

Annex 2: Empirical framework and regression results for analysis of urban inequality

To assess the extent of structural transformation that has taken place in urban areas, the following empirical framework was used:

There are two wage (or consumption) equations:

$$\log y_i = \sum_{k=1}^K \alpha_{97,k} w_{k,i} + \sum_{l=1}^L \beta_{97,k} x_{l,i} + \gamma_{97} Z_i + \mu_{97,i} \quad \text{for 1997} \quad (1)$$

$$\log y_i = \sum_{k=1}^K \alpha_{04,k} w_{k,i} + \sum_{l=1}^L \beta_{04,l} x_{l,i} + \gamma_{04} Z_i + \mu_{04,i} \quad \text{for 2004} \quad (2)$$

where y_i represents real wages or consumption; $W_i = \{w_{k,i}\}_{k=1}^K$ are the dummy variables corresponding to the 4 education levels; $X_i = \{x_{l,i}\}_{l=1}^L$ are the dummy variables corresponding to the 12 industries and Z_i is the vector including all the other independent variables such as gender, age, and marital status.

Estimates the equations (1) and (2) for each individual are:

$$\log \hat{y}_i = \hat{\alpha}_{97} W_i + \hat{\beta}_{97} X_i + \hat{\gamma}_{97} Z_i \quad \text{for 1997} \quad (3)$$

$$\log \hat{y}_i = \hat{\alpha}_{04} W_i + \hat{\beta}_{04} X_i + \hat{\gamma}_{04} Z_i \quad \text{for 2004} \quad (4)$$

The wage or consumption difference during the period 1997-2004 can be decomposed as the follows:

$$\begin{aligned} \log \tilde{y}_{04} - \log \tilde{y}_{97} = & \hat{\alpha}_{97} (\overline{W}_{04} - \overline{W}_{97}) + (\hat{\alpha}_{04} - \hat{\alpha}_{97}) \overline{W}_{04} + \\ & \hat{\beta}_{97} (\overline{X}_{04} - \overline{X}_{97}) + (\hat{\beta}_{04} - \hat{\beta}_{97}) \overline{X}_{04} + \\ & \hat{\gamma}_{04} \overline{\lambda}_1 - \hat{\gamma}_{97} \overline{\lambda}_0 \end{aligned} \quad (5)$$

where $(\overline{W}_{04} - \overline{W}_{97})$ denotes the main effects of education which signify the changing education stock of the population; $(\hat{\alpha}_{04} - \hat{\alpha}_{97})$ denotes the year effects of education which indicate the changes in returns to education; $(\overline{X}_{04} - \overline{X}_{97})$ denotes the main effect of industry that signify a structural transformation or the changing industry composition; and $(\hat{\beta}_{04} - \hat{\beta}_{97})$ denotes the year effects of industry which suggest the changes to industry-specific premiums. First, a sub-sample of paid employees with wages in urban areas was analyzed. Then, the entire sample of urban households with consumption approximating income was analyzed. The results are similar.

Table 1– Estimation of wage equations (Paid employees)

Dependant variable: logarithm of real wage; standard errors in parantheses

	Phnom Penh and other urban			
	1997		2004	
	Model 1	Model 2	Model 1	Model 2
Male	0.091 (0.050)*	0.139 (0.050)***	0.073 (0.030)**	0.139 (0.030)***
Age	-0.011 (0.010)	0.012 (0.010)	0.011 (0.010)	0.032 (0.010)***
Squared age	0.011 (0.020)	-0.015 (0.010)	-0.022 (0.010)**	-0.044 (0.010)***
Head of household	-0.011 (0.060)	0.001 (0.060)	-0.057 (0.040)	-0.018 (0.040)
Married	0.062 (0.060)	0.020 (0.050)	0.056 (0.040)	0.087 (0.030)**
Immigrant	0.248 (0.090)***	0.235 (0.080)***	-0.071 (0.030)**	-0.073 (0.030)**
Work hours in the past 7 days	0.014 (...)**	0.010 (...)**	0.012 (...)**	0.009 (...)**
Highest grade level successfully completed (ref.= Class 3 or below)				
Class 4-6	0.196 (0.080)**	0.240 (0.080)***	0.166 (0.050)***	0.174 (0.050)***
Class 7-9	0.009 (0.070)	0.144 (0.070)**	0.195 (0.040)***	0.251 (0.050)***
Class 10-12	-0.091 (0.070)	0.111 (0.070)	0.341 (0.050)***	0.468 (0.050)***
Class 12 or above	-0.079 (0.080)	0.113 (0.080)	0.473 (0.050)***	0.637 (0.050)***
Industry during the past 7 days (ref.= Public administration and defense; compulsory social security)				
Agriculture, hunting and forestry; Fishing		0.255 (0.130)*		0.341 (0.070)***
Mining and quarrying; Manufacturing; Electricity, gas, and water supply		0.579 (0.070)***		0.762 (0.050)***
Construction		0.637 (0.080)***		0.543 (0.060)***
Wholesale and retail trade; repair of motor vehicles, motorcycle and personal and household goods		0.688 (0.110)***		0.370 (0.080)***
Hotels and restaurants		0.492 (0.180)***		0.557 (0.080)***
Transport, storage and communications		0.593 (0.080)***		0.763 (0.080)***
Financial intermediation		-0.126 (0.120)		0.494 (0.160)***
Real estate, renting and business activities		0.209 (0.180)		0.124 (0.180)
Education		0.371 (0.080)***		0.245 (0.050)***
Health		0.065 (0.130)		0.125 (0.100)
Other community, social and personal service activities		0.432 (0.090)***		0.604 (0.050)***
Extra-territorial organization and bodies		1.388 (0.140)***		1.046 (0.090)***
Constant	10.798 (0.230)***	10.086 (0.220)***	10.925 (0.150)***	10.053 (0.150)***
R^2	0.075	0.219	0.089	0.189
Number of observations	1299	1299	3089	3089

Notes: “...” signifies that the absolute value is inferior to 0.001.

*** indicates coefficient significant at 1% level;

** indicates coefficient significant at 5% level;

* indicates coefficient significant at 10% level.

Source: Royal Government of Cambodia Ministry of Planning, National Institute of Statistics: Cambodia Socio-economic Survey 1997 and 2004.

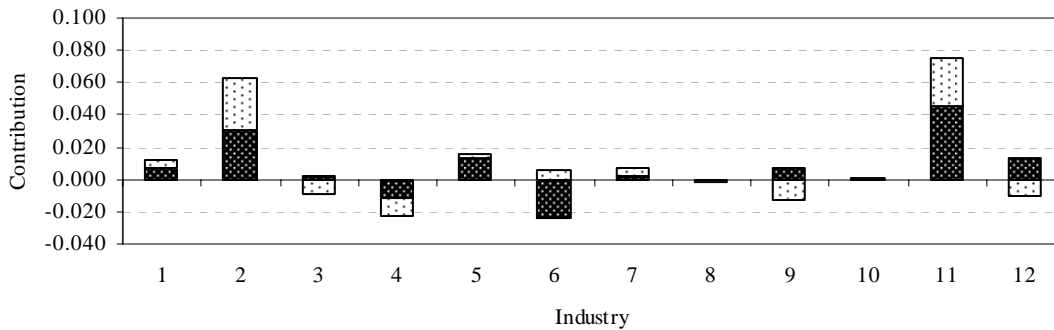
Table 2 Decomposition of wage difference between 1997 and 2004 (Phnom Penh and other urban)

	Wage difference	Contribution of various variables to wage difference				
		Education		Industry		Other variables
		Main effect	Year effect	Main effect	Year effect	
Percentage	100.0	0.4	43.1	15.2	6.9	43.7
Absolute value						
Total	0.554	0.003	0.192	0.084	0.038	0.242
Agriculture, hunting and forestry; Fishing				0.007	0.005	
Mining and quarrying; Manufacturing; Electricity, gas, and water supply				0.030	0.032	
Construction				0.002	-0.009	
Wholesale and retail trade; repair of motor vehicles, motorcycle and personal and household goods				-0.011	-0.011	
Hotels and restaurants				0.014	0.003	
Transport, storage and communications				-0.024	0.005	
Financial intermediation				0.003	0.005	
Real estate, renting and business activities				-0.001	-0.001	
Education				0.007	-0.013	
Health				...	0.001	
Other community, social and personal service activities				0.046	0.030	
Extra-territorial organization and bodies				0.013	-0.011	

Notes: Group of reference: Public administration and defense; compulsory social security.
 “...” signifies that the absolute value is inferior to 0.001.

Source: Royal Government of Cambodia Ministry of Planning, National Institute of Statistics: CSES 1997, CSES 2004.

Figure 1 Contribution of various industries to wage growth (Phnom Penh and other urban)



■ Main effect □ Year effect

- | | | | |
|---|---|----|---|
| 1 | Agriculture, hunting and forestry; Fishing | 7 | Financial intermediation |
| 2 | Mining and quarrying; Manufacturing; Electricity, gas, and water supply | 8 | Real estate, renting and business activities |
| 3 | Construction | 9 | Education |
| 4 | Wholesale and retail trade; repair of motor vehicles, motorcycle and personal and household goods | 10 | Health |
| 5 | H6otels and restaurants | 11 | Other community, social and personal service activities |
| 6 | Transport, storage and communications | 12 | Extra-territorial organization and bodies |

Table 3 Summary statistics of urban heads of households (i.e., in Phnom Penh and other urban areas), 1997 and 2004

	1997	2004
Gini Coefficient	0.433	0.432
Real per capita consumption (Riel)	3905	4924
Male (%)	72.7	75.6
Married (%)	75.2	78.4
Sector/Industry during the past 12 months (%)		
Primary sector		
Agriculture, hunting and forestry; Fishing	24.7	23.4
Secondary sector	10.1	9.8
Mining and quarrying; Manufacturing; Electricity, gas, and water supply	6.2	5.7
Construction	3.9	4.0
Tertiary sector	50.2	55.2
Wholesale and retail trade; repair of motor vehicles, motorcycle and personal and household goods	18.4	18.7
Hotels and restaurants	0.2	0.8
Transport, storage and communications	8.6	9.0
Financial intermediation	1.3	0.5
Real estate, renting and business activities	0.8	0.6
Public administration and defense; compulsory social security	14.3	13.4
Education	2.2	3.9
Health	1.0	1.3
Other community, social and personal service activities	2.7	5.7
Extra-territorial organization and bodies	0.8	1.4
Missing information	15.0	11.6
Highest grade level successfully completed (%)		
Class 3 or below	35.8	28.7
Class 4-6	22.1	22.6
Class 7-9	24.4	24.8
Class 10-12	10.2	11.6
Class 12 or above	7.5	12.3
Number of observations	2200	3494

Source: CSES 1997; CSES 2003.

Table 4 Effects of education and industry on household consumption differences between 1997 and 2004 for all urban households

	Main effects (changes in the stock of schooling attainment or composition of industry)	Year effects (changes in returns to schooling or in industry premia)	Total effects
education	13.5%	35.2%	48.7%
industry	2.5%	46.8%	49.3%

Source: CSES 1997; CSES 2003.

Table 5 Rates of return to various levels of schooling and returns to sectors of employment (i.e., sector or industry premium), 1997 and 2004

Highest grade level successfully completed (ref.= Class 3 or below)	1997	2004
Class 4-6	0.154 (0.040)***	0.187 (0.030)***
Class 7-9	0.166 (0.040)***	0.263 (0.030)***
Class 10-12	0.363 (0.050)***	0.445 (0.040)***
Class 12 or above	0.400 (0.060)***	0.609 (0.040)***
Sector of head's main occupation during the past 12 months (ref.= Primary sector)		
Secondary sector	0.252 (0.050)***	0.307 (0.040)***
Tertiary sector	0.368 (0.040)***	0.506 (0.030)***

Source: CSES 1997; CSES 2004

Note: These coefficients are obtained from running a standard Mincerian regression with dependant variable as logarithm of real consumption, and other explanatory variables include age, gender, marital status etc (see details in ANNEX); standard error in parentheses; *** denotes significant at the 1% level.

Table 6 Estimation of consumption equation (urban household heads)

Dependant variable: logarithm of real per capita consumption

	Phnom Penh and other urban			
	1997		2004	
	Model 1	Model 2	Model 1	Model 2
Male	-0.059 (0.050)	-0.017 (0.050)	0.000 (0.040)	0.050 (0.040)
Age	0.030 (0.010)***	0.029 (0.010)***	0.030 (0.010)***	0.028 (0.010)***
Squared age	-0.024 (0.010)***	-0.024 (0.010)***	-0.024 (0.010)***	-0.024 (0.010)***
Married	0.130 (0.050)**	0.135 (0.050)**	0.059 (0.050)	0.052 (0.040)
Immigrant	0.194 (0.060)***	0.202 (0.060)***	-0.181 (0.020)***	-0.185 (0.020)***
Work hours in the past 7 days	0.003 (0.000)***	0.003 (0.000)***	0.001 (0.000)	0.001 (0.000)*
Household size	-0.093 (0.010)***	-0.092 (0.010)***	-0.101 (0.010)***	-0.102 (0.010)***
Highest grade level successfully completed (ref.= Class 3 or below)				
Class 4-6	0.154 (0.040)***	0.147 (0.040)***	0.187 (0.030)***	0.170 (0.030)***
Class 7-9	0.166 (0.040)***	0.154 (0.040)***	0.263 (0.030)***	0.245 (0.030)***
Class 10-12	0.363 (0.050)***	0.333 (0.050)***	0.445 (0.040)***	0.424 (0.040)***
Class 12 or above	0.400 (0.060)***	0.376 (0.060)***	0.609 (0.040)***	0.581 (0.040)***
Sector of head's main occupation during the past 12 months (ref.= Primary sector)				
Secondary sector		0.252 (0.050)***	0.307 (0.040)***	
Tertiary sector		0.368 (0.040)***	0.506 (0.030)***	
Industry of head's main occupation during the past 12 months (ref.= Agriculture, hunting and forestry; Fishing)				
Mining and quarrying; Manufacturing; Electricity, gas, and water supply		0.386 (0.060)***	0.463 (0.050)***	
Construction		0.022 (0.070)	0.077 (0.050)	
Wholesale and retail trade; repair of motor vehicles, motorcycle and personal and household goods		0.416 (0.040)***	0.576 (0.030)***	
Hotels and restaurants		0.358 (0.250)	0.396 (0.110)***	
Transport, storage and communications		0.227 (0.050)***	0.326 (0.040)***	
Financial intermediation		0.550 (0.110)***	0.673 (0.150)***	
Real estate, renting and business activities		0.439 (0.140)***	0.893 (0.140)***	
Public admin & defense; compulsory social security)		0.348 (0.050)***	0.547 (0.040)***	
Education		0.388 (0.090)***	0.434 (0.060)***	
Health		0.563 (0.120)***	0.648 (0.090)***	
Other community, social and personal service activities		0.393 (0.080)***	0.464 (0.050)***	
Extra-territorial organization and bodies		0.543 (0.140)***	0.705 (0.090)***	
Constant	7.146 (0.170)***	7.128 (0.170)***	7.326 (0.140)***	7.355 (0.140)***
R^2	0.237	0.254	0.352	0.373
Number of observations	1823	1823	2945	2945

Notes: The standard errors are presented in parentheses.

*** indicates coefficient significant at 1% level;

** indicates coefficient significant at 5% level;

* indicates coefficient significant at 10% level.

Source: Royal Government of Cambodia Ministry of Planning, National Institute of Statistics: CSES 1997, CSES 2004.

**Table 7 Decomposition of consumption difference between 1997 and 2004
(Phnom Penh and other urban)**

	Difference	Contribution of various variables to consumption difference				
		Education		Industry		Other variables
		Main effect	Year effect	Main effect	Year effect	
Percentage	100.0	13.5	35.2	2.5	46.8	2.1
Absolute value						
Total	0.181	0.024	0.064	0.004	0.085	0.004
Mining and quarrying; Manufacturing; Electricity, gas, and water supply				-0.002	0.004	
Construction				0.000	0.002	
Wholesale and retail trade; repair of motor vehicles, motorcycle and personal and household goods				0.001	0.030	
Hotels and restaurants				0.002	0.000	
Transport, storage and communications				0.001	0.009	
Financial intermediation				-0.005	0.001	
Real estate, renting and business activities				-0.001	0.003	
Public administration and defense; compulsory social security				-0.003	0.027	
Education				0.007	0.002	
Health				0.002	0.001	
Other community, social and personal service activities				0.012	0.004	
Extra-territorial organization and bodies				0.004	0.002	

Notes: Industry: industry of head's main occupation during the past 12 months.

Group of reference: Agriculture, hunting and forestry; Fishing.

"..." signifies that the absolute value is inferior to 0.001.

Source: Royal Government of Cambodia Ministry of Planning, National Institute of Statistics: CSES 1997, CSES 2004..