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Preliminary Draft

Abstract

The potential economic returns to the demographic transition are high. As countries move from a steady state with high mortality and high fertility to an equilibrium with low mortality and fewer children, lower dependency ratios, higher investment in human and physical capital as well as increased female labor force participation contribute to economic growth. In this paper, we analyze the demographic transition at the household level, investigating the distributional patterns of the economic and welfare benefits associated with the demographic transition across socioeconomic groups within countries and over time. We find large differences in the effects of the demographic transition across socioeconomic status (SES) groups in the early stages of the demographic transition, but also substantial behavioral change across all groups during phases of rapid fertility decline, so that the long-run effects of the demographic transition on inequality remain ambiguous.

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1. Introduction

The potential economic returns to the demographic transition are high. As countries move from a steady state with high mortality and high fertility to an equilibrium with low mortality and fewer children, several factors change in a way that is conducive to economic growth: working age adults have to support fewer children and are thus richer in terms of per capita income; fewer children mean more resources per child and higher capital investment; fewer children also imply more time for parents to work; last, longer life expectancy and less reliance on within-family support implies higher investment in physical capital. In the initial stages of the demographic transition, infant mortality rates decline and fertility rates remain high. Couples make a decision over how many children to have based on a number of social determinants of fertility such as age, religion, wealth, contraceptive use, and also infant mortality (Schultz 1997). In a high infant mortality environment, families will elect to have more children than their ideal family size - partially to replace some of the lost children, and partially to anticipate future deaths in their family. With a decline in infant mortality, couples take time to adjust their expectations of infant mortality and thus the decline in fertility lags (by about 10 years) the decline in infant mortality (Angeles 2010).

The decline in fertility yields a mechanical effect on income per capita through changes in the age structure. With fewer children under working-age, total national income is divided by a smaller total population, yielding higher income *per capita* in the country. In addition to this accounting effect, the shifts in age structure trigger behavioral responses that have a positive effect on growth as described before: with fewer children to support, parents invest more in the education of their children (Becker, Murphy et al. 1990; Galor 2006), and save more for their retirement (Bloom, Canning et al. 2003), and women increasingly participate in the formal labor market (Bloom, Canning et al. 2009. As a result, economic growth accelerates, yielding what has been coined the demographic dividend (Bloom, Canning et al. 2003).

While the potential benefits of the demographic transition have been documented extensively at the country level, the distribution of the benefits within a county over time has not been explored to date. In this paper, we take a first step in this direction. We combine a large number of household level data sets from the Demographic and Health Surveys (DHS) to measure the extent to which the correlation between wealth and age structure is observable at the household level, and to investigate the degree to which demographic change contributes to a society's inequality over time.

The only paper that has, to our knowledge, investigated the distributional aspects of the demographic transition is Hausmann and Szekely (2001), who analyze a group of Latin American countries and investigate the effects of demographic transition on inequality at the household level. While inequality has a long history in the subcontinent, the authors find that the demographic transition further accentuated pre-existing trends, with faster, and earlier demographic shifts among the wealthiest population groups further increasing the gap between the rich and poor.

In this paper, we build on Hausmann and Szekely's(2001) work, and investigate whether the demographic transitions increases or decreases inequality within societies. More specifically, we investigate whether the changes in dependency ratios observed during the various stages of the demographic transition are larger in richer than among poorer households. To do this, we pool all data available from the Demographic and Health Surveys (DHS), which yields a total sample of 1.65 million households over the period from 1990-2008. We then use the asset holding information collected as part of the DHS to rank all households with respect to their absolute level of wealth. By using an absolute measure of wealth, we are able to distinguish general wealth effects (improving household wealth) from behavioral effects, i.e, we are able to see whether overall changes in dependency ratios are mostly driven by households getting richer or by households from one (or several) income groups changing their reproductive behavior.

We divide our analysis in three parts: in the first part, we provide a detailed description of the household and age structures observed in developing countries, and show basic correlations between households' SES and age structure. In the second part, we pool all available data, and

directly test whether the demographic dividend increased inequality over time (the Hausman hypothesis)by exploring time variations captured through multiple surveys rounds in each country. Last, we take a look at the three countries with very rapid demographic change, and decompose these changes in the underlying changes in income distribution and behavior conditional on income. We conclude the paper with a short summary and discussion.

2. Data and Methodology

To analyze changes in age structure at the household level over time we combine all currently available data from the Demographic and Health Surveys (DHS) into a large micro-data base covering approximately 1.65million households over the period 1990-2008.Originally designed with a focus on reproductive health similar to the World Fertility Surveys, DHS surveys have steadily grown in geographical coverage and scope over time. At present, more than 170 DHS surveys are available across 73 countries. Some of the earlier surveys collected information on female respondents only. Given the household-level focus of this study we exclude these early surveys. This leaves a total of 151 surveys in 60 countries where both household and asset information is available. As Figure 1and Table 1 illustrate, Sub-Saharan African countries are by far the largest group in the DHS sample with a total of 82 surveys, while 26, 21 and 22 surveys are available for Latin America, South-East Asia and other developing countries, respectively.

Figure 1: Spatial distribution of surveys

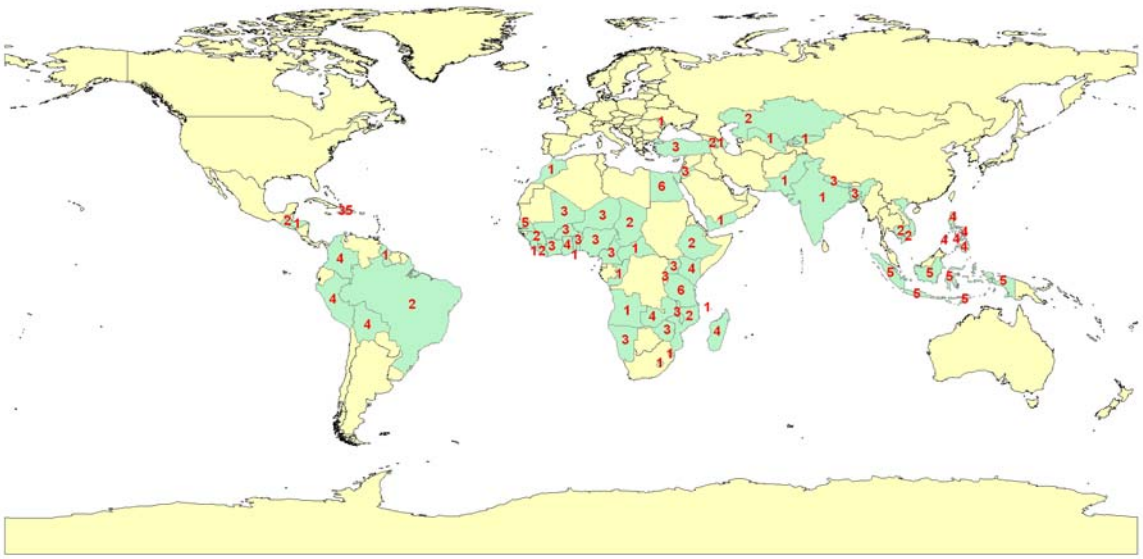


Table 1: Sample distribution

Sub-Saharan Africa	Surveys	Households	**South-East Asia**	Surveys	Households
Angola	1	2,595	Bangladesh	3	30,746
Benin	3	27,745	Cambodia	2	26,472
Burkina Faso	3	18,998	India	1	88,539
Cameroon	3	18,686	Indonesia	5	168,322
Central African Rep.	1	5,546	Nepal	3	25,379
Chad	2	12,201	Pakistan	1	7,179
Comoros	1	2,246	Philippines	4	50,375
Congo, Dem. Rep.	1	8,877	Vietnam	2	14,044
Congo, Rep.	1	5,878	*Total*	*21*	*411,056*
Cote d'Ivoire	3	12,382	**Latin America**		
Ethiopia	2	27,785	Bolivia	4	59,896
Ghana	4	29,833	Brazil	2	19,296
Guinea	2	11,317	Colombia	4	65,613
Kenya	4	33,834	Dominican Republic	5	76,822
Lesotho	1	8,581	Guatemala	2	16,863

Liberia	2	10,981	Guyana	1	2,605
Madagascar	4	39,368	Haiti	3	24,400
Malawi	3	33,141	Honduras	1	18,678
Mali	3	33,962	Peru	4	116,381
Mozambique	2	21,521	*Total*	*26*	*400,554*
Namibia	3	19,674	**Other**		
Niger	3	18,777	Armenia	2	12,677
Nigeria	3	48,776	Azerbaijan	1	7,171
Rwanda	3	26,193	Egypt, Arab Rep.	6	94,296
Senegal	5	28,009	Jordan	3	29,721
Sierra Leone	1	7,281	Kazakhstan	2	10,018
Swaziland	1	4,843	Kyrgyz Republic	1	3,672
Tanzania	6	44,524	Moldova	1	11,088
Togo	1	7,507	Morocco	1	11,509
Uganda	3	24,289	Turkey	3	27,485
Zambia	4	27,742	Uzbekistan	1	3,703
Zimbabwe	3	21,599	Yemen, Rep.	1	12,794
Total	*82*	*644,691*	*Total*	*22*	*224,134*

The DHS are a nationally representative population surveys using stratified two-stage cluster sampling(Measure DHS 1996). In the first stage, a fixed number of clusters are randomly selected in each stratum of interest; after listing all households in the selected Enumeration Areas (EAs), a fixed fraction of households is selected for the survey. Typically, each EA contains about 250 households, out of which 20 are selected for interviews. Interviewers visit selected households and complete a detailed household roster. Upon completion of the household questionnaire, all women in the household in the age range 15-49 are asked to complete a more detailed “individual questionnaire”, which collects detailed information on reproductive behavior and fertility histories, but also on the educational attainment, child health, and many other aspects of life. In some of the more recent surveys, separate survey modules for males are also available. For Measure DHS the primary focus for recoding lies with the women’s individual questionnaire. Thus, it can be the case that an individual recode is published by Measure DHS but the corresponding Household Survey is not. Earlier surveys for India are an example of where this occurs.

Given the focus of this paper on age structure and inter-household inequalities, the primary data we use in our analysis is the data collected in the household questionnaire, which is published in

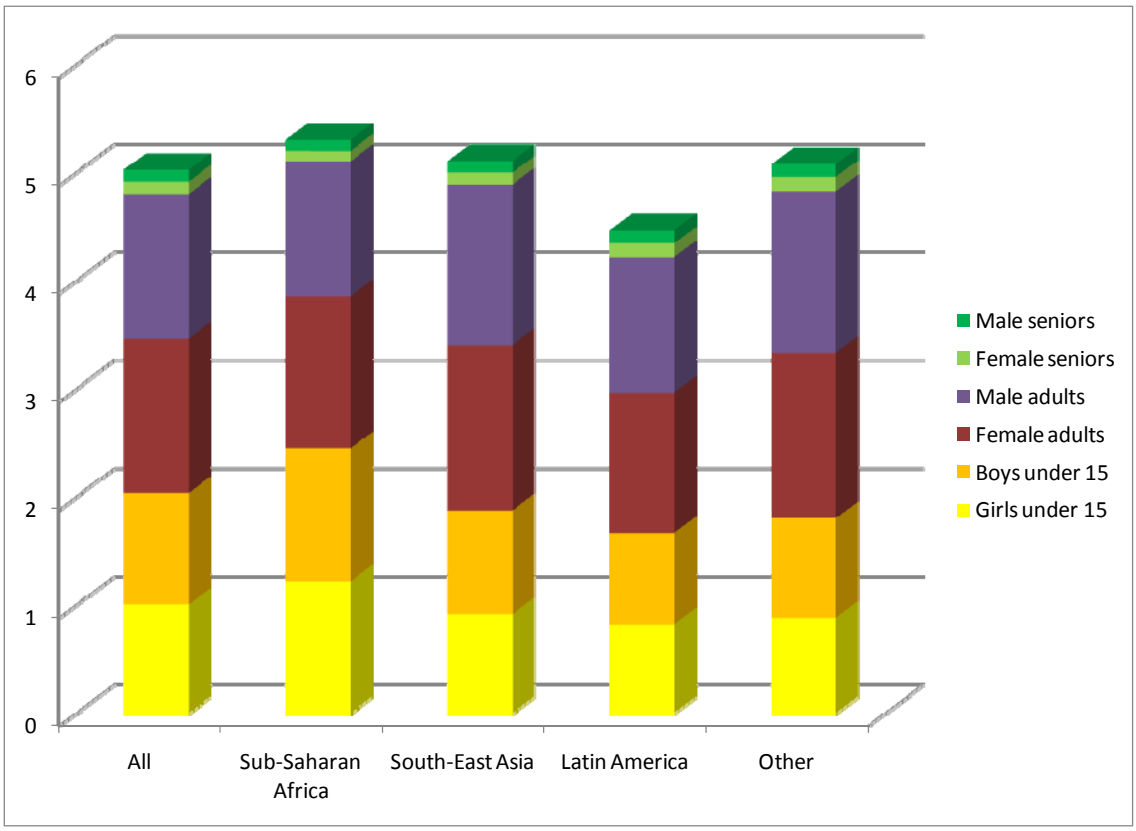
a separate household roster (HR) file. Table 2 shows descriptive statistics for these data. The average household size is very close to five persons, with an average of 2.76 adults of working age (15-64), 2.03 children under the age of 15, and only approximately one person aged 65 or older for every 5 households.

Table 2: Descriptive statistics household composition

	Obs	Mean	St.dev.	Min	Max
Girls under 15	1,680,435	1.003	1.206	0	28
Boys under 15	1,680,435	1.031	1.225	0	65
Females 15-64	1,680,435	1.426	1.021	0	33
Males 15-64	1,680,435	1.340	1.062	0	40
Females 65 plus	1,680,435	0.113	0.327	0	7
Males 65 plus	1,680,435	0.110	0.316	0	4

As Figure 2 illustrates, the average household size is fairly similar across the four country groups in our sample, with Latin America countries featuring the smallest average household size (4.6), and countries in Sub-Saharan Africa featuring the largest households (5.3). This difference is mainly driven by the number of children under 15 in the households; on average, there are 1.65 children per household in Latin America, while the average household in Sub-Saharan Africa in our sample supports 2.4 children. Households in South-East Asia as well as in the "Other" group have the largest number of adults (3.0 vs. 2.55 in Latin America and 2.65 in Sub-Saharan Africa); the number of dependent seniors is small across countries, and ranges between 0.20 and 0.25 in all regions, so that the differences between youth dependency and overall dependency ratios are generally small.

Figure2: Age structure by country group



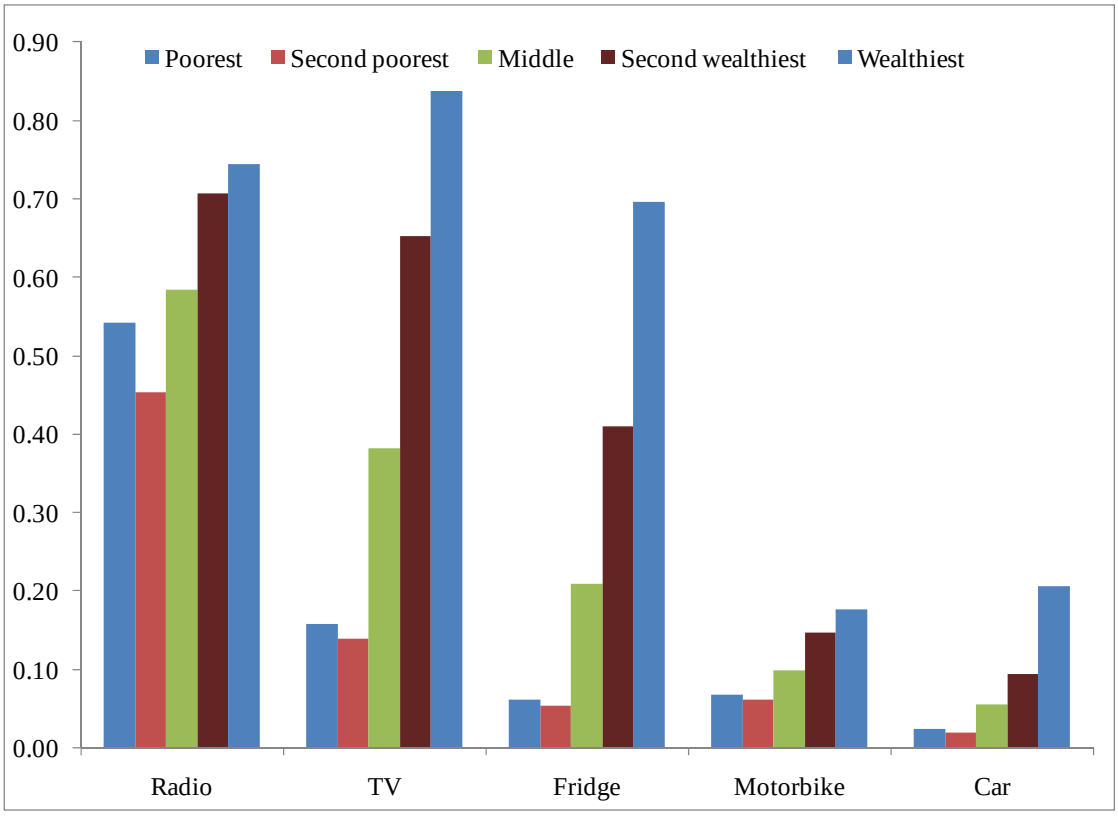
The main question we try to address in this paper is whether the benefits of the demographic transitions in terms of lower dependency ratios accrue equally to all socio-economic groups. While socio-economic classes are generally defined via the income or assets of households relative to the average income or assets holding in the same country, using a relative definition of wealth defies the purpose of our analysis, as households with unchanging characteristics would be re-classified over time as average income and asset levels change. To deal with this issue, we construct an absolute measure of socio-economic class based on a household's asset holdings. We assume that each household permanent income is the key determinant of households' ability to acquire and own an asset. We then use a logit model to estimate the household's probability to have a specific asset as:

$$\Pr(H_{aic}=1)=\alpha+\sum_{a}\mathbf{P}_{ac}\beta_{a}+\mathbf{A}\theta_{a}+\delta_{i}+\varepsilon_{aic}$$

where H_{aic} is a binary indicator for holding an asset *a* in individual household *i* at a given survey and country*c*, β_1 is a vector of effects for a matrix $\mathbf{P}_{ac}$ of country-specific continuous asset prices, θ_a is a vector of asset-specific fixed effects for the matrix A of holdings by asset type, δ_i is a household random effect, and ε_{aic} is an independently, identically, and normally distributed stochastic term. Since the household random effect δ_i is the same across all assets, we can use maximum likelihood estimation to identify the underlying latent variable, permanent income.

Using the estimated permanent household income, we divide all households in our sample in income quintiles – as Figure 3 shows, the differences in asset holdings across these five quintiles are quite pronounced. While less than 15 percent of households in the lowest quintile own a TV, fridge or motorbike, the same holds true for 80, 70 and 20% of households in the wealthiest quintile, respectively.

Figure 3: Asset holdings by permanent income quintiles



3. Empirical Analysis and Results

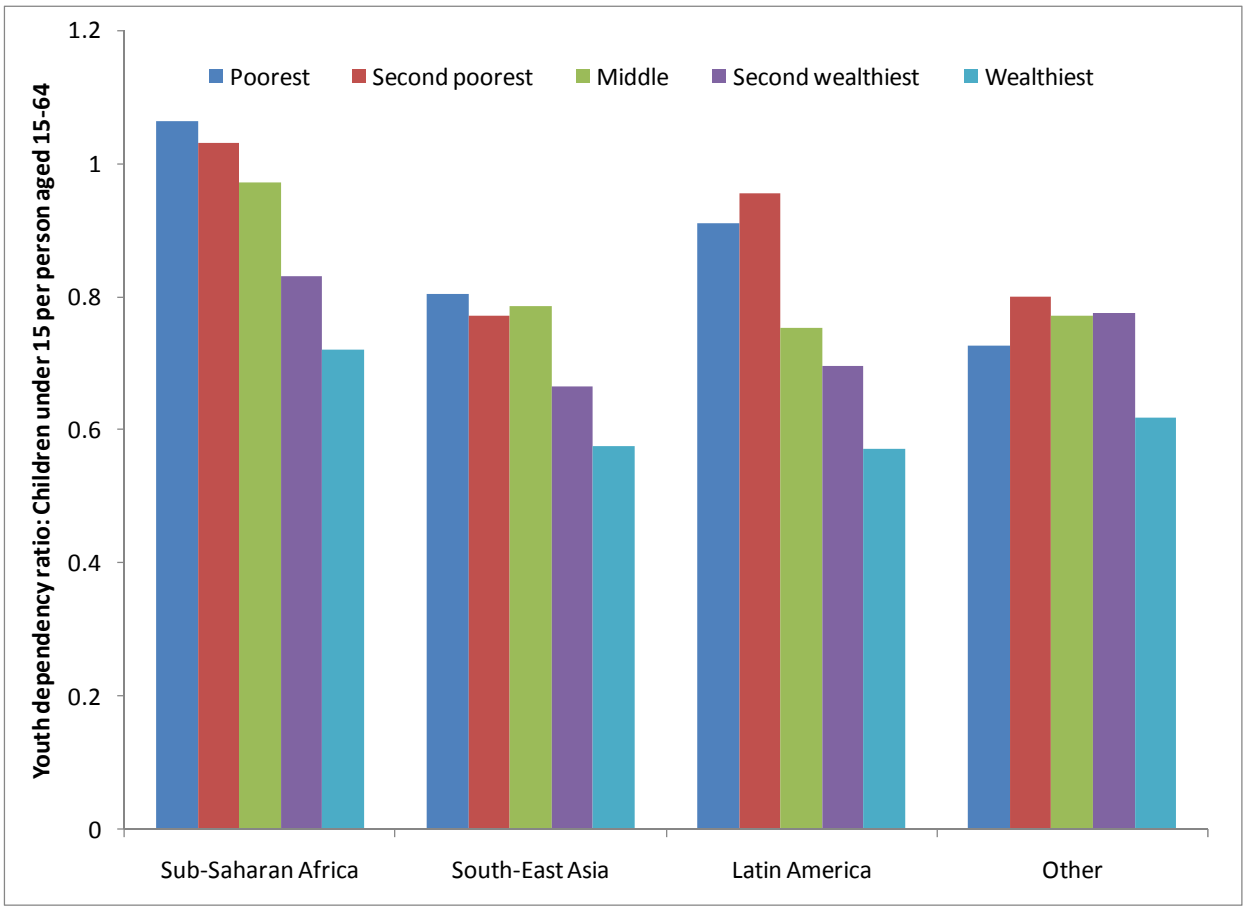
3.1. Cross-sectional relation between household wealth and age structure

The first question we addressin this section is whether the positive correlation between dependency ratio and income observed across countries also holds in the cross-section of households. To do so, we follow the approach in the macro literature and define youth and old age dependency ratios as the number of household members under 15 and over 65, respectively,divided by the number of household members of working age (15-64).Across countries, youth dependency ratios range between 0.21 (Italy) and 1.07 (Uganda), with developed countries clustered around a value of 0.25, and most developing countries having youth dependency ratios close to 1 (WDI, 2007). Taking the numbers reported in Table 1, we get an average youth dependency ratio in our sample of 0.73 children under 15 per working-age adult, and an average old age dependency ratio of 0.08 individuals aged 65 and older per working-age adult. Given the rather small number of older dependents as well as work-life spans well beyond age 65 in many developing countries, we mainly focus on youth dependency in this paper.

At the household level, youth dependency ratios show substantial variation. One complication with youth dependency ratios defined at the household level are cases where households have no working-age adults, in which case the ratio will not be defined. This is fortunately the case for less than one percent of households, which we drop in our analysis.

Figure 4 shows the relation between permanent income and youth dependency by country group. The similarity in the patterns across regions is remarkable. While the lowest SES groups have youth dependency ratios of one or higher in all four regions, the highest SES groups have dependency ratios that range between 0.6 (South-East Asia and Latin America) and 0.75 (Sub-Saharan Africa).

Figure 4: Youth dependency by region and permanent income

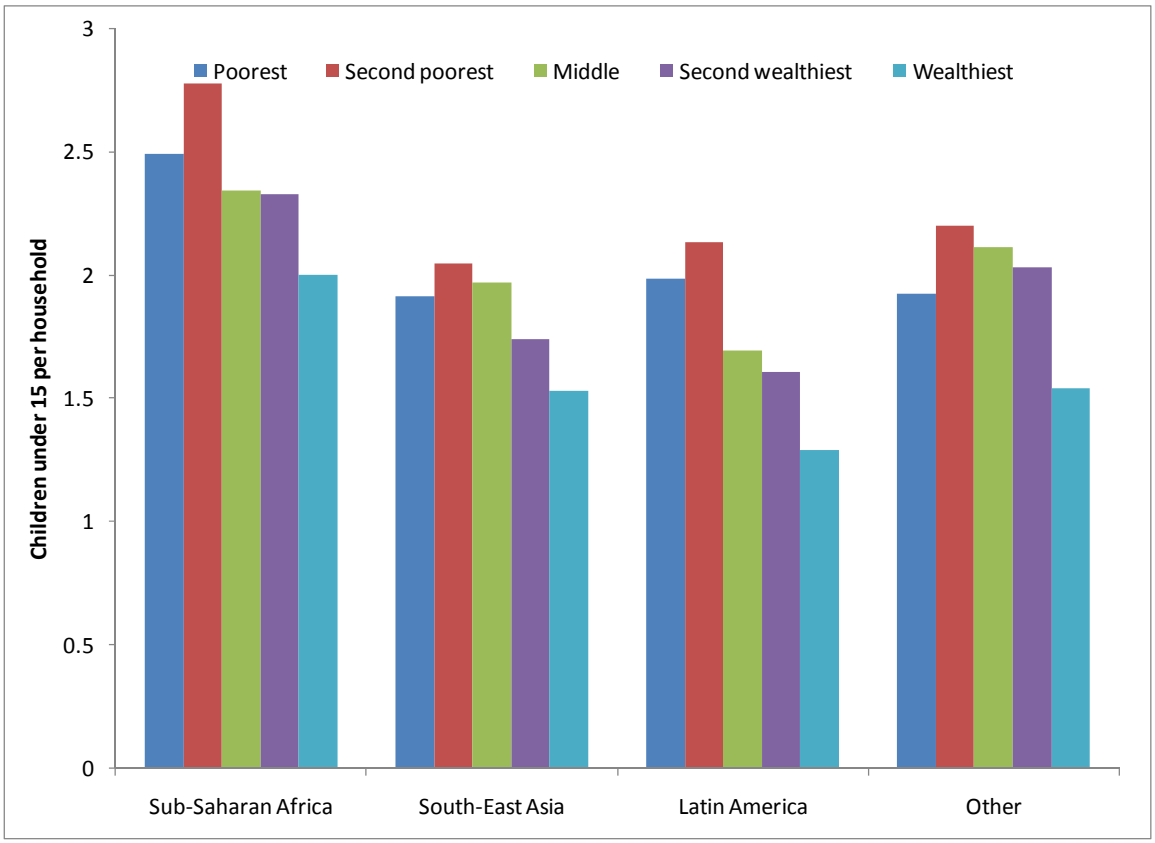


The wealth gradient in the youth dependency ratio is most pronounced in Sub-Saharan Africa and Latin America. In Sub-Saharan African countries, the youth dependency ratio is 1.07 for the poorest households compared to 0.72 for the wealthiest ones. In Latin America, the youth dependency ratio is 0.91 for the poorest households and 0.57 for the wealthiest ones.

The changes in reproductive behavior associated with the demographic transition do not only affect total fertility rates, but are generally also associated with later marriage and delayed childbearing. As a result, households do not only have a lower absolute number of small children, but host on average also more adults (given the cut-off for adulthood in our study is 15 or older), as men and women stay with their original households in their teens and twenties before starting their own family. These young adults may remain in school while continuing to live with their parents, or they may start their working lives and contribute to the overall wealth of the household old. Since these young adults could contribute to wealth and mechanically

lower youth dependency ratios, we expect the wealth gradient of youth dependency to be steeper than the wealth gradient observed for the absolute number of children per household. In Figure 5, we show the relation between household wealth and the absolute number of children.The relation between permanent income and the absolute number of dependent children looks more nuanced within and across regions. In all four regions, the number of children is largest in the second poorest group, and declines only for the higher wealth quintiles.

Figure 5: Number of dependent children by region and permanent income



3.2 Wealth and youth dependency over time

In Hausmann and Szekely (2001),the authors use Latin American household data to argue that the demographic transition was a phenomenon predominantly enjoyed by the wealthy.Even though the above graphs and tables have shown a rather robust association between wealth and dependency ratios, the cross-sectional nature of the data presented does not allow us to draw any conclusion regarding changes in dependency over time in general, and during the demographic

transition in particular. In this section, we try to further investigate the relation between the demographic transition and both the mean and the distribution of outcomes by exploring the time variation captured by multiple survey rounds in a given country. To investigate whether declines in dependency ratios affect all SES groups equally, we estimate the following model:

$$YD_{ijt} = \alpha + \sum_{w=1}^{5} PI_{wijt}\beta_w + \gamma\delta_t + \sum_{w=1}^{5} \phi\delta_t * PI_{wijt} + \rho\delta_j + \varepsilon_{ijt}, \qquad (1.1)$$

where *YD* is our measure of youth dependency of household i in country j and period t, *PI* is our measure of permanent income and δ_t and δ_j are time and country fixed effects, respectively. Our sample covers the period 1990-2008, a period associated with substantial fertility decline in some, and modest fertility decline in most other countries. The hypothesis we wish to investigate is whether the changes in youth dependency equally accrued to all SES groups. If the hypothesis is true, all changes in youth dependency across surveys should be captured by time effects, and ϕ, the estimated coefficient on the interaction between the permanent income variable and the time dummies should be zero. That is, none of the five wealth quintiles should exhibit change patterns that differs from the global average.

Table 3 displays the results of this estimation in our sample. We show four main specifications. In column 1, we take youth dependency ratio - defined as before as the number of children under the age of 15 per adult of working-age in the household - as dependent variable, and regress it on the wealth quintiles, a *post* indicator ($\delta_t = 1$) which marks the 50% of the more recent surveys (collected after 2000), and the interaction terms between the wealth quintiles and the post dummy. Since the composition of countries before and after 2000 varies, we control for country fixed effects in column 2 of Table 3, which largely absorbs the variations in youth dependency across countries. In columns 3 and 4, we repeat the regressions from the first two columns, but use the number of children under 15 as dependent variable rather than the youth dependency ratio. While youth dependency is the variable more commonly used in general, the number of dependent children for a given household wealth (rather than the number of children per adult for

a given wealth level) is likely to be more intuitive variable from the perspective of the child's welfare

Table 3: Regression results

Dependent Variable	**Youth Dependency Ratio**		**Children under 15 per household**	
	(1)	(2)	(3)	(4)
Second SES quintile	-0.114*	-0.0250	-0.00154	0.0305
	(0.0570)	(0.0203)	(0.156)	(0.0568)
Third SES quintile	-0.126***	-0.0684***	-0.205**	-0.0318
	(0.0305)	(0.0230)	(0.0800)	(0.0584)
Fourth SES quintile	-0.266***	-0.149***	-0.382***	-0.171***
	(0.0396)	(0.0211)	(0.114)	(0.0463)
Fifth SES quintile	-0.400***	-0.265***	-0.758***	-0.470***
	(0.0334)	(0.0299)	(0.0996)	(0.0609)
Post	-0.0326	-0.0313	-0.0666	-0.132**
	(0.0316)	(0.0256)	(0.0899)	(0.0591)
Post * second quintile	0.174***	0.0447	0.139	-0.0390
	(0.0528)	(0.0529)	(0.157)	(0.0829)
Post*third quintile	-0.0313	-0.0353	-0.0652	-0.114*
	(0.0313)	(0.0229)	(0.0734)	(0.0587)
Post*fourth quintile	-0.0175	-0.0492**	-0.169	-0.163***
	(0.0450)	(0.0236)	(0.119)	(0.0562)
Post*fifth quintile	0.0236	-0.00550	-0.0461	-0.0425
	(0.0370)	(0.0303)	(0.101)	(0.0640)
Constant	1.015***	0.951***	2.350***	2.256***
	(0.0235)	(0.0193)	(0.0692)	(0.0453)
Country fixed effects	NO	YES	NO	YES
Observations	1,622,784	1,622,784	1,680,435	1,680,435
R-squared	0.030	0.057	0.025	0.090
F-Stat interaction terms	5.43	5.94	1.88	7.26
p-value	0.00	0.00	0.13	0.00

Robust standard errors in parentheses are clustered at the country level.
*** p<0.01, ** p<0.05, * p<0.1

The results are consistent across specifications: on average smaller estimates on group differences once we control for country fixed effects in columns 2 and 4. The estimated coefficients in columns 2 and 4 imply that the wealthiest households have on average a .265 lower dependency ratio, and similarly, support on average 0.47 children less than the poorest households in our sample.

Looking at column 2, we see that the estimated interaction terms between the time dummy and the higher wealth quintiles are negative, even though only the interaction with the fourth wealth quintile is statistically different from zero. The results look slightly stronger for the number of dependent children (column 4), with all interaction terms negative, and the interaction terms with the third and fourth wealth quintile significantly different from zero at the 90 and 99% confidence level, respectively.As shown in the last row of Table 3, the interaction terms are highly significant jointly (F(4,59)=7.26, p-value 0.00), so that we can reject the null of equal change across groups. The point estimates displayed in column 4 suggests that the decline in the number of dependent children was 0.13 among households in the lowest quintile, 0.17 among households in the second quintile, 0.26 among households in the third quintile, 0.30 among households in the fourth, and 0.18 among households in the top wealth quintile. Given that households of the middle wealth quintiles (3 and 4) experience the fastest declines and thus at least partially catch up with the households at the top (who start out with about 0.3 fewer dependent children), the overall effect on inequality is not obvious and clearly dependent on the distribution of households across the respective wealth quintiles.

The estimation strategy described in equation (1) identifies the effects of interest by using average changes in countries over time. Given that some countries (such as Uganda and Zambia) have only just started the demographic transition, while other countries (such as Peru) have experienced major demographic change over the sample period, the results presented in Table 3 represent a mix of country-specific time changes. To see whether group divergence depends on the magnitude of the aggregate change, we divide our sample in three groups: countries with major declines in fertility, countries with intermediate declines in fertility, and countries with low, or no decline in fertility, and re-estimate the previous models in the three subsamples. Table 4 shows the basic division of countries into the three groups – the results of the stratified estimation are displayed in Table 5 below.

Table 4: Country grouping my magnitude of fertility decline in sample period

Large fertility declines
Benin, Bolivia, Cameroon, Cote d'Ivoire, Dominican Republic, Egypt, Arab Rep., Namibia, Peru

Intermediate fertility declines

Colombia, Indonesia, Jordan, Kenya, Nepal, Philippines, Zimbabwe

Low fertility declines or increases

Burkina Faso, Ghana, Haiti, Madagascar, Malawi, Mali, Niger, Rwanda, Senegal, Tanzania, Turkey, Uganda, Zambia

Table 5: Stratified Regressions

	Youth Dependency Ratio			**Children under 15 per household**		
	(1)	(2)	(3)	(4)	(5)	(6)
Second SES quintile	-0.000773	-0.00925	-0.0161	0.142	0.0225	0.0471
	(0.0200)	(0.0195)	(0.0305)	(0.0984)	(0.0724)	(0.0415)
Third SES quintile	-0.111**	-0.00643	-0.0744***	-0.0944	0.0966	-0.00894
	(0.0379)	(0.0273)	(0.0201)	(0.111)	(0.0654)	(0.0711)
Fourth SES quintile	-0.174***	-0.115***	-0.184***	-0.199**	-0.140**	-0.123
	(0.0376)	(0.0189)	(0.0308)	(0.0613)	(0.0512)	(0.0997)
Fifth SES quintile	-0.303***	-0.241***	-0.272***	-0.588***	-0.395**	-0.416***
	(0.0607)	(0.0413)	(0.0334)	(0.0795)	(0.128)	(0.101)
Post	-0.118**	-0.0382	0.0411	-0.382***	-0.101	0.0440
	(0.0401)	(0.0363)	(0.0317)	(0.0706)	(0.0754)	(0.0570)
Post * second quintile	0.297***	-0.0878*	0.0311	0.0568	-0.0741	-0.123
	(0.0548)	(0.0365)	(0.0585)	(0.160)	(0.108)	(0.143)
Post*third quintile	0.0113	-0.0767	-0.0147	-0.0112	-0.235*	-0.0753
	(0.0297)	(0.0422)	(0.0244)	(0.0801)	(0.102)	(0.0785)
Post*fourth quintile	-0.00109	-0.0427	-0.0621*	-0.0759	-0.140	-0.232**
	(0.0404)	(0.0404)	(0.0329)	(0.0644)	(0.0916)	(0.0805)
Post*fifth quintile	0.0567	0.0171	-0.0802**	0.123	-0.0277	-0.183**
	(0.0567)	(0.0302)	(0.0365)	(0.0814)	(0.0903)	(0.0776)
Constant	0.968***	0.852***	1.036***	2.259***	1.956***	2.512***
	(0.0399)	(0.0156)	(0.0212)	(0.0694)	(0.0498)	(0.0394)
Country fixed effects	YES	YES	YES	YES	YES	YES
Sample	Large decline	Medium decline	Small/no decline	Large decline	Medium decline	Small/no decline
Observations	406764	383709	364082	425882	394843	376721
R-squared	0.036	0.046	0.034	0.057	0.047	0.095

Robust standard errors in parentheses are clustered at the country level.
*** p<0.01, ** p<0.05, * p<0.1

The stratified regressions yield two main results: first, for countries with very large declines in fertility, the average declines in dependency ratios are large (-0.382 dependent children), and appear to accrue relatively evenly to all SES groups (column 4).Among countries in this group, households in the fourth quintile have seen the largest declines in the number of dependent

children (-0.46), while the declines are smallest among the wealthiest households (-0.26). The patterns look very different for countries with medium, and particularly in countries with small declines, where the richest households experience much faster declines than households in the poorest quintiles. The point estimates reported in column (6) of Table 5 suggest that the number of dependent children increased on average by 0.04 children among households in the poorest quintiles, while the number of dependent children decreases by 0.19 and 0.14 children in households of the fourth and fifth wealth quintiles respectively.

3.3Major demographic changes: 3 case studies

To provide a better sense of magnitudes of these group-specific differences and their respective contributions to the broad demographic trends observed, we take a closer look at the three countries with the largest declines in youth dependency in our sample: Cote d'Ivoire, Namibia, and Peru. As Table 6 shows, all three countries have not only experienced rapid declines in total fertility rates, but also substantial improvements in terms of their youth dependency ratio and the average number of children under 15 per household.

Table 6: Top 3 countries in terms of you dependency decline

	Survey	Children under 15	Youth dependency ratio	Total fertility rate
Cote d'Ivoire	1994	3.03	0.91	6.01
	1998	2.61	0.76	5.51
	2005	2.38	0.82	4.82
Namibia	1992	2.77	0.92	5.93
	2000	2.04	0.84	4.29
	2006	1.82	0.77	3.66
Peru	1991	2.13	0.84	3.86
	1996	1.96	0.82	3.30
	2000	1.65	0.71	3.00
	2003	1.33	0.60	2.82

Source: Children under 15, youth dependency ratios from the Demographic and Health Surveys. Total Fertility Rate from the World Development Indicators.

Following the approach taken in the previous section, we can decompose the experienced declines at the country level into two main contributing factors: changes in the distribution of incomes, and changes in dependency ratios for a given SES level. As we have shown in the previous section (Table 5), youth dependency ratios have changed for all groups; in order to get to the total change in dependency, we need to also take shifts in the wealth distribution over time into consideration. By showing both group specific dependencies and the size of groups over time, we can isolate whether the quintile specific fertility rate is changing over time, or whether households are getting richer over time and those richer households have fewer children. Table 7 shows both factors for the three selected countries. The right hand side of the table shows the percentage of households in each income category. Progress in terms of income is visible in all three countries. While 38% of households in Cote d'Ivoire were placed in the lowest income quintile in the first survey round, the same was true for only 23% of households in 2005. Similar declines were observed in Peru, while the picture for Namibia is more nuanced, with a higher fraction of households ranking in the poorest quintile in 2006 than in 1992, but also substantial increases at the very top of the distribution.

As to the relative declines in the average number of dependent children across wealth quintiles, the three selected countries display patterns only partially consistent with the large-sample results presented in section 3.2.

Table 5: Decomposition of dependency declines

	Children under 15					Population share				
Cote d'Ivoire	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
1994	2.68	3.46	2.53	3.59	3.82	38%	21%	20%	11%	10%
1998	2.30	2.92	2.14	2.88	3.32	17%	16%	29%	30%	8%
2005	2.34	2.61	2.16	2.36	2.61	23%	21%	23%	23%	9%
Change	-13%	-25%	-15%	-34%	-32%	-39%	0%	17%	113%	-9%
Namibia										
1992	2.61	3.40	2.79	2.45	1.80	30%	35%	14%	6%	16%

2000	2.12	2.48	1.80	1.85	1.64	21%	29%	14%	14%	22%
2006	1.99	1.97	1.87	1.67	1.50	41%	10%	15%	9%	25%
	-24%	-42%	-33%	-32%	-17%	40%	-71%	7%	59%	56%
Peru										
1991	2.45	2.48	2.34	2.22	1.69	12%	16%	16%	21%	35%
1996	2.04	2.39	2.04	1.90	1.35	12%	20%	16%	37%	14%
2000	1.65	2.01	1.74	1.64	1.15	13%	19%	16%	38%	15%
2003	1.31	1.56	1.38	1.37	1.05	8%	18%	15%	37%	23%
	-47%	-37%	-41%	-38%	-38%	-34%	11%	-10%	73%	-34%

While in Cote d'Ivoire the largest changes are observed among the richest quintiles, the same is not true for Namibia, where the largest change is observed for the second income quintile households; for Peru, the changes appear to be more or less equal across all income quintiles.

To see how important these changes in the income distribution are relative to the behavioral changes, we calculate the time path of the average number of children under two counterfactual assumptions in Table 6. In the first counterfactual, we keep the original wealth distribution unchanged (fraction of households in each quintile kept constant at initial year distribution), and allow SES-specific behavior to move as empirically observed (Table 5). In the second counterfactual, we make the opposite assumption, and calculate how dependency ratios would have changed if behavior had stayed the same as in the first survey (initial quintile-specific number of dependent children) , but the distribution of income had changed as it did empirically (population shares across wealth quintiles change over time as per Table 5). The results of these two counterfactuals are displayed in columns 3 and 4 or Table 6, respectively. In the first column, the actual number of dependent children <15 are reported. In column 2 ("Original Wealth:)" the share of households in each wealth quintile is held constant at the initial year values and the number of children <15 changes as per Table 5. In column 3,("Original Behavior"),the number of dependent children <15 is held constant at initial year rates and the distribution of the population over the wealth quintiles changes over time as per Table 5.

The counterfactuals clearly reveal the main drivers of the observed changes: while the effects of wealth appear marginal (the distribution of households across SES has not changed much), the effects of behavioral change seem to more or less exclusively drive the overall declines

observed. Our calculations imply that dependency ratios would have changed very little (Namibia) or even would have even increased (Cote d'Ivoire, Peru) if SES specific behavior had not changed over the sample period. That is, the change in dependency is driven by the change in quintile wealth-group specific changes rather than the increase in proportion of households in the richer quintiles.

Table 6: Counterfactual scenarios

Cote d'Ivoire	Actual	Original wealth	Original behavior
1994	3.03	3.03	3.03
1998	2.61	2.57	3.12
2005	2.38	2.39	3.13
Namibia			
1992	2.77	2.77	2.77
2000	2.04	2.11	2.66
2006	1.82	1.87	2.50
Peru			
1991	2.13	2.13	2.13
1996	1.96	1.83	2.25
2000	1.65	1.55	2.23
2003	1.33	1.28	2.18

4. Summary and Conclusion

In this paper, we have used pooled micro-data from 60 low and middle income countries to investigate the degree to which the demographic dividend generally measured at the country-level is realized at the household level. The available cross-country evidence suggests that the decline in fertility rates triggered by improvements in mortality during the demographic transition is associated with lower dependency ratios, higher human (and physical) capital investment as well as higher female labor force participation. In this paper we show that a similar association between income and dependency ratios can be found at the micro level. Independent

of the country and region, high SES households are characterized by lower youth dependency ratios, and a lower absolute number of dependent children than low SES households.

Despite the strong cross-sectional association between wealth and age structure at the household level, the implications for the demographic transition on inequality are not obvious from long-term perspective. The longitudinal analysis, as well as thecountry case studies presented, suggest that all socioeconomic groups experience smaller dependency ratios over time, especially during phases of rapid fertility decline. Given the strong empirical association between family size and education, lower dependency ratios are thus likely lead to higher human capital investment across all SES groups over time. The long-term implications of these shifts in human capital investment for differences in human capital and life-time across SES groups appear ambiguous from a theoretical perspective, and will depend both on the elasticity of human capital investment with respect to family size and the relative returns to education.

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