# Age-Labor Income Profile

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# Research Question

To what extent do labor income models capture the structural determinants of income, and how does the balance between their interpretability and predictive accuracy affect their usefulness for policymaking?

Is there empirical evidence of a non-linear (concave) relationship between age and labor income in Bogotá, and how does this relationship change when controlling for hours worked and type of employment?

# Data

Table 1: Summary statistics for continuous variables

| | Promedio | SD | Min | P10 | Mediana | P90 | Max |
|---|---|---|---|---|---|---|---|
| Ingresos laborales por hora | 8.541.87 | 13.866.13 | 0.47 | 2.333.33 | 4.837.49 | 16.855.89 | 350.583.3 |
| mes | 6.5 | 3.36 | 1 | 2 | 6 | 11 | 12 |
| total_hours | 47.6 | 15.16 | 1 | 30 | 48 | 66 | 130 |
| Edad | 38.89 | 13.2 | 18 | 23 | 37 | 58 | 91 |
| y_total_m | 1.617.551 | 2.431.319 | 84 | 400.000 | 992.744.7 | 3.033.333 | 70.000.000 |
| N. menores de edad en el hogar | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N. adultos mayores inactivos en el hogar | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

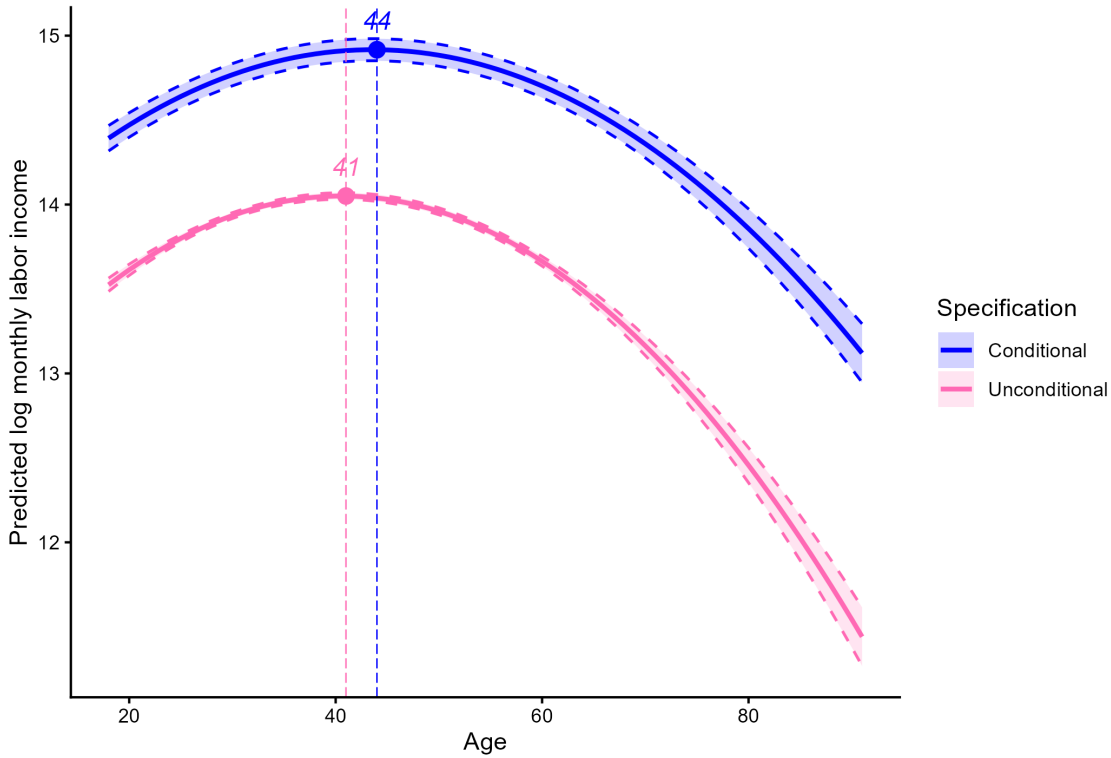
# Data

Table 2: Distribution of categorical variables

| | N | % | Promedio | SD |
|---|---|---|---|---|
| Sexo | | | | |
| Male | 7,775 | 52.7% | 8,876 | 14,765 |
| Female | 6,989 | 47.3% | 8,170 | 12,782 |
| Máximo nivel educativo | | | | |
| Complete secondary | 4,812 | 32.6% | 5,123 | 4,599 |
| Tertiary education | 6,115 | 41.4% | 13,958 | 19,810 |
| Complete primary | 1,346 | 9.1% | 4,265 | 2,824 |
| Incomplete primary | 662 | 4.5% | 3,679 | 2,047 |
| Incomplete secondary | 1,732 | 11.7% | 4,399 | 2,913 |
| None | 97 | 0.7% | 3,234 | 2,694 |
| Formalidad | | | | |
| Formal | 8,894 | 60.2% | 10,990 | 16,350 |
| Informal | 5,870 | 39.8% | 4,833 | 7,466 |
| Posición ocupacional | | | | |
| Public sector employee | 571 | 3.9% | 17,101 | 12,260 |
| Private sector employee | 8,757 | 59.3% | 8,587 | 13,101 |
| Self-employed | 4,391 | 29.7% | 7,283 | 13,309 |
| Domestic worker | 563 | 3.8% | 4,087 | 1,672 |
| Employer | 473 | 3.2% | 14,451 | 28,890 |
| Other | 8 | 0.1% | 3,334 | 2,961 |
| Day laborer | 1 | 0% | 4,375 | NA |
| Cantidad de trabajadores de la empresa | | | | |
| Self-employed | 3,542 | 24% | 6,068 | 12,177 |
| 2–5 employees | 2,754 | 18.7% | 5,767 | 10,143 |
| 6–10 employees | 1,033 | 7% | 6,369 | 7,494 |
| 11–50 employees | 1,886 | 12.8% | 8,628 | 14,147 |
| More than 50 employees | 5,549 | 37.6% | 11,873 | 16,364 |

# Results

Figure 1: Descriptive Statistic Continuos variables



# Results

| | Log Monthly Labor Income | | |
|---|---|---|---|
| | Linear | Quadratic (Unconditional) | Quadratic (Conditional) |
| | (1) | (2) | (3) |
| Constant | 14.0*** | 12.4*** | 12.8*** |
| | (0.023) | (0.064) | (0.070) |
| Age | -0.003*** | 0.084*** | 0.070*** |
| | (0.0006) | (0.003) | (0.003) |
| Age squared | | -0.001*** | -0.0008*** |
| | | $(3.76 \times 10^{-5})$ | $(3.43 \times 10^{-5})$ |
| Total hours worked | | | 0.013*** |
| | | | (0.0004) |
| = Privatesectoremployee | | | -0.756*** |
| | | | (0.034) |
| = Self-employed | | | -1.24*** |
| | | | (0.035) |
| = Domesticworker | | | -1.45*** |
| | | | (0.047) |
| = Employer | | | -0.529*** |
| | | | (0.049) |
| = Other | | | -1.94*** |
| | | | (0.281) |
| = Daylaborer | | | -1.41* |
| | | | (0.790) |
| Number of observations | 14,764 | 14,764 | 14,764 |
| $R^2$ | 0.00187 | 0.05000 | 0.22643 |
| Adjusted $R^2$ | 0.00180 | 0.04987 | 0.22596 |
| Root Mean Squared Error | 0.89556 | 0.87370 | 0.78841 |

# Discussion

## 1. Evidence of a Non-Linear and Concave Age–Income Profile

The quadratic specifications show a positive coefficient on age and a negative coefficient on age$^2$, generating a **concave age–earnings profile**. There is clear evidence of an **earnings peak within the observed age range**, around 40 years.

In contrast, the linear model fails to capture this non-linearity and exhibits very low explanatory power.

- Results are consistent with the theory: "Earnings rise at a diminishing rate over the working life, and decline when net investment becomes negative, as in old age. The typical (logarithmic) working-life earnings profile is, therefore, concave" (Mincer, 1974)

# Discussion

## 2. Effect of Conditioning on Hours Worked and Employment Type

Including controls for hours worked and employment type shifts the estimated **earnings peak to slightly older ages (approximately 41–43 years)** and substantially improves model fit.

This suggests that part of the observed non-linearity is driven by differences in labor intensity and occupational structure, rather than solely by human capital accumulation.

- Including hours worked as a control is crucial, since "any analysis of labor supply requires an understanding of ... hours of work" (Blundell & MaCurdy, 1999).

# Discussion

## 3. Economic Interpretation in the Context of Bogota's Labor Market

The results support the theoretical prediction of a concave life-cycle earnings profile. However, the shape of the profile is influenced by labor market characteristics such as occupational heterogeneity and variation in working hours.

Overall, the observed age–income pattern reflects both experience accumulation and structural labor market factors.

- This result is consistent with Bogota's labor-market structure, where informality is substantial: "Medellín or Bogotá, have [informality] rates of about 50%" (García, 2013).

# References

Mincer, J. A. (1974). Schooling, Experience, and Earnings. National Bureau of Economic Research.

Blundell, R., & MaCurdy, T. (1999). Labor supply: A review of alternative approaches. In O. Ashenfelter & D. Card (Eds.), Handbook of Labor Economics (Vol. 3A). Elsevier.

García, G. A. (2013). Labor informality: choice or sign of segmentation? A Quantile Regression Approach at the Regional Level for Colombia (Preliminary version).