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Informal Jobs and Contribution to Social Security: Evidence from a Double Selection Model

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Informal Jobs and Contribution to Social Security: Evidence from a Double Selection Model *

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Abstract

We estimate a double selection model to study informality in the Chilean labor market. We use three different measures of informality: lack of a signed contract, contribution to social security and both at the same time. The double selection states that, in a first stage, individuals chose between the formal and informal sector, the one that gives them the highest utility, and in a second stage, employers will select some workers from the ones that chose the formal sector, but some workers will not be chosen and then will be excluded from the formal sector. We find that this double selection model fits the data better than a simple selection model, confirming that there is some exclusion. We also find that education is that variable that is most highly correlated with informality. Finally, the results suggest that the head of the household is less likely to be informal, which could imply that informality affects mostly the secondary labor force in the household. Also, the number of children are negatively correlated with being formal.

1 Introduction

Informality has been consider one of the most important issue of labor precariousness for Latin America (Arias et al (2007)). We measure informality using three definitions. The first one correspond to a lack of a signed contract, which is the usual metric found in the literature, nonetheless we include as a second definition, which is the no contribution to the social security system and a third one which is not having a signed contract and not contributing to the social security system. The lack of a signed contract and not contributing most likely will imply that the worker is not contributing to any health provider, and does not have insurance in case of a work injury and is not covered by the legislation of the labor code, creating a general situation of precariousness.

Using national data, for the period 1990-2006, we observe that informality increased slightly for males, from 16.6 to 17.8, but the increment was larger for females, from 13.2 to 16.9. Despite the rise in informality these figures are low for Latin American standards. The age groups mostly affected by informality are young

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people, between 14 and 24 years old. There is also a big correlation between the educational level of the individuals and informality, workers with less than 12 years of schooling (less than secondary education) are more informal than workers with 12 or more years of education. Interestingly, there are no important differences in the informality level between workers with 12 or more than 12 years of education. Informal workers earn less than formal workers, for all educational levels. Males have a wage premium that increases with education, which does not happen for women.

Informality is also correlated with firm size, smaller firms (2 to 5 workers) have almost 40% of their workers with no signed contract, but firms with more than 200 workers have 7% of their labor force as informal. Also, almost 40% of the informal workers are in firms with less than 10 workers. Agriculture is the most informal sector in the economy and mining is the most formal, with figures close to 95% of formality. Informal workers perceive their condition as transitory and data from an actual panel shows that 70% of the informal workers in 2002 are not informal in 2006.

We investigate the degree of self-selection into informality. Individuals could consider the informal sector more attractive than the formal sector, because they do not have to pay for taxes, which could amount for at least 20% of the total income. Also, informal workers are covered by the public health system. On the other hand, individuals could want to work in the formal sector, but they did not find a job, which creates exclusion, this happens when there is a queue to enter in the formal sector. We observe that the formal sector has several advantages in terms of wages and most of the big firms tend to be the most formal, which could imply that informality is related to more precarious jobs and the formal sector is related to the modern sector of the economy.

We estimate a double selection model for the year 2006 to understand how individuals allocate in the formal and informal sectors. The model we estimate specifies a self-selection equation for individuals, which is usually called "in the queue" equation. This equation describes the usual Roy model of self-selection in which individuals choose the sector that gives them the highest wage or utility. We add to the "in the queue" equation a new one, which assumes that not all individuals that want to work in the formal sector will be able to find a job, entrepreneurs will select some workers that are in the queue and the non selected workers will have to go to the informal sector. The selection that employers do is called "chosen from the queue". We estimate the model for the three definitions of informality.

We have to overcome the problem of partial observability of the data, since we do not observe individuals who would were not selected from the queue. Our results show that when we use as dependent variable the contribution to social security, the model tends to be identified, but it is harder to identify the model for lack of a signed contract or the combination of no contract and no contribution.

We find that the double selection model explains better the data than a simple selection model. Also, both decisions tend to be simultaneous and not sequential. Nonetheless, most of the variability in being formal, measure as contribution to social security, is mostly due to self-selection and not to exclusion.

The variable that is most related to informality is education. The most educated workers tend to be more formal for all the models that we estimate. Household characteristics are also important. The number of children are negatively correlated with formality and being head of the household is positively correlated. In terms of demand variables, smalls firms tend to offer more informal contracts than bigger firms, which is evidence that informality is correlated with low productivity.

2 Data

We use the CASEN survey (Encuesta de Caracterizacion Socioeconomica) to measure informality in Chile. This survey is representative of the whole country and is the biggest database to study the Chilean labor market. The descriptive statistics that we present here correspond to all the waves available of the CASEN, however, in the model estimation, we will use only the information for the 2006 survey¹.

An informal worker is any worker that does not have a signed contract, in table 1 we present the evolution of informality for the 1990-2006 period.

Table 1 : No Signed Contract

	Females				Males			
	14 or more	14 to 24	25 to 54	55 to 64	14 or more	14 to 24	25 to 54	55 to 64
1990	13.2	19.0	11.2	12.5	16.6	27.2	13.7	14.6
1992	10.8	17.0	8.9	8.2	14.2	21.1	12.1	13.5
1994	14.7	25.3	11.5	13.0	18.5	28.4	15.8	16.2
1996	16.9	28.3	13.7	17.9	20.7	32.0	17.5	22.3
1998	19.0	26.9	16.8	17.7	21.8	35.5	18.6	18.3
2000	18.4	33.3	15.6	14.7	20.9	33.6	18.4	18.7
2003	18.0	32.4	14.8	16.3	20.5	32.5	18.0	19.5
2006	16.9	25.7	14.4	17.4	17.8	28.3	15.2	16.6

We observe several patterns in table 1. First, males have a higher informality rate than females, for the whole period and for different age groups. Second, informality affects more young individuals than the rest of the population, for instance, for some years, the informality rate in the 14 to 24 years old group almost doubles the rate of the 25 to 55 years old group. The fact that informality is higher for males and young workers is somewhat contradictory, informality, as lack of a contract, can be the result of rigidities in the labor market, which should be greater for women and young individuals², but only in the latter group we find higher levels of informality. We can also appreciate that informality increased from 1992 to 1998 to decrease afterwards. It is important to notice that during the 1990-96 period, informality increased, even though the Chilean economy experienced high growth rates, and that in 1998 when the economy suffered a recession, informality also increased, which seems to indicate that informality has no direct relationship with economic growth.

Comparing these numbers with other Latin American countries we can say that the level of informality in Chile is low. In 1999, Soares (2004) reports a rate of informality of 30% for Brazil. He also reports that during the 90s, informality in Brazil did not react to the better economic conditions of the country and informality has increased steadily since 1989. Argentina presented informality levels close to 50% during 2004, for urban areas (Arias, et. al 2006). In this case, informality did have a relationship with the economic cycle, since it increased considerably from 2002 to 2004.

Table 2 shows the informality levels if we consider only wage workers that do not contribute to the social pension system.

¹The 2006 survey includes information on parents characteristics, which are incorporated in the estimation.

²Minimum wage could be a problem for hiring unskilled young workers and the maternal benefits could make less attractive for an employer to have a contract signed with a woman.

Table 2 : No Contribution to Social Security

	Females				Males			
	14 or more	14 to 24	25 to 54	55 to 64	14 or more	14 to 24	25 to 54	55 to 64
1990	17.5	27.8	14.4	17.5	19.6	34.8	15.5	17.3
1992	19.4	31.5	15.4	15.5	21.1	34.2	17.3	18.6
1994	15.2	26.4	11.5	17.2	17.7	27.6	15.1	13.7
1996	17.5	28.5	14.3	17.5	20.3	31.7	17.0	19.4
1998	18.9	29.5	16.0	17.4	21.1	35.7	17.4	20.6
2000	19.4	36.0	16.2	14.9	21.4	36.8	18.0	20.0
2003	19.7	36.4	15.8	19.2	20.0	33.5	17.0	18.8
2006	17.7	28.3	14.7	18.1	17.7	31.5	13.9	18.0

First of all, informality levels are higher when we use this definition. Most of the workers coincide in both categories³, but it seems that the "honoraries" kind of contract is very important in the labor market. We again observe that males have a higher informality rate and that young individuals tend to be more informal. Changes in informality over the years are less consistent under this new definition, but we do observe a lower informality rate in 2006 than in 1990. However, the levels of informality do not vary considerably during the period, for any of the groups shown in the table.

Table 3 shows the rate for the most vulnerable group, the one that does not have a signed contract and does not make contributions to the social security system.

Table 3 : No Contribution and No Signed Contract

	Females				Males			
	14 or more	14 to 24	25 to 54	55 to 64	14 or more	14 to 24	25 to 54	55 to 64
1990	8.5	14.3	6.9	6.5	10.3	19.6	7.8	8.9
1992	8.0	13.7	6.2	4.8	10.4	16.6	8.6	9.0
1994	10.7	19.6	7.8	11.3	13.1	22.0	10.9	9.8
1996	12.4	21.8	9.7	13.3	15.5	25.8	12.9	13.4
1998	14.6	22.4	12.5	13.0	17.0	29.6	14.2	14.5
2000	14.9	29.0	12.3	10.2	16.8	29.0	14.3	15.2
2003	14.6	28.0	11.6	13.7	15.9	27.4	13.8	13.0
2006	13.2	21.5	11.1	12.5	13.5	24.0	11.1	12.1

Again men have higher rates than women, but the difference is very small in 2006. Young individuals have higher rates than the rest of the population. For this definition we observe more clearly the increase in informality from 1990 to 2000, to observe a drop after that. Nonetheless there is an important increment in informality for the whole period, of 4.7 percentage points in the case of women and 3.2 for males, which cannot be observed for the other two legal definitions of informality in tables 1 and 2.

Table 4 shows the percentage of informality, measure as a lack of a signed contract, by educational level. We divided the sample in 4 groups, the first one is for individuals between 0 and 7 years of education, which translates into less than primary education, the second group is for individuals with less than complete

³In 2006, 80% of the population that were informal under definition 1, were also informal under definition 2.

secondary education, the third group is individuals with secondary education and the last group is for individuals with more than secondary education.

Table 4 : No Signed Contract by Educational Level

	Females				Males			
	0 to 7	8 to 11	12	>12	0 to 7	8 to 11	12	> 12
1990	25.5	19.1	12.8	7.8	25.7	18.4	10.8	7.8
1992	19.7	17.2	9.8	5.3	22.8	15.7	8.9	5.6
1994	28.2	25.9	13.7	8.0	27.2	22.5	13.4	9.1
1996	31.3	23.0	17.3	10.8	33.9	24.0	13.6	10.8
1998	40.7	29.5	17.7	10.7	35.2	26.7	15.1	10.8
2000	34.6	29.4	18.7	11.0	34.6	25.7	16.1	10.8
2003	34.7	29.2	17.6	11.7	33.2	25.0	16.9	12.0
2006	28.2	24.8	15.7	12.7	26.9	22.8	13.7	12.2

Several features can be observed when considering educational level, first, informality decreases with education, which confirms that informality is correlated with low skills. However, during the whole period, the difference in rates between the least and most educated groups has decreased considerably. Males and females with more than 12 years of education present an increase of 4.4 and 4.9 percentage point in informality, respectively, creating almost two similar groups, the one with less than 12 years of education and the one with 12 or more years of education. At the same time, the informality rate for least educated group are similar at the beginning and at the end of the period, but increasing to reach a peak in 1998 and decreasing afterwards.

Table 5 summarizes the wage ratios between the formal and informal sector, measure as a lack of signed contract. The ratios are calculated over the hourly wage for females and males.

Table 5 : Wage Ratios

	Females				Males			
	0 to 7	8 to 11	12	>12	0 to 7	8 to 11	12	>12
1990	1.04	1.35	1.13	1.14	1.22	1.27	1.46	1.49
1992	1.46	1.26	1.75	1.53	1.30	1.30	1.58	1.53
1994	0.56	1.11	1.51	0.93	1.28	1.29	1.23	1.83
1996	1.27	1.29	1.01	1.07	1.37	1.43	1.42	1.67
1998	1.16	1.25	1.28	1.02	1.33	1.43	1.47	1.79
2000	1.29	1.23	1.19	1.12	1.36	1.34	1.56	1.75
2003	1.14	1.17	1.34	1.21	1.29	1.32	1.42	1.50
2006	1.26	1.20	1.24	1.14	1.38	1.30	1.38	1.37

The ratios for males show that workers in the formal sector always earn more than workers in the informal sector and that the difference tends to increase with the level of education. However, this regularity is not found in 2006, when there are almost no differences by educational level. We cannot be sure if this is a trend in the data or just an anomaly for that year. The ratios for females show a similar pattern than the ratios for males, formal females earn a higher wage than informal females, but the differences are smaller than for males. There are two exceptions, in 1994 for the most and least educated group. For the cell of 0 to 7

years of education, a detailed inspection of the data shows that is because of the presence of some outliers, which makes this ratio less than one. In the case of the most educated group there are no outliers in the data, but the 0.93 is consistent with small differences in wages in that educational level.

Table 6 presents the incidence of informality by economic sector. We can appreciate that agriculture is the most informal sector in the economy, with rates that could reach 40% in some years, this sector seems to hire an important number of unskilled labor and since the type of work is highly stationary, firms tend not to formalize the labor relationship. The next most informal sectors are commerce, transportation and construction, with figures close to 20% for the year 2006. The least informal sector is mining, where around 95% of the workers have a signed contract⁴.

Table 6 : Informality by Economic Sector

	Agric.	Mining	Manu.	Elec.	Construc.	Commerce	Transport.	Serv. 1	Serv. 2
1990	33.9	6.0	11.9	3.6	16.0	16.2	15.9	8.6	8.9
1992	28.4	6.4	9.4	2.6	12.4	14.3	14.8	4.5	8.5
1994	33.0	6.9	13.6	11.2	23.5	18.7	21.3	9.1	12.0
1996	39.7	6.2	15.4	9.1	20.6	21.2	24.5	10.2	12.6
1998	41.8	4.3	14.8	12.4	27.7	20.8	24.8	12.5	14.5
2000	38.4	6.1	16.3	7.6	26.8	20.1	26.3	12.3	13.6
2003	33.8	4.2	16.5	6.6	25.8	20.2	24.6	14.0	13.6
2006	27.4	4.5	16.6	4.7	19.1	19.0	21.0	12.1	13.5

In table 7, we observe the informality rate by region. The most informal regions tend to be the ones that have agriculture as their main activity, as is the case of the IV, VI, VII and VIII regions. The regions at the extreme south are ones with the lowest rates.

Table 7 : Informality by Region

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	MR
1990	7.2	9.3	13.4	22.1	14.7	19.2	36.6	21.8	13.2	13.2	9.0	8.0	12.5
1992	9.6	9.9	12.3	12.1	11.8	10.6	28.7	17.8	17.0	20.2	14.4	4.2	10.1
1994	14.9	15.6	11.6	21.5	18.5	15.2	25.6	18.5	21.7	25.1	15.3	11.1	14.8
1996	13.3	13.3	15.3	22.5	17.9	24.8	36.4	21.6	23.6	21.4	14.6	18.6	16.6
1998	19.7	11.0	16.8	26.5	23.4	25.2	33.4	21.6	21.7	25.7	18.3	18.0	17.6
2000	22.5	11.5	15.2	22.5	23.1	24.1	29.0	23.8	24.4	19.8	14.2	10.9	17.2
2003	21.4	11.3	12.9	25.9	22.3	19.6	27.8	21.7	26.4	18.8	13.3	14.9	17.5
2006	17.6	14.2	11.6	23.4	19.1	16.5	22.3	18.0	18.2	16.6	12.0	13.1	16.7

Table 8 shows the lack of a signed contract by firm size. As expected small firms are the ones that have the higher informality rates, with a trend that seems to increase over time. In 2003, almost half of the workers in firms from 2 to 5 workers had no signed contract. These results could indicate that small firms face some kind of constraints that prevent them from formalizing the relationship with their workers, for instance, if the wage paid to the workers is close to the minimum wage, then formalizing the contract leads to an increment in the wage because of the contributions to the social security system. Also, formalizing the contract implies

⁴The sectors are: Agriculture; Mining, Manufacture; Electricity, Water and Gas; Construction; Commerce, Restaurants and Hotels ; Transport and Communications; Financial Services and Municipality and Personal Services.

that the firm must be paying taxes and register in the tax office, which could not be the standard case for most of these small firms. Maybe there is some fixed cost of formalization that prevents firms from doing it and those same costs prevent the growth of the firm. In that case, facilitating the formalization could lead to growth on firms. Nonetheless, informality could be a symptom of a bad project and in that case there is less scope for public policy.

Table 8 : Informality by Firm Size

Number of workers	2 to 5	6 to 9	10 to 49	50 to 199	> 200
1990	30.6	22.1	13.0	7.7	5.8
1992	29.8	18.0	11.8	6.9	4.1
1994	42.1	23.7	13.1	9.3	5.8
1996	40.0	24.2	16.1	11.3	7.4
1998	46.6	29.9	19.2	11.2	7.9
2000	45.5	29.2	19.2	12.6	7.7
2003	49.4	31.2	19.4	12.2	7.4
2006	44.2	30.7	17.8	11.1	7.4

In 2006, almost 40% of the informal workers were in firms with less than 10 workers and 11% were in firms with more than 200 workers, which implies that most of the informal labor is in the smallest firms and not only that the smallest firms are more informal.

This section of the report shows the main characteristics of informality, when we use the legal definition we find that younger individual, with low skills, working in agriculture and in small firms tend to be informal. This description points out to a fragile sector in the economy, which offers poor job conditions for its workers.

2.0.1 Informality Transitions

There is an additional survey available, which was taken to study the social security system in Chile, and that we will use to study informality transitions. The survey is representative of the individuals affiliated to the AFP (Pension Funds Administrators) and not for the whole population. The advantage of this survey is the short panel that can be built with the three waves available. The information is for the years 2002, 2004 and 2006.

Table 9 shows informality using the same definitions of informality presented before: No signed contract, no contribution to the social security system and self-employment. We include a fourth category which is making contribution for less than the actual wage, which has been detected as a common practice in the Chilean labor market.

Table 9 : Informality Rates

	Females			Males		
	No Contract	No Contrib.	Less Contrib.	No Contract	No Contrib.	Less Contrib.
2002	13.4	12.0	9.8	16.3	13.5	11.9
2004	15.2	14.0	4.9	15.7	14.8	7.7
2006	14.8	15.0	5.1	13.0	11.9	7.1

The percentages are similar for not having a contract and no contribution. The information on contribution for less than the legal amount shows that this practice has decreased during the period, affecting in

2006 between 5% to 7% of affiliated workers.

This survey also collects information of how the job is perceived, and it could be temporal or permanent. This question allow us to have a proxy of how permanent informality could be. The results in table 10 show that informal workers tend to consider their job not as permanent as formal workers. This could be an indication that informality is only temporal. However, self-employed workers perceive their job as more permanent than the other informal workers.

Table 10 : Consider the Job as Permanent

	w/Contract	wo/Contract	Contribution	No Contribution	Wage Worker	Self-Employed
2002	88.5	55.9	87.2	57.7	83.4	66.0
2004	87.1	51.1	86.4	52.4	81.1	66.1
2006	85.8	51.1	85.2	52.2	80.7	61.7

Since this is a panel, we can construct transition matrices from formality to informality and the other way around. Table 11 shows this transitions for the case of workers with and without a signed contract. We observe that formality is very stable, 95% of formal workers are still formal workers after 2 or 4 years. Also, informal workers tend to change their status by 60% when comparing over 2 years and 70% for 4 years.

Table 11: Transitions, Contract

02 to 04	wo/contract	w/contract	04 to 06	wo/contract	w/contract	02 to 06	wo/contract	w/contract
wo/contract	39.67	60.33		40.75	59.25		29.07	70.93
w/contract	4.66	95.34		4.03	95.97		4.32	95.68

Table 12 shows the same transition, but now using the definition of contribution. The results are very similar than the ones presented for contract. Most formal workers keep the formality condition over 2 and 4 years, and 60% of the informal workers move to formality over 2 years and 70% over 4 years.

Table 12: Transitions, Contribution

02 to 04	wo/contract	w/contract	04 to 06	wo/contract	w/contract	02 to 06	wo/contract	w/contract
wo/contract	38.63	61.37		41.64	58.36		28.98	71.02
w/contract	4.44	95.56		3.33	96.67		4.05	95.95

Table 13 presents the transitions for self-employment. In this case we observe that wage workers also keep their condition, but with lower rates than the previous definitions of informality. Also self-employed workers move to wage workers with more difficulty than workers not contributing or without a contract, most of this could be due to the fact that there is more self-selection in the self-employment condition.

Table 13: Transitions, Self-Employment

02 to 04	salaried w	self emp	04 to 06	salaried w	self emp	02 to 06	salaried w	self emp
salaried w	92.67	7.33		93.14	6.86		91.74	8.26
self emp	34.44	65.56		43.15	56.85		44.98	55.02

The results of the actual transitions show that the appreciations of workers, shown in table 10 are accurate and that the informality condition under the legal definition is not highly permanent, nonetheless we do not observe all the transitions that occurred during the whole period and there could be a group of workers that go back and forth in a more regular way.

3 Estimation

We estimate a double selection model to measure the degree of self-selection and exclusion into the informal sector. This kind approach was developed by Porier (1980) and Abowd and Farber (1982). They consider that the decision process has two steps, which could be sequential or simultaneous. Similar models have been estimated by Mengistae (1998), Soares (2004) and Co et al (2005). The model describes the formal and informal as two sectors that coexist in the economy, individuals will choose a sector according to the following decision rule:

$$\begin{aligned} d_1 &= 1 & \text{if } I_1 = X_1\beta_1 + u_1 > 0 \\ d_1 &= 0 & \text{if } I_1 = X_1\beta_1 + u_1 \leq 0 \end{aligned}$$

We will call this condition as "in the queue". This setup correspond to a traditional Roy model, in which agents choose the sector that provides the highest utility level.

Utility depends on variables X_1 that will include education, potential experience, number of children in the household, non-labor income, regional dummies, among others variables.

This setup assumes that every worker that wants to work in the formal sector will find a formal job, however, it is possible that there is a queue to work in the formal sector, and that entrepreneurs select certain workers, based on productivity and costs, which will cause that the non selected individuals must go back to the informal sector. We will write the entrepreneurial selection as:

$$\begin{aligned} d_2 &= 1 & \text{if } I_2 = X_2\beta_2 + u_2 > 0 \\ d_2 &= 0 & \text{if } I_2 = X_2\beta_2 + u_2 \leq 0 \end{aligned}$$

This condition will be called "chosen from the queue". The inclusion of variables X_2 measure labor costs and some productivity characteristics of the workers.

Two different models, that take into account both selection equations, will be estimated. The first one, estimated by Abowd-Farber, assumes that the worker's and entrepreneur's decision are sequential. The second one, estimated by Porier, assumes that the decisions are simultaneous. Soares (2004) estimates a third model, using information on the desire of informal workers to work in the formal sector, he takes advantage of specific questions in a Brazilian survey. Our data does not include variables that indicate if an informal worker wants to switch jobs and we cannot estimate that model.

Assuming that u_1 and u_2 have a bivariate normal distribution with means zero and unit variances and zero covariances, as is in the case of a sequential process, the likelihood function is:

$$L_1 = \prod_{d=1} [\Phi(X_1\beta_1) \Phi(X_2\beta_2)] \prod_{d=0} [1 - \Phi(X_1\beta_1) \Phi(X_2\beta_2)]$$

where Φ is the normal cdf and d is an indicator of whether the individual is in the formal sector ($d = 1$) or not ($d = 0$). We do not observe d_1 or d_2 .

In the simultaneous case, there is a correlation ρ between both error terms, then the likelihood function is:

$$L_2 = \prod_{d=1} [\Phi_2(X_1\beta_1, X_2\beta_2; \rho)] \prod_{d=0} [1 - \Phi_2(X_1\beta_1, X_2\beta_2; \rho)]$$

where Φ_2 is the cdf of a bivariate normal distribution.

This model is identified with exclusion restrictions, one or more variables in X_1 must not be included in X_2 . The variables "in the queue" equation not included in "chosen from the queue" are family characteristics. We included in the "chosen from the queue" equation a dummy variable that indicated if the workers is married (or has a partner) or not, because the employer could consider that a married worker is more responsible or has more care in keeping a job. Also we include the size of the firm, measured as number of workers in that firms, as a proxy of firm productivity, which could affect the decision of hiring a worker formally or not.

Usually, these models are hard to estimate because all the identification strategy depends on exclusion restrictions and because there is partial observability. When we observe an individual in the informal sector, we do not know if it is because of self-selection or because it was excluded from the formal sector. The partial observability sometimes implies that the models converge only for a set of variables, which the research must find after some trial and error, which makes these models less attractive. We find that partial observability it is an important problem, which can be partially solved using different definitions of informality, in the section of the paper that presents the results we discuss this issue further.

We take advantage of the estimation of the two models to calculate the following probabilities. First, the probability that an individual is found in the formal sector, which is:

$$\begin{aligned} \Pr(I_{1i}^* > 0 \text{ and } I_{2i}^* > 0) &= \Phi(X_1\beta_1)\Phi(X_2\beta_2) \quad \text{in the case of the sequential model} \\ &= \Phi_2(X_1\beta_1, X_2\beta_2; \rho) \quad \text{in the case of the simultaneous model} \end{aligned}$$

Second, we can calculate the probability of being in the queue:

$$\begin{aligned} \Pr(I_{1i}^* > 0) &= \Phi(X_1\beta_1) \quad \text{in the case of the sequential model} \\ &= \Phi(X_1\beta_1) \quad \text{in the case of the simultaneous model} \end{aligned}$$

Third, the probability of being chosen from the queue conditional on being on the queue:

$$\begin{aligned} \Pr(I_{1i}^* > 0 | I_{2i}^* > 0) &= \Phi(X_2\beta_2) \quad \text{in the case of the sequential model} \\ &= \Phi_2(X_1\beta_1, X_2\beta_2; \rho) / \Phi(X_1\beta_1) \dots \text{in the case of the simultaneous model} \end{aligned}$$

We can also will calculate the length of the queue, which is the inverse of the probability of being chosen from the queue, given that a worker is on the queue.

The estimation is made using the CASEN survey for the years 2006, we consider males between 25 and 54 years old that worked more than 20 hours per week.

3.1 Estimation of model without queue

We first estimate the model assuming that there is no "chosen form the queue" selection. This model is a simple Roy model of comparative advantages. This model is estimated to compare the results with the double selection model that we show in the next section.

The model (1) uses that variables that describe the employer's decision of hiring a formal worker and the model (2) describes the decision made by the individual. We present the results for the second definition of informality, that is, informality as no contribution to the social security system. The results for the other two definitions are presented in the appendix.

Table 15: Probit Results, Formality as contribution to social security

	(1)		(2)	
Years of education	0.0081	(7.951)	0.0076	(7.541)
Potential Experience	0.0000	(0.018)	-0.0008	(-0.553)
Potential Experience Squared	0.0000	(0.292)	-0.0000	(-0.444)
Married (d)	0.0565	(4.579)	0.0386	(3.429)
south (d)	0.0091	(1.042)	0.0002	(0.029)
north (d)	0.0060	(0.576)	0.0144	(1.685)
central (d)	-0.0030	(-0.422)	-0.0041	(-0.632)
6 to 9 people work in the firm (d)	0.0490	(7.390)		
10 to 49 people work in the firm (d)	0.0908	(16.202)		
50 to 199 people work in the firm (d)	0.1148	(22.807)		
200 or more people work in the firm (d)	0.1756	(27.239)		
Number of children less than 2 years old			-0.0159	(-2.690)
Number of children Between 3 and 5 years old			-0.0038	(-0.661)
Number of children Between 6 and 10 years old			0.0010	(0.217)
Number of children Between 11 and 17 years old			0.0060	(1.698)
Number of elderly			-0.0076	(-0.853)
Number of S.E. workers			0.0186	(2.085)
Number of unemployed			-0.0129	(-1.827)
Number of formal workers			0.0752	(27.895)
Head of HH: (d)			0.0974	(8.670)
mother primary education (d)			0.0080	(0.955)
mother secondary education (d)			0.0180	(1.814)
father primary education (d)			-0.0023	(-0.265)
father secondary education (d)			-0.0207	(-1.702)
father college education (d)			-0.0083	(-0.399)
Per capita Non-Labor Income			-0.0046	(-2.374)
Observations	9572		9572	
Log lik.	-3015.1831		-2971.3292	

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

Basically, we estimate a reduce-form probit, for the probability of being in the formal sector. The results in table 15 show that education, being married and head of the household increase the probability of being a formal worker. Also household characteristics are very important. For instance, the number of formal workers, other than the individual in the regression, affect positively the probability of being formal. The result on head of the household could imply that informality is a characteristic of the secondary labor force in the household.

Other household characteristics are also important. The number of children with 2 or less years of age are negatively correlated with formality and the number of unemployed individuals in the house are

also negatively correlated with formality. The characteristics of the parents are not highly correlated with informality, only individuals with mother with secondary education have a higher probability of being formal.

The country was divided in four categories north, central, south and the metropolitan region, which includes Santiago and was left as a comparison group. There are not important differences in formality rates by region.

Finally, per capita non-labor income has a negative effect on formality, which is a somewhat unexpected result because we would expect that poor households should decrease the probability of being formal. However, some variables do indicate that poorer households tend to be less formal, as the result on number of formal workers and number of unemployed people in the household tell us.

Characteristics of the firm are highly correlated with informality, the bigger the firm, the higher the probability workers are formal.

3.2 Estimation of model with queue

In table 16, we present the results for the sequential and simultaneous models.

Table 16: Biprobit Estimations, Formality as contribution to social security

	Sequential		Simultaneous	
<hr/>				
IQ				
Years of education	0.0403	(3.238)	0.0398	(3.287)
Potential Experience	-0.0041	(-0.275)	-0.0062	(-0.423)
Potential Experience Squared	-0.0001	(-0.366)	-0.0001	(-0.186)
south	0.1558	(1.652)	0.1449	(1.555)
north	0.3754	(3.091)	0.3476	(2.962)
central	0.1258	(1.709)	0.1177	(1.624)
Number of children less than 2 years old	-0.1224	(-2.062)	-0.1162	(-2.043)
Number of children Between 3 and 5 years old	0.0046	(0.076)	0.0011	(0.019)
Number of children Between 6 and 10 years old	-0.0016	(-0.036)	-0.0049	(-0.116)
Number of children Between 11 and 17 years old	0.0292	(0.829)	0.0314	(0.925)
Number of elderly	-0.0708	(-0.844)	-0.0629	(-0.786)
Number of S.E. workers	0.1641	(1.871)	0.1564	(1.852)
Number of unemployed	-0.1152	(-1.740)	-0.1109	(-1.752)
Number of formal workers	0.6358	(14.623)	0.6343	(14.872)
Married	0.2245	(2.354)	0.2192	(2.355)
Head of HH:	0.6401	(9.408)	0.6176	(9.565)
mother primary education	0.0242	(0.290)	0.0315	(0.394)
mother secondary education	0.2287	(2.080)	0.2198	(2.052)
father primary education	0.0236	(0.270)	0.0204	(0.243)
father secondary education	-0.2163	(-2.115)	-0.2068	(-2.085)
father college education	-0.1679	(-0.941)	-0.1526	(-0.870)
Per capita Non-Labor Income	-0.0365	(-2.278)	-0.0362	(-2.292)
<hr/>				
CFQ				
Years of education	0.0450	(2.618)	0.0380	(2.339)
Potential Experience	0.0047	(0.233)	0.0036	(0.185)
Potential Experience Squared	-0.0000	(-0.000)	0.0000	(0.057)
Married	0.1341	(1.002)	0.1254	(0.998)
south	-0.1131	(-0.794)	-0.0795	(-0.583)
north	-0.4146	(-2.669)	-0.3952	(-2.667)
central	-0.2532	(-2.060)	-0.2215	(-1.914)
6 to 9 people work in the firm	0.5328	(5.317)	0.5043	(5.373)
10 to 49 people work in the firm	1.0575	(10.990)	1.0185	(11.288)
50 to 199 people work in the firm	1.9009	(7.494)	1.8658	(7.444)
200 or more people work in the firm	5.2364	(0.066)	5.5521	(0.025)
<hr/>				
Observations	9572		9572	
Log lik.	-2784.6876		-2768.2966	
athrho			-1.4997	(-1.37)
rho			-0.9051	
<hr/> <hr/>				

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

We are now estimating the "in the queue" (IQ) equation jointly with the "chosen from the queue" (CFQ) equation. Analyzing the IQ equation first, we observe again that education is positively correlated with formality, for both equations, experience is still not correlated with formality. Being the head of the household, married, the number of formal workers in the household are still positively correlated with formality, and the number of children in the household, number of unemployed people in the household and per capita non-labor income affect negatively formality. The regional variables changed their importance, now being in the metropolitan region, the comparison group, is negatively correlated with formality. Now we find that mothers with secondary education are positively correlated with formality, but fathers with secondary education are negatively correlated.

The estimations for the "chosen from the queue" equation, which should give us information on how employers select their workers, shows that employers prefer workers with more education and who live in the metropolitan region, being married does not affect the employer's decision. Again we find that smaller firms have higher informality.

In the simultaneous case we estimate the correlation between both error terms, for this definition of formality we find a correlation close to minus one, but not in the boundary of the parameter, when the same specification is used with the other two definitions of formality, the correlation coefficient it is almost minus one and the coefficient has a very low t statics, which is evidence that the exclusion restrictions are not able to solve the problem of partial observation.

Next, we test the hypothesis that there is no queue in the labor market, this is tested assuming that all the parameters in the "chosen from the queue" are zero, except for the constant, that must be high enough to give everybody a probability of being chosen equal to one. We also test if there is no universal queue, which implies that everybody wants to work in the formal sector, but the all the selection is made by the employer, this hypothesis translates into that the parameters of the "in the queue" equation are all zero, with the exception of the constant, which must be high enough to make all workers want to go to the formal sector.

Table 17: LR Tests

	Sequential		Simultaneous	
	universal queue	no queue	universal queue	no queue
LR	460.99	373.41	493.77	406.19
p-values	0.001	0.001	0.001	0.001
Critical Values	48.268	31.264	48.268	31.264

The results of the test are shown in table 17, and they suggest that none of these extreme situations is the most appropriate description of the labor market, and is evidence in favor of a double selection model, like the ones that we are estimating is the one that fits the data in a better way.

3.3 Average Queue

Using the estimates of the models we can calculate the probability that individuals are a) being in the formal sector, b) being in the queue, c) being chosen from the queue , the results are shown in table 18.

Table 18: Probabilities, Sequential Model (Formality as Contribution)

	Being Formal	In the Queue	Chosen from the Q
Primary	0.82 (0.14)	0.89 (0.10)	0.91 (0.11)
Secondary	0.89 (0.10)	0.93 (0.07)	0.95 (0.08)
Tertiary	0.94 (0.07)	0.96 (0.05)	0.98 (0.05)
MR	0.89 (0.11)	0.92 (0.09)	0.97 (0.06)
North	0.90 (0.11)	0.96 (0.06)	0.94 (0.10)
Central	0.87 (0.12)	0.92 (0.08)	0.94 (0.10)
South	0.87 (0.12)	0.92 (0.08)	0.94 (0.09)
Not Head of H.	0.83 (0.16)	0.88 (0.14)	0.94 (0.09)
Head of H.	0.89 (0.10)	0.94 (0.06)	0.95 (0.09)
Not Married	0.81 (0.16)	0.87 (0.12)	0.92 (0.11)
Married	0.89 (0.11)	0.93 (0.07)	0.95 (0.08)
Total	0.88 (0.12)	0.93 (0.08)	0.95 (0.09)

Standard Deviation in parentheses

Table 19: Probabilities, Sequential Model (Formality as Contribution)

	Being Formal	In the Queue	Chosen from the Q
Primary	0.82 (0.15)	0.90 (0.10)	0.91 (0.12)
Secondary	0.89 (0.10)	0.93 (0.07)	0.95 (0.08)
Tertiary	0.93 (0.08)	0.96 (0.05)	0.98 (0.05)
MR	0.89 (0.11)	0.92 (0.09)	0.96 (0.07)
North	0.90 (0.12)	0.95 (0.06)	0.94 (0.11)
Central	0.86 (0.13)	0.92 (0.08)	0.93 (0.10)
South	0.87 (0.12)	0.92 (0.08)	0.94 (0.09)
Not Head of H.	0.83 (0.17)	0.88 (0.13)	0.93 (0.11)
Head of H.	0.89 (0.11)	0.94 (0.06)	0.95 (0.09)
Not Married	0.80 (0.17)	0.88 (0.12)	0.91 (0.13)
Married	0.88 (0.11)	0.93 (0.07)	0.95 (0.09)
Total	0.88 (0.12)	0.93 (0.08)	0.94 (0.09)

Standard Deviation in parentheses

From tables 18 and 19 we can analyze how the process of self-selection and exclusion interact to determine the probability of being formal. For the categories shown in the table, we see that all groups have a probability of being chosen higher than 0.9, but we can see a groups with lower averages in the probability of being in the queue. Overall, both probabilities, being in the queue and chosen from the queue, have similar standard deviations, then both contribute almost in the same amount to the variance of being formal.

4 Conclusions

We show that informality has increased during the last 16 years in Chile, nonetheless the actual levels of informality are low compare to other Latin American countries. Young workers tend to be more informal and almost 40% of the workers in small firms are informal. There is also an important correlation between education and informality. These figures show that informality is related to poor labor conditions and that the informal sector could be a precarious one.

We estimate a double selection models to explain informality in labor market. The first selection is a

self-selection process, in which individuals choose which sector gives them the highest utility. In the second selection, employers pick some individuals to work in the formal sector, creating exclusion. The test of the model indicates that the double selection models fit the data better than a simple selection model. Moreover, a sequential model of double selection seems more appropriate than a simultaneous model. However, we had the problem of partial observability, and the double selection model is identified for only one of the three possible definitions of informality.

For formality measured as contribution to social security, the results of the double selection model show that in the labor market there is self-selection into informality and selection (or exclusion) made by the employers. This suggest that workers find more profitable to go to the informal sector than to the formal one, however, this option leaves them with no social protection and with less funds to finance retirement, which suggest that they do not take into account all the costs of their decision or that their discount factor is too high.

Education is the most important variable that affects the probability of being formal. This result is robust for all the different models that we estimate. For the self-selection part of the model, we find that the number of children affects negatively the probability of choosing the formal sector, the same effect has the number of unemployed people in the household. On the other hand, being the head of the household and married are positively correlated with formality, the latter results suggest that informality could affect mostly the secondary labor force.

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Appendix

Table 1A: Probit Results, Formality as Having a Signed Contract

	(1)		(2)	
Years of education	0.0099	(8.858)	0.0097	(8.792)
Potential Experience	-0.0011	(-0.693)	-0.0013	(-0.828)
Potential Experience Squared	0.0000	(0.932)	-0.0000	(-0.218)
Married (d)	0.0530	(4.075)	0.0403	(3.306)
south (d)	0.0111	(1.171)	-0.0003	(-0.037)
north (d)	0.0143	(1.311)	0.0246	(2.740)
central (d)	0.0005	(0.059)	-0.0028	(-0.398)
6 to 9 people work in the firm (d)	0.0536	(6.956)		
10 to 49 people work in the firm (d)	0.1095	(17.777)		
50 to 199 people work in the firm (d)	0.1346	(24.633)		
200 or more people work in the firm (d)	0.1975	(28.552)		
Number of children less than 2 years old			-0.0178	(-2.721)
Number of children Between 3 and 5 years old			-0.0068	(-1.061)
Number of children Between 6 and 10 years old			-0.0038	(-0.797)
Number of children Between 11 and 17 years old			0.0030	(0.776)
Number of elderly			0.0025	(0.254)
Number of S.E. workers			0.0248	(2.558)
n_desem			-0.0082	(-1.048)
Number of formal workers			0.0906	(28.358)
Head of HH: (d)			0.0916	(7.956)
mother primary education (d)			0.0062	(0.670)
mother secondary education (d)			-0.0039	(-0.318)
father primary education (d)			0.0030	(0.313)
father secondary education (d)			-0.0034	(-0.282)
father college education (d)			-0.0135	(-0.600)
Per capita Non-Labor Income			-0.0031	(-1.412)
Observations	9580		9580	
Log lik.	-3298.0403		-3273.2840	

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

Table 2A: Biprobit Results, Formality as a signed contract

	Sequential		Simultaneous	
iq				
Years of education	0.0248	(2.148)	0.0270	(2.371)
Potential Experience	-0.0055	(-0.390)	-0.0068	(-0.491)
Potential Experience Squared	-0.0003	(-1.158)	-0.0003	(-0.960)
south	0.2603	(2.757)	0.2389	(2.582)
north	0.2829	(2.977)	0.2654	(2.832)
central	0.2465	(3.546)	0.2301	(3.360)
Number of children less than 2 years old	-0.1438	(-2.573)	-0.1299	(-2.436)
Number of children Between 3 and 5 years old	-0.0085	(-0.142)	-0.0088	(-0.155)
Number of children Between 6 and 10 years old	-0.0422	(-1.029)	-0.0452	(-1.152)
Number of children Between 11 and 17 years old	-0.0044	(-0.133)	-0.0013	(-0.041)
Number of elderly	0.0755	(0.875)	0.0656	(0.811)
Number of S.E. workers	0.1749	(2.167)	0.1738	(2.228)
n_desem	-0.0597	(-0.922)	-0.0625	(-1.016)
Number of formal workers	0.6856	(14.413)	0.6886	(14.603)
Married	0.1782	(1.847)	0.1800	(1.935)
Head of HH:	0.5517	(8.135)	0.5355	(8.396)
mother primary education	-0.0157	(-0.190)	-0.0046	(-0.058)
mother secondary education	-0.0351	(-0.338)	-0.0297	(-0.294)
father primary education	0.1011	(1.182)	0.0918	(1.123)
father secondary education	0.0474	(0.471)	0.0392	(0.402)
father college education	-0.0339	(-0.206)	-0.0331	(-0.203)
Per capita Non-Labor Income	-0.0192	(-1.190)	-0.0188	(-1.190)
cfq				
Years of education	0.0765	(4.862)	0.0649	(4.328)
Potential Experience	0.0015	(0.082)	0.0007	(0.038)
Potential Experience Squared	0.0004	(1.099)	0.0004	(1.087)
Married	0.1807	(1.463)	0.1712	(1.472)
south	-0.3128	(-2.245)	-0.2715	(-2.050)
north	-0.2295	(-1.347)	-0.2337	(-1.465)
central	-0.4292	(-3.575)	-0.3951	(-3.517)
6 to 9 people work in the firm	0.4729	(5.217)	0.4448	(5.253)
10 to 49 people work in the firm	1.1010	(12.188)	1.0526	(12.544)
50 to 199 people work in the firm	1.9031	(9.124)	1.8532	(9.060)
200 or more people work in the firm	5.4593	(0.056)	5.2397	(0.080)
Observations	9580		9580	
Log lik.	-3043.9949		-3024.0121	
athrho			-4.1744	(-0.06)
rho			-0.9995	

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

Table 3A: Probabilities, Sequential Model (Formality as a signed contract)

	Being Formal	In the Queue	Chosen from the Q
Primary	0.79	0.88	0.90
	0.16	0.11	0.13
Secondary	0.88	0.93	0.95
	0.11	0.07	0.09
Tertiary	0.93	0.95	0.98
	0.08	0.05	0.06
MR	0.88	0.90	0.97
	0.11	0.10	0.06
North	0.89	0.93	0.96
	0.11	0.07	0.08
Central	0.85	0.92	0.92
	0.14	0.08	0.12
South	0.84	0.92	0.92
	0.14	0.08	0.12
Not Head of H.	0.82	0.88	0.93
	0.16	0.13	0.11
Head of H.	0.87	0.93	0.94
	0.12	0.07	0.10
Not Married	0.79	0.88	0.90
	0.16	0.11	0.14
Married	0.87	0.92	0.94
	0.13	0.08	0.10
Total	0.86	0.92	0.94
	0.13	0.08	0.11

Table 4A: Probabilities, Simultaneous Model (Formality as a signed contract)

	Being Formal	In the queue	Chosen from the Q
Primary	0.79	0.88	0.89
	0.17	0.10	0.14
Secondary	0.88	0.93	0.94
	0.11	0.07	0.10
Tertiary	0.92	0.95	0.97
	0.08	0.05	0.06
MR	0.88	0.91	0.96
	0.12	0.09	0.07
North	0.89	0.93	0.95
	0.11	0.07	0.09
Central	0.84	0.92	0.91
	0.15	0.08	0.13
South	0.84	0.92	0.91
	0.14	0.08	0.12
Not Head of H.	0.82	0.89	0.92
	0.17	0.12	0.13
Head of H.	0.87	0.93	0.94
	0.12	0.07	0.11
Not Married	0.79	0.88	0.89
	0.18	0.11	0.15
Married	0.87	0.92	0.94
	0.13	0.08	0.11
Total	0.86	0.92	0.93
	0.14	0.08	0.11

Table 5A Probit Results, Formality as Having a Signed Contract or Contribution to SS

	(1)		(2)	
Years of education	0.0074	(8.533)	0.0070	(8.183)
Potential Experience	-0.0010	(-0.779)	-0.0013	(-1.064)
Potential Experience Squared	0.0000	(1.028)	0.0000	(0.077)
Married (d)	0.0395	(3.745)	0.0288	(2.975)
south (d)	0.0053	(0.695)	-0.0009	(-0.128)
north (d)	-0.0045	(-0.473)	0.0068	(0.893)
central (d)	-0.0050	(-0.810)	-0.0056	(-1.007)
6 to 9 people work in the firm (d)	0.0369	(6.984)		
10 to 49 people work in the firm (d)	0.0746	(15.956)		
50 to 199 people work in the firm (d)	0.0911	(20.731)		
200 or more people work in the firm (d)	0.1482	(25.601)		
Number of children less than 2 years old			-0.0094	(-1.850)
Number of children Between 3 and 5 years old			-0.0038	(-0.769)
Number of children Between 6 and 10 years old			-0.0038	(-1.024)
Number of children Between 11 and 17 years old			0.0039	(1.295)
Number of elderly			0.0011	(0.142)
Number of S.E. workers			0.0171	(2.232)
n_desem			-0.0118	(-1.992)
Number of formal workers			0.0601	(26.309)
Head of HH: (d)			0.0815	(8.022)
mother primary education (d)			0.0062	(0.874)
mother secondary education (d)			0.0052	(0.566)
father primary education (d)			-0.0017	(-0.231)
father secondary education (d)			-0.0103	(-1.023)
father college education (d)			-0.0082	(-0.436)
Per capita Non-Labor Income			-0.0028	(-1.622)
Observations	9587		9587	
Log lik.	-2585.7292		-2583.1417	

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

Table 6A Biprobit Results, Formality as Having a Signed Contract or Contribution to SS

	Sequential		Simultaneous	
iq				
Years of education	0.0448	(3.287)	0.0446	(3.396)
Potential Experience	-0.0200	(-1.162)	-0.0217	(-1.291)
Potential Experience Squared	0.0001	(0.300)	0.0002	(0.477)
south	0.1427	(1.318)	0.1282	(1.209)
north	0.1985	(1.618)	0.1786	(1.497)
central	0.1161	(1.370)	0.1033	(1.247)
Number of children less than 2 years old	-0.1044	(-1.506)	-0.0970	(-1.462)
Number of children Between 3 and 5 years old	-0.0338	(-0.500)	-0.0369	(-0.569)
Number of children Between 6 and 10 years old	-0.0625	(-1.308)	-0.0633	(-1.375)
Number of children Between 11 and 17 years old	0.0220	(0.551)	0.0245	(0.635)
Number of elderly	0.0961	(0.923)	0.0903	(0.916)
Number of S.E. workers	0.1854	(1.853)	0.1799	(1.861)
n_desem	-0.1518	(-2.109)	-0.1452	(-2.105)
Number of formal workers	0.7332	(11.260)	0.7324	(11.404)
Married	0.2613	(2.412)	0.2588	(2.482)
Head of HH:	0.6948	(8.921)	0.6705	(9.097)
mother primary education	0.0300	(0.312)	0.0329	(0.355)
mother secondary education	0.1095	(0.856)	0.1005	(0.805)
father primary education	0.0193	(0.192)	0.0192	(0.199)
father secondary education	-0.1001	(-0.834)	-0.0919	(-0.788)
father college education	-0.2433	(-1.248)	-0.2238	(-1.165)
Per capita Non-Labor Income	-0.0231	(-1.094)	-0.0229	(-1.102)
cfq				
Years of education	0.0539	(3.358)	0.0471	(3.058)
Potential Experience	0.0077	(0.414)	0.0057	(0.314)
Potential Experience Squared	-0.0000	(-0.000)	0.0000	(0.077)
Married	0.0935	(0.696)	0.1013	(0.800)
south	-0.0862	(-0.631)	-0.0583	(-0.439)
north	-0.2529	(-1.566)	-0.2471	(-1.597)
central	-0.2377	(-2.088)	-0.2111	(-1.928)
6 to 9 people work in the firm	0.4960	(5.099)	0.4784	(5.168)
10 to 49 people work in the firm	1.0757	(11.417)	1.0517	(11.660)
50 to 199 people work in the firm	1.8039	(8.813)	1.7798	(8.763)
200 or more people work in the firm	5.3626	(0.037)	5.2216	(0.049)
Observations	9587		9587	
Log lik.	-2394.6035		-2380.3396	
atrho			-3.3828	(-0.01)
rho	0.0000		-0.9977	

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

Table 7A: Probabilities, Sequential Model (Formality as Having a Signed Contract or Contribution to SS)

	Being Formal	In the Queue	Chosen from the Q
Primary	0.84	0.91	0.92
	0.14	0.09	0.10
Secondary	0.91	0.95	0.96
	0.09	0.06	0.07
Tertiary	0.95	0.97	0.98
	0.06	0.04	0.04
MR	0.92	0.95	0.97
	0.09	0.07	0.06
North	0.92	0.96	0.96
	0.10	0.06	0.08
Central	0.89	0.94	0.94
	0.12	0.07	0.09
South	0.89	0.94	0.94
	0.11	0.07	0.08
Not Head of H.	0.86	0.91	0.95
	0.15	0.12	0.08
Head of H.	0.91	0.95	0.95
	0.10	0.05	0.08
Not Married	0.84	0.90	0.93
	0.14	0.11	0.10
Married	0.91	0.95	0.95
	0.10	0.06	0.08
Total	0.90	0.94	0.95
	0.11	0.07	0.08

Table 8A: Probabilities, Simultaneous Model (Formality as Having a Signed Contract or Contribution to SS)

	Being Formal	In the Queue	Chosen from the Q
Primary	0.84	0.91	0.91
	0.14	0.09	0.11
Secondary	0.91	0.95	0.96
	0.09	0.05	0.07
Tertiary	0.95	0.97	0.98
	0.06	0.04	0.05
MR	0.92	0.95	0.97
	0.10	0.07	0.06
North	0.91	0.96	0.96
	0.10	0.06	0.09
Central	0.89	0.94	0.94
	0.12	0.07	0.10
South	0.89	0.94	0.94
	0.12	0.07	0.09
Not Head of H.	0.86	0.91	0.94
	0.15	0.12	0.10
Head of H.	0.91	0.95	0.95
	0.10	0.05	0.08
Not Married	0.84	0.90	0.92
	0.15	0.10	0.12
Married	0.90	0.95	0.95
	0.10	0.06	0.08
Total	0.90	0.95	0.95
	0.11	0.07	0.09