Income Mobility in Ecuador:
New evidence from individual income tax returns

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Outline

- Goals of the paper

- Motivation

- Literature review

- Data and methodology

- Main findings

- Concluding remarks

1. Goals of this paper

- Analyze income mobility in Ecuador with a focus on the top and on the middle of the distribution. This study is based on income tax returns database from 2004 to 2011.

- We study whether the evolution of top income shares has been accompanied by an increase or a decrease in mobility for the high income groups.

- We study whether there is a surge of an Ecuadorian middle class.

- We analize the factors associated with income mobility over the 2008-2011 period.

2. Motivations

- The first motivation is based on the growing interest in the study of income inequality at the top of the distribution using income tax data and national accounts (Piketty 2001, 2003).

- Method: Kuznets (1953), Atkinson and Piketty (2007, 2010).

- Top income series in more than 26 countries.

The World Top Incomes Database
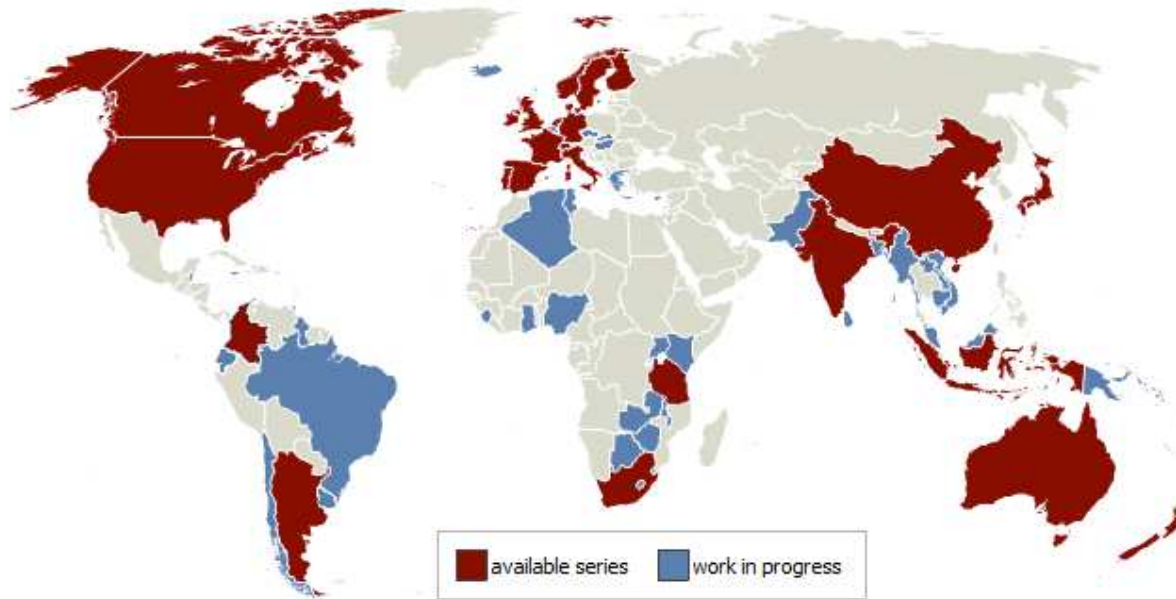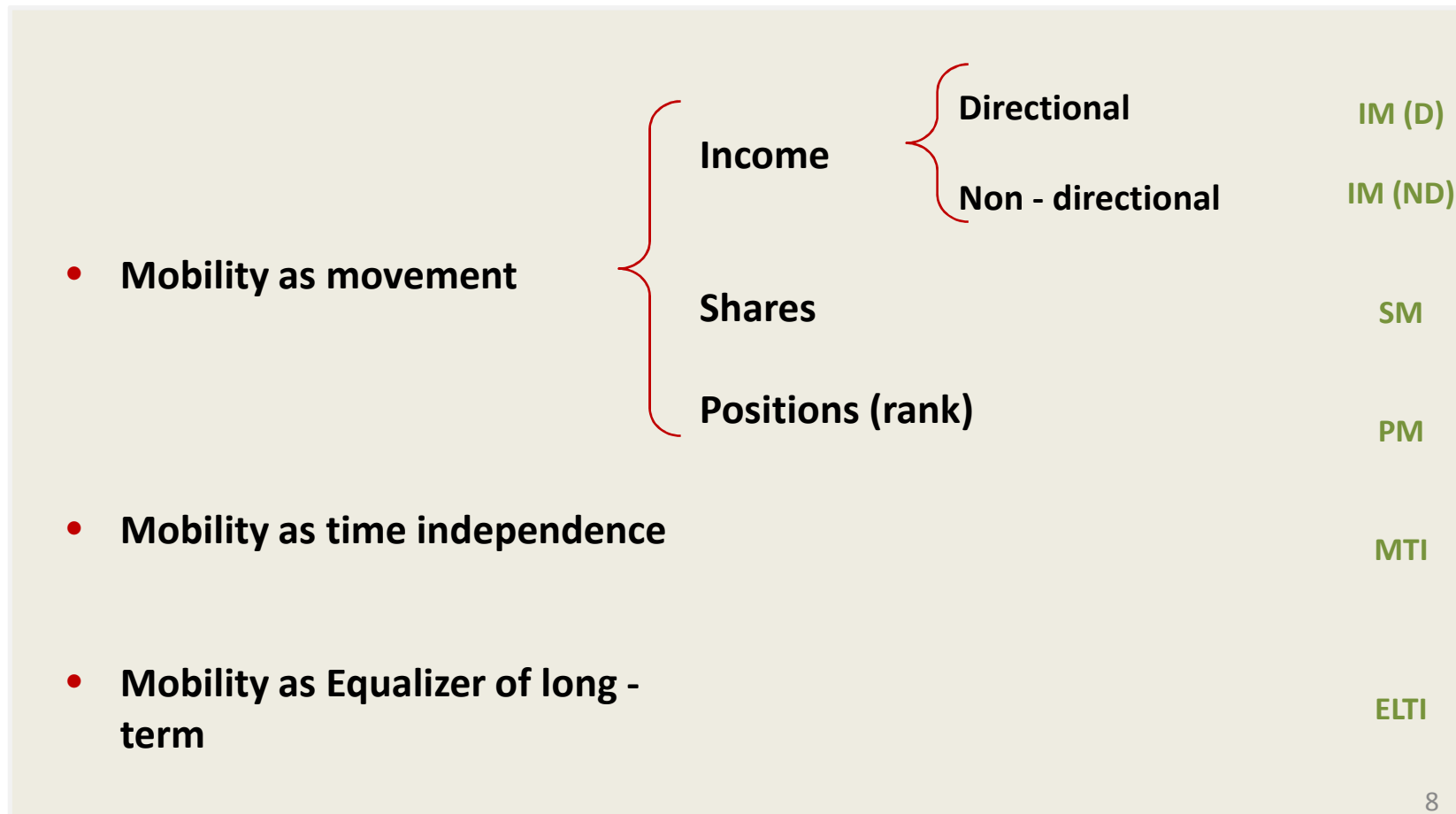
2. Motivations

- The second motivation is based on the study of intragenerational mobility.

- A recent economic report from the World Bank documented that almost 43% of Latin American individuals had experienced changes in their economic status over the last years.

- Mostly upward movements.

- In Ecuador estimates of income mobility are scarce mainly due to lack of appropriate data.

3. Literature review

- Sociological and economic approaches of mobility. In this paper we focus on an economic approach.

- Literature on income mobility is vast : there is not a harmonized framework of mobility measurement. Mobility might connotes different ideas to different researchers.

- An important review of conceptual and methodological issues is provided in Fields (2000), Atkinson et al (2001), Jenkins and Van Kerm (2006), ,Fields (2008), Burkhauser and Couch (2011), Jantti and Jenkins (2013)

- Drawing on the taxonomy by Fields (2001) :
  - Two different magnitudes : intra-generational and intergenerational
  - Three broad conceptions of mobility
  - These concepts do capture very different aspects of mobility

- **Mobility as movement**
  - **Income**
    - **Directional** — IM (D)
    - **Non - directional** — IM (ND)
  - **Shares** — SM
  - **Positions (rank)** — PM

- **Mobility as time independence** — MTI

- **Mobility as Equalizer of long - term** — ELTI

3. Literature review on top incomes

Author	Country	Data	Findings
Intra-generational mobility			
Auten and Gee (2009) Auten et al. (2013)	United States : 1987 – 2005 United States : 2005 - 2010	Income tax returns	40% placed in the top 1% remains at the top in 2005. And more than 50% moved to a different centile.
Kopczuk (2010)	United States, since 1937	Social Security administration	There is not mobility at the top. 60% probability of remains at the top.
Saez & Veall (2005)	Canada : 1982 - 2000	Income tax returns	Not mobility at the top ; probability stay 60%
Landais (2009)	France : 1996 - 2006	Income tax returns	Not mobility at the top : probability stay 67%
Intergenerational mobility			
Chetty (2014)	United States : 1996 - 2012	Federal income tax	Mobility depends on the geographical area and the fact of moving is driving by factors like ethnic origin, parent's income level, family characteristics, social networks, etc. But not for top 1%.
Bjorklund et al (2012)	Sweden	Income tax returns	Transmitions between fathers and sons at the top is very strong. Elasticity of almost 0.9.

3.1 Hypotheses

- **H1:** Income inequality declining trend has not improve income mobility at the very top.

- **H2:** There is a high degree of upward income mobility in Ecuador over the past years.

- **H3:** Upward mobility is mainly explained by the initial position in the income distribution.

- **H4:** The upward *economic effect* of education on income mobility should be more or as important as initial position.

4. Data

- Longitudinal micro data from income tax returns from 2004 to 2011. The universe of tax filers.

- Information from 3 different types of tax form:
  - 107: salaries and wages
  - 102a: wages, self-employment income, capital returns and other possible source of income.
  - 102: income information (labor and capital) for individuals who required to keep accounting books.

- For instance: 2.3 million tax filers in 2011

- Unit of observation : individuals

- Anonymous data

4. Data

- Advantages of tax statistics:

    - Tax data are relatively homogenous within a country.

    - Provide a better picture of the top and the middle of the distribution.

    - Provide composition of incomes.

    - Real panel database.

- Disadvantages of tax statistics:

    - Evasion and elusion.

    - Tax reforms change the definition of income across time.

4. Data

- Information on individual characteristics of tax filers from the Ecuadorian Civil Registry.

- Six explanatories variables.
  - Initial position in the income distribution: i.e. 10 deciles
  - Age: -20 years, 20-29, 30-39, 40-49, 50-59 and 60 + years
  - Gender: 1=men, 0=women
  - Marital status: 1=married, 0=otherwise
  - Level of education: 1=high school and more, 0 less than high school.
  - Geographical region: North, Center, South, Coast, Pichincha and Guayas.

5. Methodology

1. We construct annual series on top shares of income by relating the amounts of individual income tax returns (numerator of the share) to a comparable control total for full population (denominator of the share).

    –   Income definition : income reported on tax returns that includes salaries and wages, self-employment and small business, rents and capital income (interest and dividends) and items reported as other income: long term capital gains, inheritances, donations and legal deductions to obtain income.

    –   Income definition is before personal income taxes and employee payroll taxes.

    –   Top 1% (P99 – P100), top 0.5% (P99.5-100), top 0.1% (P99.9-100), top 0,01 (P99.99-100) etc.

5. Methodology

- To construct incomes shares : income of each fractile / control income reported by household surveys.

- Period: 2004-2011

• Control for total income

- Total income from Ecuadorian household survey ENEMDU

- wages, self-employment, capital, transfers, secondary income. (~65% of GDP)

• Control for total population

- Information from ENEMDU

- Adult population (economically active population) age 20 and older.

5. Methodology

- Top income persistence: we calculate the probability of remaining in the top 1%, top 0.1% and the top 0.01% after different periods of time (Saez and Veall, 2005; Landais, 2009)

- Transitions between top fractiles: Using transitions matrices we examine movements of individuals across top fractiles.

2. We analyze mobility for all tax filers from 2004-2011.

   - Income deciles are constructed relative to the tax filing population.

5. Methodology

3. Factors associated with mobility in Ecuador 2008 - 2011: we estimate transition probabilities of upward or downward movements while controlling for control variables:

    – Counting procedure

    – Multinomial logit model

    – Generalized ordered logit model

- Tax filers in 2008: 1.9 million

- Tax filers in 2011: 2.3 million
    - Control by initial position: 1.4 million of observations
    - With all control variables: 737.891 observations

Methodological limitation : how many income centiles?

We use two additional methods:

- A multinomial logit model to assess upward or downward movements of at least 10 centiles from a given initial position.

- A logistic model where the dependent variable measures the change in the percentile position of an individual from 2008 to 2011.

Main findings

Table 4. Thresholds and average incomes in top groups within the top percentile, Ecuador 2011

| Thresholds | Income threshold | | Income Groups | Number of tax units | Average income | |
| | US$ | US$ (PPP) | | | US$ | US$ (PPP) |
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Full Population	9 408 267	$9 417	$17 896
P90	$7 141	$13 572	Top 10-5%	470 413	$28 648	$54 446
P95	$12 898	$24 512	Top 5-1%	376 331	$32 350	$61 481
P99	$33 800	$64 236	Top 1-0.5%	47 041	$91 712	$174 298
P99.5	$47 537	$90 342	Top 0.5-0.1%	37 633	$102 172	$194 176
P99.9	$98 236	$186 695	Top 0.1-0.05%	4 704	$299 473	$569 145
P99.95	$138 201	$262 648	Top 0.05-0.01%	3 763	$337 840	$642 059
P99.99	$313 641	$596 071	Top 0.01% - Top 0,001%	847	$773 507	$1 470 039
P99.999	$1 132 662	$2 152 608	Top 0,001%	94	$2 893 022	$5 498 146

Note : In 2011 for Ecuador PPP US$ 1 = 0,52618

Note 2 : Computations are based on income tax returns statistics.

Fig 1. Income Share of the top 1 percent in Ecuador 2004 - 2011
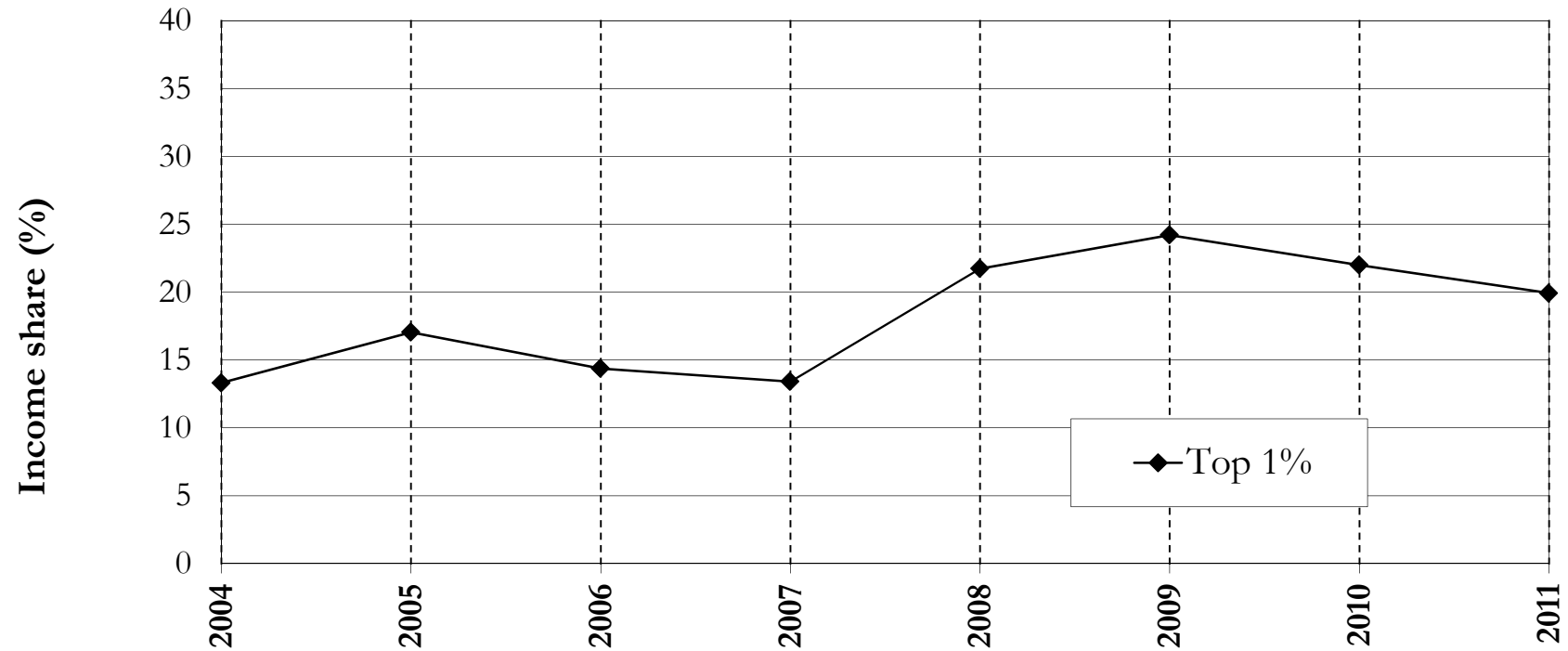
Source: Author's calculation based on individual income tax returns.
Number of tax units is estimated. Total income is estimated from household surveys.
Top shares are obtained from income tax returns statistics.

In 2011 almost 20% of total income goes to the top 1% of the population

Fig 2. Top 1 - 0.5%, Top 0.5 - 0.1%, Top 0.1%
Ecuador, 2004 - 2011
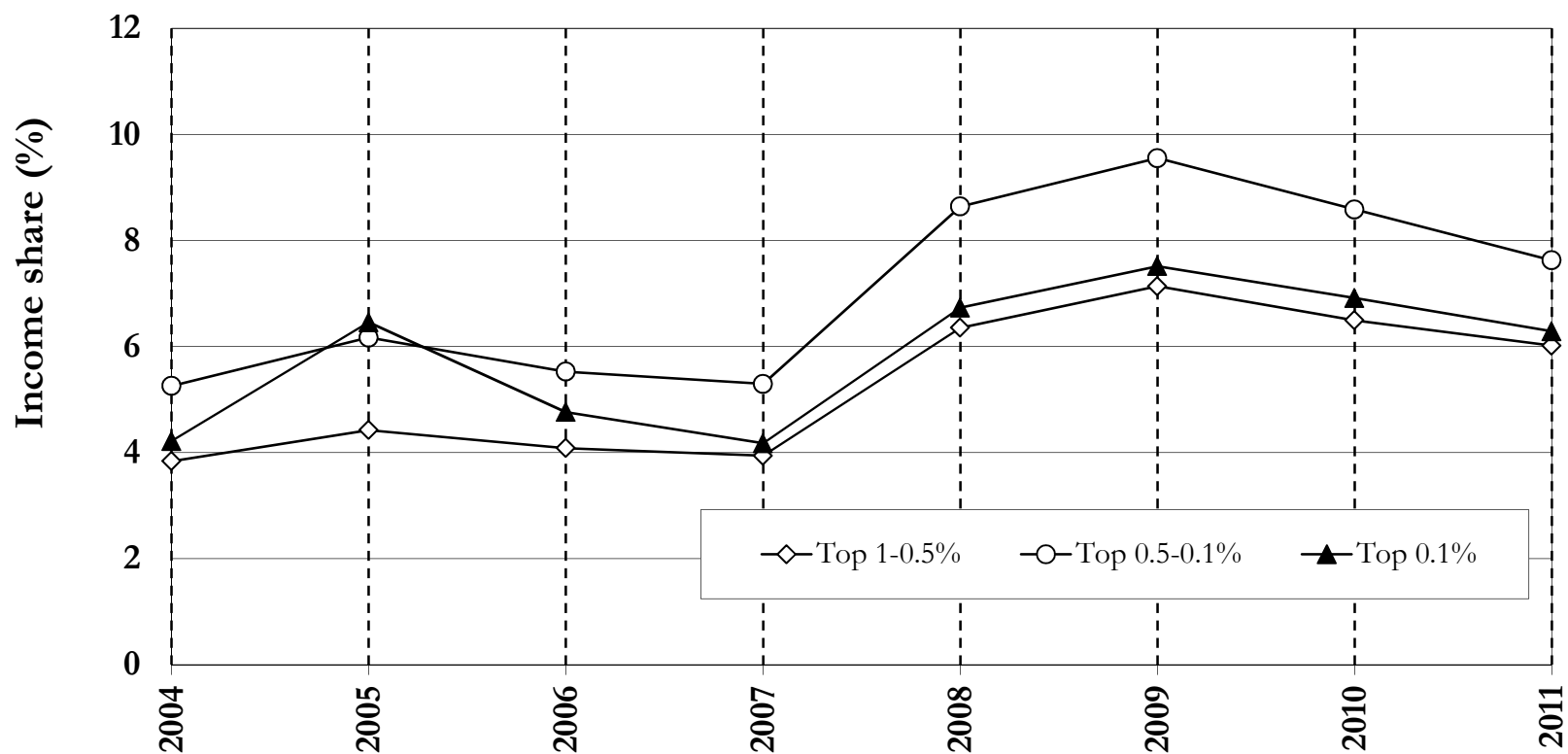
Source: Author's calculation based on individual income tax returns.
Number of tax units is estimated. Total income is estimated from household surveys.
Top shares are obtained from income tax returns statistics.

Fig 3. Evolution of top income mobility in Ecuador (2004 - 2011)
Income mobility among the P99 - P100

A. Probability of staying in the top 1% group
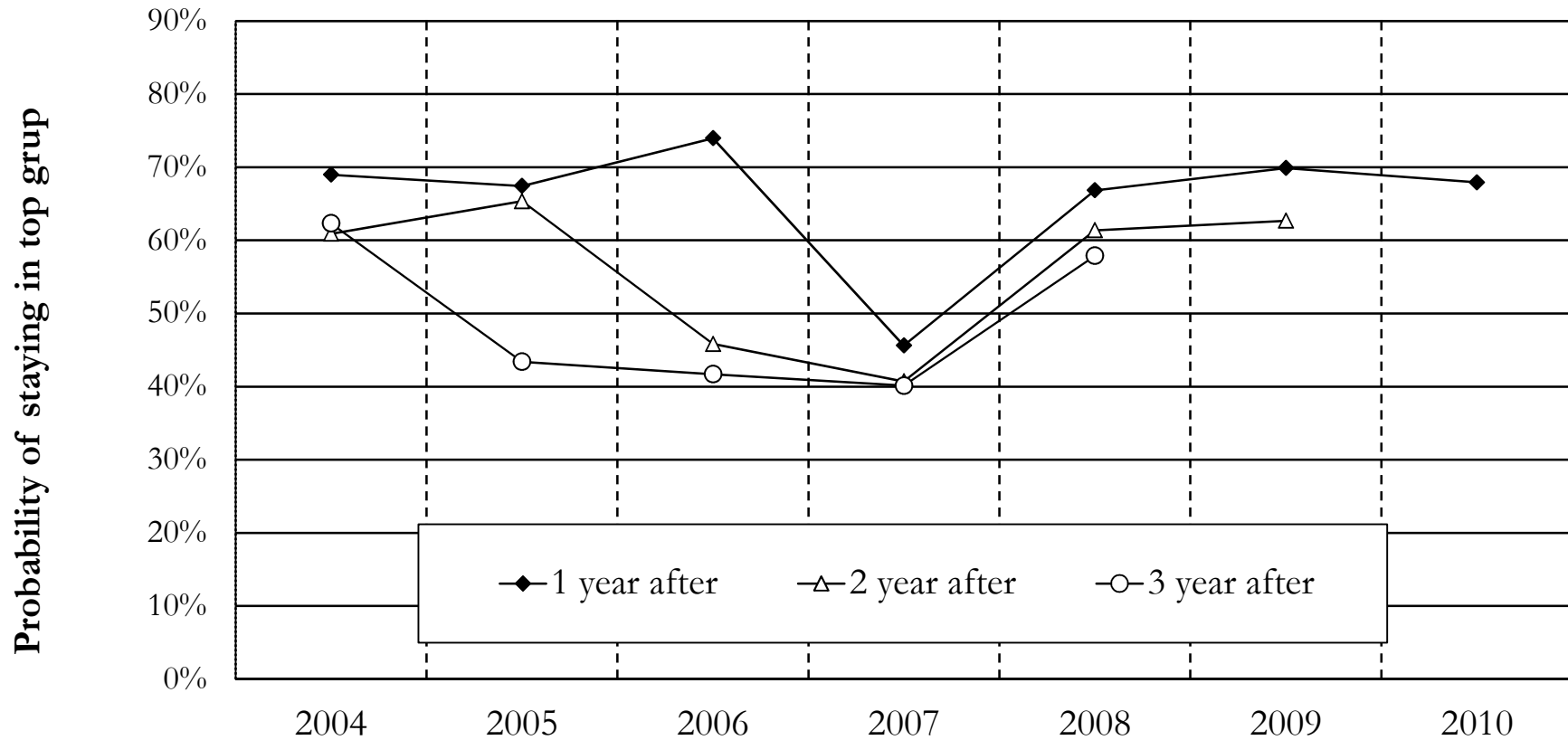
Probabilities on average : 65%, 56%, 49%

Fig 5. Evolution of top income mobility in Ecuador (2004 - 2011)
Income mobility among the P99.99 - P100

C. Probability of staying in the top 0,01% group

Source : Author's computations using individual income tax returns

Probabilities on average : 32%, 19%, 15%

Table 5 : Top Income Mobility in Ecuador (a,b)

Transitions between income fractiles 2004 - 2011

% of net fractile members

Destination 2011

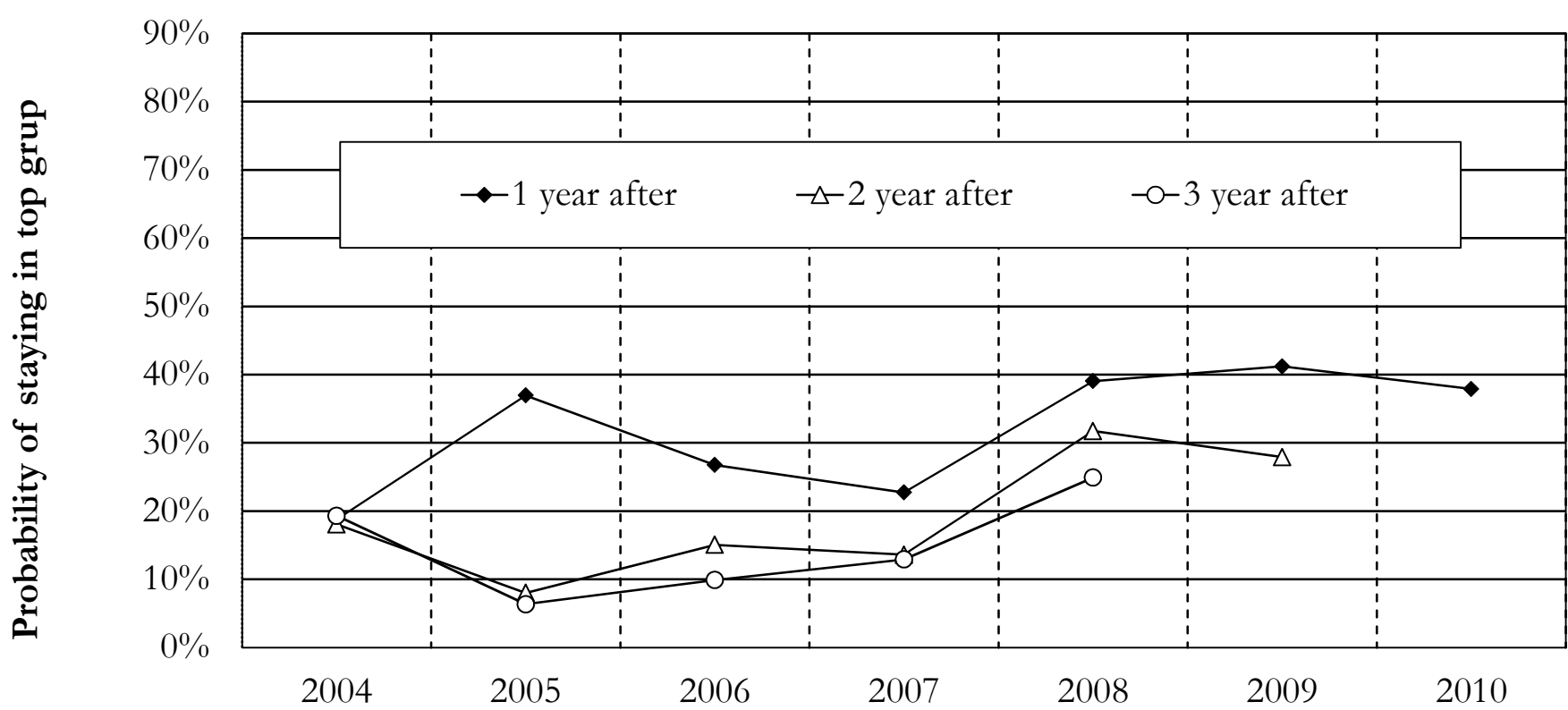| Origin 2004	Bottom 95%	Top 5%	Top 1%	Top 0,5%	Top 0,1%	Top 0,05%	Top 0,01%	Total
Bottom 95%	**77,4**	17,4	2,4	2,2	0,3	0,3	0,1	100
Top 5%	44,3	**48,9**	4,1	2,4	0,2	0,1	0,0	100
Top 1%	19,8	50,0	**17,7**	10,9	0,9	0,6	0,1	100
Top 0,5%	19,4	29,3	21,5	**25,1**	2,8	1,7	0,3	100
Top 0,1%	23,9	18,9	10,2	30,3	**9,3**	6,4	1,1	100
Top 0,05%	24,0	17,2	9,9	23,6	10,6	**11,2**	3,6	100
Top 0,01%	35,0	17,1	7,4	12,5	5,8	12,1	**10,1**	100
Total	61,7	29,7	4,3	3,5	0,5	0,4	0,1	100

(a) Top series are obtained from income tax returns statistics

(b)For top shares, control population and control total income are estimated from household surveys

- Diagonal entries present the « stayers groups»
- Rows correspond to top percentiles at origin (2004)
- Columns correspond to top percentiles at destination (2011)

Top 1%:
- 82% (100%-17%)moved by 2011
- 13% moved up and 70% moved down.
- 50% moved down to top 5%

Top 0.1% = 7.5% moved up
83% moved down but only 23.9% had
dropped to the bottom 95%

Table 6 : Top Income Mobility in Ecuador (a,b)
Transitions between income fractiles 2008 - 2011
% of net fractile members

Destination 2011

Origin 2008	Bottom 95%	Top 5%	Top 1%	Top 0,5%	Top 0,1%	Top 0,05%	Top 0,01%	Total
Bottom 95%	**86,7**	12,0	0,7	0,5	0,1	0,0	0,0	100
Top 5%	24,1	**65,2**	7,1	3,3	0,2	0,1	0,0	100
Top 1%	16,2	30,3	**29,3**	22,2	1,3	0,7	0,1	100
Top 0,5%	19,1	18,6	14,0	**37,2**	6,8	3,7	0,5	100
Top 0,1%	20,3	16,3	8,1	22,9	**13,5**	17,1	2,0	100
Top 0,05%	20,7	14,6	8,3	18,7	8,5	**21,6**	7,6	100
Top 0,01%	24,2	16,8	5,9	10,6	4,7	13,0	**24,9**	100
Total	71,0	23,2	2,9	2,3	0,3	0,2	0,1	100

(a) Top series are obtained from income tax returns statistics

(b) For top shares, control population and control total income are estimated from household surveys

- Diagonal entries present the « stayers groups»
- Rows correspond to top percentiles at origin (2008)
- Columns correspond to top percentiles at destination (2011)

Top 1%:
- 71% (100%-29.3%)moved by 2011
- 24.3% moved up
- 30. 3% moved down to top 5%
- 16% had dropped to the bottom 95%

Top 0.1% = 87% moved. 20% dropped to bottom 95%.

Factors associated with income mobility

Markov transitions probabilities

1. Counting procedure:

$$P_{xj} = \frac{\eta_{xj}}{\sum_{j=1}^{10} \eta_{xj}}$$

Where:

- η_{xj} is the number of tax filers who were in decile x in year t-3 an now are in decile j in year t
- P_{xj} is the probability of a tax filer being in decile j in year t, given that he was in state x in year t - 3

2. Multinomial logit model

$$\Pr(y_i = j | X) = \begin{cases} \dfrac{1}{1 + \Sigma_{m=2}^{10} \exp(X_i \beta_m)}, \text{if } j = 1 \\[4ex] \dfrac{\exp(X_i \beta_j)}{1 + \Sigma_{m=2}^{10} \exp(X_i \beta_m)}, \text{if } j = 2, 3, \dots 10 \end{cases}$$

- where X is the vector of explanatory variables for the ith observation and βj is the vector of parameters to be estimated for each jth outcome.

- The dependent variable takes ten different outcomes: 1 if first decile, 2 if second decile, 3 if third decile, ... 10 if ten decile.

3. Generalized ordered logit model

- Because of natural ordering in the deciles positions, predicted probabilities are calculated:

$$\Pr(y_i = j | X) = \begin{cases} \dfrac{\exp(\alpha_1 - X_i\beta_1)}{1 + \exp(\alpha_i - X_i\beta_1)}, \text{for } j = 1 \\[2em] \dfrac{\exp(\alpha_j - X_i\beta_j)}{1 + \exp(\alpha_j - X_i\beta_j)} - \dfrac{\exp(\alpha_{j-1} - X_i\beta_{j-1})}{1 + \exp(\alpha_{j-1} - X_i\beta_{j-1})}, \text{for } j = 2 \text{ to } J - 1 \\[2em] 1 - \dfrac{\exp(\alpha_{J-1} - X_i\beta_{J-1})}{1 + \exp(\alpha_{J-1} - X_i\beta_{J-1})}, \text{for } j = J \end{cases}$$

- where α are ordered estimated cutpoints and where j ranges from 1 to 10.

Panel A: full population without control variables (probabilities obtained by counting transitions or predicted from generalized ordered logit model, or from multinomial logit model)

Origin 2008		Destination 2011												
N	%	DECILE	1	2	3	4	5	6	7	8	9	10	Total	Total 3
90 940	6,5%	1	16,7	12,8	12,9	11,4	10,6	9,1	7,0	5,5	5,5	8,6	100,0	42,4
110 400	7,8%	2	10,6	13,0	14,8	15,9	15,7	12,5	7,8	5,2	2,8	1,8	100,0	46,4
129 258	9,2%	3	6,8	8,8	12,8	18,2	18,6	14,7	9,6	5,1	3,3	1,9	100,0	51,6
142 433	10,1%	4	4,7	6,1	9,9	24,7	20,5	14,9	9,2	5,2	2,9	1,9	100,0	60,2
151 185	10,7%	5	3,5	4,3	6,1	10,2	22,3	24,0	15,2	7,9	4,0	2,4	100,0	61,5
156 316	11,1%	6	2,4	2,7	3,7	3,8	8,4	26,9	27,8	14,5	6,2	3,7	100,0	69,2
160 197	11,4%	7	1,7	1,6	2,2	1,9	2,9	7,6	29,2	31,7	16,0	5,1	100,0	76,9
162 898	11,6%	8	1,4	1,1	1,5	1,2	1,5	2,8	7,9	34,1	38,6	9,7	100,0	82,5
155 070	11,0%	9	1,8	1,2	1,5	1,3	1,5	2,2	4,1	10,6	42,1	33,7	100,0	86,4
149 800	10,6%	10	2,9	1,1	1,8	1,4	1,4	1,8	2,7	4,3	11,7	71,0	100,0	87,0
1 408 497	100,0%													

- A high degree of mobility especially tax filers of 2nd and 3rd decile : 87% moved by 2011.
- Between 75% and 66% of people placed in the 4th and the 8th decile.
- A much larger portion of individuals moved up to a higher decile than dropped to a lower decile.
- Diagonal entries increases with higher deciles.

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Panel B: sub-sample without control variables (probabilities obtained by counting transitions or predicted from multinomial logit model) or with control variables (probabilities from multinomial logit model)

| Origin 2008 | | Destination 2011 | | | | | | | | | | | | |
N	%	DECILE	1	2	3	4	5	6	7	8	9	10	Total	Total 3
28 996	3,9%	1	15,1	15,0	14,4	13,4	12,6	11,1	7,2	4,6	3,4	3,3	100,0	44,4
50 954	6,9%	2	10,3	12,4	14,5	14,9	16,1	13,6	8,7	5,1	2,9	1,4	100,0	45,4
61 086	8,3%	3	6,8	8,4	11,8	16,7	19,2	15,6	11,1	5,6	3,4	1,6	100,0	51,5
68 311	9,3%	4	4,8	6,0	9,0	24,0	21,6	15,0	9,9	5,3	2,9	1,6	100,0	60,5
85 100	11,5%	5	3,2	4,1	5,9	9,4	23,1	24,6	15,9	8,3	3,7	1,9	100,0	63,5
92 512	12,5%	6	2,0	2,5	3,3	3,3	7,7	27,9	29,3	15,1	5,8	3,1	100,0	72,3
95 860	13,0%	7	1,2	1,5	1,9	1,6	2,7	6,9	30,2	36,3	13,7	4,0	100,0	80,2
95 297	12,9%	8	0,9	1,0	1,1	0,9	1,2	2,4	7,6	40,0	37,0	7,9	100,0	84,9
86 509	11,7%	9	0,9	0,8	1,1	0,8	1,0	1,7	3,3	9,5	48,3	32,6	100,0	90,4
73 266	9,9%	10	1,0	0,6	1,0	0,8	0,9	1,3	1,9	3,4	11,4	77,7	100,0	92,6
737 891	100,0%													

- Results suggest that individuals placed into the middle deciles (3th to 8th) are more likely to experience upward movements (56% on average) than a downward movement (19% on average) or simply no movement (25% on average).

Panel C: sub-sample with control variables (transition probabilities from generalized ordered logit model)

Origin 2008		Destination 2011												
N	%	DECILE	1	2	3	4	5	6	7	8	9	10	Total	Total 3
28 996	3,9%	1	*14,8*	**14,8**	**14,3**	13,6	12,9	11,3	7,2	4,7	3,2	3,2	100,0	43,9
50 954	6,9%	2	10,3	**12,4**	**14,4**	**14,8**	*16,3*	13,7	8,7	5,1	2,8	1,4	100,0	45,5
61 086	8,3%	3	6,8	8,4	**11,8**	**16,4**	*19,2*	15,7	11,1	5,7	3,3	1,5	100,0	51,3
68 311	9,3%	4	4,8	6,0	9,1	*23,5*	**21,6**	**15,2**	10,0	5,4	2,8	1,6	100,0	60,3
85 100	11,5%	5	3,2	4,1	5,9	9,4	**22,8**	*24,7*	**16,1**	8,3	3,7	1,9	100,0	63,6
92 512	12,5%	6	1,9	2,4	3,2	3,6	7,8	**27,5**	*29,4*	**15,2**	5,9	3,1	100,0	72,1
95 860	13,0%	7	1,2	1,4	1,9	1,8	2,8	7,0	**29,8**	*36,3*	**13,9**	4,0	100,0	80,0
95 297	12,9%	8	0,8	0,9	1,1	1,0	1,3	2,5	7,7	*39,7*	**37,0**	**8,0**	100,0	84,7
86 509	11,7%	9	0,8	0,7	0,9	0,9	1,1	1,7	3,4	**9,5**	*48,0*	**32,8**	100,0	90,3
73 266	9,9%	10	0,9	0,5	0,9	0,8	0,9	1,3	2,0	**3,6**	**11,5**	*77,7*	100,0	92,8
737 891	100,0%													

This table reports mean values of transition probabilities from positions in the income distribution in 2008 to decile positions in 2011. Deciles are computed on the entire tax filing population but transitions probabilities are computed for survivors in 2011. In models with control variables, predicted probabilities are conditioned by previous position in income distribution, birth region, age, gender, marital status, and education. The most important probability by decile is in italic and in blue. The three most important probabilities are in bold. Their sum is in column "Total 3".

Results suggest that individuals placed into the middle deciles (3th to 8th) are more likely to experience upward movements (56% on average) than a downward movement (19% on average) or simply no movement (25% on average).
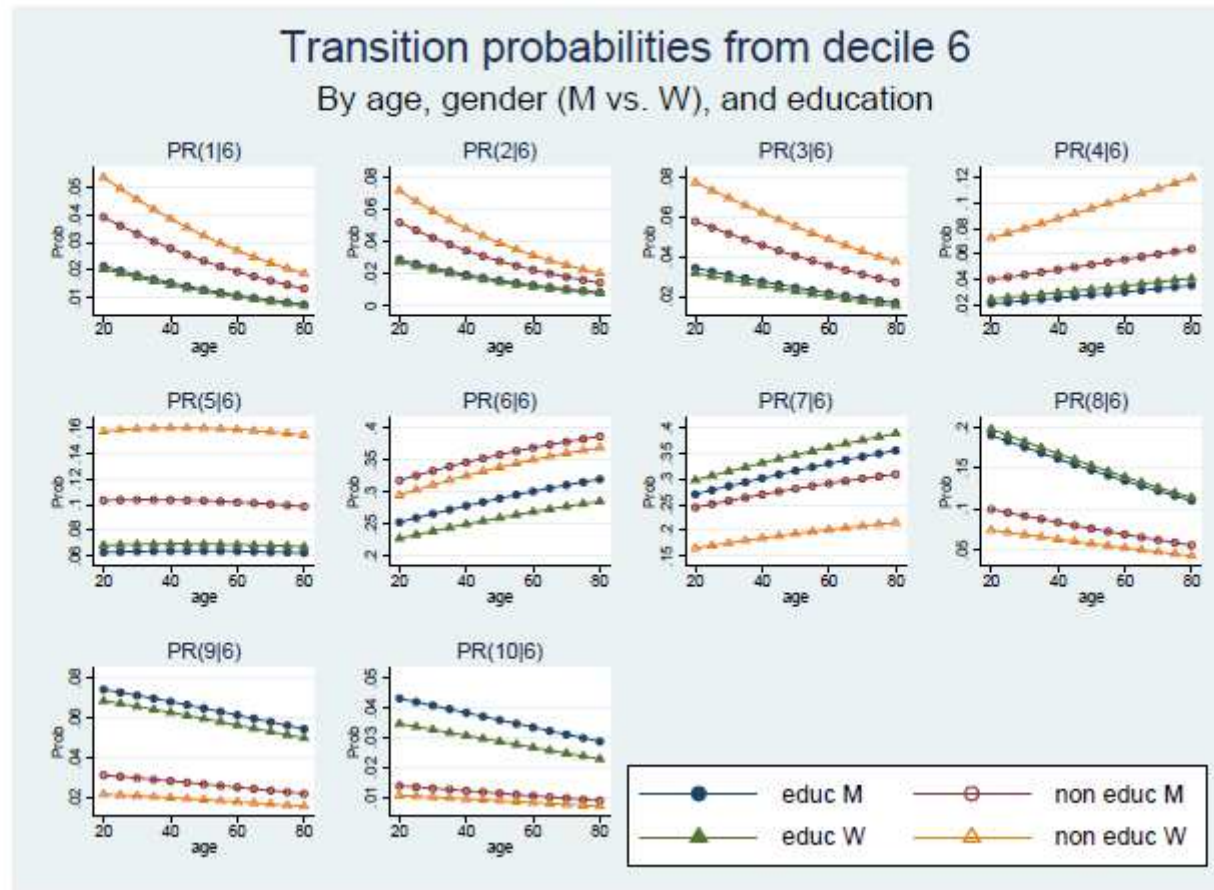
Figure 11

Transition probabilities from decile 6
By age, gender (M vs. W), and education

- Changes in predicted probabilities suggest that having a scholar degree highly influences the probability of moving across the income distribution.
- Probabilities of moving up are higher for those starting in the 6th decile and who have a scholar degree.
- Probabilities of falling to the lowest deciles are higher for those starting in the 6th decile and without a scholar degree.

How many income centiles?

4. Strong movements predicted by a multinomial logit model

$$\Pr(y_i = j | X) = \begin{cases} \dfrac{1}{1 + \Sigma^3_{m=1}\, \exp(X_i \beta_m)}, \text{if } j = 1 \\[4mm] \dfrac{\exp(X_i \beta_j)}{1 + \Sigma^3_{m=1}\, \exp(X_i \beta_m)}, \text{if } j = 2, 3 \end{cases}$$

- where X is the vector of explanatory variables for the ith observation and βj is the vector of parameters to be estimated for each jth outcome.

- The dependent variable takes three different outcomes: **1** if not movement or weak movement, **2** if strong upward movement, and **3** if strong downward movement. Where strong means a movement superior to 10 centiles.

- Probabilities of strong upward or downward mobility are estimated relative to the base category of « weak movement »

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Downward and upward movements of at least 10 centiles (Logit Multinomial)

	(1) upward	(1) downward	(2) upward	(2) downward	(3) upward	(3) downward	(4) upward	(4) downward	(5) upward	(5) downward	(6) upward	(6) downward
dec1	3.053*	na	2.758*	na	2.438*	na	1.144*	na	0.849*	na	0.635*	na
	(0.023)		(0.028)		(0.039)		(0.031)		(0.024)		(0.020)	
dec2	2.484*	0.155*	2.247*	0.145*	2.155*	0.133*	0.997	0.135*	0.742*	0.130*	0.555*	0.113*
	(0.017)	(0.002)	(0.021)	(0.003)	(0.029)	(0.004)	(0.026)	(0.004)	(0.020)	(0.004)	(0.016)	(0.004)
dec3	2.182*	0.362*	1.973*	0.338*	2.067*	0.345*	0.961	0.365*	0.710*	0.352*	0.532*	0.307*
	(0.014)	(0.004)	(0.018)	(0.005)	(0.027)	(0.007)	(0.025)	(0.010)	(0.019)	(0.010)	(0.015)	(0.010)
dec4	0.969*	0.332*	0.877*	0.311*	0.830*	0.298*	0.394*	0.329*	0.290*	0.319*	0.217*	0.279*
	(0.006)	(0.003)	(0.008)	(0.004)	(0.010)	(0.005)	(0.010)	(0.008)	(0.008)	(0.008)	(0.006)	(0.008)
dec5	0.862*	0.376*	0.778*	0.352*	0.717*	0.310*	0.342*	0.350*	0.237*	0.345*	0.176*	0.299*
	(0.005)	(0.003)	(0.007)	(0.004)	(0.008)	(0.005)	(0.009)	(0.009)	(0.006)	(0.009)	(0.005)	(0.009)
dec6	0.673*	0.287*	0.608*	0.270*	0.537*	0.221*	0.270*	0.263*	0.172*	0.264*	0.127*	0.228*
	(0.004)	(0.002)	(0.005)	(0.003)	(0.006)	(0.004)	(0.007)	(0.006)	(0.004)	(0.007)	(0.004)	(0.007)
dec7	0.556*	0.217*	0.505*	0.205*	0.409*	0.156*	0.207*	0.187*	0.125*	0.191*	0.092*	0.165*
	(0.003)	(0.002)	(0.004)	(0.002)	(0.005)	(0.003)	(0.005)	(0.005)	(0.003)	(0.005)	(0.003)	(0.005)
dec8	0.314*	0.176*	0.285*	0.167*	0.192*	0.116*	0.099*	0.144*	0.057*	0.150*	0.042*	0.129*
	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.004)	(0.001)	(0.004)
dec9	0.093*	0.221*	0.084*	0.209*	0.059*	0.131*	0.033*	0.176*	0.019*	0.185*	0.014*	0.160*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)	(0.005)	(0.000)	(0.005)
dec10	na	0.250*	na	0.234*	na	0.130*	na	0.181*	na	0.191*	na	0.166*
		(0.002)		(0.003)		(0.002)		(0.004)		(0.005)		(0.005)
pichincha			1.074*	1.121*	1.215*	1.246*	1.185*	1.210*	1.117*	1.238*	1.118*	1.238*
			(0.009)	(0.012)	(0.013)	(0.018)	(0.013)	(0.018)	(0.012)	(0.018)	(0.012)	(0.018)
guayas			1.227*	1.130*	1.474*	1.301*	1.436*	1.255*	1.351*	1.275*	1.346*	1.273*
			(0.010)	(0.012)	(0.017)	(0.020)	(0.017)	(0.019)	(0.016)	(0.020)	(0.016)	(0.020)
coast			1.030*	1.087*	1.046*	1.112*	1.066*	1.133*	1.053*	1.133*	1.045*	1.128*
			(0.009)	(0.012)	(0.012)	(0.018)	(0.013)	(0.018)	(0.013)	(0.018)	(0.013)	(0.018)
center			1.119*	0.934*	1.107*	0.897*	1.130*	0.910*	1.077*	0.923*	1.073*	0.922*
			(0.010)	(0.011)	(0.013)	(0.015)	(0.014)	(0.015)	(0.013)	(0.015)	(0.013)	(0.015)
south			1.116*	0.979	1.241*	0.988	1.291*	1.012	1.241*	1.032	1.234*	1.030
			(0.011)	(0.012)	(0.016)	(0.017)	(0.017)	(0.018)	(0.016)	(0.018)	(0.016)	(0.018)
age19							1.602*	1.310*	1.303*	1.367*	1.348*	1.386*
							(0.047)	(0.047)	(0.039)	(0.050)	(0.040)	(0.051)
age20_29							2.555*	1.124*	2.007*	1.183*	2.061*	1.193*
							(0.058)	(0.022)	(0.046)	(0.024)	(0.048)	(0.024)
age30_39							2.173*	0.823*	1.770*	0.862*	1.812*	0.868*
							(0.049)	(0.016)	(0.041)	(0.017)	(0.042)	(0.017)

age40_49		1.608*	0.634*	1.338*	0.663*	1.364*	0.666*
		(0.037)	(0.013)	(0.031)	(0.014)	(0.032)	(0.014)
age50_59		1.073*	0.524*	0.965	0.540*	0.975	0.541*
		(0.027)	(0.012)	(0.024)	(0.012)	(0.024)	(0.012)
gender				1.199*	1.118*	1.667*	1.319*
				(0.008)	(0.009)	(0.027)	(0.027)
married				1.044*	0.964*		
				(0.007)	(0.008)		
education				2.015*	0.845*		
				(0.015)	(0.008)		
marriedman						1.090*	0.982
						(0.009)	(0.010)
marriedwoman						0.974	0.937*
						(0.010)	(0.013)
educman						1.809*	0.802*
						(0.015)	(0.009)
educwoman						2.874*	1.009
						(0.043)	(0.020)
Obs.	1 408 497	1 408 497	737 891	737 891	737 891	737 891
Chi2 statistic	430313.03	430980.62	268284.33	271640.32	277792.66	278645.23
Log pseudolikelihood	-1174173.92	-1173263.96	-587039.69	-581542.11	-575765.08	-575336.37

Exponentiated coefficients
* p<0.01
na: coefficients non available because they cannot be estimated (no upward movement for dec10 and no downward movement for dec1)
Omitted categories are north, age60.

5. Modeling centile effects

- We measure the change in the centile position from the base period (2008) to the end of the period (2011).

- The simplest would be the difference in the two percentiles positions : 40th centile to the 50th centile = moved up 10 centiles.

- However, this variable presents consistency problems since the centile range is bounded by zero and 100.

5. Modeling centile effects

- We use a logit transformation of the dependent variable.
- Following Auten and Gee (2009) the dependent variable is defined as:

$$y = logit(decent) = ln\ (dcent/\ (1 - decent))$$

$$decent = \frac{1/2(endcentile - startcentile) + 50}{100}$$

- Where *decent* is a transformation scaled in such a manner that individuals whose income remain the same at the end of the period, hold a dependent variable of « zero »
- This transformation allows us to use logistic regression to model movement in the population.

Factors associated with income mobility in Ecuador
Regression results, 2008 - 2011

	(1)		(2)		(3)		(4)		(5)		(6)	
	dcent	centile effect	dcent	centile effect	dcent	centile effect	dcent	centile effect	dcent	centile effect	dcent	centile effect
dec1	0.981*	45	0.969*	45	0.725*	35	0.657*	32	0.573*	28	0.534*	26
	(0.002)		(0.002)		(0.003)		(0.004)		(0.004)		(0.005)	
dec2	0.517*	25	0.507*	25	0.513*	25	0.441*	22	0.359*	18	0.320*	16
	(0.002)		(0.002)		(0.002)		(0.004)		(0.004)		(0.004)	
dec3	0.373*	18	0.363*	18	0.376*	19	0.297*	15	0.216*	11	0.177*	9
	(0.001)		(0.002)		(0.002)		(0.004)		(0.004)		(0.004)	
dec4	0.185*	9	0.174*	9	0.172*	9	0.089*	4	0.012*	1	-0.026*	-1
	(0.001)		(0.002)		(0.002)		(0.004)		(0.004)		(0.004)	
dec5	0.117*	6	0.105*	5	0.104*	5	0.018*	1	-0.073*	-4	-0.112*	-6
	(0.001)		(0.002)		(0.002)		(0.003)		(0.004)		(0.004)	
dec6	0.080*	4	0.066*	3	0.071*	4	-0.016*	-1	-0.126*	-6	-0.167*	-8
	(0.001)		(0.002)		(0.002)		(0.003)		(0.004)		(0.004)	
dec7	0.059*	3	0.045*	2	0.053*	3	-0.034*	-2	-0.160*	-8	-0.201*	-10
	(0.001)		(0.002)		(0.002)		(0.003)		(0.004)		(0.004)	
dec8	0.016*	1	0.000	0	0.013*	1	-0.075*	-4	-0.214*	-11	-0.254*	-13
	(0.001)		(0.002)		(0.002)		(0.003)		(0.004)		(0.004)	
dec9	-0.095*	-5	-0.110*	-5	-0.063*	-3	-0.150*	-7	-0.295*	-15	-0.335*	-17
	(0.001)		(0.002)		(0.002)		(0.003)		(0.004)		(0.004)	
dec10	-0.250*	-12	-0.265*	-13	-0.140*	-7	-0.224*	-11	-0.380*	-19	-0.419*	-21
	(0.001)		(0.002)		(0.002)		(0.003)		(0.004)		(0.004)	
pichincha			0.007*	0	0.016*	1	0.017*	1	0.004	0	0.004	0
			(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
guayas			0.016*	1	0.024*	1	0.025*	1	0.014*	1	0.013*	1
			(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
coast			-0.020*	-1	-0.015*	-1	-0.016*	-1	-0.016*	-1	-0.017*	-1
			(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	

Continued on next page

	(1)		(2)		(3)		(4)		(5)		(6)	
	dcent	centile effect	dcent	centile effect	dcent	centile effect	dcent	centile effect	dcent	centile effect	dcent	centile effect
			(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
center			0.045*	2	0.032*	2	0.032*	2	0.022*	1	0.022*	1
			(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
south			0.039*	2	0.039*	2	0.041*	2	0.031*	2	0.030*	1
			(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
age19							-0.075*	-4	-0.108*	-5	-0.104*	-5
							(0.005)		(0.005)		(0.005)	
age20_29							0.084*	4	0.041*	2	0.044*	2
							(0.003)		(0.003)		(0.003)	
age30_39							0.097*	5	0.061*	3	0.063*	3
							(0.003)		(0.003)		(0.003)	
age40_49							0.092*	5	0.060*	3	0.061*	3
							(0.003)		(0.003)		(0.003)	
age50_59							0.086*	4	0.069*	3	0.069*	3
							(0.003)		(0.003)		(0.003)	
gender									0.022*	1	0.067*	3
									(0.001)		(0.003)	
married									0.018*	1		
									(0.001)			
education									0.171*	9		
									(0.001)			
marriedman											0.025*	1
											(0.001)	
marriedwoman											0.006*	0
											(0.002)	
educman											0.157*	8
											(0.001)	
educwoman											0.221*	11
											(0.003)	
Obs.	1408497		1408497		737 891		737 891		737 891		737 891	
F-statistic - full model	54200.9		36331.2		17541.5		13373.3		12751.5		11764.0	
R2	0.278		0.279		0.263		0.266		0.284		0.285	
Root MSE	0.534		0.533		0.417		0.416		0.411		0.410	

* p<0.01

Concluding remarks

- Income mobility at the top of the distribution is low and it remains stable over the 2004 - 2011 period.

- Top income individuals are more likely to move between the top 5% and the top 0,1% of the distribution.

- The proportion of individuals who drop to the bottom 95% is inferior to the proportion of individuals who remains into the top 5% by the final year.

- There is an important degree of mobility in the middle of income distribution. More than 50% of individuals moved to a higher decile group over the 2008-2011 period.

Concluding remarks

- Third, results of regressions analysis suggest that initial position in the income distribution is closely associated with the probability of upward mobility or downward mobility.

- Moreover, having a high school degree is associated with moving up in the income distribution by about 10 centiles between 2008 and 2011.

Income Mobility in Ecuador:
New evidence from individual income
tax returns

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