How Does Working Time Flexibility Affect Workers' Productivity in a Routine Job? Evidence from a Field Experiment

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Motivation

- Flexible work (time and place) promotes work-life balance and reduces the gender gap, but employers offer it relatively rarely to employees.
- Is this justified? Maybe not if
  1. it (intrinsically) motivates workers ⇒ higher productivity for any pay level;
  2. workers value it ⇒ willing to work for lower wage, or to work harder in return.
- However, productivity may also decrease, because
  1. moral hazard: monitoring is more difficult ⇒ more shirking
  2. adverse attraction: attracts workers who prefer "life" to "work".

- *Causal* evidence on this is scarce, especially wrt *time* flexibility = focus of this research (started in 2018, before COVID-19)

Existing Findings in a Nutshell

- Causal evidence on motivation of flex *time* from panel data:
  1. Flex *schedules* raises productivity, essentially by working more (e.g. Beckman, Cornelissen and Kräkel, 2017);
  2. Effect of *part-time* work is mixed (Garnero, 2016): less fatigue versus higher fixed start-up costs?

- Causal evidence on motivation and selection of *remote work* mostly from field experiments:
  1. Also mostly positive effects on productivity by working more (Bloom et al. 2015);
  2. Exception are *negative* effects of “dull" routine task in experiment with students (Dutcher, 2012).
  3. *Positive* attraction effect if choice is offered to employees in call center (Bloom et al. 2015), but *negative* at hiring stage (Harington and Emanuel, 2020).

This paper

We designed and implemented a (pilot) field experiment in Bogota to provide causal evidence of the effects on productivity in a routine temporary job of two flexible working arrangements:

1. Choice of time worked per week (full and part time)
2. Choice of schedule (when to start and stop working)

Holding the workplace fixed: no working from home.

Research questions

Does flexible working arrangements affect workers' productivity on the job? And How?

Aim at disentangling two potential effects:

1. **Ex ante sorting effect:** Do more productive workers self-select into more flexible jobs?

2. **Ex post motivational effect:** Does more flexible working arrangements increase productivity on the job?

and at disentangling further mechanisms: precision, speed, and effective time (less absenteism or fewer breaks?)

Contribution

1. One of first field experiments on flex *time* rather than *place*;
2. New method in experimental setting to disentangle *in the hiring stage* ex-ante attraction/selection from ex-post motivational effects: innovation is to measure productivity in the application stage *prior to randomizing candidates into flex regimes*;
3. Determine whether the negative effect on productivity of a “dull" routine task related to *schedule* or *place* flexibility.

Experimental protocol

Stages of the experiment

1. **Recruitment phase:** Posting of a job offer (ad) & application of candidates through an online platform
2. **Random assignment of a contract type** to applicants
   - Full-time non-flexible
   - Part-time non-flexible
   - Full-time flexible
   - Part-time flexible
3. **Random assignment of a job offer among those interested**
   3-week job, hired and trained workers to type a Chilean Agrarian Census
4. **Measuring performance on the job** during the 3 weeks under the different contract environment

Experimental protocol

Stage 1. Job ad

- We placed real job ads for **data entry clerks** during 1 month in standard job postings (internet and newspaper) in Bogota.
- Job requirements: no specific level of education or specialized skills required.
- **Important:** no reference to the contract type.

> **Job Advertisement** *Title*: Prestigious university needs data clerks to support a research project. *Description*: Contract for the provision of services. *Duration*: three weeks. If you are interested in this offer, apply via the following link: LINK, or send us a message via Whats-App.

Experimental protocol

Stage 1. Application process

1. (N=686) Applicants filled an **online form** with standard (and less standard) questions:
   - Level of education, labor market experience
   - Demographic characteristics: age, gender, marital status, dependents

2. (N=535) went until **a pre-employment test** (to measure ***ex ante* productivity)** similar to the task to be performed

Experimental protocol

Stage 2. Contract type assignment

***Random assignment** to 1 out of 4 contract types paying 7.000 COP/hour (= 2.33 USD; 1.3 MW)*

- T_1 **Full-time Non-flexible (Control group) 40** hours per week. Monday to Friday. **8 AM – 5 PM**.
- T_2 **Part-time Non-flexible 20** hours per week. Monday to Friday. **8 AM – 12 PM (or 2 PM-5 PM)**.
- T_3 **Full-time Flexible 40** hours per week. Monday to Friday. Flexible time schedule within a **8 AM – 8 PM** time frame.
- T_4 **Part-time Flexible 20** hours per week. Monday to Friday. Flexible time schedule within a **8 AM – 8 PM** time frame.

Experimental protocol

Stage 3 and 4. ***Job offer*** *to interested applicants and* ***performance measurement***

- **Aim** = hiring (N=13) x 4 contract types = (N=52) individuals.
- **Problem**: Many refusals + deadline start contract ⇒ Eventualy, N=79 were contacted and only **N=34** worked during 3 weeks.
- We observed and measured the ***ex post*** **level of productivity** for each worker
- We had monitors in each computer lab during all working hours

Summary - stages of the experiment

	Experimental stages	*Obs.*
0	Applicants who **started** the online survey	686
1	*First **randomization**: assignment of contract types*	
	Applicants who finished the survey & tests received 1^{st} email with the contract type	535
2	Interested applicants in the offer	438
3	Interested applicants after 2^{nd} email	384
4	*Second **randomization**: job offers*	
	Received an offer	79
	Accepted the offer and were hired	38
	Took the job and finished the work period	34

Data and descriptive statistics

Sample of applicants (N=535)

Variable	(T1) Full-time non-flexible Mean	(T2) Part-time non-flexible Mean	(T3) Full-time flexible Mean	(T4) Part-time flexible Mean	Standardized difference (2)-(1)	(3)-(1)	(4)-(1)
Stratification Variables							
Female	0.69	0.63	0.67	0.65	-0.12	-0.04	-0.08
High Productivity	0.23	0.18	0.19	0.23	-0.12	-0.10	0.00
Dependents	0.24	0.20	0.19	0.19	-0.08	-0.12	-0.12
Other Control Variables							
Age Groups							
20- 25 yrs old	0.47	0.44	0.43	0.50	-0.06	-0.09	0.07
26- 30 yrs old	0.16	0.23	0.25	0.22	0.16	0.22	0.14
31 yrs old and more	0.36	0.33	0.32	0.27	-0.06	-0.09	-0.19
Educational Levels							
High School or less	0.26	0.29	0.32	0.24	0.05	0.12	-0.06
University	0.31	0.29	0.23	0.27	-0.04	-0.18	-0.09
Vocational	0.43	0.42	0.45	0.50	-0.01	0.05	0.13
N	140	132	150	113			

Data and descriptive statistics

Sample of Workers (N=34)

Variable	(T1) Full-time non-flexible Mean	(T2) Part-time non-flexible Mean	(T3) Full-time flexible Mean	(T4) Part-time flexible Mean	Standardized difference (2)-(1)	(3)-(1)	(4)-(1)
Stratification Variables							
Female	0.64	0.86	0.44	0.57	0.48	-0.38	-0.13
High Productivity	0.27	0.14	0.22	0.14	-0.30	-0.11	-0.30
Dependents	0.27	0.14	0.11	0.43	-0.30	-0.39	0.32
Other Control Variables							
Age Groups							
20- 25 yrs old	0.27	0.14	0.22	0.43	-0.30	-0.11	0.32
26 - 30 yrs old	0.36	0.43	0.11	0.43	0.13	-0.57	0.13
31 yrs old and more	0.36	0.43	0.67	0.14	0.13	0.59	-0.48
Educational Level							
High School or less	0.27	0.43	0.22	0.14	0.32	-0.11	-0.30
University	0.45	0.43	0.22	0.14	-0.05	-0.47	-0.64
Vocational	0.27	0.14	0.56	0.71	-0.30	0.56	0.86
N	11	7	9	7			

Outcome variables (1)

Ex post productivity

Average productivity of individual i in period $t \in \{1, 2\}$ (AP_{it}) is set equal to the total number of "correct" images typed C_{it}, for a contracted period of time T_{it}:

$$AP_{it} = C_{it}/T_{it} \tag{1}$$

where $T_{it} = 40$ hours for FT workers and $T_{it} = 20$ hours for PT workers

Outcome variables (2):

Ex post productivity: decomposition

- To explore mechanisms, we decompose AP_{it} into:

$$AP_{it} \equiv C_{it}/T_{it} = (C_{it}/N_{it}) \times (N_{it}/D_{it}) \times (D_{it}/T_{it}) \equiv \prod_{j=1}^{3} AP_{it,j} \quad (2)$$

  where $N_{it} = \#$ images typed and
- *Precision*: (C_{it}/N_{it})
- *Speed*: (N_{it}/D_{it})
- *Effective time*: (D_{it}/T_{it}), where D_{it} is *actual* working time (excluding breaks and time absent). Which can be further decomposed as:

$$D_{it}/T_{it} + B_{it}/T_{it} + A_{it}/T_{it} = 1 \quad (3)$$

  where B_{it} = time taking breaks (> 15 sec.) and A_{it} = is the time absent (= leaving lab).

Outcome variables (3):

Ex-ante productivity: decomposition

- Average *ex-ante* productivity is # correct images over *actual* typing time, because contractual time is not available ex-ante.
- $\Rightarrow$ Decompose in *precision* and *speed* only:

$$AP^{A}_{i,0} \equiv C^{A}_{i}/D^{A}_{i} = \left(C^{A}_{i}/N^{A}_{i}\right) \times \left(N^{A}_{i}/D^{A}_{i}\right) \tag{4}$$

Results: Testing sorting along *ex-ante* productivity

Ex ante Productivity measures (ln)	Productivity # Correct/ Time	Precision #Correct / Questions	Speed # Questions / # Time
T_2 : Part-time non-flexible	−.01	−.03	.01
	(.07)	(.04)	(.06)
T_3 : Full-time flexible	−.02	−.05	.03
	(.07)	(.04)	(.06)
T_4 : Part-time flexible	.05	.01	.04
	(.07)	(.04)	(.06)
Accept	−.21	−.08	−.12
	(.15)	(.10)	(.10)
T_2 × *Accept*	.00	−.11	.11
	(.41)	(.31)	(.16)
T_3 × *Accept*	.39**	.20	.20
	(.20)	(.12)	(.17)
T_4 × *Accept*	.36	.07	.29
	(.23)	(.12)	(.22)
Constant	−2.61***	−.26***	−2.36***
	(.07)	(.04)	(.06)
R Squared	.16	.051	.16
N	535	535	535

Results: Testing Motivational Effects on *Ex-Post* Productivity

Productivity (ln)	No $AP^{A}_{i,1}$	Control $AP^{A}_{i,1}$
T2: Part-time non-flexible	.12	.18
	(.27)	(.18)
	[.66]	[.37]
T3: Full-time flexible	.40*	.28*
	(.15)	(.16)
	[.06]	[.10]
T4: Part-time flexible	.15	.09
	(.22)	(.23)
	[.17]	[.43]
Ex ante productivity - *Precision (ln)*		.89***
		(.14)
Ex ante total productivity *(ln)*		−.08
		(.21)
Constant	−1.73***	−1.64***
	(.11)	(.49)
R Squared	.2	.52
NT	68	68

Exploring Mechanisms: Decomposing Total Effect

	Global- Productivity				Without Sorting Effects			
	Total (C/T)	Precision (C/N)	Speed (N/D)	Ef.Time (D/T)	Total (C/T)	Precision (C/N)	Speed (N/D)	Ef.Time (D/T)
T2: Part-time	.12	−.08	.00	.20	.18	−.07	−.00	.26*
non flexible	(.27)	(.10)	(.14)	(.12)	(.18)	(.05)	(.10)	(.13)
	[.66]	[.52]	[.98]	[.13]	[.37]	[.16]	[.98]	[.10]
T3: Full-time	.40*	.04	.14	.22**	.28*	−.01	.04	.25**
flexible	(.15)	(.02)	(.08)	(.12)	(.16)	(.04)	(.10)	(.11)
	[.06]	[.63]	[.23]	[.05]	[.09]	[.85]	[.66]	[.04]
T4: Part-time	.15	.03	.12	.00	.09	−.01	.03	.07
flexible	(.22)	(.02)	(.11)	(.17)	(.23)	(.04)	(.13)	(.13)
	[.17]	[.38]	[.12]	[1.00]	[.43]	[.71]	[.43]	[.62]
Ex ante prod-*Precision*					.89***	.24**	.15	.50**
					(.26)	(.09)	(.19)	(.20)
Ex ante total prod*(ln)*					−.08	.02	.18	−.29*
					(.21)	(.03)	(.13)	(.16)
NT	68	68	68	68	68	68	68	68

Exploring Mechanisms: Decomposing Time Use Effect

	Global			Without Sorting Effects		
	Ef.Time (D/T)	Absenteeism (A/T)	Breaks (B/T)	Ef.Time (D/T)	Absenteeism (A/T)	Breaks (B/T)
T2: Part-time	.10	.04	−.14***	.12*	.03	−.15***
non-flexible	(.06)	(.04)	(.04)	(.06)	(.04)	(.04)
	[.12]	[.33]	[.00]	[.10]	[.55]	[.01]
T3: Full-time	.09*	−.01	−.08**	.10*	−.01	−.08**
flexible	(.05)	(.04)	(.03)	(.05)	(.03)	(.03)
	[.08]	[.85]	[.03]	[.07]	[.73]	[.04]
T4: Part-time	.02	.11	−.14***	.05	.10	−.14***
flexible	(.07)	(.05)	(.04)	(.06)	(.03)	(.04)
	[.60]	[.33]	[.00]	[.18]	[.44]	[.00]
Ex ante prod-Precision				.20**	−.12**	−.08*
				(.08)	(.06)	(.05)
Ex ante total prod.				−.11	.07	.04
				(.07)	(.05)	(.04)
NT	68	68	68	68	68	68

Conclusion (1)

- Findings suggest:
  1. Flex time schedules enhance producitivity upto 50%
     - 1.1 20% by attracting more productive workers;
     - 1.2 30% by enhanced motivation, i.e. by increasing *effective* working time resulting from taking fewer breaks.
  2. Part-time schedules do not enhance productivity:
     - 2.1 Do not attract more productive workers.
     - 2.2 Less breaks, but not more productive, because also either less precise, or more absent.

Conclusion (2)

- Comparison to existing findings:
  1. Similar source of enhanced productivity: **working more**.
  2. In US — **selection in hiring** $\longleftrightarrow$ + in Columbia for short temp job $\Rightarrow$ consequence of $\neq$ labour market conditions?
  3. For this “dull" routine task — effect of *remote work* on productivity (Dutcher 2012) turns into + of *time-schedule* flexibility $\Rightarrow$ Explained by **positive role of monitoring** as commitment device?

- Next Steps
  - Find firm or public adminstration willing to experiment on **larger scale** (more workers, longer period), with focus on scheduling flexibilty, and/or remote work.
  - **Ideas and collaboration** are more than welcome!