Labor Supply and Paid Sick Leaves

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Motivation

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- Chile: 8 out of 10 workers file a sick leave claim in a given year with an duration of 10.2 days

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- Administrative data on claims 2010 - 2019
- Match individuals to their employment records

Contribution to the literature

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1. Design of public insurance programs

   Mainly focused on optimal design of unemployment insurance and disability insurance
   Aron-Dine, Einav, and Finkelstein (2013), Einav and Finkelstein (2018), Chetty (2008, 2009), Chetty and Finkelstein (2013),Cutler and Zeckhauser (2000), Gruber (1997), Hendren (2017)

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  - UI is transitory, the relevant moral-hazard margin in UI is the program outflow

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   Estimation of causal effects of variation in sick pay generosity and duration

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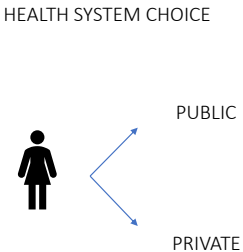
- Contribution: estimate effects of variation in sick paid on work-absence behavior under non-linear benefit schemes

Overview

Institutional Details

Institutional details: the process of filing a claim



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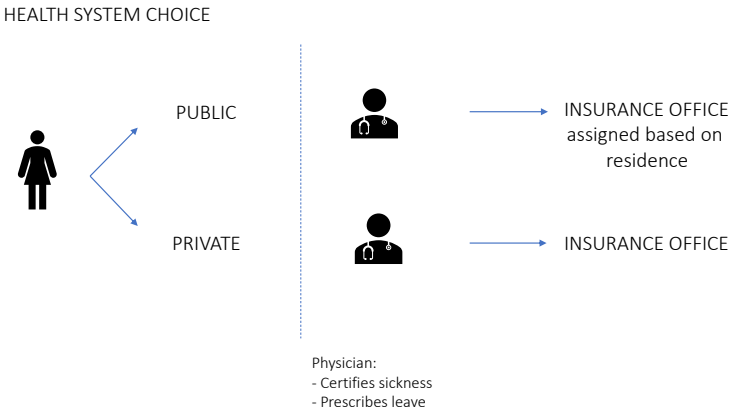

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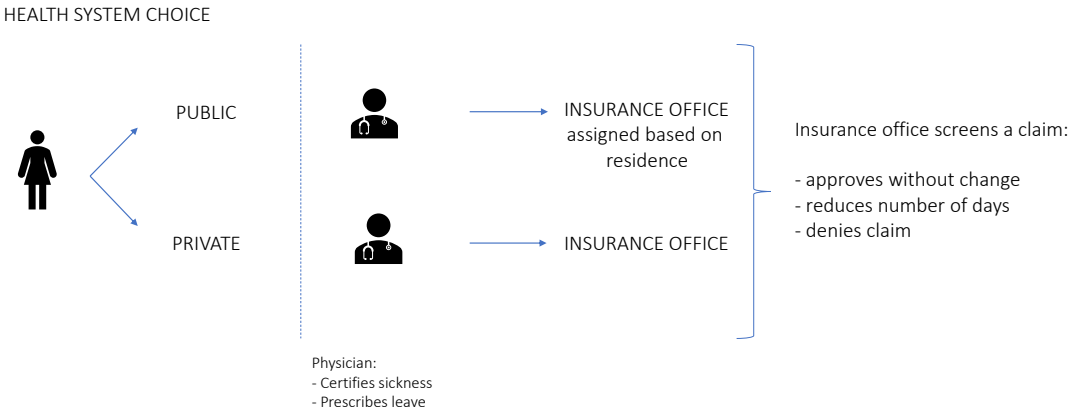


Chilean Sickness Insurance System

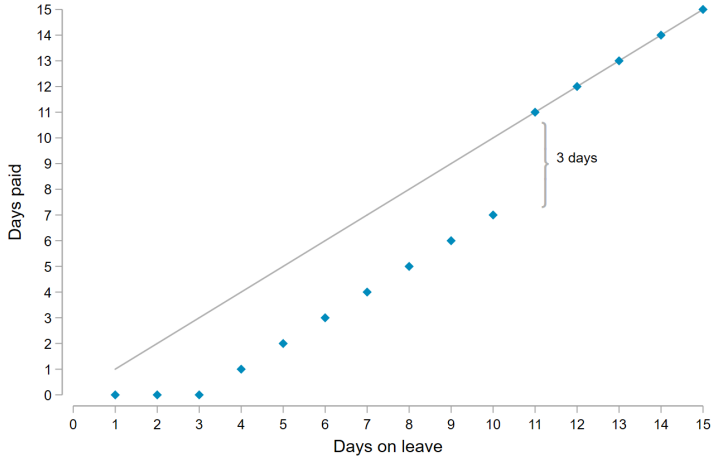
Eligibility criteria

- Physician certifying the sickness
- 6 months of health insurance enrollment before the leave starting date
- 3 months of contributions before the leave starting date

Benefits scheme

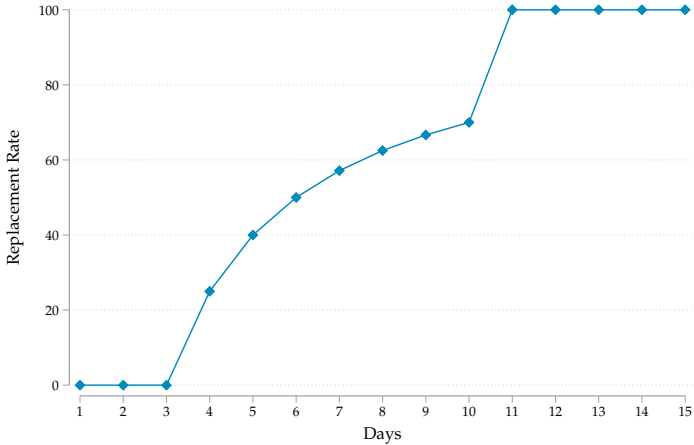
- Non-payable period of 3 days: $\tau = 0 \times w$
- From day 4 till day 10 the worker receives: $\tau = (\text{Leave days} - 3) \times w$
- Starting at day 11 the replacement rate is 100% : $\tau = \text{Leave days} \times w$

Days paid as a function of days on leave



Notes: This graphs shows the relation between days paid and days on leave. The 3-days-non-payable period only applies to the first 10 days. For leaves 11 or more days long there is no non-payable period. This creates a discontinuity as those 3 days "are recovered" by the worker.

Replacement Rate



Notes: The replacement rate is the proportion of lost wages that the worker is paid. This rate is a function of the total number of days on leave. In the Chilean system, for leaves 11 or more days long there is no non-payable period, this creates a sharp increase in the replacement rate.

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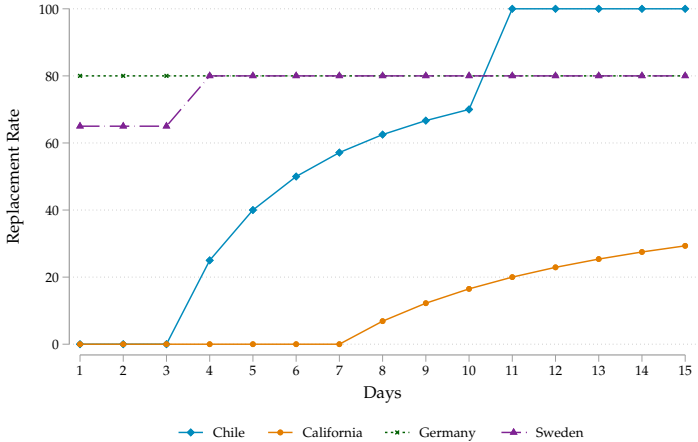

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Administrative data on sick leave claims between 2010 - *2019*

- worker's enrollment in private or public health insurance provision
- days prescribed by the physician and days approved by the insurer office
- main diagnose and physician's identifier associated to the claim

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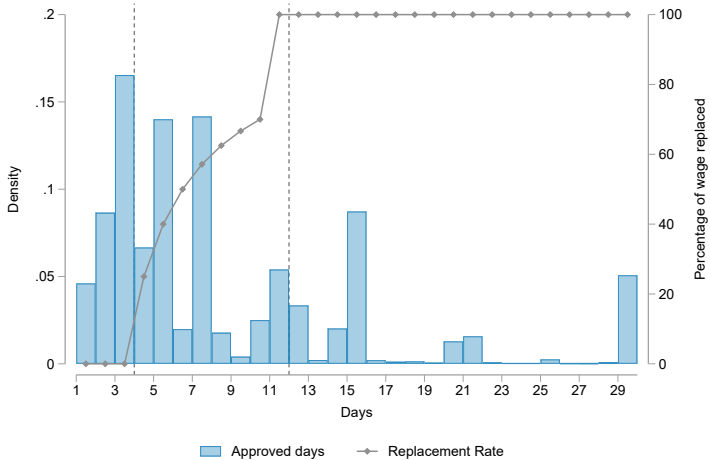
Match employer-employee data

- Unemployment insurance records of the private sector workers (80-90% of the labor force)
- Worker: education, date of birth, marital status, monthly wages, municipality of residence
- Firm: size, location, economic activity

Distribution of Days on Paid Sick Leave



Notes: This figure shows the distribution of days on paid sick leave. The replacement rate is overlaying (secondary axis). The first vertical line marks up to 3 days long sick leaves, the second vertical line marks up to 11 days long sick leaves. The 30% of leaves are accumulated in the 1-3 days span, the 42% in the 4-10 days span and the remaining 28% in the 11+ days span.

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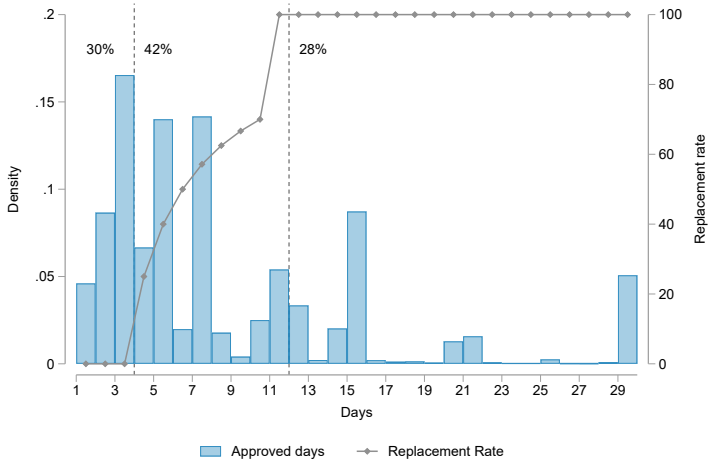

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Worker's Characteristics by Sick Leave Duration

	All workers	No leave	Duration of sick leave		
			1 to 3 days	4 to 10 days	11 or more days
Age	37.90	38.23	34.65	36.04	38.51
	(11.17)	(11.28)	(9.68)	(10.63)	(10.98)
Female	0.40	0.36	0.50	0.51	0.55
	(0.49)	(0.48)	(0.5)	(0.5)	(0.5)
Married	0.32	0.32	0.26	0.30	0.34
	(0.47)	(0.47)	(0.44)	(0.46)	(0.47)
% temp workers	0.36	0.39	0.25	0.30	0.26
	(0.48)	(0.49)	(0.44)	(0.46)	(0.44)
Years of education	11.82	11.72	12.67	12.08	11.96
	(2.91)	(2.95)	(2.78)	(2.72)	(2.75)
Montly wages (2013 USD)					
Unconditional mean	926.49	919.69	1292.93	990.95	936.29
	(1.86)	(1.76)	(3.22)	(2.55)	(2.42)
Conditional difference			263***	64.46***	6.69***
			(2.72)	(1.94)	(1.77)
Observations	2,908,109	2,207,680	132,186	256,649	312,583

Notes: This table presents summary statistics for all workers in the social security system and by claim status and claim duration. Pooled years 2010 to 2016. Conditional difference accounts for workers' gender, age, age squared, marital status, temporary contract dummy and time fixed effects.

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Theoretical Framework

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Assumptions:

- Economy populated by N ex-ante identical workers.
- Time is discrete, and each period t represents one month, composed by M days.
  - In today's model, there is no connection between periods, study one period.
- There is a Social Planner that maximizes aggregate welfare.

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Workers are expected utility maximizers and derive utility from consumption and leisure.

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$$U(c, h) = v(c) - \underbrace{g(h)}_{\text{disutility from work}} - \underbrace{k_s \max\{0, \theta - (M - h)\}}_{\text{disutility from work if sick}}$$

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All types receive a wage rate (w) per day worked

- Wage rate is posted before workers lean their type
- There is no ex post wage bargaining

Setup: Social Planner

Seeks to maximize the sum of individual expected utility subject to a feasibility constraint

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$$\max_{w} W(\theta) = N \sum_{\theta=0}^{M} P(\theta = m) V(\theta) \quad s.t. \quad Q \geq T$$

Where $V(\theta) = \max_{h \in [0,M]} U(h; \theta)$

$$Q = N \sum_{\theta=0}^{M} P(\theta = m) h(\theta) z(\theta)$$

$$T = N \sum_{\theta=0}^{M} P(\theta = m) w h(\theta)$$

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Introduces a sickness insurance system

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$$\begin{aligned}
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- Increases in the distance between "true" sickness and the requested days on leave
- Alternative representations:
  - High cost of misreporting sickness level ‣ Graph
  - Low cost of misreporting sickness level ‣ Graph
  - No penalties for sick working, penalties for missing work if healthy ‣ Graph

Sickness Insurance System

Worker's Problem

$$\max_{h\in[0,M]} U(h,\theta) = v(wh + \underbrace{\tau(h)}_{\text{sick pay}}) - g(h) - k_s \max\{0, \theta - (M-h)\} - \underbrace{e(\theta,h)}_{\text{application cost}}$$

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Planner's Problem

$$\max_{\omega} W(\theta) = N\sum_{\theta=0}^{M} P(\theta = m)V(\theta)$$

$$Q = N\sum_{\theta=0}^{M} P(\theta = m)wh(\theta) + N\sum_{\theta=0}^{M} P(\theta = m)\underbrace{\tau(h)}_{\text{sick pay}} + \underbrace{\nu L}_{\text{admin cost}}$$

Where:

- τ represents the replaced wages or sick pay defined before
- ν represents a unit administrative cost and L the number of sick leave claims

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How does the optimal policy looks like?

- Given the piece-wise linear structure: there is a set of parameters that maximize welfare

Is the provision of paid sick leave welfare improving?

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	No insurance	**With paid sick leave provision**			
	(1)	(2)	(3)	(4)	(5)
Utility and productivity					
Risk aversion	1.75	1.75	1.75	1.75	1.75
Disutility from work	0.001	0.001	0.001	0.001	0.001
Disutility from work if sick	0.05	0.05	0.05	0.05	0.05
Productivity when sick	0	0	0	0	0
Sick leave contract					
Replacement rate [1,3]	-	0	0	0	0
Replacement rate [4,10]	-	0.8	0.8	0.3	0.3
Replacement rate [11,M]	-	1	1	1	1
Cost of misreporting	-	high	low	high	low

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Notes: This table summarizes the assumptions made in the alternative simulations of the model. The first panel presents assumptions relative to utility and productivity. The second panel presents assumptions on application costs and structure of the paid sick leave contract.

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Cost of misreporting	-	high	low	high	low
Labor supply results	⋆	⋆	⋆	⋆	⋆
Av. days on leave while healthy	0	0	0.908	0	0.729
Total product	181,273	181,144	173,881	181,144	174,898
Wage rate	0.85	0.677	0.627	0.677	0.6341
Total welfare	-2030	-1702	-1770	-1739	-1766
Value of consumption	-1738	-1490	-1570	-1527	-1563
Utility cost of work	213	212	200	212	203
Utility cost of working sick	79	0	0	0	0

Notes: This table summarizes aggregate results from simulations of the model. Column 1 considers the case with no insurance. Columns 2 and 4 consider the case with insurance and high application costs with alternative values for the replacement rate. Columns 3 and 5 consider the case with insurance and low application costs with alternative values for the replacement rate. Assumptions on the utility function are presented in the previous slide

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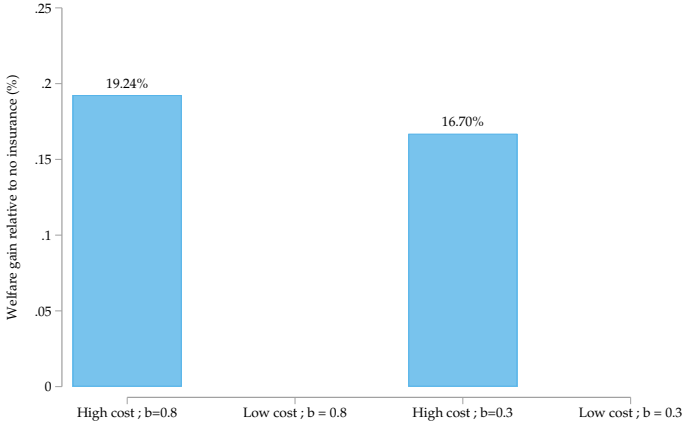
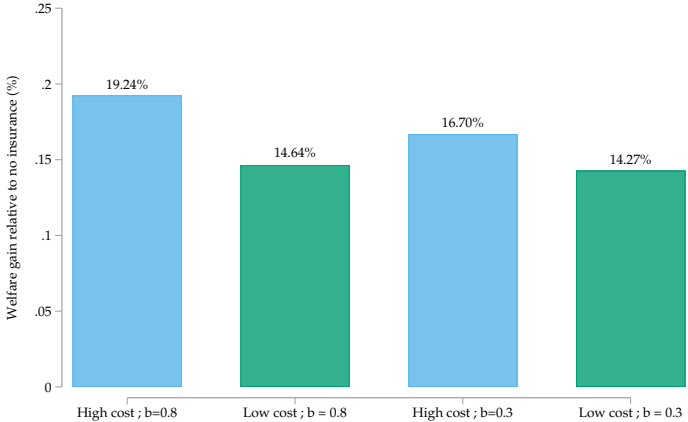
Changes in aggregate welfare: insurance effect



Notes: This figure shows welfare gains relative to the no insurance case. High cost refers to a high cost of misreporting sickness (setting $e(h, \theta)$ to a quadratic cost function). The parameter b is the replacement rate between 4 and 10 days.

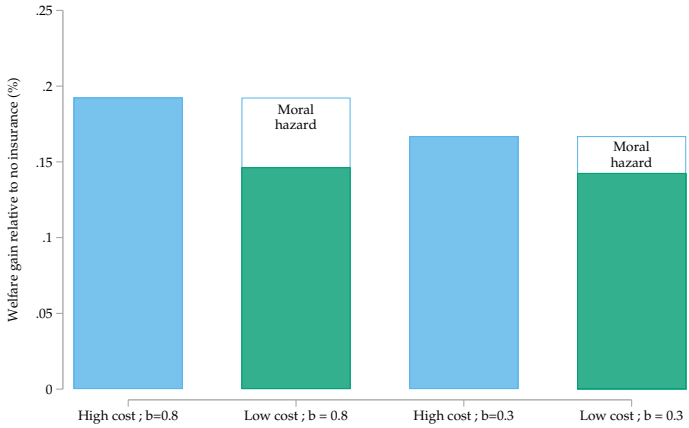
▸ Application cost

Changes in aggregate welfare



Notes: This figure shows welfare gains relative to the no insurance case. High cost refers to a high cost of misreporting sickness (setting $e(h, \theta)$ to a quadratic cost function) and low cost refers to low costs of misreporting in the range of +/- 2 days. The parameter b is the replacement rate between 4 and 10 days.

Moral Hazard reduces welfare gains from insurance



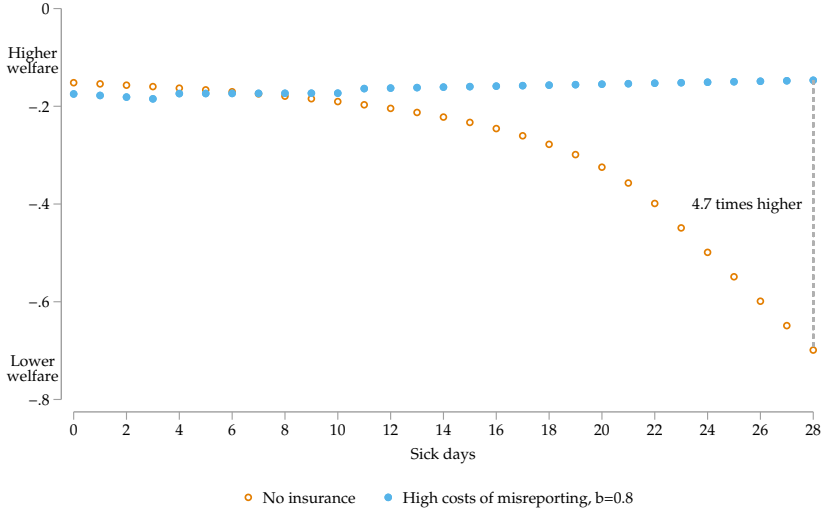
Notes: This figure shows welfare gains relative to the no insurance case. The forgone welfare due to moral hazard amounts to increasing the replacement rate from $b = 0.3$ to $b = 0.8$.

Welfare improvements: distributional effects

Focus on the first bar of the previous graph

- Who are the winners and losers from the introduction of insurance?

Sick workers' welfare improves up to 4.7 times



A world with moral hazard

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What are the effects from changes the paid sick leave contract?

- Eliminate the non-payable period, i.e. $b_1 = b_2$ for $M - h \in [1, 10]$ Results

Conclusions and next steps

Introduction of paid sick leave is welfare improving: huge gains for workers who are very sick

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In a context where faking sickness is easy

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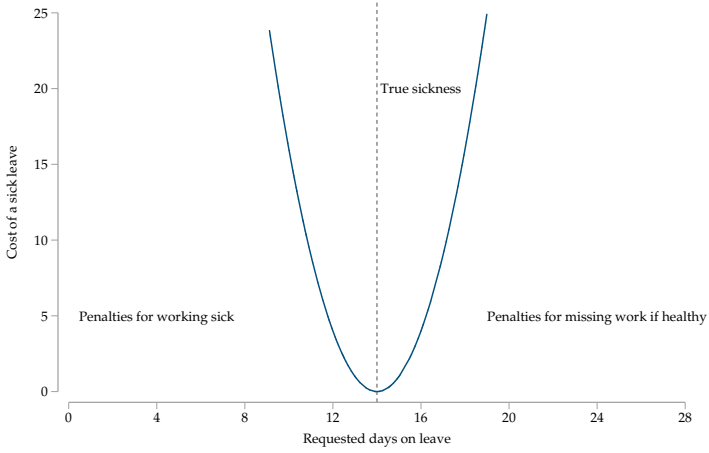
Next steps

- Relax the assumption that all workers have the same disutility from work
- Relax the assumption that all workers face the same distribution of health shocks

Open question: how does the optimal policy looks like in different economies? e.g. aging population

Appendix

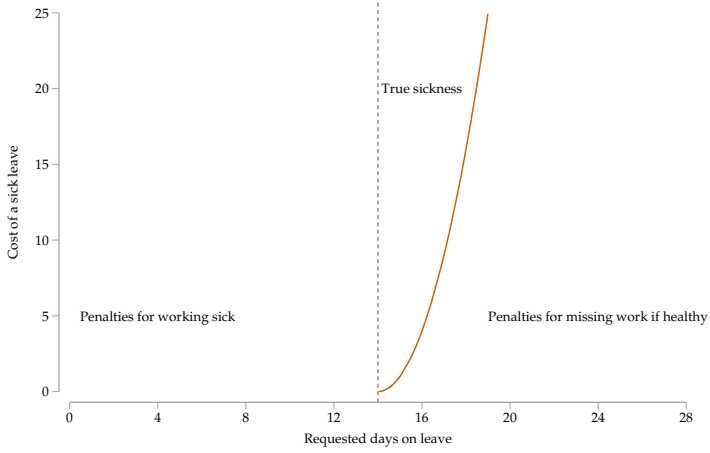
Cost of a sick leave claim: $e(h, \theta) = (\theta - (M - h))^2$



Notes: This graphs shows the application cost under the assumption of high cost of misreporting sickness level for a type whose true sickness is 14 days. If this worker wants to get an extra day on leave relative to her true sickness (i.e. $(M - h) = \theta + 1$) the cost is 1, in the model this equals two times the disutility from working sick for 10 days.

▸ Back ▸ Back to table

Penalties for positive deviations assuming $e(h, \theta) = (\theta - (M - h))^2$



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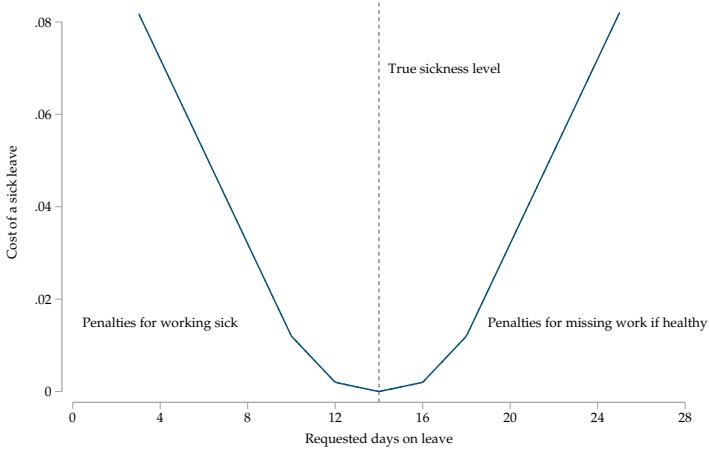
Cost of a sick leave claim: low misreporting costs



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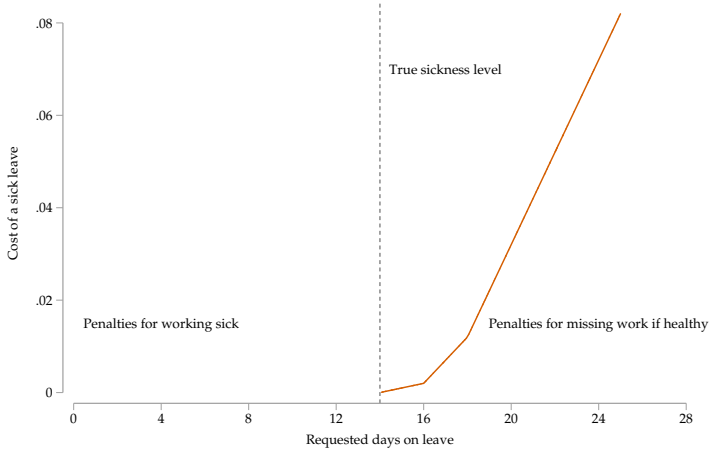

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▸ Back ▸ Back to table

Baseline model

Distribution of sickness:

- Probability of being healthy (and the share of healthy workers) $p = 0.35$
- Probability of sickness is decreasing in the number of days. Graph

Utility function

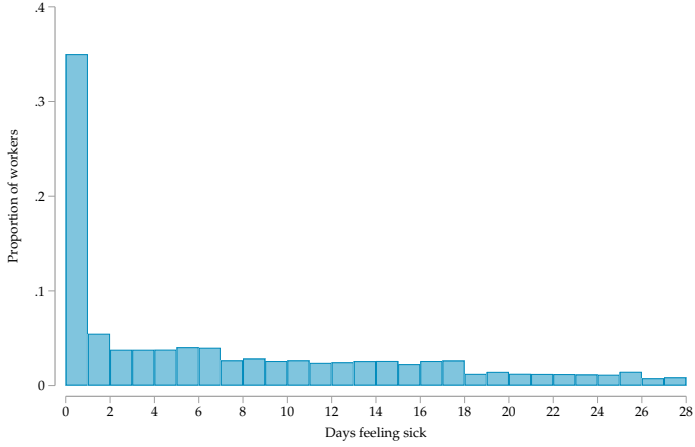
- Constant relative risk aversion $v(c) = \frac{c^{1-\gamma}}{1-\gamma}$; $\gamma = 1.75$
- Disutility from work: $g(h) = 0.001h$
- Disutility from work when sick : $g_{sick}(h) = k_s \max\{0, \theta - (M - h)\}$; $k_s = 0.05$

Productivity

- On a sick day a worker produces $\varepsilon = 0$ units of the good
- Average productivity $z(\theta) = 1 - \frac{\theta}{M}$

Back

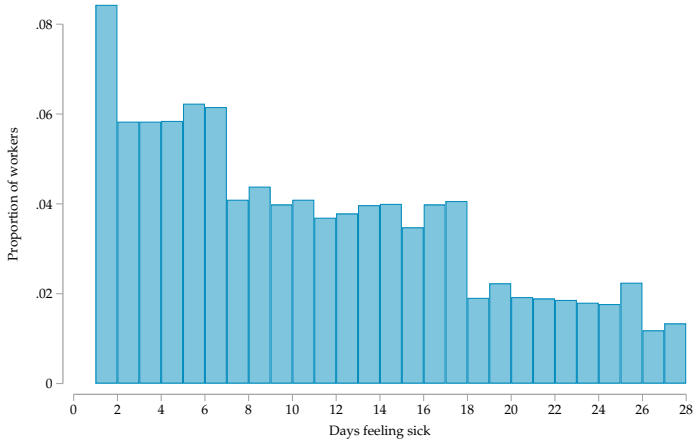
Distribution of health shocks



Notes: This graphs shows the distribution of health shocks. The first bar represents the proportion of healthy workers (p $= 0.35$). The probability of being sick 1 day is $p_1 = 0.055$, the probability of being sick for more than 20 days is $P(\theta \geq 20 = 0.0786$

▸ Back

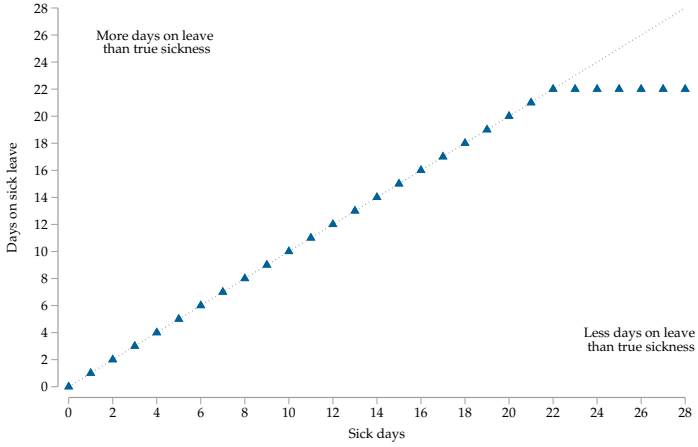
Distribution of health shocks



Notes: This graphs shows the distribution of health shocks conditional on begin sick ($\theta > 0$). The conditional probability of being sick 1 day is $P(\theta = 1|\theta > 0) = 0.0843$, the conditional probability of being sick for up to 3 days is $P(\theta \leq 3|\theta > 0) = 0.201$. The probability of being sick for more than 20 days is $P(\theta \geq 20) = 0.1209$

▸ Back

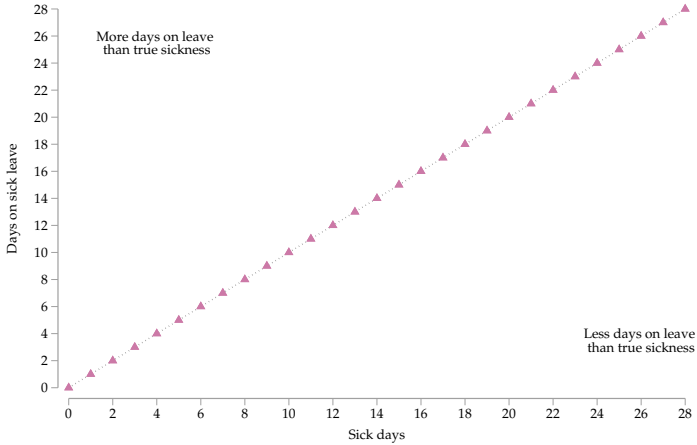
Labor supply: model with no insurance



Notes: This figure shows days on sick leave as a function of days felling sick if there is no access to sick leave insurance. Very sick workers work 6 days. Why 6 days? A sick worker chooses to work one more day while sick if the utility added by the extra day is positive: $U(h = j + 1) > U(h = j)$. The last day added will be were $U(h = j + 1) - U(h = j) = 0 \rightarrow k + j_s = \frac{w^{1-\gamma}}{1-\gamma}\left((j+1)^{1-\gamma} - j^{1-\gamma}\right); j \approx 6$

▸ Back

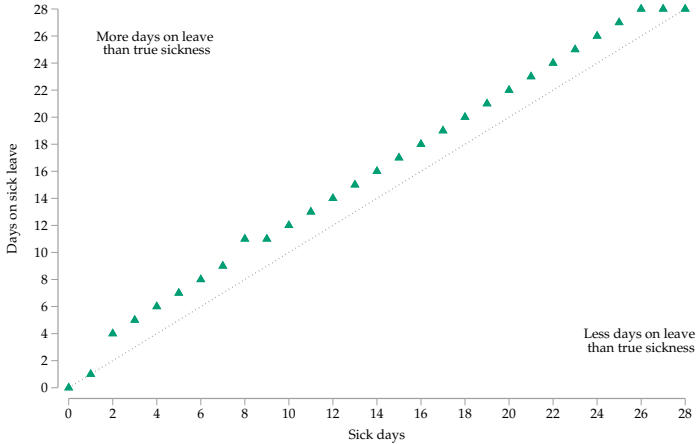
Insurance with **high** cost of misreporting: everyone shows up to work



Notes: This figure shows days on sick leave as a function of days felling sick. When the social planner imposes a cost of deviating that is very high, it is optimal for workers to report their true sickness at the time of applying for a paid sick leave.

Back

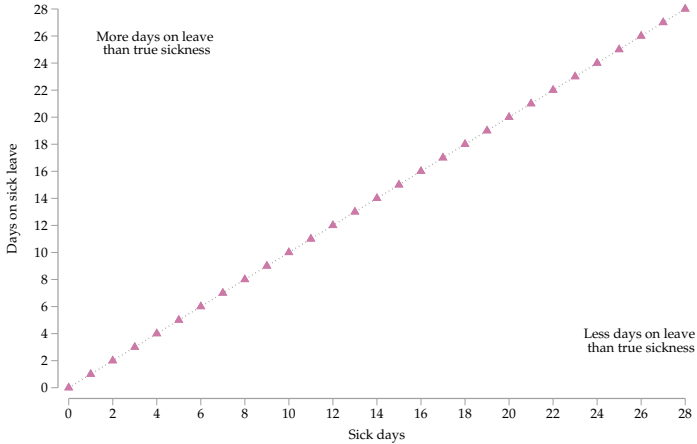
Insurance with **low** cost of misreporting: some workers fake their type



Notes: This figure shows days on sick leave as a function of days felling sick, $b = 0.8$. When the cost of faking +/- 2 days around the true sickness level is low, workers find optimal to report more days and extend sickness leave. In this example, almost all types ask for an extra day on leave.

▸ Back

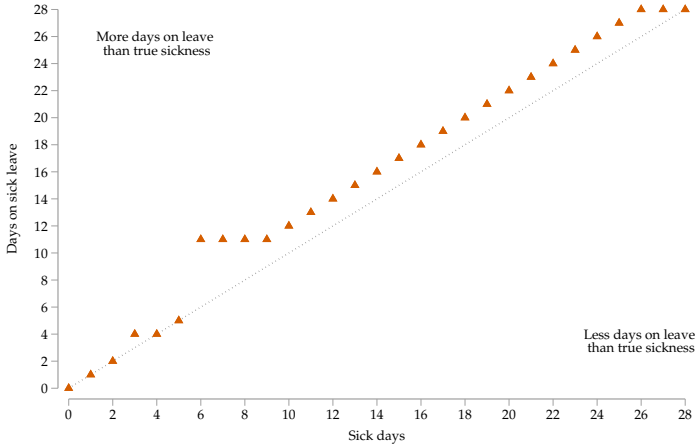
Insurance with **high** cost of misreporting: everyone shows up to work



Notes: This figure shows days on sick leave as a function of days felling sick. When the social planner imposes a cost of deviating that is very high, it is optimal for workers to report their true sickness at the time of applying for a paid sick leave.

Back

Insurance w/**low** cost of misreporting: 11 days kink plays an important role



Notes: This figure shows days on sick leave as a function of days felling sick, $b = 0.3$. When the cost of faking +/- 2 days around the true sickness level is low, workers find optimal to report more days and extend sickness leave. In this example, there is bunching at 11 days from workers with true sickness $\theta \in [6, 10]$.

Back

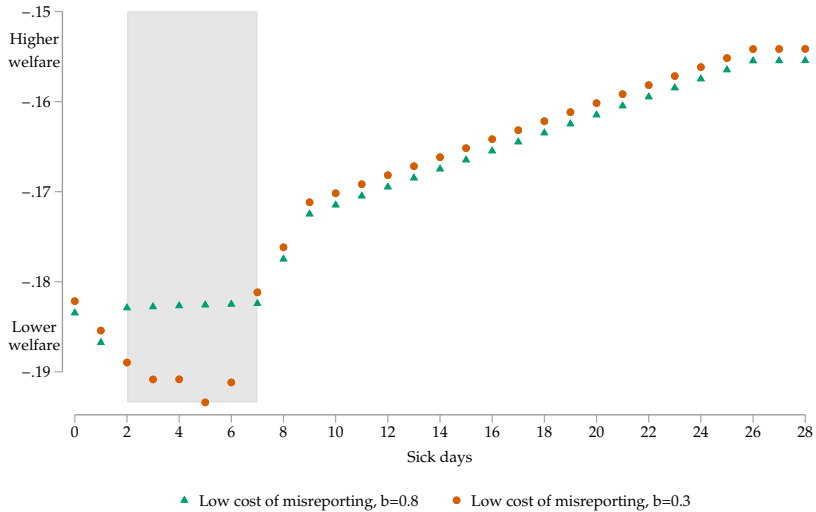
A world with moral hazard

Assume that the government can not implement the contract with **high** application costs

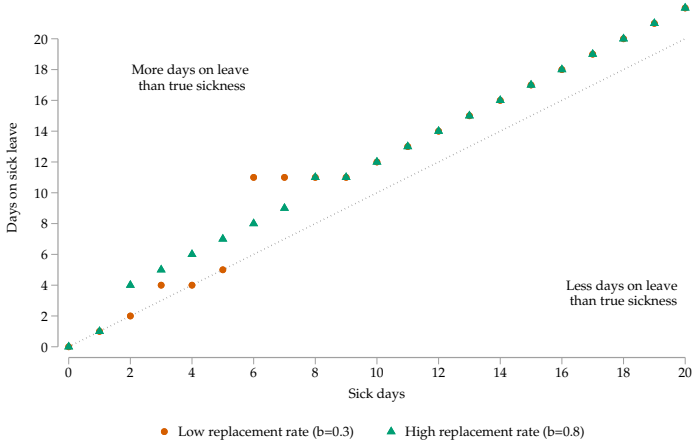
Focus on the effects from changes in the replacement rate: $b = 0.30$ compare to $b = 0.80$

- How much do workers deviate? ▸ Labor Supply
- Among sick workers
  - When $b = 0.8$ sick leaves are on average 0.908 days longer than their sickness level (5902 days)
  - When $b = 0.3$ sick leaves are on average 0.729 days longer than their sickness level (4738 days)
- Aggregate product: is 0.5% higher with a lower replacement rate
- Aggregate welfare: is 2% higher with a higher replacement rate
- How does welfare compare among workers?

Workers who changed their behavior are those mildly sick ($\theta \in [2, 7]$)



Insurance with **low** cost of misreporting and different values of b



Notes: This figure shows days on sick leave as a function of days felling sick. When the social planner imposes a cost of deviating that is very high, it is optimal for workers to report their true sickness at the time of applying for a paid sick leave.

Back

Eliminate non-payable period?

Parameters	**No insurance**	**With paid sick leave provision**			
	(1)	(2)	(3)	(4)	(5)
Sick leave contract					
Replacement rate [1,3]	-	0	0.8	0	0.3
Replacement rate [4,10]	-	0.8	0.8	0.3	0.3
Replacement rate [11,M]	-	1	1	1	1
Cost of misreporting	-	low	low	low	low

Back

Eliminate non-payable period?

Parameters	**No insurance**	**With paid sick leave provision**			
	(1)	(2)	(3)	(4)	(5)
Sick leave contract					
Replacement rate [1,3]	-	0	0.8	0	0.3
Replacement rate [4,10]	-	0.8	0.8	0.3	0.3
Replacement rate [11,M]	-	1	1	1	1
Cost of misreporting	-	low	low	low	low
Days of leave while healthy (average)	0	0.908	1.531	0.729	0.671
Total product	181,273	173,881	165,425	174,898	175,237
Product loss due to cheating	0	3.4%	6.0%	2.7%	2.5%
Wage	0.850	0.627	0.598	0.6341	0.6339
Welfare gain		14.74%	11.46%	15.06%	15.21%
Total welfare	-2030	-1769	-1821	-1764	-1762
Value of consumption	-1738	-1569	-1630	-1563	-1561
Utility cost of work	-213	-200	-191	-201	-201
Utility cost of SICK work	79	0	0	0	0

Back

Eliminate non-payable period?

Parameters	**No insurance**	**With paid sick leave provision**			
	(1)	(2)	(3)	(4)	(5)
Sick leave contract					
Replacement rate [1,3]	-	0	0.8	0	0.3
Replacement rate [4,10]	-	0.8	0.8	0.3	0.3
Replacement rate [11,M]	-	1	1	1	1
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Back

Eliminate non-payable period?

Parameters	**No insurance**	**With paid sick leave provision**			
	(1)	(2)	(3)	(4)	(5)
Sick leave contract					
Replacement rate [1,3]	-	0	0.8	0	0.3
Replacement rate [4,10]	-	0.8	0.8	0.3	0.3
Replacement rate [11,M]	-	1	1	1	1
Days of leave while healthy (average)	0	0.908	1.531	0.729	0.671
Total product	181,273	173,881	165,425	174,898	175,237
Product loss due to cheating	0	3.4%	6.0%	2.7%	2.5%
Wage	0.850	0.627	0.598	0.6341	0.6339
Welfare gain		14.74%	11.46%	15.06%	15.21%
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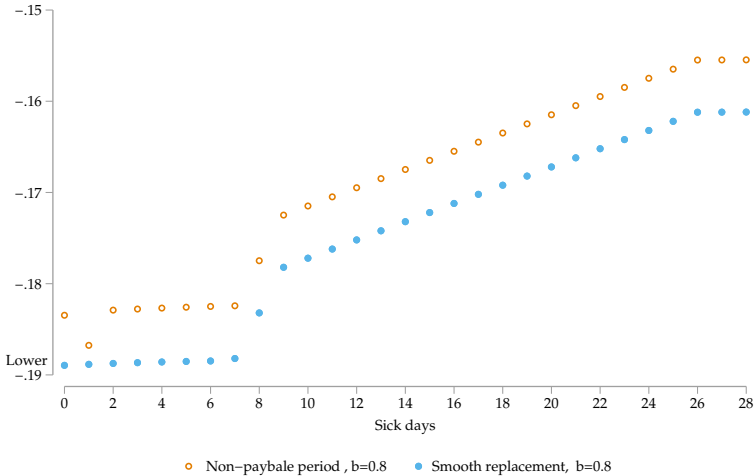
Value of consumption	-1738	-1569	-1630	-1563	-1561
Utility cost of work	-213	-200	-191	-201	-201
Utility cost of SICK work	-79	0	0	0	0

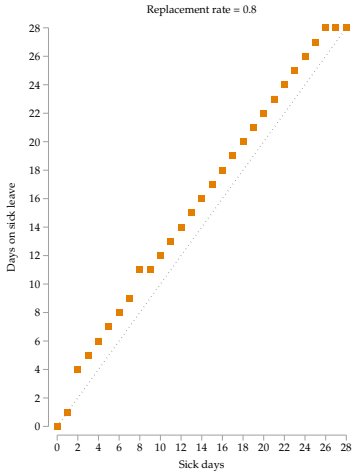
Back

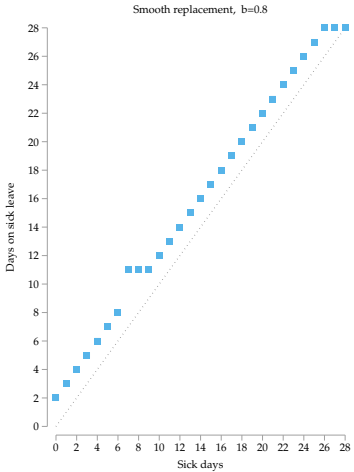
Welfare gains from implementing a non-payable period



Back

Labor supply for generous replacement rate





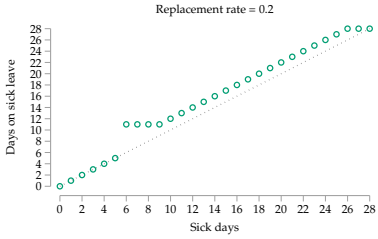
Back

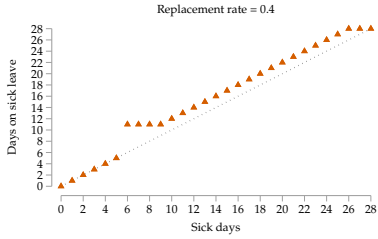
Eliminate non-payable period?

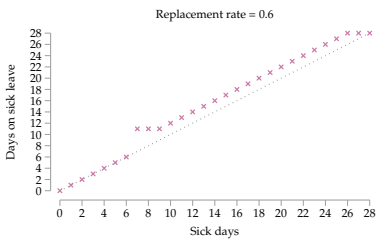
Parameters	**No insurance**	**With paid sick leave provision**			
	(1)	(2)	(3)	(4)	(5)
Sick leave contract					
Replacement rate [1,3]	-	0.2	0.4	0.6	0.8
Replacement rate [4,10]	-	0.2	0.4	0.6	0.8
Replacement rate [11,M]	-	1	1	1	1
Cost of misreporting	-	low	low	low	low
Days of leave while healthy (average)	0	0.671	0.671	0.609	1.531
Total product	181,273	175,237	175,237	176,808	165,425
Product loss due to cheating	0	2.5%	2.5%	2.2%	6.0%
Wage	0.85	0.636	0.633	0.638	0.598
Welfare gain		15.21%	15.23%	15.82%	11.46%
Total welfare	-2030	-1762	-1761	-1752	-1821
Value of consumption	-1738	-1561	-1560	-1549	-1630
Utility cost of work	-213	-201	-201	-203	-191
Utility cost of SICK work	79	0	0	0	0

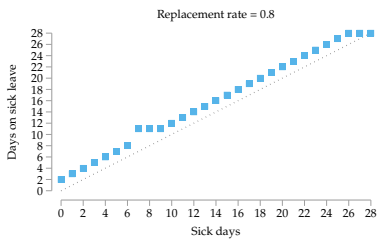
Back

Labor supply effects of alternative levels of b









Age decomposition

	All workers	No leave	Duration of sick leave		
			1 to 3 days	4 to 10 days	11 or more days
Age	37.90	38.23	**34.65**	**36.04**	**38.51**
	(11.17)	(11.28)	(9.68)	(10.63)	(10.98)
18 - 25 years old	0.15	0.15	0.17	0.17	0.12
26 - 35 years old	0.32	0.30	0.42	0.37	0.33
36 - 45 years old	0.26	0.26	0.25	0.25	0.27
46 - 55 years old	0.20	0.20	0.12	0.16	0.20
56 - 65 years old	0.08	0.08	0.03	0.05	0.08
Female	0.40	0.36	0.50	0.51	0.55
	(0.49)	(0.48)	(0.5)	(0.5)	(0.5)
Married	0.32	0.32	0.26	0.30	0.34
	(0.47)	(0.47)	(0.44)	(0.46)	(0.47)
% temp workers	0.36	0.39	0.25	0.30	0.26
	(0.48)	(0.49)	(0.44)	(0.46)	(0.44)
Years of education	11.82	11.72	12.67	12.08	11.96
	(2.91)	(2.95)	(2.78)	(2.72)	(2.75)
Monthly wages (2013 USD)					
Unconditional mean	926.49	919.69	1292.93	990.95	936.29
	(1.86)	(1.76)	(3.22)	(2.55)	(2.42)
Conditional difference			263***	64.46***	6.69***
			(2.72)	(1.94)	(1.77)
Observations	2,908,109	2,207,680	132,186	256,649	312,583

▸ Back

Education decomposition

	All workers	No leave	Duration of sick leave		
			1 to 3 days	4 to 10 days	11 or more days
Age	37.90	38.23	34.65	36.04	38.51
	(11.17)	(11.28)	(9.68)	(10.63)	(10.98)
Female	0.40	0.36	0.50	0.51	0.55
	(0.49)	(0.48)	(0.5)	(0.5)	(0.5)
Married	0.32	0.32	0.26	0.30	0.34
	(0.47)	(0.47)	(0.44)	(0.46)	(0.47)
% temp workers	0.36	0.39	0.25	0.30	0.26
	(0.48)	(0.49)	(0.44)	(0.46)	(0.44)
Years of education	11.82	11.72	12.67	12.08	11.96
	(2.91)	(2.95)	(2.78)	(2.72)	(2.75)
Elementary	0.13	0.15	0.05	0.10	0.11
High school	0.68	0.68	0.67	0.70	0.70
College or more	0.18	0.18	0.28	0.20	0.19
Monthly wages (2013 USD)					
Unconditional mean	926.49	919.69	1292.93	990.95	936.29
	(1.86)	(1.76)	(3.22)	(2.55)	(2.42)
Conditional difference			263***	64.46***	6.69***
			(2.72)	(1.94)	(1.77)
Observations	2,908,109	2,207,680	132,186	256,649	312,583

▸ Back

Income decomposition

	All workers	No leave	Duration of sick leave		
			1 to 3 days	4 to 10 days	11 or more days
Age	37.90	38.23	34.65	36.04	38.51
	(11.17)	(11.28)	(9.68)	(10.63)	(10.98)
Female	0.40	0.36	0.50	0.51	0.55
	(0.49)	(0.48)	(0.5)	(0.5)	(0.5)
Married	0.32	0.32	0.26	0.30	0.34
	(0.47)	(0.47)	(0.44)	(0.46)	(0.47)
% temp workers	0.36	0.39	0.25	0.30	0.26
	(0.48)	(0.49)	(0.44)	(0.46)	(0.44)
Years of education	11.82	11.72	12.67	12.08	11.96
	(2.91)	(2.95)	(2.78)	(2.72)	(2.75)
Monthly wages (2013 USD)					
Unconditional mean	926.49	919.69	1292.93	990.95	936.29
	(1.86)	(1.76)	(3.22)	(2.55)	(2.42)
Conditional difference			263***	64.46***	6.69***
			(2.72)	(1.94)	(1.77)
First quartile	0.25	0.27	0.10	0.18	0.21
Second quartile	0.25	0.25	0.20	0.27	0.27
Third quartile	0.25	0.24	0.30	0.28	0.27
Fourth quartile	0.25	0.24	0.39	0.27	0.25
Observations	2,908,109	2,207,680	132,186	256,649	312,583

▸ Back