Agricultural Transformation and Labor Mobility During the ARIP Period in Turkey: Evidence from Micro-data, 2000-2002

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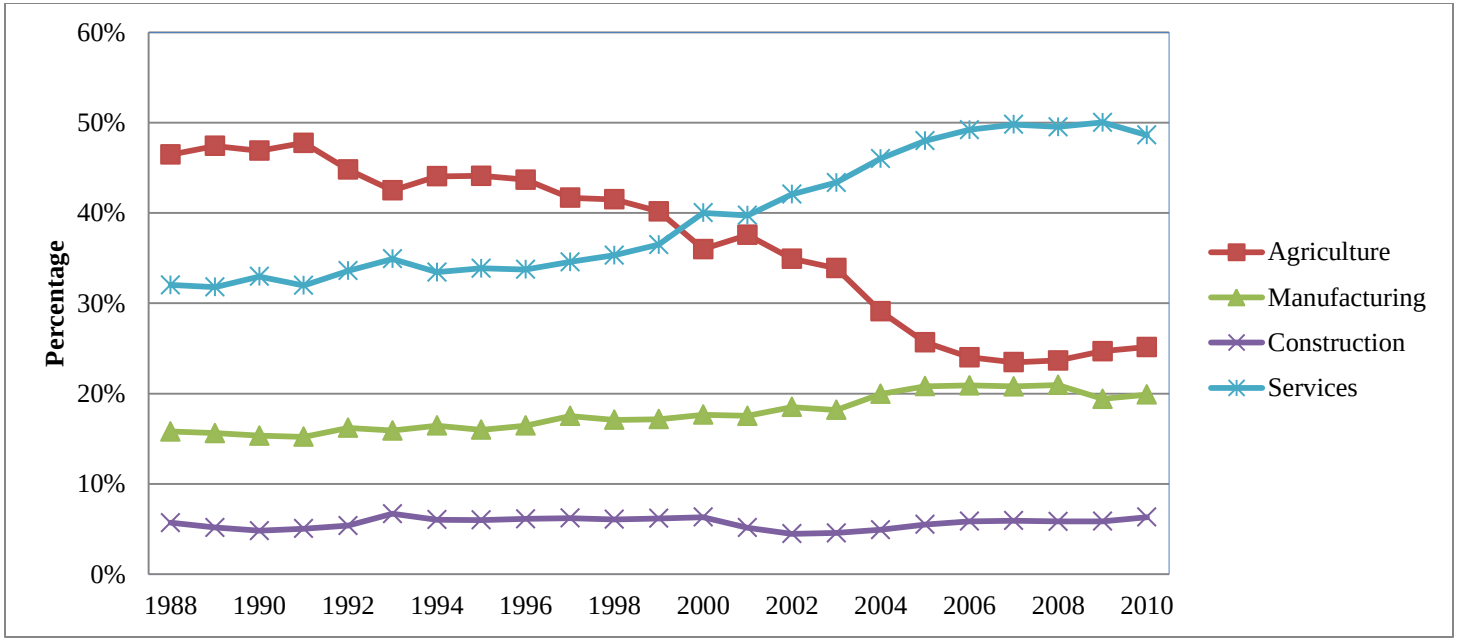
We study a period during which ARIP (Agricultural Reform Implementation Project) was in effect.

Figure 1: Employment by sectors



Source: HLFS database, TURKSTAT (2011)

Detailed study of the Labor Market consequences of ARIP: İlkkaracan and Tunalı, "Agricultural Transformation and the Rural Labor Market in Turkey." Ch.7 in ***Rethinking Structural Reform in Turkish Agriculture: Beyond the World Bank's Strategy***, edited by Barış Karapınar, Fikret Adaman, and Gökhan Özertan. Hampshire: NOVA, 2010.

Putting things in perspective:

There was a major crisis in 2001. Ag Employment actually rose in 2001, and then declined until the next crisis in 2008.

Table 1: Share of different sectors in total employment

	2000		2001		2002	
Employment						
Agriculture	7,458	(30.9%)	8,089	(33.7%)	7,769	(32.6%)
Manufacturing	3,954	(16.4%)	3,775	(15.7%)	3,811	(16.0%)
Construction	3,731	(15.5%)	3,582	(14.9%)	3,638	(15.2%)
Services	8,984	(37.2%)	8,551	(35.7%)	8,638	(36.2%)
Total	24,127	(100%)	23,997	(100%)	23,856	(100%)

Source: HLFS database, TURKSTAT (2011)

The aim of our paper:

Study intersectoral flows at a time when the agricultural transformation was enhanced.

Key finding: There is substantial mobility between Agricultural and Non-agricultural employment.

We rescale our estimates so that we can quantify the mobility.

Reference working age population: 27.1 million.

Reference Agricultural employment: 8.1 million (30%).

Rate of mobility:

Each year:

230,000 individuals move from AG to NAG;

160,000 individuals move from NAG to AG.

What we do:

We use the short panel component of HLFS 2000-2.

Problem: There is *attrition* and *substitution*.

Attrition:

An individual who is present at round *t* is missing at round *t+1*.

Substitution:

An individual who is missing at round *t* returns at round *t+1*.

We use the RAN model to correct for attrition and substitution.

Tunalı, Ekinci and Yavuzoğlu, "Rescaled Additively Nonignorable Model of Attrition: A Convenient Semi-Parametric Bias-Correction Framework for Data with a Short Panel Component." Revised, September 2011, 15 pp.

Consequences of attrition and substitution:

Consider a two-round panel and let

y_{ij} = labor market state of individual i at round j, j = 1,2;

x_i = fixed characteristics of individual i;

D_i = 1 if individual is present at both rounds, 0 else.

Object of interest:

$f(y_1, y_2 \mid x)$, the joint distribution of labor market states, conditional on x.

We observe: $f(y_1, y_2 \mid x, D = 1)$.

In general: $f(y_1, y_2 \mid x, D = 1) \neq f(y_1, y_2 \mid x)$.

It can be shown that:

(key equation) $f(y_1, y_2 \mid x) = w(y_1, y_2 \mid x)\, f(y_1, y_2 \mid D = 1, x)$.

We express the reflation factors $w(y_1, y_2|x)$ as a function of y_1, y_2.

Identifying information comes from marginals published by TURKSTAT:

(12) $$\sum_{y_2} f(y_1, y_2 | x) = \sum_{y_2} w(y_1, y_2 | x) f(y_1, y_2 | D = 1, x) = f_1(y_1 | x)$$

(13) $$\sum_{y_1} f(y_1, y_2 | x) = \sum_{y_1} w(y_1, y_2 | x) f(y_1, y_2 | D = 1, x) = f_2(y_2 | x)$$

We specify $w(y_1, y_2|x)$ additively so that we end up with a just-identifed model.

We use MATLAB to solve the equation system.

We rely on bootstrap methods for inference.

$w(y_1, y_2|x) = 1$ "no bias"

$w(y_1, y_2|x) > 1$ "downward bias" or "under-represented" in BP

$w(y_1, y_2|x) < 1$ "upward bias" or "over-represented" in BP

Example: Let y_j denote Labor Market State in period j, w/ values

$y = 0$ (NP), $y = 1$ (employed in AG), $y = 2$ (employed in NAG), $y = 3$ (UNEMP).

We introduce 6 indicators:

$$z_{1t} = \begin{cases} 1, & \text{employed in agriculture } (y_t = 1) \\ 0, & \text{otherwise} \end{cases};$$

$$z_{2t} = \begin{cases} 1, & \text{employed in non-agriculture } (y_t = 2) \\ 0, & \text{otherwise} \end{cases};$$

$$z_{3t} = \begin{cases} 1, & \text{unemployed } (y_t = 3) \\ 0, & \text{otherwise} \end{cases}.$$

We treat non-participation in both periods as the reference category, and introduce the linear reflation function:

$$w(z_{1j}, z_{2j}) = \vartheta_0 + \vartheta_1 z_{11} + \vartheta_2 z_{12} + \vartheta_3 z_{21} + \vartheta_4 z_{22} + \vartheta_5 z_{31} + \vartheta_6 z_{32}.$$

The reflation function captures the propensity to remain in the balanced panel as a function of the labor market states occupied in periods 1 and 2.

Tabular representation of the 4x4 problem:

DATA:

$P_{y1,y2} = f(y_1, y_2 | D=1)$, fractions in the balanced panel.

$f_1(y_1)$ and $f_2(y_2)$, "unbiased" marginals (published by TURKSAT).

	$y_2 = 0$	$y_2 = 1$	$y_2 = 2$	$y_2 = 3$	
$y_1 = 0$	$\vartheta_0 P_{00}$	$(\vartheta_0 + \vartheta_2) P_{01}$	$(\vartheta_0 + \vartheta_4) P_{02}$	$(\vartheta_0 + \vartheta_6) P_{03}$	$f_1(0)$
$y_1 = 1$	$(\vartheta_0 + \vartheta_1) P_{10}$	$(\vartheta_0 + \vartheta_1 + \vartheta_2) P_{11}$	$(\vartheta_0 + \vartheta_1 + \vartheta_4) P_{12}$	$(\vartheta_0 + \vartheta_1 + \vartheta_6) P_{13}$	$f_1(1)$
$y_1 = 2$	$(\vartheta_0 + \vartheta_3) P_{20}$	$(\vartheta_0 + \vartheta_3 + \vartheta_2) P_{21}$	$(\vartheta_0 + \vartheta_3 + \vartheta_4) P_{22}$	$(\vartheta_0 + \vartheta_3 + \vartheta_6) P_{23}$	$f_1(2)$
$y_1 = 3$	$(\vartheta_0 + \vartheta_5) P_{30}$	$(\vartheta_0 + \vartheta_5 + \vartheta_2) P_{31}$	$(\vartheta_0 + \vartheta_5 + \vartheta_4) P_{32}$	$(\vartheta_0 + \vartheta_5 + \vartheta_6) P_{33}$	$f_1(3)$
	$f_2(0)$	$f_2(1)$	$f_2(2)$	$f_2(3)$	

Objective: Choose $\Theta = \{\vartheta_0, \vartheta_1, \vartheta_2, \vartheta_3, \vartheta_4, \vartheta_5, \vartheta_6\}$ so that row & column restrictions are met.

In the current paper, we consider 4 labor market states:

0. Non-participation (NP)
1. Agricultural employment (AG)
2. Non-agricultural employment (NAG)
3. Unemployement (UNEMP)

In this case we have 7 equations in 7 unknowns.

We repeat the analysis with different *x*:

All (age 15+)

Males, females

Urban males, rural males

Urban females, rural females

Analysis of Reflation Factors -- All

8 Annual Transitions between 2000-2002

Table R1. All (Age 15+)					Period t+1 (NP) 0	Period t+1 (AG) 1	Period t+1 (NAG) 2	Period t+1 (UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	6	0	2
			≤10%	Mild	0	1	1	4
		Deflate by	≤10%	Mild	0	1	4	1
			>10%	Severe	8	0	3	1
	(AG) 1	Inflate by	>10%	Severe	7	8	8	8
			≤10%	Mild	1	0	0	0
		Deflate by	≤10%	Mild	0	0	0	0
			>10%	Severe	0	0	0	0
	(NAG) 2	Inflate by	>10%	Severe	0	6	0	3
			≤10%	Mild	0	1	0	4
		Deflate by	≤10%	Mild	3	1	8	0
			>10%	Severe	5	0	0	1
	(UNEMP) 3	Inflate by	>10%	Severe	1	7	5	7
			≤10%	Mild	6	1	3	1
		Deflate by	≤10%	Mild	1	0	0	0
			>10%	Severe	0	0	0	0

Analysis of Reflation Factors -- Males

8 Annual Transitions between 2000-2002

Table R2. Male (Age 15+)					Period t+1			
					(NP) 0	(AG) 1	(NAG) 2	(UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	6	0	2
			≤10%	Mild	0	0	0	4
		Deflate by	≤10%	Mild	7	1	4	0
			>10%	Severe	1	1	4	2
	(AG) 1	Inflate by	>10%	Severe	7	8	7	8
			≤10%	Mild	1	0	1	0
		Deflate by	≤10%	Mild	0	0	0	0
			>10%	Severe	0	0	0	0
	(NAG) 2	Inflate by	>10%	Severe	0	5	0	3
			≤10%	Mild	0	1	0	3
		Deflate by	≤10%	Mild	4	1	4	0
			>10%	Severe	4	1	4	2
	(UNEMP) 3	Inflate by	>10%	Severe	5	7	6	8
			≤10%	Mild	3	0	2	0
		Deflate by	≤10%	Mild	0	0	0	0
			>10%	Severe	0	1	0	0

Analysis of Reflation Factors -- Females

8 Annual Transitions between 2000-2002

Table R3. Female (Age 15+)					Period t+1			
					(NP) 0	(AG) 1	(NAG) 2	(UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	8	0	1
			≤10%	Mild	0	0	2	5
		Deflate by	≤10%	Mild	3	0	3	2
			>10%	Severe	5	0	3	0
	(AG) 1	Inflate by	>10%	Severe	6	8	6	8
			≤10%	Mild	1	0	1	0
		Deflate by	≤10%	Mild	0	0	0	0
			>10%	Severe	1	0	1	0
	(NAG) 2	Inflate by	>10%	Severe	1	8	0	3
			≤10%	Mild	2	0	6	3
		Deflate by	≤10%	Mild	0	0	0	1
			>10%	Severe	5	0	2	1
	(UNEMP) 3	Inflate by	>10%	Severe	2	8	4	6
			≤10%	Mild	3	0	2	0
		Deflate by	≤10%	Mild	0	0	1	0
			>10%	Severe	3	0	1	2

Analysis of Reflation Factors – Urban Males

8 Annual Transitions between 2000-2002

Table R4. Urban Male (Age 15+)					Period t+1 (NP) 0	(AG) 1	(NAG) 2	(UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	0	0	3
			≤10%	Mild	0	0	0	4
		Deflate by	≤10%	Mild	3	5	2	0
			>10%	Severe	5	3	6	1
	(AG) 1	Inflate by	>10%	Severe	2	0	2	5
			≤10%	Mild	0	0	0	1
		Deflate by	≤10%	Mild	3	5	4	1
			>10%	Severe	3	3	2	1
	(NAG) 2	Inflate by	>10%	Severe	0	0	0	6
			≤10%	Mild	4	4	8	2
		Deflate by	≤10%	Mild	0	2	0	0
			>10%	Severe	4	2	0	0
	(UNEMP) 3	Inflate by	>10%	Severe	7	5	8	8
			≤10%	Mild	1	2	0	0
		Deflate by	≤10%	Mild	0	0	0	0
			>10%	Severe	0	1	0	0

Analysis of Reflation Factors – Rural Males

8 Annual Transitions between 2000-2002

Table R5. Rural Male (Age 15+)					Period t+1 (NP) 0	Period t+1 (AG) 1	Period t+1 (NAG) 2	Period t+1 (UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	1	4	5
			≤10%	Mild	0	2	2	1
		Deflate by	≤10%	Mild	4	2	2	0
			>10%	Severe	4	3	0	2
	(AG) 1	Inflate by	>10%	Severe	3	4	5	6
			≤10%	Mild	1	3	0	2
		Deflate by	≤10%	Mild	1	0	2	0
			>10%	Severe	3	1	1	0
	(NAG) 2	Inflate by	>10%	Severe	2	2	1	2
			≤10%	Mild	1	1	1	6
		Deflate by	≤10%	Mild	5	5	4	0
			>10%	Severe	0	0	2	0
	(UNEMP) 3	Inflate by	>10%	Severe	6	6	7	8
			≤10%	Mild	1	1	1	0
		Deflate by	≤10%	Mild	1	1	0	0
			>10%	Severe	0	0	0	0

Analysis of Reflation Factors – Urban Females

8 Annual Transitions between 2000-2002

Table R6. Urban Female (Age 15+)					Period t+1			
					(NP) 0	(AG) 1	(NAG) 2	(UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	1	2	6
			≤10%	Mild	0	1	3	0
		Deflate by	≤10%	Mild	0	3	1	1
			>10%	Severe	8	3	2	1
	(AG) 1	Inflate by	>10%	Severe	1	0	3	4
			≤10%	Mild	1	4	1	2
		Deflate by	≤10%	Mild	4	4	3	1
			>10%	Severe	2	0	1	1
	(NAG) 2	Inflate by	>10%	Severe	5	5	8	7
			≤10%	Mild	3	2	0	0
		Deflate by	≤10%	Mild	0	0	0	1
			>10%	Severe	0	1	0	0
	(UNEMP) 3	Inflate by	>10%	Severe	5	5	6	7
			≤10%	Mild	3	2	1	1
		Deflate by	≤10%	Mild	0	0	0	0
			>10%	Severe	0	1	1	0

Analysis of Reflation Factors – Rural Females

8 Annual Transitions between 2000-2002

Table R7. Rural Female (Age 15+)					Period t+1 (NP) 0	Period t+1 (AG) 1	Period t+1 (NAG) 2	Period t+1 (UNEMP) 3
Period t	(NP) 0	Inflate by	>10%	Severe	0	5	0	1
			≤10%	Mild	0	1	5	4
		Deflate by	≤10%	Mild	2	0	2	2
			>10%	Severe	6	2	1	1
	(AG) 1	Inflate by	>10%	Severe	0	4	3	2
			≤10%	Mild	3	3	1	1
		Deflate by	≤10%	Mild	2	0	2	4
			>10%	Severe	3	1	2	1
	(NAG) 2	Inflate by	>10%	Severe	2	4	1	3
			≤10%	Mild	0	1	3	1
		Deflate by	≤10%	Mild	3	0	1	3
			>10%	Severe	3	3	3	1
	(UNEMP) 3	Inflate by	>10%	Severe	6	6	7	6
			≤10%	Mild	1	1	0	0
		Deflate by	≤10%	Mild	1	1	0	2
			>10%	Severe	0	0	1	0

Dominant bias patterns in the Balance Panel (6-8 cells have same sign)

From	Into	All		M		F		Ur-M		Ru-M		Ur-F		Ru-F	
NP	NP		+		+		+		+		+		+		+
	AG	-		-		-			+				+	-	
	NAG		+		+		+		+	-					
	UNE	-				-		-		-		-			
AG	NP	-		-		-			+				+		
	AG	-		-		-			+	-				-	
	NAG	-		-		-			+						
	UNE	-		-		-		-		-		-			
NAG	NP		+		+							-			+
	AG	-		-		-						-			
	NAG		+		+	-		-			+	-			
	UNE	-		-		-		-		-		-			
UNE	NP	-		-		-		-		-		-		-	
	AG	-		-		-		-		-		-		-	
	NAG	-		-		-		-		-		-		-	
	UNE	-		-		-		-		-		-		-	

Summary of dominant bias patterns in the BP:

ALL/M/F: Transitions into/out of UNEMP are under-represented;
... AG are under-represented.

ALL/M/F: Transitions from AG to NAG are under-represented;
... from NAG to AG are under-represented.

ALL/M/F: Transitions from NP to NP, NAG are over-represented;
... from NAG to NP, NAG are over-represented.

Variations emerge when broken down by location as well as sex.

One pattern is extremely consistent:

Transitions into/out of UNEMP are under-represented.

Annual Forward Transitions, All (15+)

Share	From\Into	NP	AG	NAG	UNEMP	Row sum
0.5	NP	84	6	7	3	100
0.17	AG	21	73	5	2	101
0.29	NAG	13	2	79	6	100
0.04	UNEMP	30	5	37	28	100

Inflate to a fictional population of size 2,710

Expand by	From\Into	NP	AG	NAG	UNEMP	Row sum
13.6	NP	1142	82	95	41	1360
4.6	AG	97	336	23	9	460
7.9	NAG	103	16	624	47	790
1	UNEMP	30	5	37	28	100

Total = 2,710

Inflate to a reference population of size 27.1 million

(2000-02 average was 24.6 million)

(x 10,000)

Expand by	From\Into	NP	AG	NAG	UNEMP	Row sum
10000	NP	1142	82	95	41	1360
10000	AG	97	336	23	9	460
10000	NAG	103	16	624	47	790
10000	UNEMP	30	5	37	28	100

Each year:

230,000 individuals moved from AG to NAG;

160,000 individuals moved from NAG to AG.

Note:

Ag employment was around 7.5-8.1 million between 2000-2.

Ag employment for our reference population would be around 8.3-9 million.

Gender differences are considerable!

Annual forward transitions

Male (Age 15+)			Period t+1			
Mean of TUIK marginals			(NP) 0	(AG) 1	(NAG) 2	(UNEMP) 3
Period t	.2662208	(NP) 0	74	7	13	6
	.1876217	(AG) 1	14	75	8	3
	.4903384	(NAG) 2	9	2	82	7
	.0558192	(UNEMP) 3	21	6	44	29

Annual forward transitions

Female (Age 15+)			Period t+1			
			(NP) 0	(AG) 1	(NAG) 2	(UNEMP) 3
Mean of TUIK marginals						
Period t	.7333045	(NP) 0	89	6	3	2
	.1539729	(AG) 1	27	71	1	1
	.0943301	(NAG) 2	24	2	70	4
	.0183925	(UNEMP) 3	44	3	22	31

Comparisons of Weighted and Unweighted Model Estimates

FROM AG	Mlogit Estimates			Weighted Mlogit Estimates		
	NP	NAG	UNEMP	NP	NAG	UNEMP
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Period Dummies: (Ref. Q1 and year_2000)						
Q2	-0.373***	-0.022	-0.200**	-0.333***	-0.004	-0.165
Q3	-0.277***	-0.078**	0.002	-0.265***	-0.060*	0.038
Q4	-0.109***	-0.031	0.124***	-0.100***	-0.012	0.149***
year_2001	-0.035	0.024	0.217*	0.051	0.297***	0.308**

FROM NAG	Mlogit Estimates			Weighted Mlogit Estimates		
	NP	AG	UNEMP	NP	AG	UNEMP
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Period Dummies: (Ref. Q1 and year_2000)						
Q2	-0.081***	0.188	0.014**	-0.075***	0.200	0.039
Q3	-0.080***	0.095**	-0.021	-0.072***	0.092*	0.021
Q4	-0.045***	0.069	0.016***	-0.052***	0.061	0.038***
year_2001	-0.040	-0.163	0.198*	-0.125	-0.349***	0.227**

Comparisons of Weighted and Unweighted Model Estimates (Continued)

FROM AG	Mlogit Estimates			Weighted Mlogit Estimates		
	NP	NAG	UNEMP	NP	NAG	UNEMP
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Period Dummies: (Ref. Q1 and year_2000)						
Q2	-0.047**	-0.100	0.050	-0.053**	-0.135	0.065
Q3	0.239***	0.048	0.273***	0.295***	0.101***	0.301***
Q4	0.241***	-0.029**	0.245***	0.237***	-0.024*	0.232***
year_2001	0.122***	-0.218	0.660***	0.170*	-0.021**	0.627***
year_2002	-0.119	-0.207*	0.508***	-0.063**	0.060	0.550***

FROM NAG	Mlogit Estimates			Weighted Mlogit Estimates		
	NP	AG	UNEMP	NP	AG	UNEMP
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Period Dummies: (Ref. Q1 and year_2000)						
Q2	0.042**	-0.006	-0.020	0.041**	0.015	0.025
Q3	0.058***	-0.044	0.078***	0.072***	-0.084***	0.079***
Q4	0.073***	-0.055**	0.097***	0.071***	-0.053*	0.103***
year_2001	0.095***	-0.018	0.469***	0.058*	-0.199**	0.415***
year_2002	0.007	0.147*	0.483***	-0.093**	-0.112	0.423***

The individual determinants of transitions

FROM AG	NP		NAG		UNEMP	
	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.
Residential Area: (Ref. urban_male)						
rural_male	-0.874***	0.068	-1.181***	0.086	-1.563***	0.139
urban_female	1.379***	0.084	-1.558	0.190	-1.670***	0.284
rural_female	0.010***	0.069	-3.356***	0.155	-3.319***	0.204
Age Groups: (Ref. age 15_24)						
age_2534	-0.300***	0.065	0.289	0.141	-0.074**	0.183
age_3544	-0.462***	0.070	0.444	0.152	-0.645***	0.216
age_4554	-0.432***	0.072	-0.059	0.159	-1.409***	0.248
age_5564	-0.045***	0.075	-0.567***	0.185	-1.946***	0.320
age_65over	0.675***	0.080	-1.350	0.258	-3.292***	0.611
Education Levels: (Ref. primary5)						
illit	0.162***	0.043	-0.238***	0.135	0.839***	0.176
lit	0.043***	0.066	-0.444***	0.174	0.050**	0.294
primary8	0.947	0.173	-0.126	0.446	-1.766**	1.004
midall	0.445	0.080	0.161***	0.126	-0.175***	0.233
highgen	0.011***	0.111	-0.043***	0.163	0.065***	0.237
highvoc	0.155***	0.157	0.439***	0.212	0.639***	0.264
univ4plus	-0.535***	0.425	1.018***	0.334	0.509***	0.594
univoc	-0.153***	0.575	0.837***	0.465	2.057***	0.492

The individual determinants of transitions (Continued)

FROM NAG	NP		AG		UNEMP	
	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.
Residential Area: (Ref. urban_male)						
rural_male	-0.083***	0.052	2.740***	0.079	-0.158***	0.062
urban_female	1.462***	0.040	0.157	0.172	-0.250***	0.059
rural_female	1.201***	0.090	2.855***	0.143	-0.901***	0.203
Age Groups: (Ref. age 15_24)						
age_2534	-0.653***	0.050	-0.136	0.144	-0.214**	0.065
age_3544	-0.759***	0.058	-0.083	0.155	-0.510***	0.076
age_4554	0.267***	0.058	-0.001	0.166	-0.724***	0.089
age_5564	1.081***	0.070	0.596***	0.191	-0.769***	0.137
age_65over	1.418***	0.099	0.523	0.277	-2.276***	0.457
Education Levels: (Ref. primary5)						
illit	0.409***	0.078	0.768***	0.156	0.478***	0.119
lit	0.209***	0.087	0.412***	0.187	0.375**	0.124
primary8	1.288	0.166	0.438	0.433	-0.262**	0.287
midall	-0.115	0.046	-0.642***	0.116	-0.354***	0.058
highgen	-0.436***	0.047	-1.038***	0.138	-0.674***	0.060
highvoc	-0.542***	0.058	-0.879***	0.156	-0.706***	0.073
univ4plus	-1.205***	0.066	-1.603***	0.220	-1.375***	0.099
univoc	-1.200***	0.105	-1.267***	0.300	-1.144***	0.147