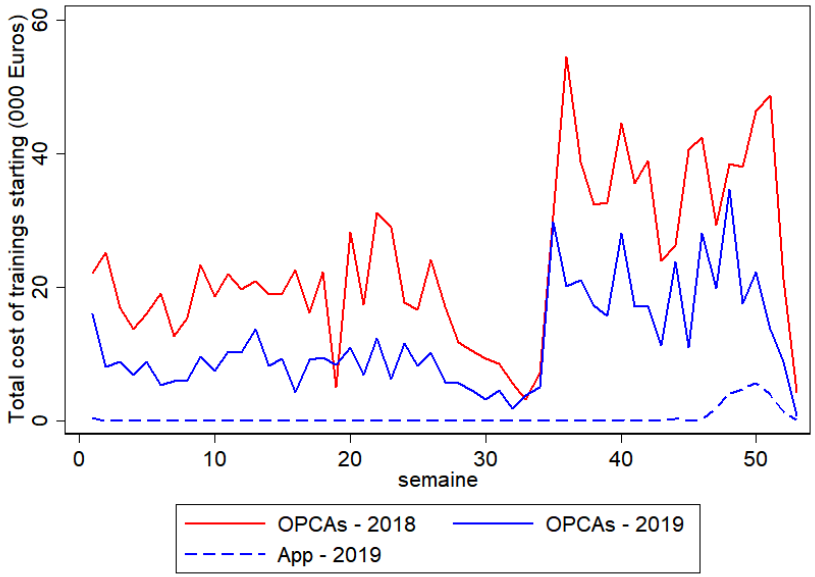
The new system after mid Nov 2019

How fast this kicks in?



CPF in the transition period





Back to institutional context

Results

Effect on n. of dossiers and total hours of training

VARIABLES	(1) ln_N	(2) ln_tot_duree	(3) ln_N	(4) ln_tot_duree
ln_max_conv	0.0407	-0.0272	0.0319	0.0171
	(0.129)	(0.143)	(0.0957)	(0.102)
Observations	26,282	26,282	133,146	133,146
R-squared	0.987	0.981	0.980	0.979
Years	2018-2019	2018-2019	2018-2019	2018-2019
Unit of anal.	Training kind	Training kind	Training program	Training program

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Back to effect on profits

Results

Effect on n. of classes per year and dossiers per class

VARIABLES	(1) ln_n_classi	(2) ln_n_per_class	(3) ln_n_classi	(4) ln_n_per_class
ln_max_conv	0.164	0.0992	-0.0203	0.00558
	(0.102)	(0.173)	(0.0492)	(0.0978)
Observations	26,282	26,282	133,146	133,146
R-squared	0.951	0.933	0.984	0.973
Years	2018-2019	2018-2019	2018-2019	2018-2019
Unit of anal.	Training kind	Training kind	Training program	Training program

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem: we don't know anything of non-CPF people. If the story is that for companies less heavily relying on CPF they "redistribute on other classes, it might also be that observed classes in the SI increase in number and decrease in size...

Back to effect on profits

Model

Setting

Assumptions:

- Quasi-linear preferences

$$m_i + \phi(x_i^{IND} + x_i^{ILA})$$

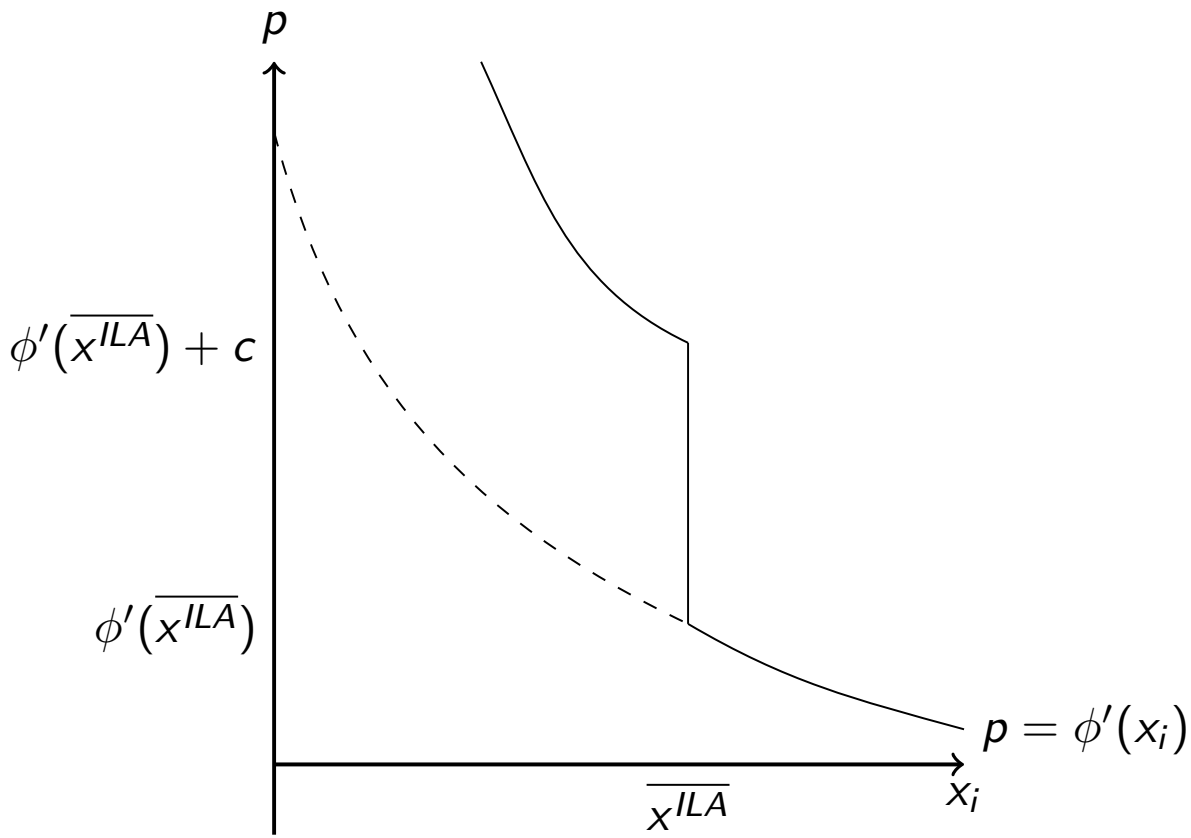
  where m_i is the numeraire, x_i^{IND} is consumption of unsubsidized training hours and x_i^{ILA} training hours subsidized by ILA.
- Supply and demand ϕ'^{-1} assumed linear (but results hold with log-linear), with slope $1/\eta^s, 1/\eta^d$, perfect competition within the relevant market
- Constraints: $m_i + p\, x_i^{IND} + \max(p - c, 0) \cdot x_i^{ILA} \leq \omega_i$ and $x_i^{ILA} \leq \overline{x^{ILA}}$

Model

Results

2 relevant insights:

1. ILA pushes up demand only for quantities below $\overline{x^{ILA}}$ ...

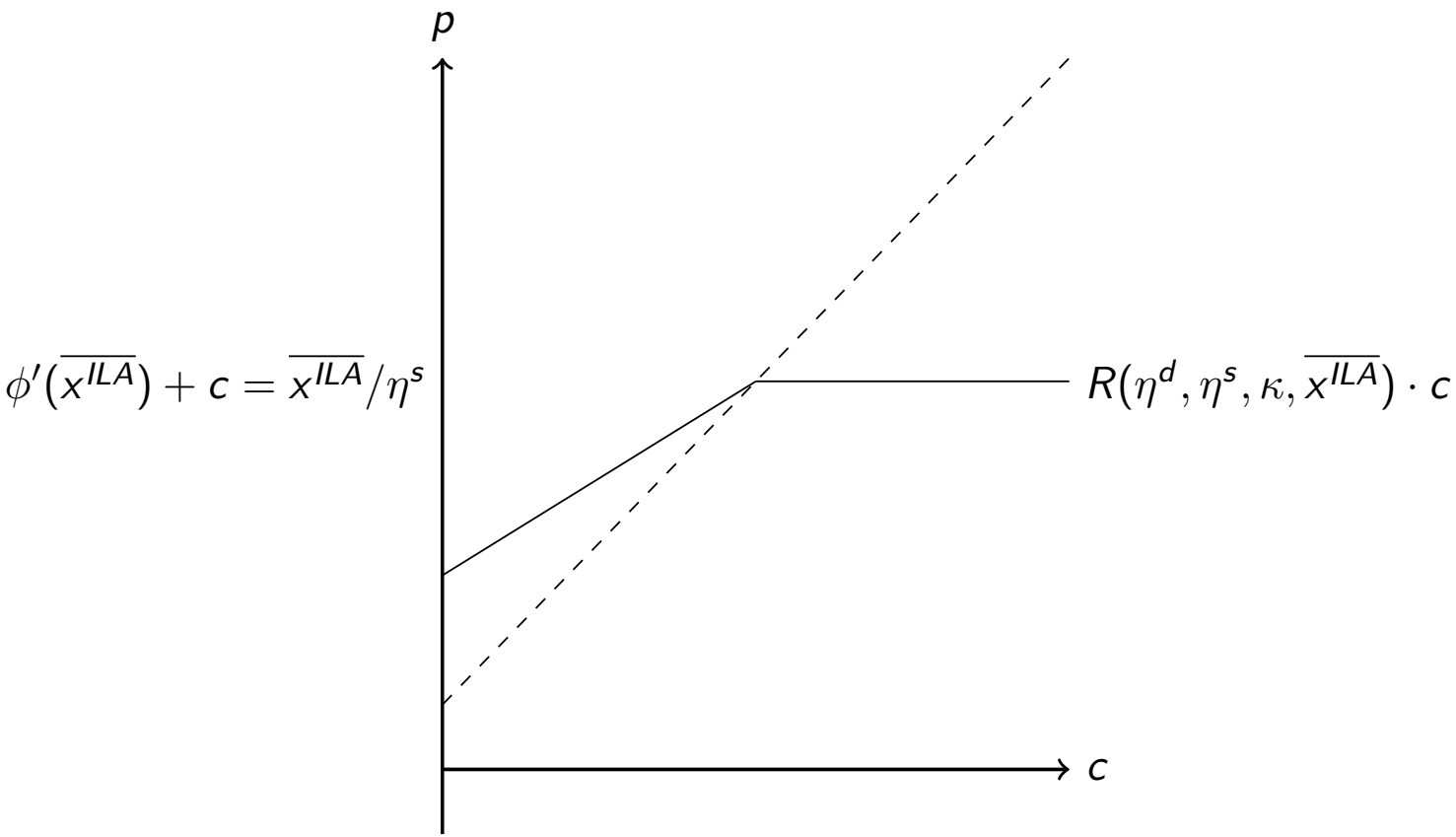


Model

Results

2 relevant insights:

1. ... hence prices and gross subsidy caps are linked through a non-linear concave function $p_t = R(\eta^d, \eta^s, \kappa, \overline{x^{ILA}}) \circ c$



Model

Results

2 relevant insights:

2. What happens with discretionary additions?
   - If hours are added: define $x^{\tilde{ILA}}$, the maximum subsidy hours gross of discretionary additions, $R(\eta^d, \eta^s, \kappa, x^{\tilde{ILA}})$ doesn't change in slope
   - If the per-hour subsidy is increased: define $\tilde{c}$, the per-hour cap to subsidy value gross of discretionary addition, one can instrument gross subsidy caps with net subsidy caps c_t, shocked by the reform. If policy μ is linear and invariant $\tilde{c} = c + \mu \cdot \max(p - c, 0)$, and

$$\Delta \tilde{c}_t = (1-\mu)\left[1 + \frac{\eta^d}{\eta^s + \eta^d} \frac{\mu}{1 - \frac{\eta^d}{\eta^s+\eta^d}\mu}\right] \Delta c_t$$

$$\Delta p_t = \frac{\eta^d}{\eta^s + \eta^d} \frac{1-\mu}{1 - \frac{\eta^d}{\eta^s+\eta^d}\mu} \Delta c_t$$

Hence given $\beta^{FS} = \frac{\Delta \tilde{c}_t}{\Delta c_t}$ and $\beta^{RF}_{prices} = \frac{\Delta p_t}{\Delta c_t}$, then:

$$\mu = \frac{1 - \beta^{FS}}{1 - \beta^{RF}_{prices}} \quad ; \quad \eta^d/\eta^s = \frac{\beta^{RF}_{prices}}{\beta^{FS} - \beta^{RF}_{prices}} \tag{3}$$

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