

Voluntary health insurance in Chile: determinants of enrollment, financial protection and access to care

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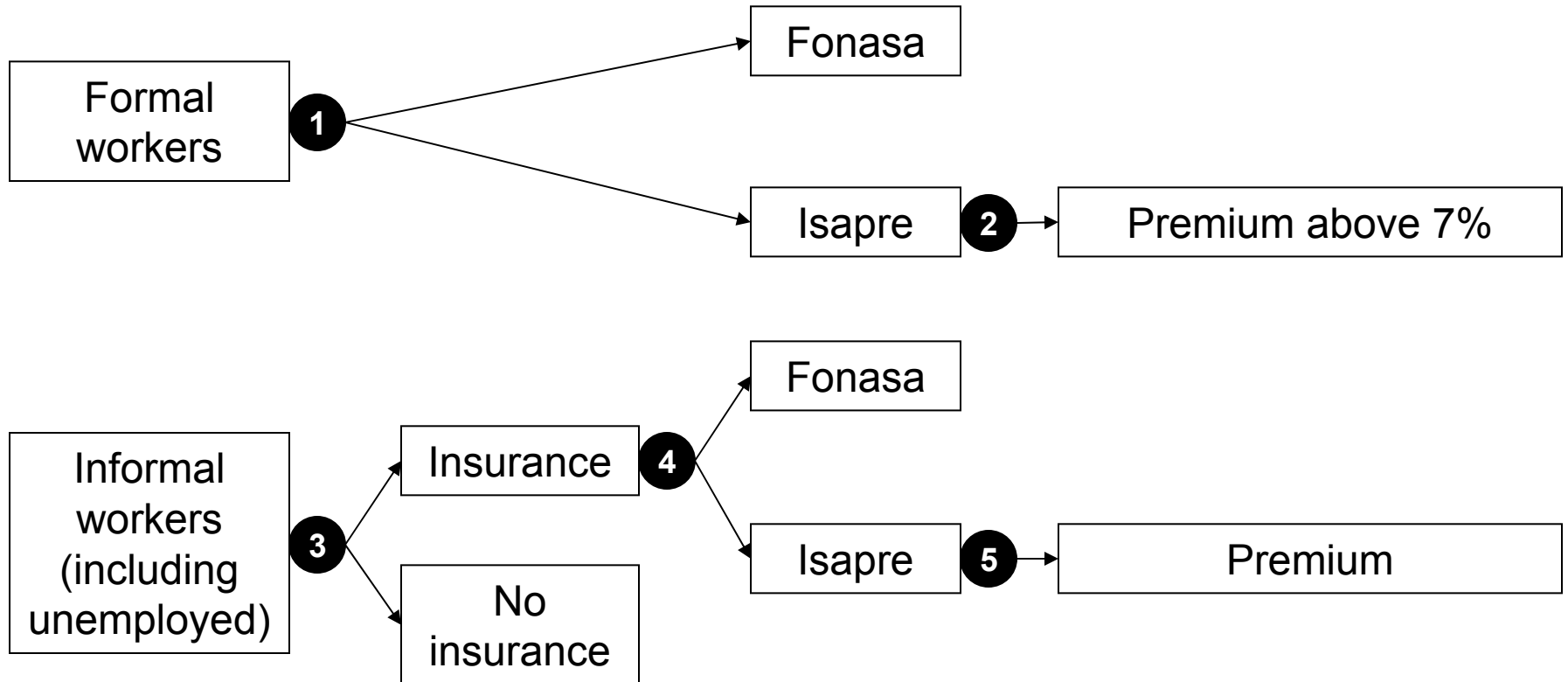
Rodrigo Muñoz

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Types of voluntary health insurance in Chile

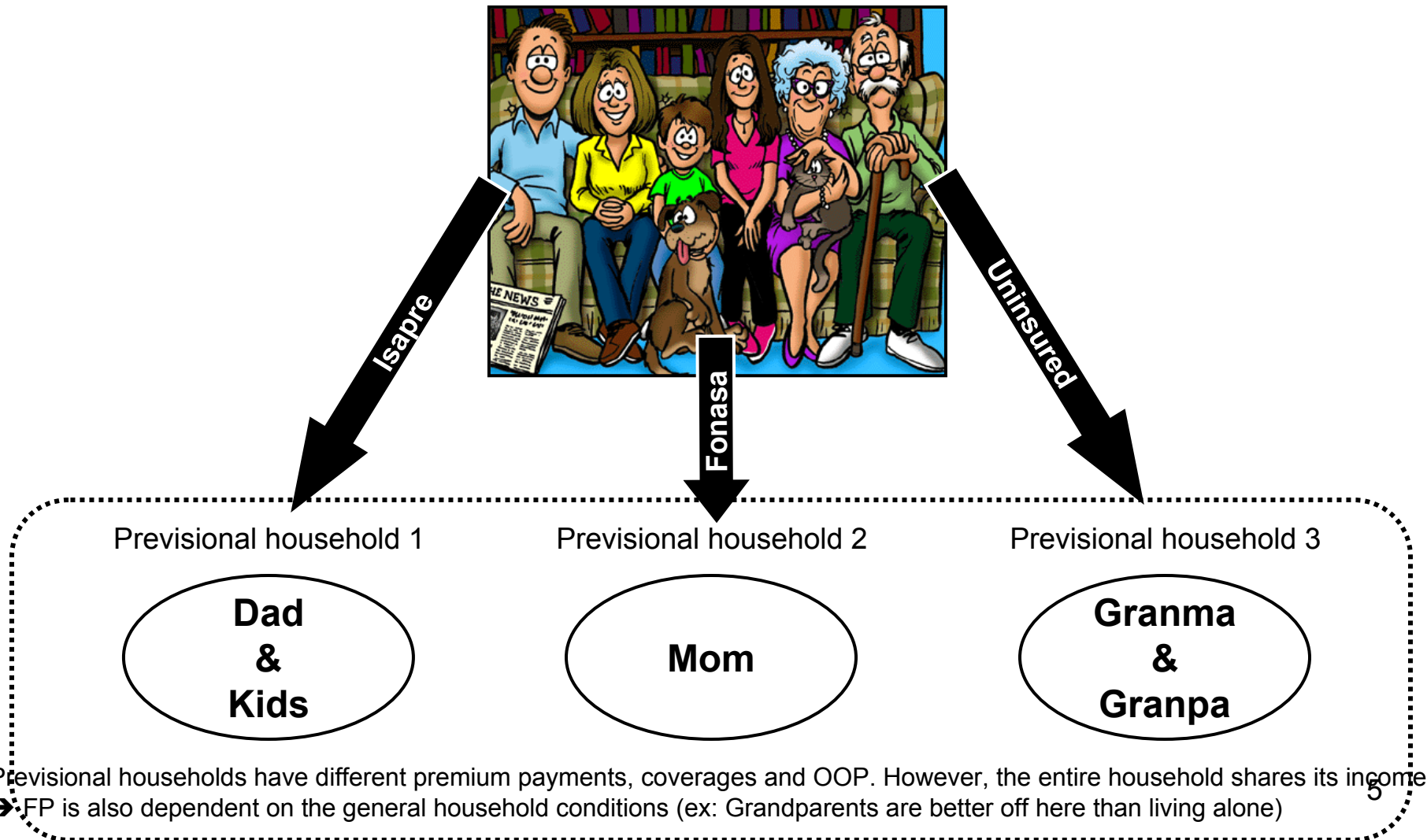
Household decision tree regarding health insurance



Types of voluntary health insurance in Chile

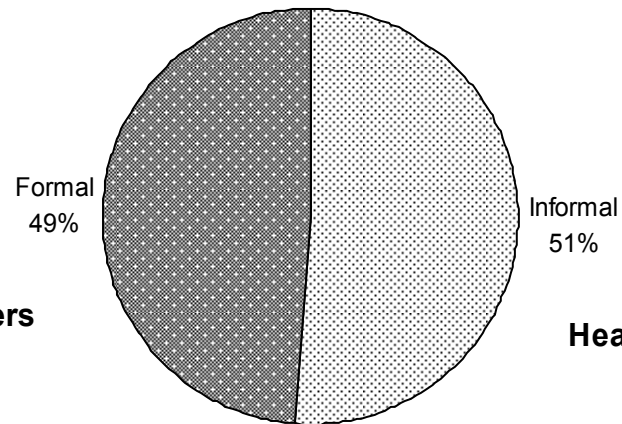
- In Chile's health insurance system, voluntary health insurance is limited by the possible choices a household is faced with.
- On one hand, formal workers are required to buy at least a 7% premium. Their decision is choosing between Isapre or Fonasa (*choice 1*), and in buying additional coverage above 7% in the case of Isapre (*choice 2*).
- On the other hand, informal workers may choose Isapre or Fonasa (*choice 4*), or may remain uninsured (*choice 3*). When choosing Isapre, they may buy any premium they wish (*choice 5*).

Unit of analysis: the “previsional” household

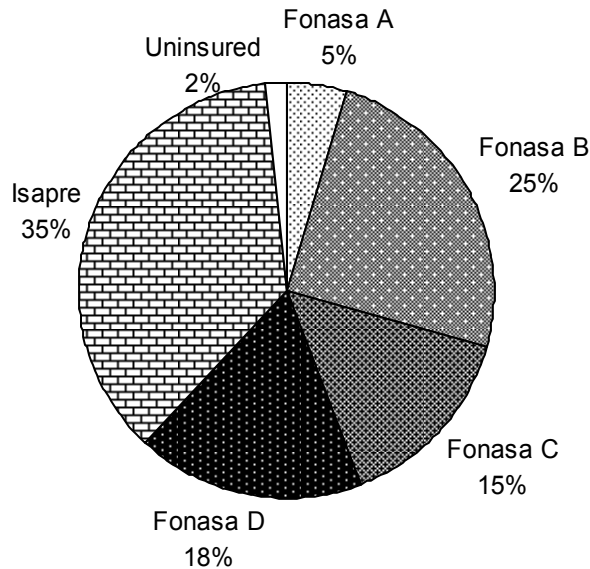


Basic voluntary insurance statistics

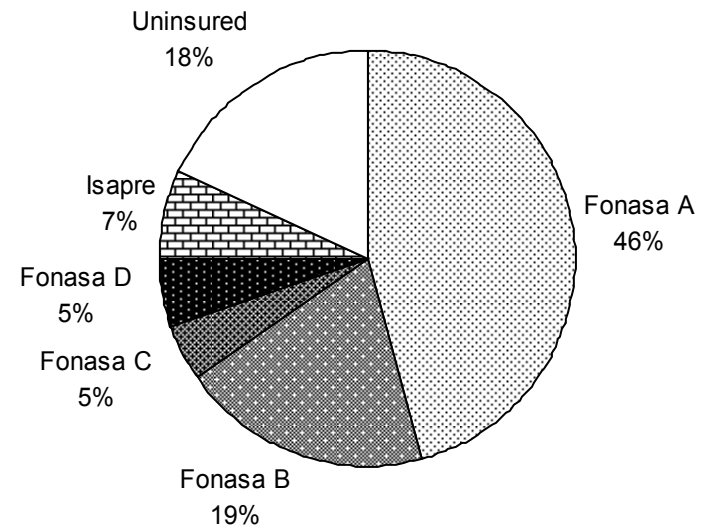
Distribution of formal and informal workers



Health insurance among formal workers



Health insurance among informal workers

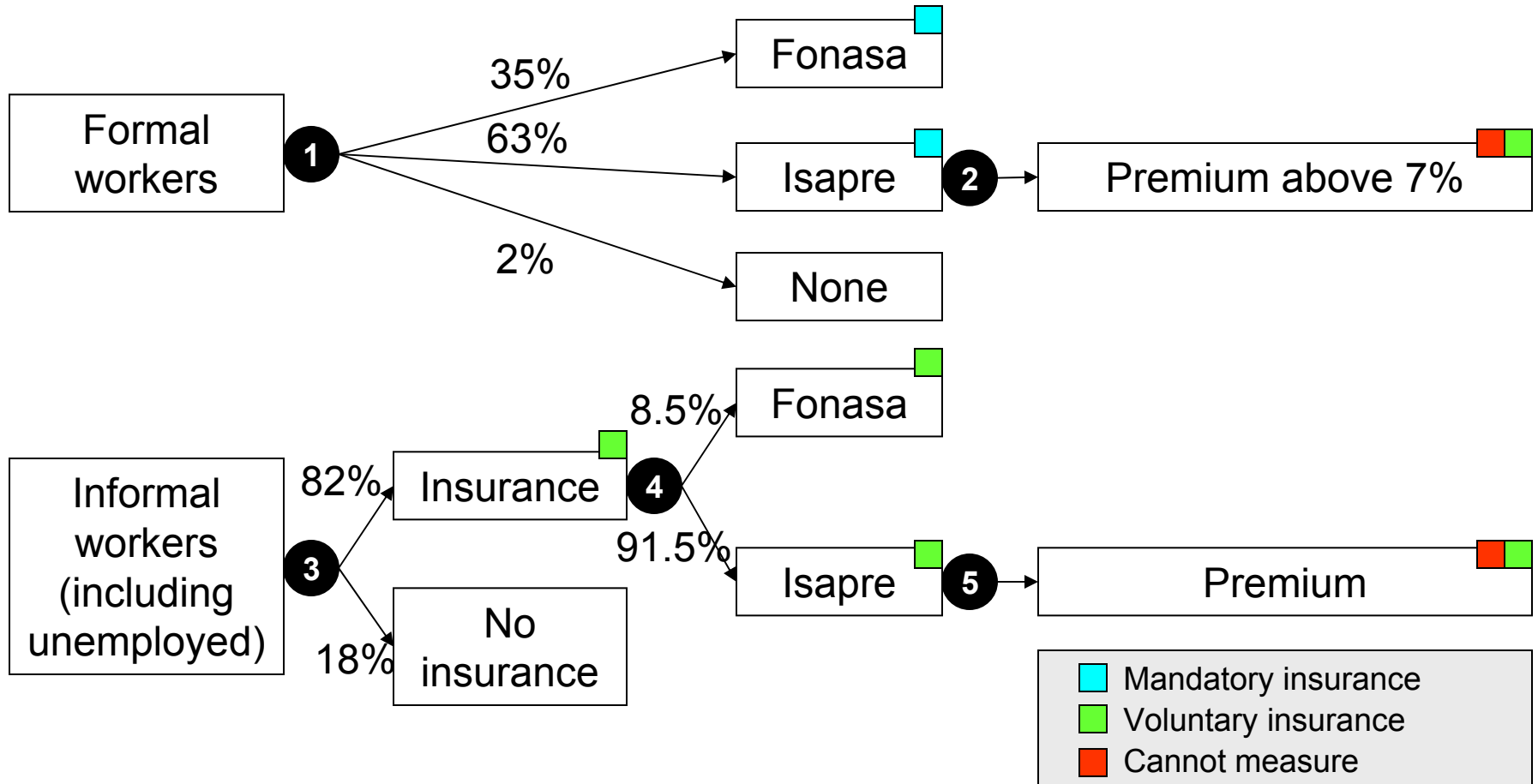


Basic voluntary insurance statistics

- The number of informal and formal workers is almost equal.
- Among formal workers, 35 percent choose Isapre and 63 percent choose Fonasa (choice 1). The remaining 2 percent were either erroneously surveyed or present an illegal situation.
- Among informal workers, 18 percent choose to remain uninsured (choice 3) and 7 percent choose Isapre versus Fonasa (choice 4)
- CASEN 2000 does not allow measuring choices 2 and 5, because insurance premium is unknown.

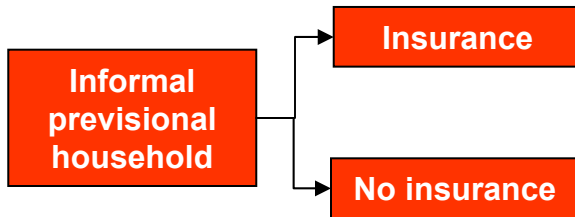
Types of voluntary health insurance in Chile

Household decision tree regarding health insurance



Determinants of enrollment (choice 3)

- Econometric estimation of the determinants of enrollment (choice 3 of informal workers)



- Significant model
- Model has low predictive power (because most informal workers are insured)
- All explanatory variables are highly significant (more than 1%)

Logit model: probability of enrolling

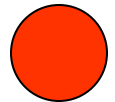
-2 Log likelihood Cox & Snell R Square Nagelkerke R Square
 6,204,686 0.081 0.133

	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	0.407	0.012	1,206	1	0	1.50
<i>Per capita income quintiles</i>						
Quintile 1	0.486	0.004	18,760	1	0	1.63
Quintile 2	0.210	0.003	3,704	1	0	1.23
Quintile 3	0.082	0.003	558	1	0	1.09
Quintile 4	0.034	0.004	95	1	0	1.04
Quintile 5						1.00
<i>Level of education</i>						
None						1.00
Primary	0.071	0.012	37	1	0	1.07
Secondary	-0.598	0.003	37,691	1	0	0.55
College	-0.238	0.003	6,941	1	0	0.79
<i>Family risk factor</i>						
1	0.278	0.000	356,255	1	0	1.32
2						1.00
4						1.32
						2.30

Determinants of enrollment (choice 3): magnitude of the effects

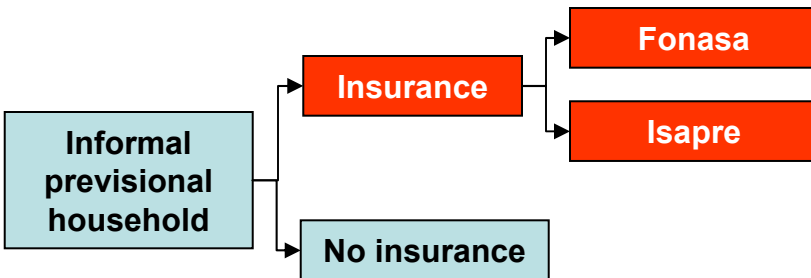
Probability of enrolling	Family risk factor				
	1	2	4	8	16
<i>Level of education (third quintile)</i>					
None	0.68	0.74	0.83	0.94	0.99
Primary	0.70	0.75	0.84	0.94	0.99
Secondary	0.56	0.63	0.75	0.90	0.99
College	0.50	0.57	0.70	0.88	0.98
<i>Per capita income quintiles (secondary education)</i>					
Quintile 1	0.66	0.72	0.81	0.93	0.99
Quintile 2	0.59	0.66	0.77	0.91	0.99
Quintile 3	0.56	0.63	0.75	0.90	0.99
Quintile 4	0.55	0.62	0.74	0.89	0.99
Quintile 5	0.54	0.61	0.73	0.89	0.99

- Families with high risk factors (larger, with more women and older members) have a higher probability of enrolling.
- The probability of enrollment is negatively correlated with income.
- The probability of enrollment decreases with educational level.



Insurance type selection for the informal workers (choice 4): Fonasa versus Isapre

- Econometric estimation of insurance type selection (choice 4 of informal workers)



- Significant model
- Model with moderate explanatory power
- All explanatory variables are highly significant (more than 1%)

Logit model: probability of selecting Isapre vs Fonasa among the informal workers

	B	S.E.	Wald	df	Sig.	Exp(B)
-2 Log likelihood						
2,348,803						
Cox & Snell R Square						
0.159						
Nagelkerke R Square						
0.365						
Constant	-2.419	0.041	3,557	1	0	0.09
<i>Per capita income quintiles</i>						
Quintile 1	-3.229	0.007	219,792	1	0	0.04
Quintile 2	-3.068	0.007	194,254	1	0	0.05
Quintile 3	-2.083	0.005	165,945	1	0	0.13
Quintile 4	-1.350	0.004	94,449	1	0	0.26
Quintile 5						1.00
<i>Level of education</i>						
None						1.00
Primary	0.185	0.042	20	1	0	1.20
Secondary	1.693	0.010	27,708	1	0	5.44
College	1.033	0.004	77,181	1	0	2.81
<i>Family risk factor</i>						
1	-0.047	0.001	3,912	1	0	0.95
2						1.00
4						0.95
						0.87

Insurance type selection for the informal workers (choice 4): magnitude of the effects

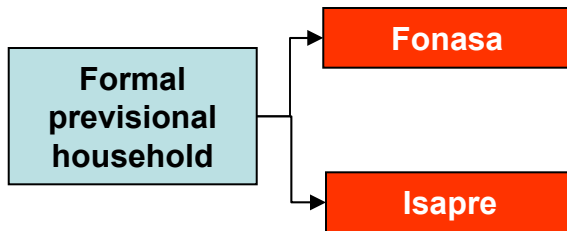
Probability of selecting Isapre vs Fonasa among the informal workers

	Family risk factor				
	1	2	4	8	16
<i>Level of education (third quintile)</i>					
None	0.01	0.01	0.01	0.01	0.01
Primary	0.01	0.01	0.01	0.01	0.01
Secondary	0.06	0.06	0.06	0.05	0.03
College	0.16	0.16	0.14	0.12	0.09
<i>Per capita income quintiles (secondary education)</i>					
Quintile 1	0.02	0.02	0.02	0.02	0.01
Quintile 2	0.03	0.02	0.02	0.02	0.01
Quintile 3	0.06	0.06	0.06	0.05	0.03
Quintile 4	0.13	0.12	0.11	0.09	0.07
Quintile 5	0.36	0.35	0.33	0.29	0.22

- The probability of selecting Isapre over Fonasa increases abruptly with the level of education and income.
- As family risk factors become larger, the probability of selecting Isapre decreases.

Insurance type selection for the formal workers (choice 1): Fonasa versus Isapre

- Econometric estimation of insurance type selection (choice 1 of formal workers)



- Significant model
- Model with moderate to high explanatory power
- All explanatory variables are highly significant (more than 1%)

Logit model: probability of selecting Isapre vs Fonasa among the formal workers

	B	S.E.	Wald	df	Sig.	Exp(B)
-2 Log likelihood						
6,860,090						
Cox & Snell R Square						
0.259						
Nagelkerke R Square						
0.354						
Constant	-0.049	0.016	10	1	0.002	0.95
<i>Per capita income quintiles</i>						
Quintile 1	-3.119	0.005	449,470	1	0	0.04
Quintile 2	-2.317	0.003	497,821	1	0	0.10
Quintile 3	-1.483	0.003	259,645	1	0	0.23
Quintile 4	-0.863	0.003	96,492	1	0	0.42
Quintile 5						1.00
<i>Level of education</i>						
None						1.00
Primary	-0.633	0.017	1,469	1	0	0.53
Secondary	1.219	0.006	46,569	1	0	3.39
College	0.825	0.002	135,252	1	0	2.28
<i>Family risk factor</i>						
1	0.014	0.000	1,267	1	0	1.01
2						1.00
4						1.01
						1.04

Insurance type selection for the formal workers (choice 1): magnitude of the effects

Probability of selecting Isapre vs Fonasa among the formal workers					
	Family risk factor				
	1	2	4	8	16
<i>Level of education (third quintile)</i>					
None	0.18	0.18	0.19	0.19	0.21
Primary	0.10	0.11	0.11	0.11	0.13
Secondary	0.28	0.29	0.29	0.30	0.33
College	0.47	0.48	0.48	0.50	0.53
<i>Per capita income quintiles (secondary education)</i>					
Quintile 1	0.07	0.07	0.07	0.08	0.09
Quintile 2	0.15	0.15	0.15	0.16	0.17
Quintile 3	0.28	0.29	0.29	0.30	0.33
Quintile 4	0.42	0.43	0.43	0.45	0.47
Quintile 5	0.63	0.64	0.64	0.66	0.68

- As for formal workers, the probability of selecting Isapre over Fonasa increases with the level of education and income.
- As opposed to informal workers, larger family risk factors mean a larger probability of selecting Isapre over Fonasa.
- In general, the probability of selecting Isapre over Fonasa is larger among formal than informal workers.

Impact on access to health care: magnitude of the effects

Probability of seeking care for health problem					
	Family risk factor				
	1	2	4	8	16
<i>Level of education (formal worker; third quintile)</i>					
None	0.52	0.54	0.58	0.64	0.76
Primary	0.51	0.53	0.56	0.63	0.75
Secondary	0.61	0.63	0.66	0.72	0.82
College	0.59	0.61	0.64	0.70	0.81
<i>Occupation (Secondary education; third quintile)</i>					
Formal	0.61	0.63	0.66	0.72	0.82
Informal	0.56	0.58	0.62	0.68	0.79
<i>Per capita income quintiles (secondary education; formal worker)</i>					
Quintile 1	0.57	0.59	0.63	0.69	0.80
Quintile 2	0.63	0.65	0.68	0.74	0.83
Quintile 3	0.61	0.63	0.66	0.72	0.82
Quintile 4	0.63	0.65	0.68	0.74	0.83
Quintile 5	0.71	0.73	0.76	0.80	0.88

- Families with high risk factors (larger, with more women and older members) have a larger probability of seeking care when faced with a health problem.
- As with the selection of Isapre, access to health care increases with education, up until secondary.
- Formal workers are more likely to seek care than informal ones.
- Income is largely correlated with the probability of access to health care.

Financial protection - definition

Definition: $FP = \mu_{NMC} / \sigma_{NMC}$

- Hypothesis: the coefficient of variation of non medical consumption (NMC) is a good measure of financial protection (FP).
- Reasoning:
 - A large NMC (thus large μ_{NMC} and FP) is good for households: more resources are left for uses other than health.
 - A low variation of NMC (thus low σ_{NMC} and large FP) is good for households: the risk of being left with little resources for other uses is low.

Financial protection - definition Calculation of a household's NMC

$$\text{NMC} = Y - P - \text{OOP}$$

- Y is the household's monthly income
- P is the monthly health insurance premium that is set to 7% of the household income in most cases:

$$P = Y \cdot \pi \quad (\pi = 7\%)$$

- OOP depends on the magnitude of the health shock (S) and the insurance coverage (Cov)

$$\text{OOP} = S \cdot (1 - \text{Cov})$$

Financial protection - definition Calculation of a household's Isapre coverage

- Reference coverage for a single male aged 20-49 years (Risk Factor = 1), with a salary of \$260.000, and paying a premium of 7% of his salary, is 80%.

$$\text{Cov}_{\pi = 7\%, \text{RF} = 1, Y = \$260.000} = 80\%$$

- For other salaries, coverage is proportional:

$$\text{Cov}_{\pi = 7\%, \text{RF} = 1} = 80\% \cdot (Y / 260.000)$$

- For other families' Risk Factors, coverage is inversely proportional:

$$\text{Cov}_{\pi = 7\%} = 80\% \cdot (Y / 260.000) \cdot (1 / \text{RF})$$

- For other premiums, coverage is proportional:

$$\text{Cov} = 80\% \cdot (Y / 260.000) \cdot (1 / \text{RF}) \cdot (\pi / 7\%)$$

- Finally, coverage is considered having a 90% ceiling:

$$\text{Cov} = \text{Min}(90\%, 80\% \cdot (Y / 260.000) \cdot (1 / \text{RF}) \cdot (\pi / 7\%))$$

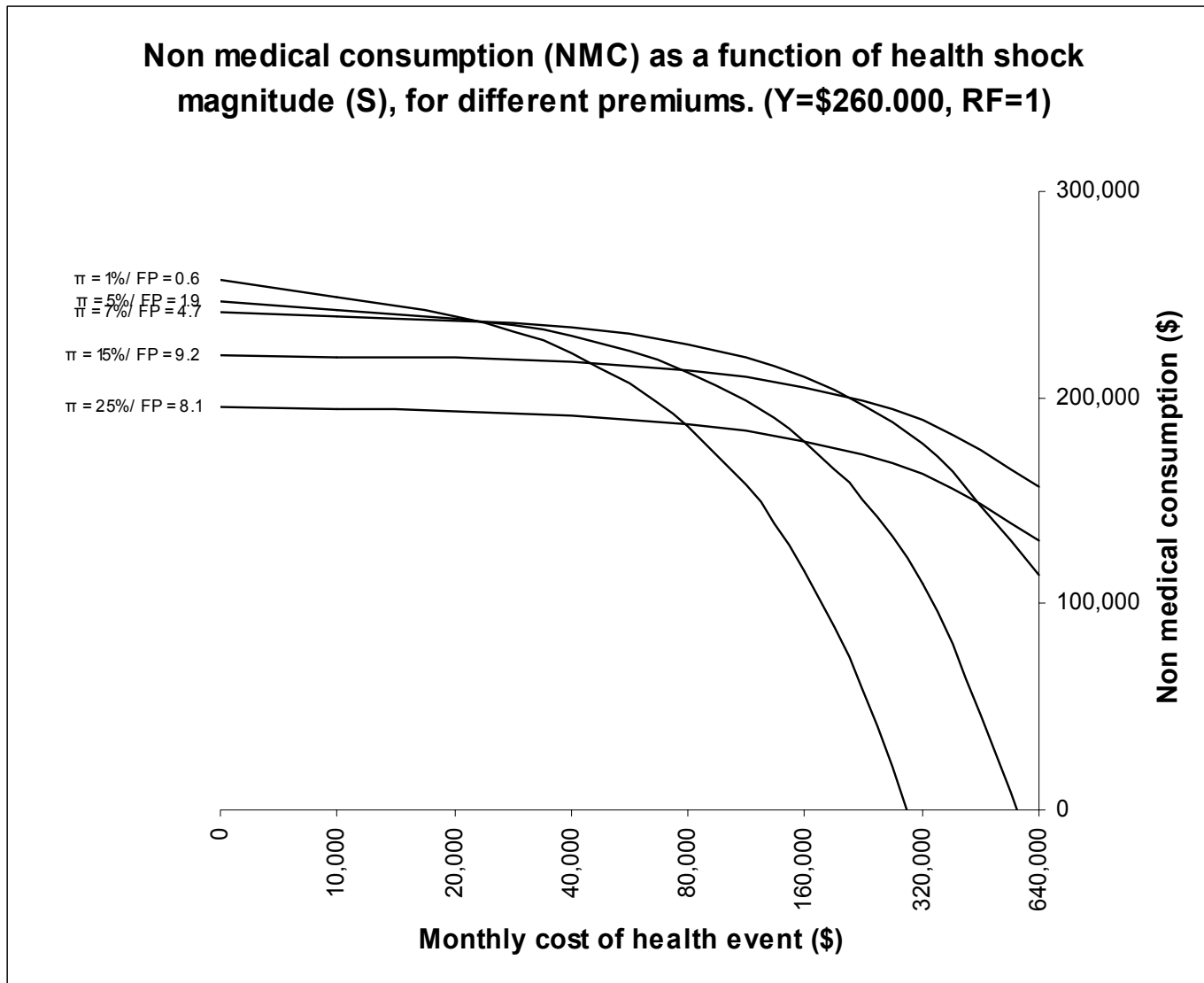
Financial protection - definition Calculation of a household's NMC

- In summary, a household's NMC depends of its income, composition, premium and health shock magnitude.

$$\text{NMC} = f(Y, RF, \pi, S)$$

- Next, we make a deterministic exploration of the impact of these variables on FP.

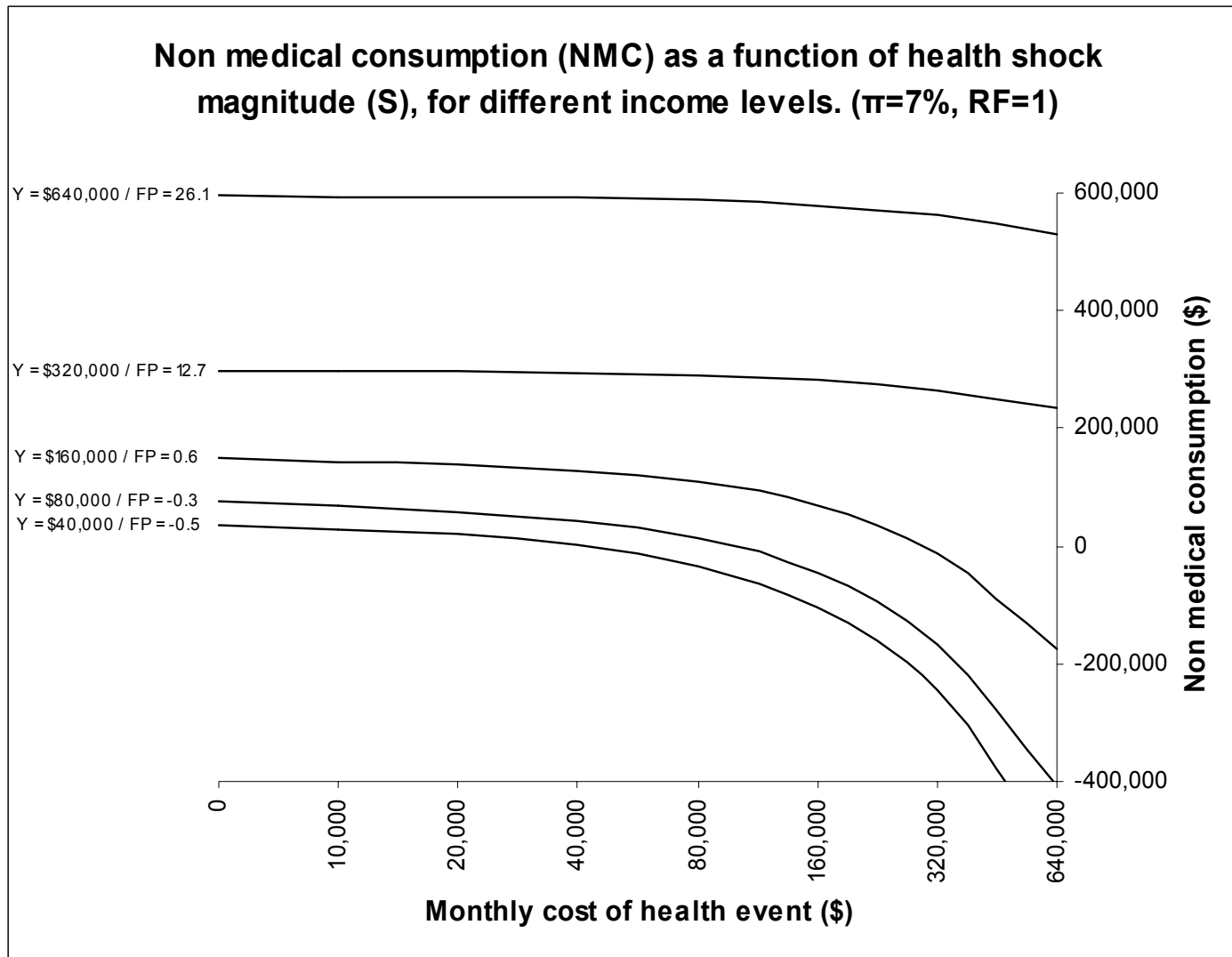
Deterministic exploration of the impact of voluntary health insurance on FP



Deterministic exploration of the impact of voluntary health insurance on FP

- As expected, NMC decreases as S increases.
- For a low π (1% and 5%), NMC has an acute slope, being highest when there is no shock ($S = 0$), and lowest for big shocks. This produces a high variability in NMC, and thus a low FP.
- For a medium π (7%), NMC has a less acute slope, generating a larger FP.
- For a large π (15% and 25%), NMC is much less sensitive to shocks (which increases FP due to the lower variability). However, the cost of the premium starts taking significance, lowering the average of NMC and thus its FP.

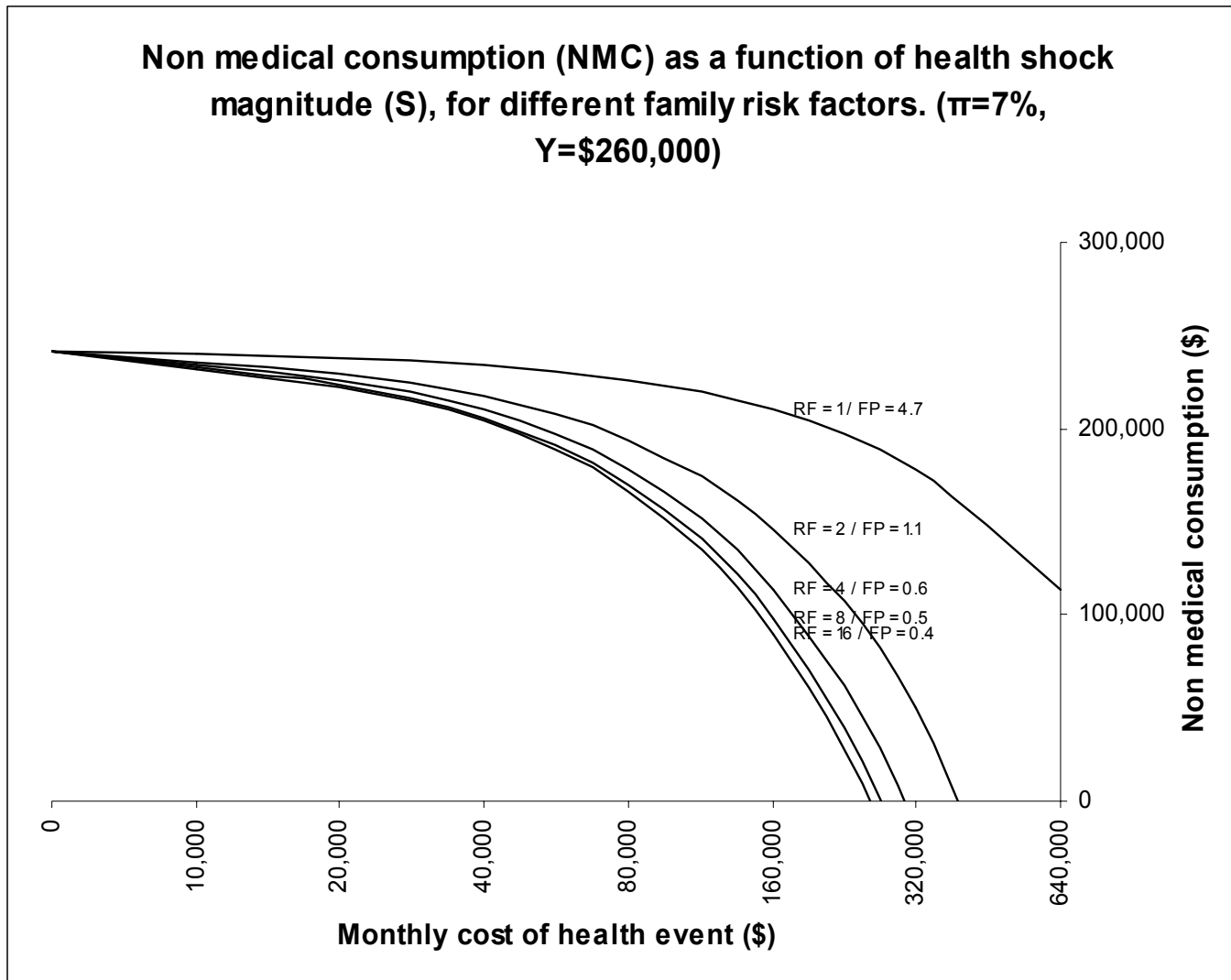
Deterministic exploration of the impact of voluntary health insurance on FP



Deterministic exploration of the impact of voluntary health insurance on FP

- FP increases with income for two reasons:
 - First, the average NMC increases with income
 - Second, NMC is less sensitive to shocks at high income levels (because of the better coverage these household obtain for the same 7% premium)

Deterministic exploration of the impact of voluntary health insurance on FP



Deterministic exploration of the impact of voluntary health insurance on FP

- FP decreases with a family's Risk Factor, because, for the same 7% premium, coverage decreases with RF.

Empirical data on FP

Financial protection by type of insurance in the formal and informal sectors, 2000

	Informal						Total
	Fonasa A	Fonasa B	Fonasa C	Fonasa D	Isapre	Uninsured	
Previsional households	3,302,099	1,381,908	329,547	382,671	488,728	1,300,093	7,185,046
Per capita monthly income (Ch\$)	49,327	104,952	117,938	182,714	488,436	133,458	115,368
Health problems during last 30 days (%)	36	32	28	27	27	18	31
Sought ambulatory care (%)	77	79	73	78	72	62	75
Hospitalized during last 12 months (%)	24	17	16	16	19	6	18
Monthly OOP (\$)	15,425	67,597	101,055	160,458	76,608	186,816	72,264
Monthly premium (\$)	15,014	23,675	27,725	42,131	155,216	0	25,527
NMC as a percentage of income (%)	65	56	37	36	67	-12	47
Per capita monthly NMC-mean (\$)	36,914	68,132	70,928	111,575	420,471	74,290	81,229
Per capita monthly NMC-sd (\$)	63,668	147,362	151,397	205,000	705,964	355,031	273,383
Financial protection	0.58	0.46	0.47	0.54	0.60	0.21	0.30
	Formal						Total
	Fonasa A	Fonasa B	Fonasa C	Fonasa D	Isapre	Uninsured	
Previsional households	319,757	1,688,383	1,016,572	1,221,667	2,477,971	118,086	6,842,436
Per capita monthly income (Ch\$)	44,723	71,589	74,959	107,121	241,497	138,737	139,869
Health problems during last 30 days (%)	39	31	30	29	29	18	30
Sought ambulatory care (%)	80	79	82	84	86	69	83
Hospitalized during last 12 months (%)	24	19	17	15	21	8	19
Monthly OOP (\$)	25,245	55,385	96,015	142,722	134,182	184,685	106,366
Monthly premium (\$)	18,165	21,724	21,624	29,667	79,861	0	43,640
NMC as a percentage of income (%)	75	64	49	42	53	0	53
Per capita monthly NMC-mean (\$)	34,441	48,052	40,270	56,853	183,577	85,510	97,547
Per capita monthly NMC-sd (\$)	45,263	114,356	91,358	152,085	298,253	229,025	214,622
Financial protection	0.76	0.42	0.44	0.37	0.62	0.37	0.45

Source: Authors from Casen 2000

Empirical data on FP

- In both the informal and formal sector, Fonasa A (indigents) and Isapre show the largest FP.
- The uninsured, particularly those in the informal sector show the lowest FP (high variance of NMC).
- We may conclude that voluntary health insurance increases FP. For example, an informal worker that chooses Isapre over staying uninsured almost triples his/her FP.

Linear regression of NMC

- Linear regression:
 $\ln(\text{NMC}) = a + bx_1 + \dots$
- Independent variables:
 - Income quintile
 - Health insurance type
 - Level of education
 - Family risk factor
 - Occupation
- Resulting model significant and with high predictive power

Linear regression: ln(NMC)					
R-squared	0.692				
	B	S.E.	Beta	t	Sig.
Constant	12.637	0.002		5495.268	0
<i>Per capita income quintiles</i>					
Quintile 1	-2.785	0.001	-1.038	-3903.261	0
Quintile 2	-2.025	0.001	-0.748	-2993.394	0
Quintile 3	-1.577	0.001	-0.549	-2400.856	0
Quintile 4	-1.107	0.001	-0.369	-1751.061	0
Quintile 5					
<i>Health insurance</i>					
Fonasa A	0.061	0.001	0.024	83.615	0
Fonasa B	0.117	0.001	0.043	156.763	0
Fonasa C	0.027	0.001	0.007	30.287	0
Fonasa D	-0.051	0.001	-0.014	-58.508	0
Isapre	0.102	0.001	0.037	123.61	0
Uninsured					
<i>Level of education</i>					
None					
Primary	-0.100	0.002	-0.007	-45.052	0
Secondary	-0.035	0.001	-0.011	-65.065	0
College	0.083	0.001	0.030	158.398	0
<i>Family risk factor</i>					
	-0.009	0.000	-0.021	-127.123	0
<i>Formal occupatior</i>					
	-0.037	0.000	-0.016	-80.718	0

Linear regression of NMC

NMC formal workers with secondary education and risk factor = 1

	Per capita income quintile				
	1	2	3	4	5
<i>Health insurance</i>					
Fonasa A	16,859	36,049	56,424	90,278	273,115
Fonasa B	17,822	38,108	59,645	95,432	288,707
Fonasa C	16,287	34,826	54,509	87,215	263,848
Fonana D	15,072	32,228	50,443	80,708	244,164
Isapre	17,556	37,540	58,757	94,011	284,409
Uninsured	15,854	33,900	53,059	84,895	256,829

NMC informal workers with secondary education and risk factor = 1

	Per capita income quintile				
	1	2	3	4	5
<i>Health insurance</i>					
Fonasa A	17,501	37,422	58,572	93,714	283,511
Fonasa B	18,500	39,558	61,916	99,065	299,697
Fonasa C	16,907	36,152	56,584	90,535	273,891
Fonana D	15,646	33,455	52,363	83,781	253,459
Isapre	18,225	38,969	60,994	97,590	295,235
Uninsured	16,457	35,190	55,079	88,126	266,606

- As expected, the uninsured have the lowest predicted NMC in comparison to the insured.
- Isapre and Fonasa B present the highest predicted NMC.