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Determinants of Labour Contracts in Ivory Coast

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Abstract
A broad range of knowledges has oriented explanations of occupational choices and motivated empirical researches in testing the driving variables of labour market segmentation and individuals' labour market participation. In this paper, we study a multinomial logistic analysis of labour contract selection in Ivory Coast. The data were collected on the 2015 National Household Living Standard Survey, composed of 15,861 individuals aged 16-60. The study has three main results. First, females are more likely than males to prefer unwritten contracts to written contracts or self-employment. The forms of compensation held during work lead individuals to choose unwritten contracts to written contracts or self-employment. Second, education levels, age categories and interpersonal networks to access jobs lead workers to choose written contracts or self-employment relative to unwritten contracts. Third, high skilled workers with highest degrees are more likely to choose written contracts relative to unwritten ones but they prefer unwritten contracts to self-employment. These reveal the institutional foundations of occupational choices in Ivory Coast and invite important reforms in labour force and labour market.
Keywords: Occupational choice, Contract Selection, Institutions, Multinomial Logistic Regression
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1. Introduction

The pioneering work of Doeringer and Piore (2020) introduced the institutional approach to markets by distinguishing two main types of labour market: an internal (non-competitive) market and an external (competitive) market. A broad range of ideas has then oriented explanations of occupational choices, particularly labour contracts, in at least three directions: 1-the Stigler's job-search theory and recent insights based on compensations before or during work such as cash transfers received and wages (Caliendo and al. 2015), 2-the Spence's job-market signalling theory with current changes focused on education level and diploma (Hopkins, 2012) and 3-the Becker's economics of discrimination with new insights dedicated to the sex or age of individuals (Neumark, 2018). Each of these theoretical frameworks has motivated empirical researches to test the driving variables of labour market segmentation and individuals' labour market participation with the choice of a specific labour contract.

This paper presents empirical evidence of the driving predictors of labour contract selection. We study a multinomial logistic analysis of the choice of labour contracts based on McFadden (2001). The data were collected on the 2015 National Household Living Standard Survey in Ivory Coast, composed of 15,861 individuals aged 16-60[1].

2. The empirical model

The multinomial logit proposes a model of k>2 categorical outcomes and the probability that the response for the ith observation being equal to the jth outcome, presented in Cameron and Trivedi (2009, p.484-488), is given as follows:

$$P_{ij} = \frac{\exp(x_i'\beta_j)}{\sum_{l=1}^{m}\exp(x_i'\beta_l)}, \qquad j = 1, \dots, m$$

Where x_i is the vector of observed values of case-specific regressors for the ith observation and β_j is the coefficient vector for outcome j. For simplicity, if we set the base category to be the first category, then the model implies that:

$$Pr(y_i = j | y_i = j \text{ or } 1) = \frac{\Pr(y_i = j)}{\Pr(y_i = j) + \Pr(y_i = 1)} = \frac{\exp(x_i'\beta_j)}{1 + \exp(x_i'\beta_j)}$$

$\widehat{\beta_j}$ is viewed as parameters of a binary logit model between alternative j and alternative 1. So, a positive coefficient from multinomial logit means that as the regressor increases, we are more likely to choose alternative j than alternative 1.

The relative-risk ratio of choosing alternative j rather than alternative 1 is given by:

[1] In Ivory Coast, the labour code (n°2015-532, article 23-2) sets the minimum working age to 16. In addition, the social security code (law n°99-477) and order n°2012-03 set the retirement age to be 60.

$$\frac{\Pr(y_i = j)}{\Pr(y_i = 1)} = \exp(x_i' \beta_j)$$

So $e^{\beta_{jr}}$ gives the proportionate change in the relative risk of choosing alternative j rather than alternative 1 when x_{ir} changes by one unit.

Finally, the predictive probabilities and marginal effect (MEs) show how probabilities change as regressors change in the following:

$$\frac{\partial P_{ij}}{\partial x_i} = P_{ij}(\beta_j - \overline{\beta}_\iota)$$

Where $\overline{\beta}_\iota = \sum_l P_{il}\beta_l$ is a probability weighted average of the β_l. For a variable x, the marginal effect is positive if $\beta_j > \overline{\beta}_\iota$.

3. Database

The dependent variable (contractcat) denotes contract categories. It takes on the value of 1 if an individual is hired with a written contract (permanent, fixed-term and internship), 2 if hired with an unwritten contract (verbal and hired without precise contract) and 3 if the individual is self-employed.

The predictors are all case-specific variables, chosen in respect to economic theories of labour market mentioned previously. Some of the predictors are factor variables. The variable compensation (the form of compensation held during work) takes on the values ranging from 1 to 3 being, respectively, fixed cash payment; variable cash payment (per-day/hour payment, per-job payment, per-commission payment and part-of-profit payment) and finally, in-kind payment, unpaid workers and others. The variable educatlevel (education level) takes on the values ranging from 1 to 4 denoting, respectively, out-of-school; primary; secondary and higher. The variable agecat (age categories) takes on the values ranging from 1 to 3 being, respectively, 16-24; 25-35 and 36-60. The variable sex takes on the value of 1 if male and 2 if female. The other predictors are: diploma (the highest degree) and inajob (the interpersonal network to access jobs, or worker' family relationships). The summary statistics follows in table1.

Table 1: Descriptive statistics of the main variables Table 1:

Variable	Obs	Mean	Std. Dev.	Min	Max
contractcat	15,861	2.344934	.6432237	1	3
compensation	15,861	2.200429	.6436143	1	3
educatlevel	15,861	.6179938	.8881461	0	3
agecat	15,861	2.294496	.735662	1	3
diploma	15,861	1.042809	2.403811	0	20
inajob	15,861	4.42097	4.15159	1	12
sex	15,861	1.418574	.4933408	1	2

The set of contract categories has no natural ordering and the most frequently occurring category of contracts (unwritten contract) is chosen as reference group, table2.

Table 2: Dependent variable

contract categories	Freq.	Percent	Cum.
written contract	1,489	9.39	9.39
unwritten contract	7,412	46.73	56.12
self-employed	6,960	43.88	100.00
Total	15,861	100.00	

4. Empirical results

The parameter estimates are presented in table3. Relative risk ratios are proposed in table4. Predictive margins are proposed in table5 and marginal effects are in table6.

Table 3: Parameter estimates

Multinomial logistic regression — Number of obs = 15,861; LR chi2(12) = 6054.24; Prob > chi2 = 0.0000; Log likelihood = -11867.109; Pseudo R2 = 0.2032

contractcat	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
written_contract						
compensation	-2.480144	.0690562	-35.91	0.000	-2.615492	-2.344797
educatlevel	.6858185	.051188	13.40	0.000	.5854919	.786145
agecat	.5716523	.0563606	10.14	0.000	.4611875	.6821171
diploma	.0549888	.0153375	3.59	0.000	.0249279	.0850497
inajob	.0240361	.0098462	2.44	0.015	.0047378	.0433344
sex						
female	-.368451	.0821193	-4.49	0.000	-.5294018	-.2075002
_cons	.7550278	.1874941	4.03	0.000	.3875462	1.122509
unwritten_contract	(base outcome)					
self_employed						
compensation	-.1509758	.031435	-4.80	0.000	-.2125872	-.0893644
educatlevel	.0868938	.0347853	2.50	0.012	.0187159	.1550717
agecat	.7124476	.0250834	28.40	0.000	.663285	.7616102
diploma	-.0812668	.0167848	-4.84	0.000	-.1141644	-.0483692
inajob	.1041957	.0042744	24.38	0.000	.095818	.1125734
sex						
female	-.2911048	.0366577	-7.94	0.000	-.3629527	-.219257
_cons	-1.672164	.1025161	-16.31	0.000	-1.873092	-1.471236

If we set alpha level to 0.01, we would fail to reject the null hypothesis and conclude that the regression coefficient for predictor variables inajob in the written contract model and educatlevel in self-employed model has not been found to be statistically different from zero given the other predictors in the models. Since the parameter estimates are relative to the referent group, the standard interpretation of the multinomial logit is that for a unit change in the predictor variable, the logit of outcome relative to the referent group is expected to change by its respective parameter estimate (which is in log-odds units) given the variables in the model are held constant.

In the written contract model, if a subject were to increase his compensation score by one unit, the multinomial log-odds for preferring a written contract to an unwritten one would be expected to decrease by 2.48 units while holding all other variables in the model constant. The multinomial log-odds for preferring written contracts to unwritten ones would be expected to increase with a one point increase in predictor variables: educatlevel, agecat, and diploma.

In the self-employed model, the multinomial log-odds for preferring self-employment to be hired with an unwritten contract would be expected to decrease with a one point increase in predictor variables: compensation and diploma. The multinomial log-odds for preferring self-employment to unwritten contracts would be expected to increase with a one point increase in predictor variables: inajob and agecat.

Finally, the multinomial logit for females relative to males is lower for preferring written contracts to unwritten ones and lower for preferring self-employment to be hired with unwritten contracts.

Table4 shows the relative risk ratios (rrr) where rrr < 1 indicates that the outcome is more likely to be in the referent group. Given a one unit increase in compensation, the relative risk of being in the written contract group (the self-employed group respectively) would be 0.084 (0.86 respectively) times more when the other variables are held constant. If a subject were to increase his/her compensation score, we would expect him/her to be more likely to prefer an unwritten contract over a written contract or self-employment.

For females relative to males, the relative risk for preferring written contracts to unwritten ones (self-employment respectively) would be expected to decrease by a factor of 0.692 (0.747 respectively). So, females are less likely than males to prefer written contracts (self-employment respectively) to unwritten contracts. The relative risk of being in the self-employed group would be 0.92 times more for high skilled workers. So, the highest degree could lead workers to choose unwritten contracts relative to self-employment.

Table 4: Relative-risk ratios

contractcat	RRR	Std. Err.	z	P>|z|	[95% Conf.	Interval]
written_contract						
compensation	.0837311	.0057822	-35.91	0.000	.0731318	.0958667
educatlevel	1.985396	.1016284	13.40	0.000	1.795874	2.194919
agecat	1.771191	.0998255	10.14	0.000	1.585956	1.978061
diploma	1.056529	.0162045	3.59	0.000	1.025241	1.088771
inajob	1.024327	.0100858	2.44	0.015	1.004749	1.044287
sex						
female	.6918051	.0568105	-4.49	0.000	.5889572	.8126131
_cons	2.127671	.3989256	4.03	0.000	1.473361	3.072555
unwritten_contract	(base outcome)					
self_employed						
compensation	.8598685	.0270299	-4.80	0.000	.8084898	.9145123
educatlevel	1.090781	.0379431	2.50	0.012	1.018892	1.167742
agecat	2.038976	.0511445	28.40	0.000	1.941159	2.141722
diploma	.9219476	.0154747	-4.84	0.000	.8921112	.9527819
inajob	1.109818	.0047438	24.38	0.000	1.100559	1.119154
sex						
female	.7474373	.0273993	-7.94	0.000	.6956194	.8031153
_cons	.1878402	.0192566	-16.31	0.000	.1536479	.2296415

Note: _cons estimates baseline relative risk for each outcome.

Table5 shows the model's predictive probability of unwritten contract (outcome2) for each category of factor variables. We focus especially on factor variables compensation and sex that have positive relationships with outcome2 (unwritten contract) as revealed in preceding tables.

Table 5: Predictive probabilities

	Delta-method Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
compensation						
Fixed cash payment	.6096524	.012571	48.50	0.000	.5850138	.634291
Variable cash payment	.3917237	.0050633	77.37	0.000	.3817998	.4016476
in-kind payment and other	.6010476	.006887	87.27	0.000	.5875493	.6145458
educatlevel						
out-of-school	.5059105	.0058882	85.92	0.000	.4943698	.5174512
primary school	.463989	.0089438	51.88	0.000	.4464594	.4815185
secondary school	.4249861	.0114224	37.21	0.000	.4025986	.4473737
high school	.3921985	.03799	10.32	0.000	.3177395	.4666575
agecat						
(16-24)	.6773915	.009361	72.36	0.000	.6590443	.6957387
(25-35)	.4910091	.0061506	79.83	0.000	.4789542	.5030641
(36-60)	.3734561	.0054711	68.26	0.000	.3627329	.3841794
sex						
male	.4416365	.0048001	92.01	0.000	.4322286	.4510445
female	.503588	.0057655	87.34	0.000	.4922878	.5148882

Fixed cash payment and in-kind payment are the forms of compensation that have the highest effects on leading workers to choose unwritten contracts. Females are more likely to choosing unwritten contracts than males.

The model's predictive probability of outcome1 (written contract) for each category of factor variables educatlevel and agecat (appendix1) reveals that the probability of choosing written contracts is higher for individuals who have attended school than for those who have not. Moreover, this probability increases with the level of education (Graph3 in appendix3). Individuals with the highest level of education have a three-fold higher probability of preferring written contracts than those who have not been to school. Aged people of the labour force (36-60) have the highest probability of choosing written contracts. That probability decreases with age category. The model's predictive probability of outcome3 (self-employed) for each category of factor variables educatlevel and agecat (appendix2) indicates that individuals with the highest level of education are the least willing to be self-employed. The probability of self-employment increases with age and is higher for older individuals (Graph4 in appendix3).

Marginal effects obtained as discrete differences margins (dy/dx) are in table6. The average probability of being in the unwritten contract group is 0.4416 if male and 0.5035 if female, a difference of 0.0619, so the probability of working with an unwritten contract is on average just over six percentage points higher for female relative to male. The probability of working with an unwritten contract is twenty-two percentage points lower when moving from fixed to variable cash payment.

Table 6 : Marginal effects

	Delta-method				
	dy/dx	Std. Err.	z	P>|z|	[95% Conf. Interval]
compensation					
Variable cash payment	-.2179287	.0136599	-15.95	0.000	-.2447016 -.1911558
in-kind payment and other	-.0086049	.0146437	-0.59	0.557	-.0373059 .0200962
educatlevel					
primary school	-.0419215	.0108647	-3.86	0.000	-.0632159 -.0206272
secondary school	-.0809243	.0144378	-5.61	0.000	-.109222 -.0526267
high school	-.113712	.0405184	-2.81	0.005	-.1931266 -.0342974
agecat					
(25-35)	-.1863823	.0111965	-16.65	0.000	-.2083271 -.1644376
(36-60)	-.3039354	.0109517	-27.75	0.000	-.3254003 -.2824705
sex					
female	.0619514	.0075929	8.16	0.000	.0470696 .0768333

Note: dy/dx for factor levels is the discrete change from the base level.

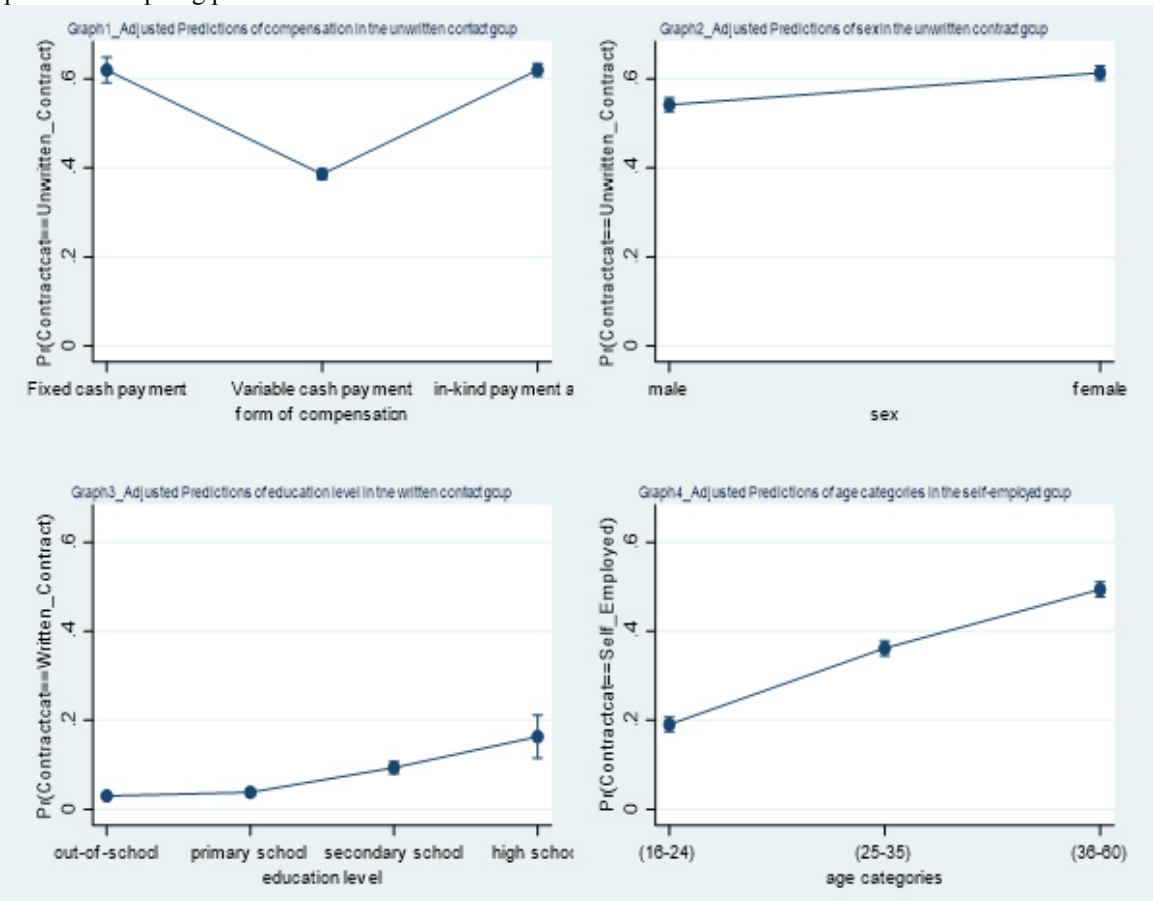
Appendix1: margins compensation educatlevel agecat sex, pr(out(1))

	Delta-method				
	Margin	Std. Err.	z	P>|z|	[95% Conf. Interval]
compensation					
Fixed cash payment	.3686023	.0123862	29.76	0.000	.3443257 .3928788
Variable cash payment	.033713	.0020843	16.17	0.000	.0296278 .0377982
in-kind payment and other	.0289365	.0028206	10.26	0.000	.0234082 .0344647
educatlevel					
out-of-school	.0605836	.0034277	17.67	0.000	.0538653 .0673018
primary school	.0729955	.0045613	16.00	0.000	.0640556 .0819354
secondary school	.1288193	.0048114	26.77	0.000	.1193891 .1382494
high school	.1810885	.016714	10.83	0.000	.1483297 .2138473
agecat					
(16-24)	.0696392	.0049509	14.07	0.000	.0599357 .0793427
(25-35)	.0918938	.0027465	33.46	0.000	.0865107 .0972769
(36-60)	.1016223	.0025619	39.67	0.000	.0966011 .1066436
sex					
male	.0974707	.0020768	46.93	0.000	.0934001 .1015412
female	.0853983	.0030438	28.06	0.000	.0794325 .0913641

Appendix2: margins compensation educatlevel agecat sex, pr(out(3))

	Delta-method				
	Margin	Std. Err.	z	P>|z|	[95% Conf. Interval]
compensation					
Fixed cash payment	.0217453	.0039939	5.44	0.000	.0139174 .0295733
Variable cash payment	.5745633	.0051823	110.87	0.000	.5644061 .5847205
in-kind payment and other	.370016	.0068379	54.11	0.000	.3566138 .3834181
educatlevel					
out-of-school	.433506	.004893	88.60	0.000	.4239158 .4430961
primary school	.4630156	.0082412	56.18	0.000	.4468632 .4791679
secondary school	.4461946	.0116207	38.40	0.000	.4234184 .4689708
high school	.426713	.0426533	10.00	0.000	.343114 .510312
agecat					
(16-24)	.2529693	.008259	30.63	0.000	.236782 .2691567
(25-35)	.417097	.0058462	71.34	0.000	.4056386 .4285554
(36-60)	.5249215	.0052488	100.01	0.000	.514634 .5352091
sex					
male	.4608928	.0046214	99.73	0.000	.451835 .4699507
female	.4110137	.0052859	77.76	0.000	.4006535 .421374

Appendix3: Graphing probabilities



5. Conclusion

This article has questioned the institutional foundations of individual' occupational choices with a special interest for the driving predictors of labour contract selection in Ivory Coast. It has shown that unwritten contracts are significantly determined by the forms of compensation held during work and female. High-educated people and aged individuals of the labour force are those who prefer written contracts. Self-employment is significantly determined by age categories. These results involve important reforms of the labour market and the labour force in Ivory Coast.

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