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Was Growth in Egypt Between 2005 and 2008 Pro-Poor

From Static to Dynamic Poverty Profile

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Abstract

This paper presents a detailed picture of how sustained growth in Egypt over 2005-2008 affected different groups both above and below the poverty line. This analysis, based on the Household Income, Expenditure and Consumption Panel Survey conducted by Egypt's national statistical agency, compares the changes in the *static* poverty profiles (based on growth incidence curves on a cross-section of data) with poverty *dynamic*s (relying on panel data, growth incidence curves and transition matrices). The two approaches yield contrasting results: the longitudinal analysis reveals that growth benefited the poor while the cross-sectional analysis shows that the rich benefitted even more. The paper also shows the importance of going beyond averages to look at the trajectories of individual households. Panel data analysis shows that the welfare of the average poor household increased by almost 10 percent per year between 2005 and 2008, enough to move out of poverty. Conversely however, many initially non-poor households were exposed to poverty. As a matter of fact, only 45 percent of the population in Egypt remained consistently out of (near-) poverty throughout the period, while the remaining 55 percent of Egyptians experienced at least one (near-) poverty episode. This high mobility is not a statistical artefact: it reflects the actual process of growth. Taking high vulnerability into account is essential when designing policies to protect the poor and to ensure that growth is really inclusive.

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Was growth in Egypt between 2005 and 2008 pro-poor? From static to dynamic poverty profile

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I. Introduction

Egypt achieved rapid growth during 2005-2008. In this period reforms and economic shocks produced gains for some groups, and losses for others. The main objective of this paper is to analyze to what extent the rapid growth experienced in Egypt between 2005 and 2008 has been pro-poor. Pro-poor growth is about changing the distribution of relative incomes through the growth process to favour the poor. This paper will refer to the "relative" definition of pro-poor growth when discussing to what extent growth benefitted the poor in Egypt between 2005 and 2008. There are two definitions for measuring pro-poor growth used in recent literature and policy-oriented discussions. The first and relative definition compares changes in the incomes of the *poor* with changes in the incomes of the *non-poor*. Using this definition, growth is pro-poor when the distributional shifts accompanying growth favour the poor. This is the definition that will be used throughout this paper. The second and absolute definition considers growth to be pro-poor if and only if poor people benefit in absolute terms, as reflected in some agreed measure of poverty (Ravallion and Chen, 2003; Kraay, 2003). In this sense, growth in Egypt was indeed benefitting the poor between 2005 and 2008, as the country achieved a substantial reduction in the poverty headcount (from 23.4 to 18.9)[2].

The paper presents a detailed picture of how different groups above and below the poverty line were affected by this period of positive growth. This analysis is based on the Household Income, Expenditure and Consumption Panel Survey (HIECPS) conducted by CAPMAS (Egypt's national statistical agency) to trace household consumption and living standards over 2005-2008. The survey is the first large scale data collection in Egypt to monitor the situation of same households over extended period of time.

The study compares Growth Incidence Curves (GIC) based on a cross section of data with GICs based on the panel data. Panel data follows the same households over time (unlike the cross section which has an anonymous approach) and allows the analysis of factors that affects household's welfare over time. It captures the dynamic aspects of poverty and growth and it is therefore an essential tool in assessing social mobility. This study finds indeed opposite results in terms of pro-poor growth between cross-section and longitudinal data. It therefore attempts to identify the main factors behind these apparently contradictory results.

This paper is divided in seven sections. The next section provides a brief review of the literature, and the subsequent (third) section contains description of data and methodologies used. Main facts about changes

[2] These data refer to the panel component of the Household Income, Expenditure and Consumption Panel Survey (HIECPS), i.e. they are comparing data from February 2005 with February 2008.

in poverty and inequality in Egypt over 2005-2008, and a broad picture of economic change are presented in section IV, showing that the growth was not benefitting the poor relatively more than the richest parts of the distribution. Fifth section discusses growth incidence curves based on panel data, and shows that growth was indeed pro-poor and that the lowest groups of the distribution benefited the most from the growth process. Section VI attempts to reconcile two opposite assessments of pro-poorness of growth in Egypt. Section VII concludes.

II. Pro-poor growth analysis: Review of the selected studies

There is a growing consensus in the literature on the conclusion that sustained and rapid economic growth translates into poverty reduction[3]. However, there is a wide disparity in the extent of poverty reduction a growth process can achieve. The relation between growth, inequality, and redistribution is among the most-debated topics in the economic analysis of development since the 1950s. This is because the link between growth and inequality is not unequivocal". Changes in the distribution are not necessarily directly linked to growth and may reflect different economic factors that are specific to individual country experience[4]. Inequality may rise or fall temporarily for reasons which are not necessarily linked to growth. A World Bank study (2005) analyzed in some depth the relationship between changes in growth and inequality in eight countries[5] in the 1990s and found that growth typically was associated with growing inequality. By contrast, the experience of many high income (OECD) countries suggests that income growth is often pro-poor, both in absolute and relative terms, reducing not only poverty but also inequality (e.g. Smeeding 1990).

There are some facts in the dynamic relationship between growth, poverty and inequality that are well established. Rising inequality tends to reduce the growth elasticity of poverty reduction, i.e. weakening the impact of growth on poverty. Also the higher the initial level of inequality in a country, the higher is the rate of growth that is needed to achieve any given proportionate rate of poverty reduction (Bourguignon, 2003). This has been shown in several cross country analysis (see among others Ravallion, 2005) but also in the analysis of single country experiences. Studies on China, India, Indonesia and Brazil that analyse growth performance in the past decade and early 2000s all show that less initial inequality was associated with a greater effectiveness in reducing poverty.

[3] See, among others, Dollar and Kraay (2002), Kraay (2006), Ravallion (2005).
[4] Ferreira and Ravallion 2008
[5] The countries selected were considered as relatively successful in delivering pro-poor growth. They were: Bangladesh, Brazil, Ghana, India, Indonesia, Tunisia, Uganda, and Vietnam.

How to measure "pro-poor" growth

It has been long recognized[6] the relevance of observing social mobility when one is willing to capture the prospects of different groups in a society. In this view, to observe aspects of the distribution of income such as inequality, poverty or the mean average income at one point in time is not enough, not even if this observation is repeated over time. We also need to see the evolution of people's income within the distribution over time[7].

This paper compares the static poverty profile of population with poverty dynamics for different groups (which relies on panel data), to assess whether growth in Egypt over 2005-2008 was pro-poor or not, i.e. if the poorest groups of the population benefited relatively more from the income redistribution triggered by the growth process. Growth incidence curves (GICs), which are widely used in development economics literature (Ravallion and Chen, 2003) to investigate the pro-poor aspect of growth, follow two marginal distributions and record changes in quintile values in time. In this way, each point of the growth incidence curve may refer to a different individual in different points in time. GICs can show how the distances between ladders of distribution change over time, but they ignore the fact that households can move to a different ladder. By contrast, panel data can trace such movements. Given the bivariate distribution of income $H_{t, t+i}(x,y)=Pr(X\leq x, Y\leq y)$, where X and Y are jointly distributed random variables that describe income at time t and t+i, panel data allow us to estimate $H_{t, t+i}(x,y)$ and not just a function of the joint distribution, as in the cross-sectional data.

The method applied here relies on the work by Jenkins and van Kerm (2008) and van Kerm (2006). They developed a technique of "mobility profiles" which tracks the changes over time in the income[8] distribution of each individual. The mobility profile reveals how the distribution has changed according to the position of the individual in the base (starting) year. It therefore shows not just the degree of progression in terms of welfare but also the re-ranking or mobility associated with this difference. The authors also show how the re-ranking effect might offset the equalizing effect of pro-poor growth and inequality can also rise despite pro-poor growth[9].

Changes over time in the progressivity of income growth cannot therefore be inferred from trends in inequality changes: the degree to which income growth becomes more pro-poor or not depends also on

[6] Hart (1976) and Schille (1977)

[7] As discussed by Gottschalk (1997), a rise in inequality may be compensated by a concomitant rise in mobility and therefore make a "snapshot" high inequality less a concern.

[8] We refer here to income for simplicity, however our analysis adopts a welfare measure based on consumption.

[9] However, the authors stressed that a regressive income growth- which favours the rich in the base year- is necessarily associated with an increase in inequality.

the changes over time in position of individuals in the distribution. Consequently, the results in terms of inequality or pro-poorness of growth might differ substantially between the conventional poverty analysis which relies on cross section data and the mobility profiles approach (or mobility statistics), based on longitudinal data. Jenkins and van Kerm (2008) show in the case of Britain that whether patterns of income growth became more pro-poor under the labour government in the year 1999-2003 (with respect to the Conservative period 1992-1996) depend on the perspective used (and the definition of income growth). According to conventional analysis using a cross-sectional perspective, income growth became more pro-poor using both absolute and proportionate growth definitions. However, from a longitudinal perspective, an increase in progression of income growth is most clearly apparent using absolute income growth definition. The picture of greater progressivity is more muted when viewed in terms of proportionate changes[10].

The sensitivity of the conclusions to how income growth is defined raises questions about how changes in income distribution over time should be assessed. In this context it is also important to bear in mind that the negative slope of the mobility profiles, which is associated with a pro-poor definition, describes a form of regression to the mean which can reflect also the effects of measurement errors and transitory variations. It is therefore essential to apply methods to mitigate the cause of potential spurious impact in the analysis.

Measurement errors in the analysis of mobility based on panel surveys

All income distribution statistics are sensitive to measurement errors and transitory variations in income, but the issue is particularly relevant when estimators are based on change measured at the household level. The observed mobility or growth rates for poor versus non-poor can be genuine – attributable to genuine economic phenomena – or reflecting the effects of measurement errors and transitory variations in income. If there is measurement error of the "classical" form (uncorrelated with the true value and over time), then the expected income increase is positive for someone with a below-average income and negative for someone with an above-average income. As a result, some of the observed progressivity in income growth may be spurious.[11] As Baulch and Hoddinott (2000) phrase it, "... some of the observed movements in and out of poverty will be a statistical artifact." This is also known as "Galton fallacy".

[10] In their analysis there is no contradiction between the results of cross-sections and panel. Egypt data analyzed in this paper demonstrates a more extreme case of diametrically opposite results from two types of analysis.

[11] Van Kerm and Jenkins (2008) use an elegant metaphor to illustrate this point. If one rolls a standard die, the expected number of spots at any roll is 3.5 (the sum of the possible scores divided by six). If the first roll in fact produces a 1, then the expected increase in the score when the die is rolled again is positive (+2.5). By contrast, if a 6 comes up first, the expected gain at the second roll is negative (–2.5). So, despite there being no association

To mitigate the impact of these factors, several methods are used. First, researchers, starting with pioneering work on Indonesia by Alderman and Garcia (1993), attempt to model the observed changes in consumption. They also construct transition matrices by quintile using predicted consumption rather than actual consumption (e.g. Woorland and Klasen or Hyat). These estimated transition matrices put a bound on possible measurement error. Second, some researchers use long panels to distinguish between persistent shocks to income or consumption and transitory ones (Friedman, 1957). For longer panels expanding more than two rounds, it is typical to average several periods and work with the resulting moving averages. By taking an average over a period of time, measurement error and transitory shocks will be partially averaged out (Shorrocks, 1978). Due to availability of just two rounds in Egypt panel we limit ourselves to the first approach.

III. Data and methodology

Living standards in Egypt are monitored with the high-quality large household survey: Household Income, Expenditures and Consumption Surveys (HIECS). Conducted every five years since 1995, these surveys have been the main (and the only official) source for poverty and inequality data in Egypt. In late 2007, faced with multiple policy demands arising from the social policy agenda, the authorities decided to make the data collection more frequent. Since the preparation of a new large survey takes time (including the need to update the sampling frame following the new 2006 census), and the survey itself takes 12 months to collect all data, the decision to proceed without delays resulted in a design requiring less preparation: it was decided to re-visit in 2008 the households interviewed in the February during HIECS 2004/05, applying the same questionnaire. International experts contacted by CAPMAS (Kalton) confirmed the feasibility of such an approach. CAPMAS conducted the field work, revisiting all addresses, completing the survey and matching the new sample to the 2004/05 data. The Household Income, Expenditure and Consumption Panel Survey (HIECPS) 2005-2008 follows the same households over time and allows an unprecedented comparability in the analysis of living standards.

The Sample: The data used in this analysis as panel (for 2005 and 2008) are based on a one-month subsample of the household from the full HIECPS 2004/05 interviewed in February 2005 and 2008 (Figure 1). The sample of HIECS 2004/05 was based on the 1996 Population Census's updated sample frames of 1,200 area sampling units (PSUs) distributed between urban and rural areas of all governorates. The area sample consists of a number of neighbouring census blocks containing 1,500 households. The

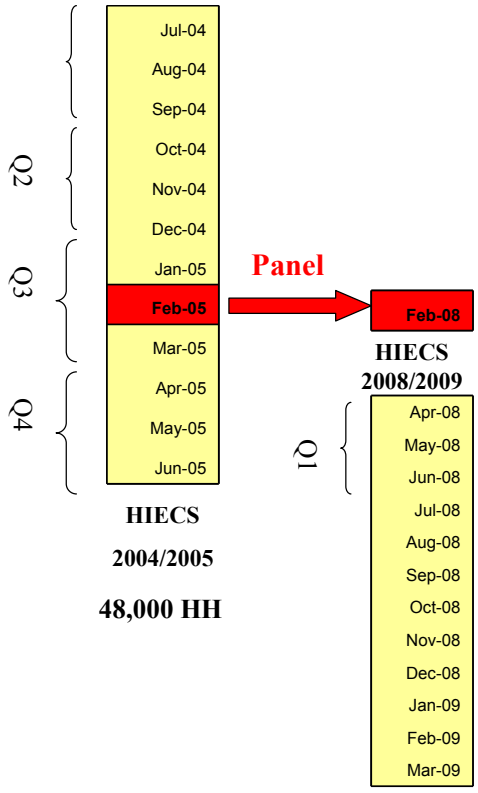
between the first and the second rolls (the die is fair), there is a correlation between the initial outcome and the change in outcome.

sample is a stratified multistage random sample, nationally and regionally (at the governorate level) representative (all 12 monthly samples of the survey spanning part of 2004 and 2005 are independent). In practice, monthly samples are not treated independently, but data collection goes over a quarter, with often filed work for a given month fully completed during a subsequent month in the same quarter. The sample of each quarter is large enough to allow for inferences at the regional and governorate levels, with the exception of Frontier governorates. Due to the large sample size of the main survey (48,000 households), even a one-month sub-sample of 4,000 households in principle is large enough to provide representative data at least for main socio-economic groups. This is of course conditional upon: (i) whether February 2005 sample is not systematically different from other months of the first quarter of 2005 (or third quarter of the survey- see Figure 1)[12], and (ii) whether attrition between 2005 and 2008 was not excessively large to undermine the sample properties[13].

[12] Indeed, some differences were found between the February sample and the full first-quarter sample in terms of regional distribution, household size, housing patterns, sector of economic activities and other aspects. Weights were used for February 2008 and 2005 to reproduce the distribution of the entire quarter of January-March 2005. Since panel structure where no replacement is allowed means that two samples of 2005 and 2008 over which the mean consumption is compared are not fully independent, it is important to make corrections to standard errors calculated based on standard assumptions.

[13] One of the characteristics of the sample selection method of CAPMAS's stratified, multistage sample design for 2004/05 is that all PSUs are not represented in each quarter, though the sample in each quarter is nationally representative. The quarterly samples are in turn subdivided into monthly samples, which may happen to be biased. Annex 1 presents details on the correction for for panel attrition

Figure 1: Panel survey: sub-sample of HIECS



The data used in this analysis rely on a one-month panel sample of the full HIECS 2004/05, containing the same (matched) households. Out of the 3,903 addresses from February 2005 sample revisited in 2008, 3,690 participated in the survey, of which 3,552 households were the same (panel) households as interviewed in 2005 and 138 were new households (at the old addresses). These 138 households do not form a panel and are not used for any analysis presented in this paper.

Main living standards indicator: consumption. In this paper, as in the previous studies of poverty and living standards in Egypt (World Bank 2007), the analysis relies on actual consumption expenditure, including all money spending on consumer goods and services (durables included), and non-monetary parts, such as imputed rents, own production and in-kind transfers received by households. Food consumption includes food that the household has purchased, grown and received from other sources for 279 items. Non-food consumption is the sum of expenditure on 298 non-food items, including expenditure on fuel, clothing, schooling, health and several miscellaneous items. Transfer and credit expenditure are also included. Compared to efforts deployed to capture each element of spending by a household, income module in the survey is rather light and relies on several aggregated items.

Correction for inflation. Egypt has experienced rapid inflation between 2005 and 2008. It is therefore important to rely on real values for comparisons over time. The CPI index disaggregated by regions and into food and non-food component was used. The second way was to use the poverty lines for each household re-estimated in actual prices as deflators (consumption is then measured in terms of poverty baskets a household can purchase in the current month, see El Laithy and Lokshin, 2003, for methodology).

IV. Economic growth, inequality and poverty over 2005-08: A cross-sectional perspective

Egypt witnessed rapid and sustained economic growth during 2005-08. This episode followed a period of economic turmoil (large depreciation of national currency) and slow, at times almost zero, growth in per capita consumption. In contrast, real GDP annual growth averaged over 6 percent, leading to an accelerated growth in total final household consumption expenditure. In per capita terms, private consumption grew at an average rate of almost 4 percent per year in this period. The HIECPS data for 2005-2008 shows remarkably similar picture. Households' real average per capita consumption[14] increased by 12.3 percent between 2005 and 2008 (3.9 percent per year) – practically identical to macroeconomic estimates from the National Accounts (Table 1). But price increases for goods and services consumed by households were also staggering. Inflation over the period was very uneven: prices of food and other basic goods and services increased much faster than other prices. The cost of the subsistence minimum food basket increased by 47 percent, far more than the overall increase in the CPI (31 percent over the three years).

Table 1: Survey Results – Growth in Monthly Mean Consumption

	Consumption per capita in 2005 LE			
	February 2005	**February 2008**	**Growth 2008-2005 (percent)**	**Annual growth rate (percent)**
Urban	3,007	3,430	14.1	4.5
Rural	1,868	2,057	10.1	3.3
Total Egypt	**2,352**	**2,641**	**12.3**	**3.9**

Source: Authors estimates based on HIECPS 2005-2008 and regional CPI indices. Note: Table uses actual household size to weight data.

[14] Using CPI index to deflate nominal figures.

Adjusting for the panel design and for over and above CPI increases in the cost of poverty basket result in less impressive growth. Table 2 shows that moving to the panel constant weights and the welfare index instead of per capita consumption (reflecting real growth rates relative to the cost of the poverty basket) welfare growth was close to 2 percent per year (6.85 percent over 2005-2008 period), and not 4 percent per year as implied by the overall CPI index. Table 5 also shows how standard errors estimated with classical assumptions are different from correct standard errors which take into consideration survey sample design (clustering) and panel properties. It means for example that for rural areas growth rate in average consumption is not statistically different from zero (at 95 percent confidence level the range around the estimate is plus minus 6 percentage points – larger that the mean estimate itself of 5.6 percent).[15]

Table 2: Growth rate of the welfare index and standard errors

	Growth rate of the welfare index,%	Standard errors, percent		
		Classic	Allowing for clustering	Panel (boostraped)
Urban	7.83	0.48	3.75	3.59
Rural	5.66	0.33	3.13	3.44
Total Egypt	**6.85**	**0.31**	**2.50**	**2.57**

Source: Authors estimates based on HIECPS 2005-2008 and regional CPI indice).
Note: Table uses fixed household size to construct constant panel weights.

This 7 percent growth in real average household welfare translated in poverty reduction, but not at the same rate for everyone. Table 3 presents assessment of poverty changes based on poverty line defined in World Bank (2007). The "lower poverty line" used here represents the cost of the minimum subsistence basket comprising food and non-food goods and services. The poverty headcount moved from about 23 percent in 2005 to about 19 percent in 2008. Poverty reduction was especially rapid in urban areas. However, large standard errors mean that only for Egypt as a whole change in poverty was significant at high confidence level (95 percent).

[15] Notably, allowing for panel design does not change the magnitude of standard error significantly (3rd and 4th columns). Hence, we can rely on simple survey methods to calculate standard errors (available as standard command in Stata).

Table 3: Poverty Measures in 2005 and 2008 with Corrected Standard Errors*

	2005						2008					
	P0		P1		P2		P0		P1		P2	
	Est.	St.Er.	Est.	St.Er.	Est.	St.Er.	Est.	St.Er.	Est.	St.Er.	Est.	St.Er.
Urban	13.2	3.3	2.7	1.1	1.0	0.5	8.6	1.8	1.8	0.5	0.6	0.2
Rural	31.1	2.9	5.8	0.8	1.6	0.3	26.5	2.8	5.5	0.8	1.8	0.3
All Egypt	**23.4**	**2.2**	**4.5**	**0.7**	**1.3**	**0.3**	**18.9**	**1.8**	**4.0**	**0.5**	**1.3**	**0.2**

Note: all measures in percentages, P0-headcount, P1-poverty gap, P2- severity of poverty (squared P1).
Table uses actual household size in 2005 and 2008 to weight data together with households sampling weights. The frontier regions are excluded from regional disaggregation due to their small sample size, yet they are included in other national averages. Source: Authors estimates based on HIECPS 2005-2008.

Indices sensitive to distribution show less impressive poverty reduction. Poverty gap (P1), and severity of poverty (P2) capture the degree of poverty as experienced by the poor. Table 3 demonstrates that assessment using changes in P2 shows no reduction in poverty, with a clear worsening in rural areas. Indeed during this period the ranks of the extreme poor – those consuming less than the cost of the subsistence food basket - swelled by 1.1 million, entirely due to the sharp increase of incidence of extreme poverty in rural areas. Hence, growth in the period 2005-2008 was not beneficial to the extreme poor, i.e. it was not pro-poor in a strict sense.

Table 4 further illustrates the bias against the poor of the growth during 2005-2008 by listing several inequality indices and dissecting the distribution. This is done by presenting percentiles of distribution: for example, p25/p10 is ratio of consumption between those who are at the 25th percentile and those who are on the 10th percentile (that is, poorer). Table 4 shows a widening of distribution at the top (p75/p50 and p90/p50 measure) and at the bottom (p25/p10 measure) – the latter exclusively in rural areas.

Table 4: Indices of Inequality for Consumption, by Urban and Rural Areas (2005-2008)

	Lower Half of the Distribution		Upper Half of the Distribution		Tails	
	p25/p10	p50/p25	p75/p50	p90/p50	p90/p10	Gini
Total						
2005	1.26	1.33	1.36	1.95	3.27	28.67
2008	1.32	1.33	1.38	1.98	3.48	30.46
Urban						
2005	1.33	1.41	1.38	2.04	3.84	30.23
2008	1.33	1.37	1.42	2.13	3.87	32.34
Rural						
2005	1.23	1.27	1.26	1.56	2.42	20.43
2008	1.29	1.31	1.28	1.59	2.68	21.99

Source: own estimates based on panel HIECPS survey 2005-2008.

The widening of the distribution is well illustrated by growth rates for different percentiles. Figure 2 shows growth-incidence curves (GICs) for Egypt overall, and for urban and rural areas, over 2005-2008. Such curves show the annual growth rate for household welfare at each percentile from the poorest (1st percentile, on the left) to the richest (100th percentile, on the right).

The positive slope of the growth incidence curves suggests that the rich gained more than the poor, especially in rural areas, which show even a fall in real welfare for the poorest percentiles in contrast to overall positive growth. In urban areas the growth incidence curve has a characteristic U-shape, suggesting that the richest and the poorest had the highest growth rate, while the middle, especially those between the 20th and 60th percentiles, experienced the slowest growth, bordering just 1 percent per year.[16] Taking bottom 20 percent as poor in the country, one can see that in absolute sense the poor as a group had a small gain (with the extreme poor in rural areas experiencing a fall in welfare). Taking into consideration confidence intervals, one can say that for Egypt and for rural areas, the poor have experienced growth rates below the mean. In fact, the poor in Egypt had the lowest growth rate, hence the growth was not pro-poor in a relative sense.

[16] It is important to remember that the period of high growth during 2005-2008 was preceded by five years of losses. For the lower-middle class, 1 percent per annum gain does not even compensate for losses incurred during the preceding five years of negative growth (during 2000-2005). Growth incidence curves for this period were presented in World Bank 2007.

Figure 2: Growth Incidence Curves, 2005-2008, for Egypt, Urban and Rural Areas

Note: grey areas show95 percent confidence intervals of the estimated growth rate.
Source: own estimates based on panel HIECPS survey 2005-2008.

This assessment should be now put to test. As stated above, there are limitations of growth incidence curves that the panel data can help to overcome.

V. Was growth in Egypt biased against the poor? Assessment based on panel data

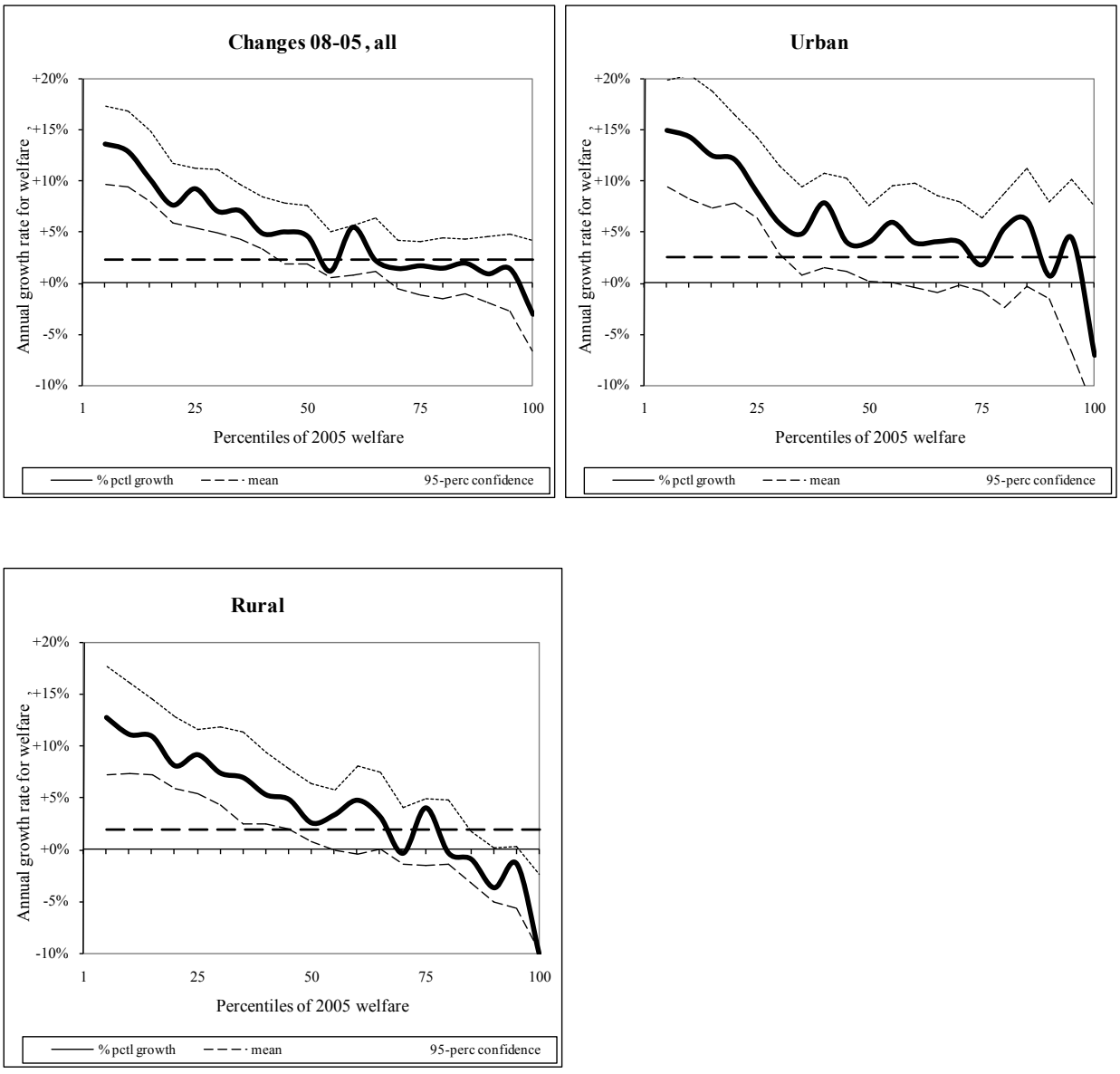
Longitudinal changes capturing actual movement of households suggest a very different pattern of mobility compared to growth incidence curves. Growth incidence curves constructed on panel data allow us to see how each person's welfare evolved over time. Panel based GICs are no anonymous, and they show the growth rates depending on where in a distribution a given person or household started. Therefore, it is not surprising to find that moving from a simple comparison across periods (Figure 2) to a longitudinal perspective produces a dramatically different picture**.** Figure 3 plots actual household growth rates over 2005-2008, ranking all households by their position in the 2005 distribution.

From the panel perspective, growth in Egypt was pro-poor. Whether in urban or rural areas, panel GICs demonstrate a clear and statistically significant negative slope- those who were among the poorest in 2005 have experienced fastest growth. Figure 3 suggests that the welfare of an average person who was poor in 2005 increased by 9.7 percent per year between 2005 and 2008, which was sufficient to move the household out of poverty. As documented in the Poverty Assessment Update (World Bank, 2007), an average poor person has a deficit of about 20 percent of consumption to reach the poverty line. Growth of about 10 percent per year accumulated over three years would fill in this poverty deficit.

A simple comparison of the magnitude of changes between cross-section (Figure 2) and panel data (Figure 3) is also quite informative. While in GIC growth rates by percentile lie within a narrow interval around the means and do not exceed 10 percent per year, the panel data show both larger changes (up to 20 percent per year) and much wider confidence intervals. With 95 percent certainty, however, it is the poorest 20 percent who have experienced positive growth over and above the growth rate of the mean.

Growth incidence curves for panel data are remarkably similar across urban and rural areas, unlike on Figure 2. In both locations we find a similar pattern and magnitude of gains for the poor. The difference for rural areas is particularly dramatic.

Figure 3: Panel Growth Rates by Percentiles of Distribution



Note: welfare rank is based on household consumption divided by its lower poverty line. Source: own estimates based on HIECPS 2005-2008.

Growth incidence curves for panel data show that in reality very few households moved along with the average growth rate of the economy (of about 2 percent per year when measured in per capita and against a cost of poverty basket): 15 percent of the population experienced annual losses in their welfare of more than 10 percent, and 25 percent experienced gains of similar magnitude. This extreme degree of mobility and a clear pattern of negatively sloped growth incidence immediately raise concerns about the impact of the measurement error. To see whether measurement error is behind the observed pattern we move now

to a detailed analysis of mobility with different data cleaning methods. We will compare the results with different cleaning approaches.

VI. Mobility: Egypt's panel data in perspective

Table 5 uses the most commonly used tool to present mobility: the transition matrix. The sample is divided into *n* equally sized income classes (e.g. deciles, 10). The matrix shows what share of each decile population in 2005 stayed in the same position in 2008 (diagonal) or moved to a different decile.

Table 5: Mobility by Deciles, 2005-2008, Actual and Cleaned Data

Percent of population in each decile by their position in 2008.

Panel A Actual data

Decile actual consumption in 2005 \ Deciles of actual consumption in 2008	1st poorest	2	3	4	5	6	7	8	9	10th richest
1st poorest	38	25	10	8	7	3	3	3	1	0
2	20	16	21	14	10	7	5	4	2	0
3	15	14	14	15	14	8	7	6	4	2
4	7	15	14	12	12	14	10	11	4	2
5	8	11	13	12	12	14	14	9	6	1
6	5	10	8	14	14	12	13	11	9	4
7	5	4	9	9	10	14	15	13	16	5
8	5	4	9	9	10	13	13	14	16	7
9	1	3	3	6	6	10	12	16	23	20
10th richest	1	2	1	2	4	5	8	11	15	52

Panel B Cleaning all 2005 & 2008

Decile modeled consumption 2005 \ Deciles of modeled consumption in 2008	1st poorest	2	3	4	5	6	7	8	9	10th richest
1st poorest	32	21	15	13	7	6	4	2	1	0
2	23	15	15	14	10	10	7	4	1	0
3	13	16	16	13	15	11	7	5	3	0
4	12	12	14	14	11	13	11	8	4	1
5	7	12	11	15	17	12	14	7	4	1
6	5	9	10	11	12	11	14	14	10	3
7	3	5	6	8	13	12	17	17	12	5
8	2	4	5	5	8	14	14	20	16	10
9	2	2	3	3	4	7	9	17	31	22
10th richest	0	1	1	2	1	3	4	7	21	60

Panel C Cleaning imputed rent values in 2008

Decile actual consumption in 2005 \ Deciles of consumption with cleaned rent in 2008	1st poorest	2	3	4	5	6	7	8	9	10th richest
1st poorest	42	19	13	8	9	4	3	2	0	0
2	18	20	16	14	11	8	5	4	4	1
3	13	14	13	16	14	11	8	5	4	2
4	9	15	17	12	12	12	11	9	3	1
5	7	12	13	14	14	13	10	8	7	2
6	4	8	13	11	12	13	16	13	7	4
7	4	6	7	11	14	13	15	16	11	4
8	2	3	5	7	8	16	11	19	18	11
9	2	2	3	5	5	8	14	17	23	21
10th richest	1	0	1	2	2	3	7	8	23	54

Panel D Cleaning 2005 only

Decile of modeled consumption 2005 \ Deciles of actual consumption in 2008	1st poorest	2	3	4	5	6	7	8	9	10th richest
1st poorest	37	22	14	10	5	4	3	3	2	1
2	19	18	15	12	10	8	8	6	4	1
3	12	12	13	12	11	12	10	10	5	2
4	9	13	10	17	12	10	11	9	5	2
5	8	9	12	12	13	13	11	10	8	3
6	5	9	11	11	11	15	13	12	9	4
7	4	6	9	10	11	13	14	15	12	6
8	2	6	8	8	11	11	12	12	19	12
9	2	2	5	4	10	9	10	14	19	24
10th richest	0	1	2	2	4	5	8	10	20	47

Note: Deciles are for real consumption per capita. Each number in this table represents a percent of the nth decile population which either remained in the same decile three years later (diagonal) or moved to a new decile (upward mobility- green, downward- grey). All rows sum up to 100, the population of each decile. Source: own estimates based on HIECPS 2005-2008.

Panel A represents initial data showing observed actual transitions between deciles of distribution. Panel B shows the most extreme cleaning, when all observations are replaced by their predictions from

regressions (Table A2 in Annex 1), panel C shows the results of the statistical cleaning by smoothing reported imputed rents over time, and panel D applies cleaning to 2005 only cleaning the initial position. Transition matrices "purged" of the measurement error and actual observed transition show remarkably consistent patterns. Everywhere the poor experience a lot of upward mobility with less than half of the lower decile staying in this position in three years, while the middle of the distribution is remarkably instable. The growth for each percentile with different cleaning assumption can be summarized also as a table (Table 6).

Table 6 Change in welfare over 2005-08 (percent): actual and cleaning measurement error

	2005 actual				2005 **modeled**				2005 **modeled**			
Deciles	change **actual**	Se	95 confidence		change **actual**	se	95 confidence		change **modeled**	se	95 confidence	
1 poorest	+33%	0.0084	+31%	+34%	+18%	0.0116	+16%	+21%	+27%	0.0060	+26%	+29%
2	+33%	0.0115	+31%	+36%	+20%	0.0152	+17%	+23%	+23%	0.0067	+22%	+24%
3	+34%	0.0141	+31%	+37%	+17%	0.0142	+14%	+19%	+21%	0.0071	+19%	+22%
4	+20%	0.0113	+18%	+22%	+16%	0.0160	+13%	+19%	+18%	0.0080	+17%	+20%
5	+16%	0.0119	+13%	+18%	+13%	0.0186	+9%	+16%	+13%	0.0081	+11%	+15%
6	+17%	0.0178	+13%	+20%	+20%	0.0243	+15%	+25%	+17%	0.0107	+15%	+19%
7	+7%	0.0177	+4%	+11%	+10%	0.0227	+5%	+14%	+16%	0.0113	+14%	+18%
8	+11%	0.0216	+6%	+15%	+13%	0.0323	+6%	+19%	+13%	0.0138	+10%	+16%
9	+9%	0.0319	+3%	+16%	+16%	0.0361	+9%	+23%	+12%	0.0164	+9%	+15%
10 richest	-30%	0.0764	-45%	-15%	+10%	0.0657	-2%	+23%	-3%	0.0274	-8%	+3%

Source: own estimates based on HIECPS 2005 and 2008

Thus, the measurement error is not an explanation behind the observed pattern of pro-poor in the panel data. Indeed, replacing actual values with predicted on Figure 3, we would observe very similar shape to the observed.[17] We conclude from this, that panel data in Egypt convincingly show that the growth over 2005-2008 was pro-poor. But they also reveal a lot of mobility not only for the poor, but also for other parts of the distribution. The cross-section (i.e. if we look only at anonymous changes) might in fact hide tremendous amount of re-ranking that is taking place between the comparisons point and reveals only a tiny part of the actual turmoil associated with economic growth in the environment of high inflation.

[17] Results available on request.

The potential effect of re-raking is illustrated by Table 7. It represents the share of the population belonging to households with different types of welfare dynamics: chronically poor (below low poverty line in both periods),[18] those who have experienced sharp and slight falls in living standards, and those who moved up a ladder of welfare. Table 7 suggests that while 36 percent of the population (22+14 percent) have experienced improvement in their position, and a further 16 percent managed to gain in line with the average, thus preserving their position as non-poor, as many as 48 percent of the population have either stayed in poverty or experienced losses – and for 17 percent there were very deep losses (movement down by more than two deciles).

Table 7: Distribution of Population by Welfare Dynamics, 2005-2008

Percent of population (Total=100)

Category	Percent of population
Chronic poor*	10
Deep falls in welfare (down by >2 deciles)	17
Slight falls in welfare (a fall to a next decile)	21
Preserving ranks as non-poor	16
Slight improvement in welfare over 2005-08	22
Big jump ahead in welfare (up by >2 deciles)	14

**Note: Lower poverty line.* *Source: Authors estimates based on panel HIECPS survey 2005-2008.*

Moreover, when only one third of those belonging to the lowest decile in the initial period preserve their ranks three years later, the meaning of 'the poor' in the definition of pro-poor growth from the cross – section perspective simply does not make sense: these are predominantly different people in 2008 compared to 2005. Hence, other measures are required to capture the effect of growth on the non-poor in terms of degree of their vulnerability to become poor. Growth may have dramatically different effects on poverty depending not only how it (positively) affects the poor, but also how it may (negatively) affect the non-poor. Further analysis is warranted to decompose the degree of "pure mobility" (i.e. whether mobility was greater the poorer the individual) from the "re-ranking" effect that we can observe only in the panel. A potential approach is the one proposed by Nissanov and Silber (2009), which tries to

[18] The analysis of poverty in Egypt is based on household consumption (and not on expenditures or income), and due to "smoothing" of consumption by households in the face of income fluctuations, it is believed to be the most stable measure of household welfare. It is therefore justifiable to assume that if a household is observed to be in poverty at both observation points – 2005 and 2008 – this household was also likely to have stayed in poverty between these points, and will remain poor for some time. Such a household is called "chronically poor", even though just two observations three years apart are available.

reconcile the difference in results observed above (between cross section and panel) by decomposing growth "convergence" (or lack of) into 3 components: (i) a coefficient representing the "structural' mobility, or change in inequality, (ii) the "pure" mobility effect (which tries to address the Galton fallacy) and the "re-ranking" effect. The authors of this study will explore this approach as a next step of the analysis with the aim to assess the relative important of "pure" mobility versus re-ranking and therefore the relative role of short term (re-ranking) versus medium to long term changes in the distribution.

VII. Conclusions

Looking at cross sectional data for 2005 and 2008, the paper demonstrates that Egypt achieved impressive poverty reduction between 2005 and 2008, thanks to rapid economic growth. However, inequality also increased during this time, attenuating the impact of growth on poverty reduction. The shape of the growth incidence curve for overall Egypt suggests that the rich gained more than the poor, especially in rural areas. However, growth incidence curves ignore the fact that households can move to a different ladder in the distribution over time. With the panel data available for Egypt 2005-2008, it is actually possible to trace such movements between 2005 and 2008.

Longitudinal changes capturing actual movement of households suggest a very different pattern of mobility compared to cross-section growth incidence curves. Growth incidence curves constructed on panel data allow seeing how each person's welfare evolved over time. From the panel perspective, growth in Egypt was pro-poor. The welfare of an average person who was poor in 2005 increased by almost 10 percent per year between 2005 and 2008; this was sufficient to move this household out of poverty. But growth also exposed some non-poor to negative dynamics, making them poor. Panel data also reveal that many middle-class households were exposed to significant risks. In the period 2005-2008, only 45 percent of the population in Egypt remained out of poverty and near-poverty. This means that 55 percent of Egyptians experienced poverty or near-poverty between 2005 and 2008, even though the poverty and near-poverty rates at a given point of time within his period fell from 46 percent to 36 percent.

This high mobility is a reflection of real economic phenomena and not a statistical artefact. The paper looks in detail at the statistical indices of mobility and mobility profiles, and finds that new HIECPS data 2005-2008 generate reasonably robust estimates of mobility. In the face of strong mobility upward and downward mobility even considerable increases of inequality observed over the period are minor factors of social welfare dynamics.

Annex I

Correcting for panel attrition. Any panel data suffer from the problem of attrition and aging. Attrition happens when a household that participated in the first round declined to comply with the survey in the subsequent data collection. Aging occurs when over time panel sample, which by design misses new household formation, loses representativeness. The attrition was systematic but not large (Table 1), while it was judged that aging over the three-year period was not serious, with limited migration and residential mobility rates observed in Egypt (e.g. Whaba).

Table A1: Structure of the full sample, panel and attrition by region in February sample

Region	Full 2005 sample	Panel sample	Attrition
Metropolitan	18.7	18.5	24.1
Lower Urban	11.7	11.3	21.9
Lower Rural	30.2	31.0	11.0
Upper Urban	10.0	9.7	18.3
Upper Rural	27.3	27.4	24.1
Frontier Urban	1.0	1.0	0.7
Frontier Rural	1.1	1.1	0.0
Total	100.0	100.0	100.0

Source: own estimates based on HIECPS data 2005-2008.

Following the methodology discussed in Kalton and Brick (2000), a simple model corrected for disparities in two stages was applied: first, correcting for differences between the one-month sample and the quarterly (representative) sample; and second, correcting for attrition within the monthly sample of the chosen survey month. At the first stage, probit regression was estimated, with the aim of evaluating the probability *Pi* that the household is sampled in February 2008 – comparing it to the full sample of the first quarter of 2005.

$$P_i = f \text{ (region, household structure, household head characteristic, housing structure)} \quad (1)$$

The regressors used in the probit function included region, household size, number of children, household head's gender, age, education and economic activity, and house type and connectivity to sewerage. The inverse of the predicted probability was used in the weighting of the population.

An additional correction for attrition within February sample was done using the same probit set up. [19] The inverse of the predicted probability of attrition was used to adjust the sampling weight in the February 2008 data. The final weights brought the February panel sample to the full quarterly sample of 2005. The analysis abstracted from possible seasonal bias (e.g. due to different timing of religious holidays). In addition, the field implementation resulted in other minor variations, such as changing some definitions or coding conventions in 2008 compared to 2005. These factors were investigated and changes made to both 2005 and 2008 to make them consistent and comparable.

Cleaning the measurement error: approaches adopted with HIECPS data. The basic approach is to first ensure as careful as possible a construction of the consumption aggregate. While consumption data is also susceptible to measurement error,[20] it is more accurately measured than any other welfare indicator in CAPMAS data (e.g. income). Measurement error may arise mainly from difficulties in accounting for the imputed value of owner-occupied housing. These values are entirely subjective, reported by households without any checks or cleaning and in some cases differ quite dramatically between 2005 and 2008. Therefore the contamination of a mobility measure is likely to occur from this source. We eliminate it by using 2005 values and regional index of median imputed rent changes between 2005 and 2008 and then perform our analysis on the sample without imputations (Jarvis and Jenkins, 1998). This is a simple statistical approach.

A more structured approach to correct for measurement error in the panel is using a regression of household welfare (measured as consumption divided by household specific poverty line) on household size, demographic structure, education and age of household head, female headship, location, the authors predicted household consumption in 2005 and 2008. A welfare regression is estimated as OLS in the following form: Log (consumption expenditure)= $\beta X_i + \epsilon_i$ where the dependent variable is the log of consumption divided by household poverty line, β is the vector of parameters that include a range of characteristics of the household and ϵ is an error term. Models for urban areas and rural areas were analysed separately (Table A2)

[19] In this multivariate framework the regional dummies were the most powerful factor determining attrition. Other factors, such as education or age, were also significant, but less so. Overall, the fit was acceptable, and the very low attrition rate of about 5 percent was judged to be sufficient to deal with the bias. Regression results are available on request.

[20] Consumption data are not immune to the measurement error problem. These variables may reflect transitory events – a bonus, the purchase of a consumer durable – that actually happened but that have only little impact on the underlying material well-being of the individual. Second, they are subject to measurement error – for example, respondents may forget certain expenditures components or include ones that should be excluded, or errors may occur in data entry etc.

Table A2: Consumption Regressions

	2005				2008			
	Urban		Rural		Urban		Rural	
	Coef	Se	Coef	se	Coef	Se	Coef	Se
Household characteristics								
Log of household size	-0.672***	*0.08*	-0.572***	*0.06*	-0.451***	*0.08*	-0.422***	*0.06*
Log of household size^2	0.025	*0.03*	0.029	*0.02*	-0.060*	*0.03*	-0.001	*0.02*
Share of children 0-6			…		…		…	
Share of children 7-16	-0.237***	*0.09*	-0.082	*0.05*	-0.162*	*0.09*	-0.154***	*0.05*
Share of male adults	-0.407***	*0.09*	-0.455***	*0.05*	-0.369***	*0.10*	-0.400***	*0.06*
Share of female adults	-0.328***	*0.10*	-0.220***	*0.06*	-0.311***	*0.10*	-0.224***	*0.07*
Share of elderly (>=60)	-0.352***	*0.12*	-0.290***	*0.08*	-0.161	*0.13*	-0.277***	*0.08*
Regions								
Metropolitan	…		…		…		…	
Lower Urban	-0.134***	*0.03*	…		-0.073***	*0.03*	…	
Lower Rural	…		0.144***	*0.01*	…		0.201***	*0.02*
Upper Urban	-0.287***	*0.03*	…		-0.217***	*0.03*	…	
Upper Rural	…		…		…		…	
Borders Urban	-0.058	*0.07*	…		-0.129*	*0.08*	…	
Borders Rural	…		-0.193***	*0.05*	…		-0.100*	*0.06*
Characteristics of household head								
Log of household head's age	0.166***	*0.06*	0.064*	*0.04*	0.209***	*0.07*	0.145***	*0.04*
Gender								
Female	0.113***	*0.04*	-0.010	*0.02*	0.100***	*0.03*	0.028	*0.02*
Education of the household head								
Illiterate	…	...	…	...	…	...	…	...
can read and write _does not hold a degree	0.216***	*0.03*	0.093***	*0.02*	0.124***	*0.04*	0.113***	*0.02*
below average degree _primary or preparatory	0.234***	*0.04*	0.124***	*0.03*	0.230***	*0.04*	0.128***	*0.03*
average degree _secondary degree or equivalent	0.326***	*0.04*	0.159***	*0.02*	0.318***	*0.04*	0.196***	*0.02*
above average degree but below university degree	0.441***	*0.06*	0.186***	*0.04*	0.349***	*0.06*	0.259***	*0.05*
University degree	0.588***	*0.04*	0.273***	*0.03*	0.646***	*0.04*	0.395***	*0.04*
above university degree _masters or PhD	0.838***	*0.12*	0.470**	*0.22*	0.943***	*0.11*	0.858***	*0.24*
Constant	0.736***	*0.20*	0.610***	*0.11*	0.494**	*0.22*	0.188	*0.14*
Number of observations	1,439		2,114		1,439		2,114	
Adjusted R2	0.474		0.440		0.457		0.375	

note: *** p<0.01, **	… -
p<0.05, * p<0.1	dropped

Source: authors estimates based on HIECSP 2005 and 2008

These results are used to assess mobility where predicted values are replacing actual observations for 2005 only, or for both 2005 and 2008. Following literature the simplest form of such correction is to instrument 2005 values with the modelled consumption to correctly position the household in the initial distribution, and then use the actual observed change over 2005-2008. Other approach is to use predicted values for both 2005 and 2008 and use changes in the predicted values to measure mobility. Clearly, we are thereby throwing away quite a lot of true mobility that would not be captured by these regressions but this approach should give us sense of the maximum extent to which our measurement error affects expenditures.

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