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 multinominal 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 multinominal 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.

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:

\[ P_{ij} = \frac{\exp(x_i'\beta_j)}{\sum_{j=1}^{m} \exp(x_i'\beta_j)}, \quad j = 1, ..., m \]

Where \( x_i \) is the vector of observed values of case-specific regressors for the ith observation and \( \beta_j \) 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:

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

\( \beta_j \) 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:

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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.
So \( e^{\beta_j} \) gives the proportionate change in the relative risk of choosing alternative \( j \) rather than alternative 1 when \( x_{ij} \) changes by one unit.

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

\[
\frac{\partial P_{ij}}{\partial x_j} = P_{ij}(\beta_j - \bar{\beta}_i)
\]

Where \( \bar{\beta}_i = \sum_i P_{ij} \beta_i \) is a probability weighted average of the \( \beta_i \). For a variable \( x_i \), the marginal effect is positive if \( \beta_i > \bar{\beta}_i \).

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

| Variable    | Obs  | Mean  | Std. Dev. | Min | Max |
|-------------|------|-------|-----------|-----|-----|
| contractcat | 15,851 | 2.344934 | .6432237 | 1   | 3   |
| compensation| 15,851 | 2.200429 | .6436143 | 1   | 3   |
| educatlevel | 15,851 | .6179938 | .8881461 | 0   | 3   |
| agecat      | 15,851 | 2.294496 | .735662  | 1   | 3   |
| diploma     | 15,851 | 1.942899 | 2.483811 | 0   | 20  |
| inajob      | 15,851 | 4.420979 | 4.15159  | 1   | 12  |
| sex         | 15,851 | 1.418574 | .4933488 | 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       | 6,968 | 43.88   | 186.00|

Total | 15,851 | 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

|                     | Coef.       | Std. Err. | z     | P>|z|    | [95% Conf. Interval] |
|---------------------|-------------|-----------|-------|--------|---------------------|
| **written_contract** |             |           |       |        |                     |
| Compensation        | -2.400444   | 0.009062  | -35.91| 0.000  | -2.615949 to -2.184979 |
| educatlevel         | 0.5858185   | 0.051388  | 13.40 | 0.000  | 0.582479 to 0.589155 |
| agecat              | 0.576523    | 0.056306  | 10.41 | 0.000  | 0.566022 to 0.587024 |
| diploma             | 0.9549888   | 0.015375  | 62.59 | 0.000  | 0.934209 to 0.975767 |
| inajob              | 0.824561    | 0.005846  | 14.04 | 0.000  | 0.813095 to 0.836027 |
| **sex**             |             |           |       |        |                     |
| female              | -0.368451   | 0.0821193 | -4.49 | 0.000  | -0.529408 to -0.207502 |
| _cons               | 0.7550278   | 0.1874541 | 4.03  | 0.000  | 0.3875462 to 1.122589 |
| **unwritten_contract** |           |           |       |        |                     |
| (base outcome)      |             |           |       |        |                     |
| **self-employed**   |             |           |       |        |                     |
| compensation        | -1.599758   | 0.031435  | -50.30| 0.000  | -1.653072 to -1.549436 |
| educatlevel         | 0.0658938   | 0.034785  | 1.90  | 0.058  | 0.097159 to 0.034628 |
| agecat              | 0.714476    | 0.020634  | 34.40 | 0.000  | 0.673205 to 0.755746 |
| diploma             | -0.0812658  | 0.016748  | -4.74 | 0.000  | -0.114044 to -0.048482 |
| inajob              | 0.104254    | 0.0042744 | 23.18 | 0.000  | 0.095913 to 0.112634 |
| **sex**             |             |           |       |        |                     |
| female              | -1.291348   | 0.036677  | -7.74 | 0.000  | -1.362952 to -1.219257 |
| _cons               | -1.672164   | 0.1825361 | -9.16 | 0.000  | -1.937389 to -1.406936 |

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 log 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 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 | MRR | Std. Err. | Z | P>|Z| | [95% Conf. Interval] |
|-------------|-----|-----------|---|------|------------------------|
| written_contract | | | | | |
| compensation | 0.837311 | 0.057822 | -35.91 | 0.000 | 0.793918 | 0.881667 |
| educatlevel | 1.35036 | 1.015324 | 15.48 | 0.000 | 1.218274 | 2.519419 |
| agecat | 1.771191 | 0.982555 | 7.30 | 0.000 | 1.345552 | 2.756051 |
| diploma | 1.055529 | 0.0152845 | 3.99 | 0.000 | 1.025241 | 1.090711 |
| inajob | 1.824327 | 0.1108858 | 3.00 | 0.000 | 1.700042 | 1.948617 |
| sex | | | | | |
| female | 0.691365 | 0.0558108 | -4.49 | 0.000 | 0.5889572 | 0.812613 |
| _cons | 2.127671 | 0.3989258 | 4.33 | 0.000 | 1.473361 | 2.872255 |
| unwritten_contract | (base outcome) | | | | |
| self_employed | compensation | 0.850685 | 0.0270299 | -4.80 | 0.000 | 0.7004988 | 0.940073 |
| educatlevel | 1.090791 | 0.379431 | 2.50 | 0.000 | 1.016902 | 1.167742 |
| agecat | 2.033979 | 0.511445 | 20.47 | 0.000 | 1.941057 | 2.127922 |
| diploma | 0.9219476 | 0.0154747 | -4.84 | 0.000 | 0.8921112 | 0.9527819 |
| inajob | 1.169818 | 0.0647483 | 24.38 | 0.000 | 1.106519 | 1.233154 |
| sex | | | | | |
| female | 0.7474373 | 0.0273999 | -7.94 | 0.000 | 0.6956194 | 0.803153 |
| _cons | 0.1784942 | 0.0192586 | -16.31 | 0.000 | 0.1556497 | 0.201339 |

Note: _cons estimates baseline relative risk for each outcome.

Table 5 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 | 0.095824 | 0.012571 | 48.59 | 0.000 | 0.0850138 | 0.106631 |
| Variable cash payment | 0.3517277 | 0.0058633 | 77.37 | 0.000 | 0.3318998 | 0.3715476 |
| in-kind payment and other | 0.6010476 | 0.066887 | 87.27 | 0.000 | 0.5875493 | 0.6145968 |
| educatlevel | out-of-school | 0.5658965 | 0.0958892 | 38.02 | 0.000 | 0.4440698 | 0.687723 |
| primary school | 0.4630805 | 0.0080436 | 51.03 | 0.000 | 0.4464594 | 0.480593 |
| secondary school | 0.4245661 | 0.0142242 | 29.72 | 0.000 | 0.4025986 | 0.4462377 |
| high school | 0.3521985 | 0.037799 | 9.29 | 0.000 | 0.3177395 | 0.3866575 |
| agecat (16-24) | 0.6773915 | 0.009361 | 72.35 | 0.000 | 0.6590443 | 0.6957387 |
| (25-35) | 0.4510991 | 0.006159 | 79.25 | 0.000 | 0.4378942 | 0.4640841 |
| (35-66) | 0.3734561 | 0.0054711 | 68.25 | 0.000 | 0.3627329 | 0.3841794 |
| sex | | | | | |
| male | 0.4416365 | 0.0648001 | 69.01 | 0.000 | 0.4222826 | 0.4510924 |
| female | 0.5053688 | 0.0576955 | 87.34 | 0.000 | 0.4862785 | 0.5244588 |

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 table 6. 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

|                          | dy/dx    | Std. Err. | z     | P>|z|   | [95% Conf. Interval] |
|--------------------------|----------|-----------|-------|-------|---------------------|
|                          | Delta-method |          |       |       |                     |
| compensation             |           |           |       |       |                     |
| Variable cash payment    | -.2179287 | .0136599  | -15.95| 0.000 | -.2447016 to -.1911568 |
| in-kind payment and other| -.0059409 | .0104437  | -0.59 | 0.557 | -.0375999 to .0257062 |
| education level          |           |           |       |       |                     |
| primary school           | -.0419216 | .0188647  | -2.23 | 0.025 | -.0791295 to -.0047137 |
| secondary school         | -.0080243 | .0144478  | -0.56 | 0.577 | -.0374222 to .0113732 |
| high school              | -.113712  | .0405104  | -2.81 | 0.005 | -.1936295 to -.0337947 |
| agecat                   |           |           |       |       |                     |
| (25-35)                  | -.1363823 | .0111965  | -12.12| 0.000 | -.1586271 to -.1141376 |
| (36-60)                  | -.3333334 | .019517   | -17.14| 0.000 | -.3624063 to -.3042605 |
| sex                      |           |           |       |       |                     |
| female                   | .0619514  | .0075929  | 8.16  | 0.000 | .0476966 to .0762063 |

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

Appendix 1: margins compensation educatlev agecat sex, pr(out(1))

|                          | dy/dx    | Std. Err. | z     | P>|z|   | [95% Conf. Interval] |
|--------------------------|----------|-----------|-------|-------|---------------------|
| compensation             | Delta-method |          |       |       |                     |
| fixed cash payment       | .3688023 | .0123892  | 29.75 | 0.000 | .3443257 to .3932788 |
| Variable cash payment    | .0337163 | .0090843  | 16.17 | 0.000 | .0156278 to .0517962 |
| in-kind payment and other| .0285365 | .0098296  | 10.25 | 0.000 | .0194882 to .0375847 |
| education level          |           |           |       |       |                     |
| out-of-school            | .0000364 | .0044277  | 17.67 | 0.000 | .0000265 to .0000463 |
| primary school           | .0722595 | .0046013  | 16.09 | 0.000 | .0636566 to .0808624 |
| secondary school         | .1288139 | .0048114  | 27.77 | 0.000 | .1195891 to .1380384 |
| high school              | .1816805 | .012714    | 14.51 | 0.000 | .1563297 to .2070313 |
| agecat                   |           |           |       |       |                     |
| (16-24)                  | .0696392 | .0095999  | 14.07 | 0.000 | .0599357 to .0793427 |
| (25-35)                  | .0918938 | .0072465  | 33.45 | 0.000 | .0765107 to .1072769 |
| (36-66)                  | .1616223 | .0145619  | 39.67 | 0.000 | .1326012 to .1906436 |
| sex                      |           |           |       |       |                     |
| male                     | .0574707 | .0029568  | 46.93 | 0.000 | .0536491 to .0612923 |
| female                   | .0853983 | .0038438  | 28.06 | 0.000 | .0784355 to .0923611 |
Appendix 2: margins compensation educatlevel agecat sex, pr(out(3))

| compensation                  | Margin  | Std. Err. | z      | P>|z|    | 95% Conf. Interval |
|-------------------------------|---------|-----------|--------|--------|-------------------|
| Fixed cash payment            | .9217453| .0039939  | 5.44   | .000   | .9197474 to .923733 |
| Variable cash payment         | .574633 | .0051823  | 110.87 | .000   | .5644061 to .5847655 |
| in-kind payment and other     | .379016 | .0068799  | 54.11  | .000   | .3566138 to .3934181 |

| educatlevel                   |         |           |        |        |                   |
|--------------------------------|---------|-----------|--------|--------|-------------------|
| out-of-school                 | .433566 | .004893   | 88.66  | .000   | .4239158 to .443216 |
| primary school                | .463915 | .002432   | 55.18  | .000   | .4448622 to .4831679 |
| secondary school              | .446184 | .011207   | 39.46  | .000   | .4234184 to .4689768 |
| high school                   | .425713 | .042653   | 10.00  | .000   | .343114 to .510312  |

| agecat                        |         |           |        |        |                   |
|--------------------------------|---------|-----------|--------|--------|-------------------|
| (16-24)                       | .252969 | .008259   | 30.63  | .000   | .236782 to .2691579 |
| (25-35)                       | .417087 | .0050462  | 71.34  | .000   | .4056366 to .4285554 |
| (36-69)                       | .524921 | .0052406  | 169.91 | .000   | .5046534 to .5459891 |

| sex                           |         |           |        |        |                   |
|--------------------------------|---------|-----------|--------|--------|-------------------|
| male                          | .460892 | .0046214  | 99.73  | .000   | .451835 to .4699587 |
| female                        | .411812 | .0062899  | 77.76  | .000   | .3886576 to .423374 |

Appendix 3: 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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