DEMOGRAPHIC RESEARCH

Research Article

**Demographic transitions and children's
resources: Bonus or divergence?**

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Abstract

How do fertility transitions affect childrenŠs resources? Existing perspectives provide two seemingly different answers: ŞDilutionŤ arguments focusing on family size predict growth in average resources, while ŞdivergenceŤ arguments focusing on family structure predict increased inequality. We suggest that these two perspectives are complementary and reconcilable within an integrated framework. Under this expanded framework, fertility transitions affect both average resource levels and inequality, and these effects depend on both the quantum and locus of fertility change, as well as on accompanying changes in family structure. Failure to consider these various characteristics of transitions and their interactions can bias estimation of transition-related changes in childrenŠs outcomes. We illustrate with data from Cameroon.

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1. Introduction

How do demographic transitions affect the family resources available to children? Current demographic theory offers two seemingly distinct predictions. On the one hand, "resource dilution" perspectives predict a bonus: As fertility declines, societies concentrate resources on smaller birth cohorts in ways that raise the average endowments of individual children (Blake 1981; Lloyd 1994; Downey 1995; Birdsall, Kelly and Sinding 2001). On the other hand, a more recent perspective (hereafter labeled "divergence") predicts growing inequality, warning that "*trends associated with the second demographic transition [notably changes in family structure ... are] leading to greater disparities in children's resources*" (McLanahan 2004:607).

Both perspectives are insightful but partial in their focus, whether on the left-hand or right-hand sides of the transition-resource link. On the left-hand side, dilution arguments emphasize changes in family size while the divergence argument emphasizes change in family structure. On the right-hand side, dilution arguments address average resource levels while the divergence argument addresses resource inequality. An integration of these two perspectives is warranted since contemporary fertility transitions often involve changes in both family size and structure but also because the welfare of children depends on both average endowments and inequality. The benefits of integration would be twofold: It would (1) broaden theoretical focus and (2) refine empirical estimation of the changes in children's resources associated with demographic transitions.

The purpose of this paper is to attempt such integration. The paper is organized around two main sections. The first, theoretical, section summarizes and integrates the dilution and divergence arguments, then draws the implications of this integrated framework. A second, empirical, section illustrates these implications with data from Cameroon. The main caveats in this theoretical argument and its empirical illustration are discussed in a concluding section.

2. Theory

2.1 Dilution and divergence

Dilution and divergence represent two different perspectives on the resource consequences of demographic transitions. Proponents of the dilution perspective see large families as straining the resources available to individual children and therefore, national declines in fertility should enhance the resources available per capita. To be sure, dilution arguments differ in their unit of analysis. Some focus on family-level dilution (Blake 1981, 1989; Cassen 1994) while others contemplate national-level dilution associated with the average family size of children (Preston 1976), relative cohort size (Easterlin 1987), the

proportion of children living in large families (Knodel et al. 1990; Bhat 2002) or age dependency ratios (Birdsall et al. 2001). Despite these differences, dilution arguments concur on three points that contrast with the divergence perspective. First, they define fertility transitions quantitatively in terms of the number of births or closely-related outcomes like family size or age dependency, whereas the divergence argument focuses on qualitative changes in the structure of families and the family contexts under which births occur (McLanahan 2004). Second, dilution arguments focus on changes in average resources while divergence arguments emphasize inequality. Third, dilution arguments are today usually invoked for high-fertility settings, whereas divergence arguments are emphasized in lower-fertility settings undergoing their "second" transition, i.e., such changes as "*delays in fertility and marriage; increases in cohabitation, divorce, and non-marital childbearing; and increases in maternal employment*" (McLanahan 2004:607).

While it is tempting to restrict divergence to the second transitions in lower-fertility nations and to restrict dilution processes to high-fertility countries, such a two-tiered theory is limiting: The changes in family structure identified as hallmarks of the second transition do not occur uniformly across developed nations (Raymo et al. 2004) nor are they confined to these nations (Lloyd 2005; Williams et al. 2005). Figure 1 shows recent changes in family size and marriage in 23 developing nations. Over this period, some countries (Columbia, The Dominican Republic, Guatemala; Malawi, Rwanda, Uganda) experienced little change in either marriage or fertility. Other countries experienced unidimensional transitions, whether in fertility (Zimbabwe, Kenya) or marriage (Mali, Senegal). Finally, a cluster of countries experienced changes in both fertility and marriage (Cameroon, Egypt, Jordan, Ghana, Nigeria, and Togo). For such countries, focusing exclusively on family size would miss part of the picture. A fuller appraisal of the effects of fertility transitions requires insights from both dilution and divergence perspectives.

2.2   Integration

Conceptually, the proposed integration merely juxtaposes the dilution and divergence arguments, as they play out at a macro-level (Figure 2). While dilution arguments link declines in fertility to growth in average resource endowments, and the divergence argument links changing family structure to increased inequality, their juxtaposition covers both aspects of fertility transitions (changes in family size and structure) and both outcomes (average resources and resource inequality).

While this juxtaposition draws attention to the complementarity of dilution and divergence arguments, a more formal analysis is needed for quantification purposes. Our formal analysis begins with the notions of family structure and family type. A family type (j) is a unique combination of parental attributes that affect the resources available to children, such as parents' SES, human capital, support networks, parenting experience, or

Figure 1:   Recent transitions in selected DHS countries
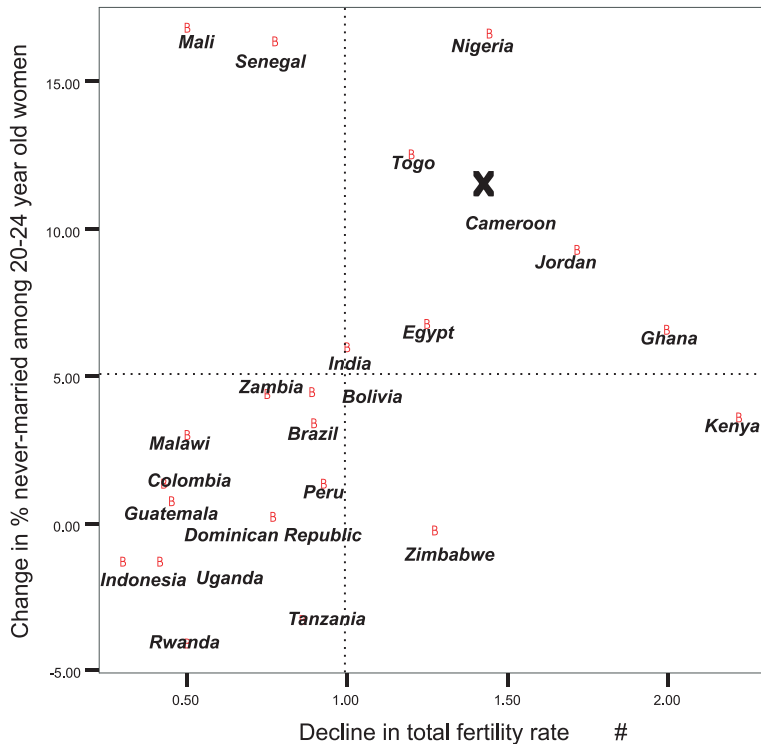
Notes: Selected countries include countries where at least two DHS surveys were fielded over the last two decades, with an inter-survey period of 7+ years (6 years in the case of India). For specific survey years per country, see www.measuredhs.com. Since the inter-survey period varied across countries, the changes were pro-rated to a 10-year period.

time available to raise children. For example, using maternal marital status and employment as criteria, families headed by single and unemployed mothers represent one type, and families with married and employed mothers represent another type. At the micro-level, family structure (T) is thus the variable defined by the set of all possible family types (j). At the macro-level, family structure is measured by the distribution of children across different family types. Given a finite set of mutually exclusive family types, the resource endowments of children can be specified. Average resource levels, in particular,

Figure 2:   Conceptual integration of dilution and divergence arguments
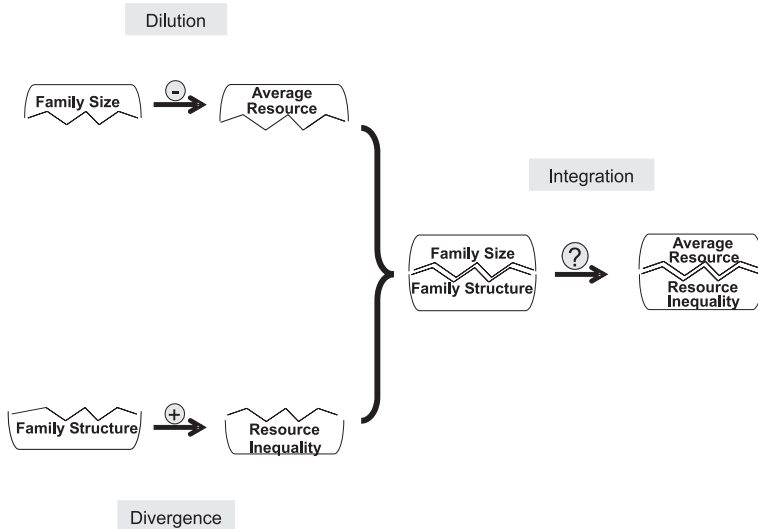
can be expressed at any time (t) as a weighted average of resource levels within family types

$$R_t = \sum_j w_{jt} X_{jt} \tag{1}$$

where w_{jt} = *proportion of children in families of type j*
X_{jt} = *level of resource per child in this family type.*

Further, $\qquad X_{jt} = C - (\beta_S S_{jt} + \beta_T T_j) \tag{2}$

where *C = the resource endowment for a child in the reference family type*
β_S and β_T = resource dilution coefficients associated with
family size (S) and family structure (T), respectively.

The change in average resource levels between two time points is:

$$\Delta R = [\sum \Delta w_j * \overline{X}_j] + [\sum \Delta X_j * \overline{w}_j] \tag{3}$$

$$\Delta R = [\sum \Delta w_j * \overline{X}_j] + [\beta_s * \sum \Delta S_j * \overline{w}_j] \tag{4}$$

where $\overline{X}_j$ and $\overline{w}_j$ *represent the average resource endowment and prevalence*
of each family type during this period (e.g. $\overline{w}_j = [w_{j(t+1)} + w_{j(t)}]/2$).

$$\Delta R \approx [\text{Structure component}] + [\text{Size component}]. \tag{4a}$$

Expression [4a] thus indicates that the change in average resource level results from addition of a "family structure component" associated with changes in the distribution of family types, and of a "family size component" associated with changes in family size within family types.

One can similarly decompose the change in resource inequality. A decomposable measure of inequality is the mean logarithmic deviation (MLD):

$$MLD_t \sum_j w_{jt} \log(1/r_{jt}) \tag{5}$$

where r_{jt} is the resource ratio of group j, $r_{jt} = X_{jt}/R_t$. [6]

Following work on income inequality by Firebaugh and Goesling (2004), the change in MLD can be decomposed as:

$$\Delta MLD \cong [\sum_j (\overline{r}_j - \overline{\ln r_j})\Delta w_j] + [\sum_j (\overline{w_j r_j} - \overline{w}_j)\Delta \ln(r_j)] \tag{7}$$

$$\Delta MLD \approx [\text{Structure component}] + [\text{Size component}]. \tag{7a}$$

As in [4], the total change in resource inequality results from addition of a "family structure component" and of a "family size component".

2.3 Implications

The proposed framework implies that the dilution and divergence perspectives are complementary and reconcilable. They can in fact be seen as two special cases of the same framework. The dilution argument can be viewed as a special case where one assumes a uni-dimensional transition in family size only (i.e., all $\triangle w_j = 0$). In this case, equation [4] reduces to its second bracketed term. A decline in fertility (most $\triangle S_j < 0$) will increase the average level of resources (since β_s is also negative) as predicted by dilution arguments. Conversely, the divergence argument can also be seen as a special case involving no change in the *quantum* and distribution of fertility (i.e., all $\triangle S_j = 0$) but some change in aggregate family structure, i.e., in the prevalence of different family types (i.e., some $\triangle w_j \neq 0$). In this case, equation [7] reduces to its first bracketed term. In practice, fertility transitions often combine the two idealized types outlined above. Accordingly, their resource implications will reflect the joint influences of changes in family size and structure. As we argue below, this warrants attention to the additive, interactive and distributional influences of fertility transitions.

2.3.1 Additivity

As the formulas [4] and [7] indicate, the total resource effect of a fertility transition is obtained by adding two components: a "family size component" and a "family structure

component." These "size" and "structure" components can offset or compound each other.

> *Proposition P1. The resource implications of fertility transitions depend additively on two components reflecting the influences of "family size" and "family structure," respectively. Failure to add the two components can bias understanding of the magnitude or even direction of the resource implications of transitions.*

2.3.2 Interactivity

While the resource implications of transitions require adding two *components*, either component reflects in fact some interaction between family size and structure. These interactions are visible in the formulas in [4] and [7]. In [4] for instance, the "size component" depends on changes in family size (the $\triangle S_j$) but also on the average prevalence of each family type (the $\overline{w}_j$). Conversely, the "structure component" depends on changes in family structure (the $\triangle w_j$) but also on the average resource endowment (the $\overline{X}_j$). Overall, how much a decline in fertility affects the resources of children depends on patterns and changes in family structure. Conversely, how much a change in family structure affects the resources of children will depend on the levels and changes in fertility. For these reasons, one expects the following:

> *Proposition P2. The implications of a dual fertility transition (i.e., one involving change in both family size and structure) are more than the mere sum of two uni-dimensional transitions (i.e., one involving change in family size only and the other involving change in family structure only).*

2.3.3 Distributional considerations

The resource implications of a decline in national fertility depend not only on the magnitude of this decline, but also on how it is distributed across the national population. Intuitively, an even decline is less likely to exacerbate inequality than one concentrated among high SES groups. The relevance of distributional aspects can be seen in formulas [4] and [7] where the size component depends on *group-specific* changes in family size (the $\triangle S_j$) or in resource ratios (the $\triangle r_j$). Put differently, the resource implications of fertility transitions depend not only on the *quantum* of fertility change but also on its *locus*, i.e., how this change is distributed across family types. A third proposition is thus

> *Proposition P3. The resource implications of fertility transitions depend on both the quantum of this change and its locus. The same decline in national*

> *fertility will have different implications depending on how evenly this decline occurs across the national population.*

3. Empirical illustration

3.1 Data and measures

Although our argument is framed at the macro-level – it examines the national changes in average resources and resource inequality that accompany demographic transitions – its empirical illustration requires micro-level data. The data used in this paper came from a demographic survey (*Enquête Population Scolarisation II* or EPS II) completed in 1999 in Cameroon. The survey used life history calendars to retrospectively reconstruct the demographic histories of a nationally representative sample of 3,369 women and their families. These data were used to create appropriate fertility history and schooling history data sets to generate estimates for the key framework measures, including period-specific measures of fertility and family structure (the S_{jt} and w_{jt}) but also resource dilution coefficients associated with family size and structure (β_S and β_T). Details on this survey and data can be found elsewhere (Eloundou-Enyegue and Williams 2006). The resulting data were consistent with other national estimates of fertility, schooling, and employment, and with known trends and patterns in these outcomes. In particular, our TFR estimates for 1991 and 1998 (5.8 and 4.6, respectively) were close to the Cameroon DHS estimates for these years (5.8 and 4.8 respectively). However, because maternal residence is measured here as time-varying (rather than time-invariant as is the case in the CDHS), our estimates of rural fertility (6.5 for 1991 and 5.4 for 1998) were higher than CDHS estimates (6.3 and 5.4) and our estimates of urban fertility (4.9 and 3.7) were lower than CDHS estimates (5.2 and 3.8, respectively).

3.1.1 Family size (S_{jt})

We approximate family size by the total fertility rate (TFR). TFRs were estimated for each family type and successive time periods (<1980, 1980-84, 1985-89, 1990-94, and 1995-98). The use of TFR, rather than family size is worth noting. Family size more closely approximates the resource experience of children but it has two drawbacks for the purpose of this analysis. First, because it is affected by past fertility, it lags behind changes in fertility and such lag would delay observation of the changes in family size associated with Africa's recent fertility transitions. Second, since changes in family size are also affected by changes in child mortality, this measure would not isolate the specific effects of changing fertility.

3.1.2 Family structure (w$_{jt}$)

Family structure, at the aggregate level, reflects the relative representation (w_{jt}) of different family types. Types can be defined on the basis of several criteria, but we selected maternal marital status and residence, as well as father's employment, because of their direct relevance for the material resources and opportunities available to children. All three variables were dichotomized. Maternal residence distinguished between rural and urban mothers; marital status distinguished between married versus unmarried mothers (whether single, divorced/separated, or widowed); father's employment distinguished between fathers employed off-farm and those who were not. Based on these dichotomized criteria, five family types were created, including families with mothers that were "rural and unmarried," "rural married," "urban unmarried," "urban married with an unemployed partner," "urban married with an employed partner," respectively. Among married rural women, no distinction was made between women with employed and those with unemployed partners because few women were found in the latter category.

3.1.3 Resource dilution coefficients (β_S and β_T)

Family size and structure are both expected to affect/dilute the resources available to children, including material resources (e.g., money) and non-material ones (e.g., time, attention, parenting experience). While both material and non-material resources are important (Blake 1989; Mauldon 1990; McLanahan 2004), they are not fungible or easily convertible into the same unit, making it difficult to evaluate their dilution along a common metric. Our conversion strategy was to use as a common metric the statistical effects on an important resource-related outcome such as school dropout. Since this outcome is dichotomous, the dilution coefficients associated with family size and type (β_S and β_T, respectively) were derived from logistic regression analysis of the effects of corresponding variables on school dropout (see Table A1 in appendix) and were expressed in odds ratio units. For the same reasons, instead of being obtained by subtraction from a baseline (as per the additive model in equation [2]), resource dilution is obtained by division from a baseline, specifically

$$X_{jt} = C/[(\beta_S^{Sjt}) * (\beta_T^{Tj})]. \qquad [2a]$$

Practically, we use as baseline a child with no sibling and with a mother who is "urban and married to an employed partner." This baseline child is assigned a resource index of 100. The resources available to other children are obtained from [2a]. For instance, assume that an additional child dilutes resources by a factor of 1.1 ($\beta_S = 1.1$) and that resources are diluted by 1.2 for a child from an urban mother married to an unemployed partner ($\beta_T = 1.2$). In that case, a child with 3 siblings and with a mother married

to an unemployed partner is expected, on average, to have a resource index of about $100/[(1.1)^3 * (1.2)]$ or about 62.6.

3.2 Methods of analysis

Three analyses are used to meet the study objectives, and they include a basic estimation, decomposition, and simulation. The first step is to estimate the implications of fertility transitions for average resource levels and for inequality. Using the input measures described above, the resource indices at the group level are computed by applying equation [2a]. Group-specific values are then aggregated (using equation [1]) to obtain the national resource level. Likewise, equation [6] is applied to calculate group-specific resource ratios (r_{jt}), and then these values are aggregated (as per equation [5]) to obtain the overall resource inequality. Marginal changes in average values and inequality (respectively) indicate the bonus and divergence from transitions (respectively). Following this overall estimation, decomposition (as per formulas [4] and [7]) is used to illustrate our theoretical proposition *P1*, about the additivity of "size" and "structure" components of fertility transitions.

To illustrate the theoretical propositions *P2* and *P3*, simulation is used. Two hypothetical scenarios are considered. The first is designed to illustrate *P2* (about interactivity) and involves estimating resource implications under different assumptions about the makeup of Cameroon's transition. Specifically, we simulate the resource implications that would be observed if a) Cameroon's transition had involved change in fertility with no change in family structure, and b) Cameroon's transition had conversely involved a change in family structure with no change in fertility. The presence of an interaction is inferred from comparison of the sum of these two unidimensional transitions with Cameroon's actual transition, which involved change in both family size and structure. If the influences of family size and family structure do not interact, then the sum of the resource implications of the two uni-dimensional transitions should equal the resource implications of Cameroon's dual transition.

Proposition *P3* (about distributional considerations) is illustrated by simulating the resource implications that would be observed if Cameroon's fertility transition were evenly distributed across all family types. Comparison of this hypothetical scenario with Cameroon's actual transition indicates how the resource implications of a fertility decline depend on the distribution of this decline.

Table 1: Cameroon's fertility transition

	Changes in family size (TFR within family (S_j))					
						$\triangle S_j$
FAMILY TYPE	<1980	1980-84	1985-89	1990-94	1995-98	
Rural Unmarried	3.09	3.31	4.56	3.59	3.26	*0.17*
Rural Married	6.85	7.48	8.15	8.05	7.16	*0.31*
Urban Unmarried	2.78	2.54	3.10	2.84	1.88	*-0.90*
Urban Married Unemployed Partner	7.01	7.62	7.19	7.74	5.68	*-1.33*
Urban Married Employed Partner	7.08	7.79	7.92	6.32	5.71	*-1.37*
AVERAGE	5.86	6.21	6.54	5.67	4.66	-1.20

	Changes in family structure (proportion in family type (w_j))					
	From mother's perspective					
						$\triangle w_j$
FAMILY TYPE	<1980	1980-84	1985-89	1990-94	1995-98	
Rural Unmarried	0.182	0.138	0.130	0.147	0.174	*-0.008*
Rural Married	0.500	0.441	0.411	0.371	0.360	*-0.140*
Urban Unmarried	0.111	0.162	0.208	0.280	0.304	*0.193*
Urban Married Unemployed Partner	0.081	0.078	0.074	0.054	0.042	*-0.039*
Urban Married Employed Partner	0.126	0.181	0.177	0.148	0.120	*-0.006*
TOTAL	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	

	Changes in family structure (proportion in family type (w_j))					
	From children's perspective					
						$\triangle w_j$
FAMILY TYPE	<1980	1980-84	1985-89	1990-94	1995-98	
Rural Unmarried	0.098	0.074	0.091	0.093	0.122	*0.025*
Rural Married	0.595	0.535	0.514	0.527	0.556	*-0.040*
Urban Unmarried	0.054	0.067	0.099	0.140	0.123	*0.070*
Urban Married Unemployed Partner	0.099	0.096	0.082	0.074	0.051	*-0.047*
Urban Married Employed Partner	0.155	0.228	0.215	0.165	0.148	*-0.007*
TOTAL	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	

3.3 Findings

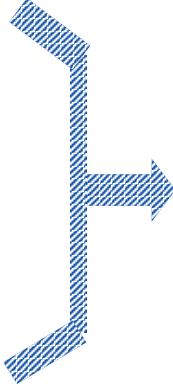### 3.3.1 Cameroon's transition

Table 1 shows Cameroon's transition in some detail. It shows, for successive time periods (<1980, 1980-84, 1985-89, 1990-94, and 1995-98), the fertility levels within family type as well as the prevalence of each family type. The trends in national fertility were plateau-shaped, similar to many African countries over the last three decades. Compared to pre-1980 levels, the national TFR increased and stayed above 6 in the 1980s, then declined in the 1990s. This decline was more pronounced among urban than rural women. However, it was more uniform across the marital and employment categories considered here. Importantly, Cameroon's decline in fertility was accompanied by changes in family structure, specifically an increase in the percentage of urban unmarried mothers (from 11.1 percent before the 1980s to 30.4 percent in 1995-98) and a remarkable decline in the percentage of rural married mothers (from 50 percent before the 1980s to 30.4 percent in 1995-98). Such transformations in family structure should affect the resource endowments of children at the national level, if family types vary in the resources availed to children. Transformations in family structure can be examined from the perspective of mothers or from the perspective of children (Preston 1976), the latter being more relevant here. An analysis from children's perspective shows similar, but less dramatic, changes in family structure. The percentage of children born to rural married mothers decreased from about 59 to 55 percent, while the percentage born to urban unmarried women increased from 5 to 12 percent. Although these changes were not linear, the main point here is that Cameroon's transition was dual in nature, affecting both fertility levels and family structure.

3.3.2 Resource implications

The resource implications of Cameroon's fertility transition are described in detail in Table 2 and they are summarized in Figure 3. As Table 2 shows, the average resource index increased from 7.85 before the 1980s to 10.07 in 1995-98. This represents a gain (bonus) of about 2.22 or 28 percent. This growth was uneven, with small gains and minor setbacks during the earlier periods but larger gains during the later two periods, when fertility began to decline. Similarly, the level of resource inequality also increased during that time period, from 0.09 to 0.20, i.e., a 122 percent increase, with much of this divergence occurring in the 1990s. Results thus clearly indicate that Cameroon's fertility transition was accompanied by both a resource bonus and divergence, with divergence being larger (122%) than growth (28%) during this period. Such findings draw attention to potential disequalizing effects of fertility transitions, even when they foster a resource
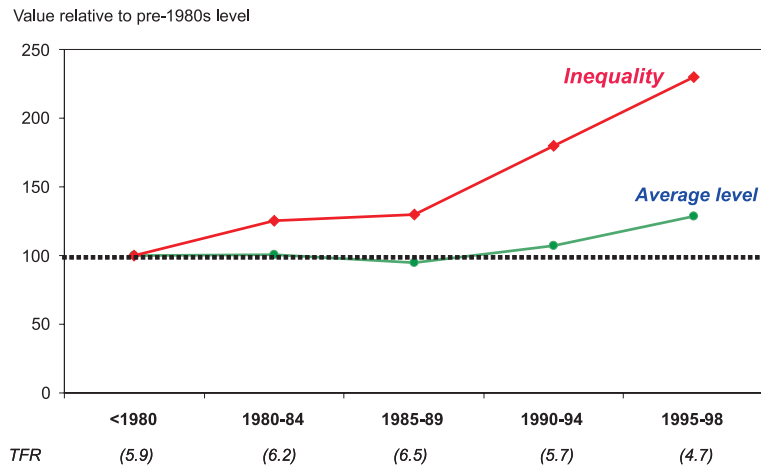
Table 2: **Estimation of the resource implications of Cameroon's transition**

CAMEROON'S TRANSITION

FAMILY TYPE	RESOURCE DILUTION Coefficients		CHANGES IN FAMILY SIZE TFR within family types (S_{jt})					CHANGES IN FAMILY STRUCTURE Proportion in family type (w_{jt})				
	Size β_S	Structure β_T	<1980	1980-84	1985-89	1990-94	1995-98	<1980	1980-84	1985-89	1990-94	1995-98
Rural Unmarried (RU)	2.88	2.88	3.09	3.31	4.56	3.59	3.26	0.098	0.074	0.091	0.093	0.122
Rural Married (RM)	2.88	2.47	6.85	7.48	8.15	8.05	7.16	0.595	0.535	0.514	0.527	0.556
Urban Unmarried (UU)	2.88	1.98	2.78	2.54	3.10	2.84	1.88	0.054	0.067	0.099	0.140	0.123
Urban Married Unemployed Partner (UMU)	2.88	1.57	7.01	7.62	7.19	7.74	5.68	0.099	0.096	0.082	0.074	0.051
Urban Married Employed Partner (UME)	2.88	1	7.08	7.79	7.92	6.32	5.71	0.155	0.228	0.215	0.165	0.148
TOTAL			5.86	6.21	6.54	5.67	4.66	1	1	1	1	1

RESOURCE IMPLICATIONS

FAMILY TYPES	RESOURCE INDEX x_{jt}					RESOURCE RATIOS r_{jt}				
	<1980	1980-84	1985-89	1990-94	1995-98	<1980	1980-84	1985-89	1990-94	1995-98
RU	10.53	9.79	6.98	8.98	9.95	1.34	1.24	0.94	1.07	0.99
RM	5.29	4.82	4.40	4.46	5.05	0.67	0.61	0.59	0.53	0.50
UU	17.12	18.84	15.26	16.74	25.90	2.18	2.39	2.05	1.99	2.57
UMU	8.12	7.43	7.90	7.31	10.14	1.03	0.94	1.06	0.87	1.01
UME	12.61	11.40	11.20	14.22	15.84	1.61	1.45	1.50	1.69	1.57
	National Resource Average (Rt)					National Resource Inequality (MLD t)				
	7.85	7.88	7.46	8.43	10.07	0.09	0.11	0.11	0.16	0.20
Change between adjacent periods		0.03	-0.42	0.97	1.64		0.02	0.00	0.11	0.04
Change between <1980s and 1995-98					2.22					*0.11*
					Bonus					Divergence

Figure 3: **Trends in children's resource levels and inequality**

Value relative to pre-1980s level

	<1980	1980-84	1985-89	1990-94	1995-98
TFR	*(5.9)*	*(6.2)*	*(6.5)*	*(5.7)*	*(4.7)*

bonus. The next issue is to understand which aspects of Cameroon's transition account for these changes.

3.3.3 Decomposition results

The decomposition results are presented in detail in Table 3 and summarized in Figure 4. The leftmost frame in Figure 4 shows the change in average resource endowment (bonus) between consecutive periods while the rightmost frame shows the change in average resource inequality (divergence). The frames also show the decomposition results in nominal units, specifically, how much the "size" and "structure" components of Cameroon's transition contributed to the national bonus and divergence, respectively. Results are shown for adjacent periods but also (in Table 3) for the overall change between the pre-1980 and 1995-98 periods.

Looking at the leftmost frame, Figure 4 shows a negligible bonus (0.03) between the first two periods, a mildly negative bonus between 1980-84 and 1985-89 (-0.42), and positive and increasing bonuses (0.97 then 1.64) since then, for a total bonus of 2.22 between the pre-1980 and 1995-98 periods. The decomposition results indicate that the "size component" of Cameroon's transition initially made negative contributions to the total bonus but these contributions became positive after 1985-89. Conversely, the "structure component" of Cameroon's transition initially made positive contributions but these contributions declined over time and became negative after 1990-94. Over the entire pe-

Table 3:   Decomposition of the resource implications of Cameroon's transition

RESOURCE IMPLICATIONS

Family types / Periods	RESOURCE INDEX					RESOURCE RATIOS				
	[1] <1980	[2] 1980-84	[3] 1985-89	[4] 1990-94	[5] 1995-98	[1] <1980	[2] 1980-84	[3] 1985-89	[4] 1990-94	[5] 1995-98
(RU)	10.53	9.79	6.98	8.98	9.95	1.34	1.24	0.94	1.07	0.99
(RM)	5.29	4.82	4.40	4.46	5.05	0.67	0.61	0.59	0.53	0.50
(UU)	17.12	18.84	15.26	16.74	25.90	2.18	2.39	2.05	1.99	2.57
(UMU)	8.12	7.43	7.90	7.31	10.14	1.03	0.94	1.06	0.87	1.01
(UME)	12.61	11.40	11.20	14.22	15.84	1.61	1.45	1.50	1.69	1.57
Period-specific totals (Rt / MLDt)	7.85	7.88	7.46	8.43	10.07	0.09	0.11	0.11	0.16	0.20
Marginals changes	(1→2) 0.03	(2→3) -0.42	(3→4) 0.97	(4→5) 1.64		(1→2) 0.02	(2→3) 0.00	(3→4) 0.04	(4→5) 0.04	
Total changes (1→5)					2.22 BONUS					0.11 DIVERGENCE

DECOMPOSITION

Bonus decomposition

	Size component					Structure component				
	1→2	2→3	3→4	4→5	1→5	1→2	2→3	3→4	4→5	1→5
(RU)	-0.06	-0.23	0.18	0.10	-0.06	-0.24	0.14	0.02	0.28	0.25
(RM)	-0.27	-0.22	0.03	0.32	-0.14	-0.31	-0.10	0.06	0.13	-0.20
(UU)	0.10	-0.30	0.18	1.21	0.78	0.23	0.55	0.66	-0.37	1.50
(UMU)	-0.07	0.04	-0.05	0.18	0.15	-0.02	-0.11	-0.06	-0.20	-0.43
(UME)	-0.23	-0.04	0.57	0.25	0.49	0.88	-0.15	-0.63	-0.26	-0.10
	-0.53	-0.75	0.92	2.06	*1.27 54.6%*	0.55	0.33	0.05	-0.42	*1.01 45.4%*

Divergence decomposition

	Size component					Structure component				
	1→2	2→3	3→4	4→5	1→5	1→2	2→3	3→4	4→5	1→5
(RU)	-0.002	-0.002	0.000	0.000	-0.005	-0.025	0.017	0.002	0.029	0.025
(RM)	0.019	0.008	0.025	0.014	0.070	-0.066	-0.023	0.016	0.033	-0.045
(UU)	0.007	-0.015	-0.004	0.043	0.021	0.019	0.046	0.055	-0.025	0.105
(UMU)	0.000	0.000	0.000	-0.001	0.000	-0.002	-0.015	-0.008	-0.023	-0.047
(UME)	-0.010	0.004	0.013	-0.007	-0.002	0.081	-0.015	-0.056	-0.020	-0.008
	0.01	-0.01	0.03	0.05	*0.08 73.6%*	0.01	0.01	0.01	-0.01	*0.03 26.4%*

Figure 4: **Decomposition results for the contributions of "size" and "structure" components to changes in resource levels and inequality (Cameroon)**

| A: <1980 to 1980-84 | B: 1980-84 to 1985-89 |
| C: 1985-89 to 1990-94 | D:1990-94 to 1995-98 |
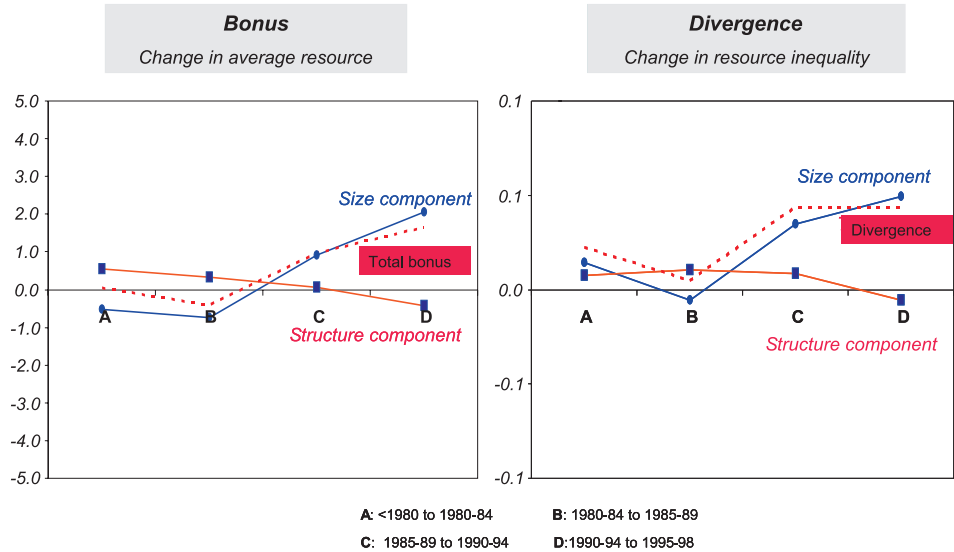
riod between the pre-1980s and 1995-98, the decomposition results (Table 3) indicate that the "size component" of Cameroon's transition accounted for about 55 percent of the bonus while the "structure component" accounted for 45 percent of the bonus. The findings in Figure 4 and Table 3 thus illustrate the study proposition about the additivity of "size" and "structure" components of fertility transitions (P1). Because each of these two components accounts for a sizeable portion of the total bonus, focusing exclusively on either one component would substantially bias estimation of the total bonus. The direction and extent of this bias vary. For the overall change between the pre-1980 and 1995-98 periods, the contributions of the "size" and "structure" components to the bonus were both positive (1.21 and 1.01, respectively). Therefore, failure to consider either component would under-estimate the total bonus. For some of the marginal changes between adjacent periods (e.g., between pre-1980s and 1980-84 (point A in Figure 4) or between 1985-89 (point B in Figure 4)), failure to consider the influences of changing family structure would under-estimate the bonus. For other periods (between 1995-98 period (point D in Figure 4)), failure to consider the influences of changing family structure would overestimate the bonus.

The conclusions from the rightmost frame are similar. Resource inequality has gen-

erally increased over time, with much of this divergence occurring during the 1990s. Decomposition analysis for the entire period between the pre-1980s and 1995-98 (Table 3) indicates that the "size" component of Cameroon's transition accounted for 74% of this divergence, while the "structure" component accounted for the remaining 26%. Again, failure to consider either component would bias estimation of the total change in resource inequality during this period. Remarkably, the "size" component –not the "structure" component– explains a larger share of the divergence in children's resources, a finding that draws attention to the distributional aspect of fertility change. This point is considered further in the following section. For now, the key insight from this decomposition is to underscore the importance of adding the "size" and "structure" components, if one is to fully estimate the resource transformations accompanying fertility transitions.

3.3.4 Simulation results

The framework's second proposition (P2) posits an interaction between changes in fertility and family structure. The question here is whether the impact of a dual transition (in family size and structure) is the mere sum of changes from the corresponding uni-dimensional transitions (one in family size only and the other in family structure only). This proposition was tested through simulation. The results, shown in Table 4, indicate the following. A uni-dimensional transition in fertility would yield a 12% bonus (rather than the 28% under the actual scenario) and a 78% divergence (rather than the 122% under the actual scenario). Likewise, a uni-dimensional transition in family structure would yield a 10% bonus and a 22% divergence. The sum of these two uni-dimensional transitions amounts to a bonus of 22% and a divergence of 100%, i.e., lower values than observed under Cameroon's actual (dual) transition. The difference in results between this dual transition and the sum of its corresponding uni-dimensional transitions reflects the interaction between change in family size and structure. These interactions are important. Even for an analyst solely interested in the influences of changing family size on children's outcomes, these influences depend on patterns and change in family structure.

Another simulation was used to illustrate the importance of distributional considerations (as per P3). Specifically, it explored the resource implications that would have been observed, had Cameroon's fertility decline been evenly distributed across all family types. The results (Table 4) indicate that under such a scenario, the resource bonus from Cameroon's transition would have been larger (40%, compared to 28% under Cameroon's actual scenario) and it would have been accompanied by milder divergence (22% as opposed to 122% under the actual scenario). In sum, had Cameroon's decline been perfectly even, it would have been accompanied by a larger and more equitable resource bonus for children.

Table 4: **Simulation of the resource implications of Cameroon's transition, under different hypothetical scenarios**

THEORETICAL PROPOSITIONS AND CORRESPONDING SIMULATION SCENARIOS	BONUS AND ITS DECOMPOSITION					INEQUALITY AND ITS DECOMPOSITION				
	Average resource level		Change (bonus)	Decomposition		Resource inequality		Change (divergence)	Decomposition	
	<1980	1995-98		"size cpnent" %	"structure cpnent" %	<1980	1995-98		"size cpnent" %	"structure cpnent" %
Proposition P2: "The implications of a dual transition are more than the mere sum of two unidimensional transitions"										
Cameroon's actual(dual) transition	7.85	10.07	2.22 [28%]	55%	45%	0.09	0.2	0.11 [122%]	74%	26%
1. Unidimensional transition in fertility	7.85	8.82	0.97 [12%]	100%	0%	0.09	0.16	0.07 [78%]	100%	0%
2. Unidimensional transition in family structure	7.85	8.61	0.76 (10%) [10%]	0%	100%	0.09	0.11	0.02 [22%]	0%	100%
(1)+(2)			1.73% [22%]					0.09% [100%]		
Proposition P3: "The same decline in national fertility has different resource implications depending on how evenly this decline occurs across the population"										
Cameroon's actual(uneven) transition	7.85	10.07	2.22 (28%) [28%]	55%	45%	0.09	0.2	0.11 (122%) [122%]	74%	26%
3. Even transition in fertility	7.85	10.98	3.13 (40%) [40%]	72%	28%	0.09	0.11	0.02 (22%) [22%]	0%	100%

4.   Conclusion and discussion

We suggest in this paper that an integration of existing dilution and divergence perspectives can improve understanding of the resource implications of fertility transitions. The integration broadens analytic focus by jointly considering the influences of family size and structure, while also documenting change in both average resource level and inequality. One basic point made throughout the paper is that transitions affect both average resource levels and inequality, with the nature and magnitude of these changes reflecting the joint influences of transformations in family size and structure. Additionally, the integrated framework refines estimation, by drawing attention to interaction and distributional considerations. The resource implications of fertility transitions do not depend only on the *quantum* of fertility decline, but on its *locus*. Furthermore, it is important to consider the *make-up* of transitions, i.e., the extent to which fertility declines occur alongside changes in family structure. Ignoring these interactions and distributional aspects can bias understanding of the resource implications of transitions, as the case of Cameroon indicates.

Several caveats must be considered in discussing this framework's insights and its purported link between fertility transitions and children's resources. The first is about causation, i.e., whether it is reasonable to view fertility transitions as exogenously causing changes in children's resources. Rather than exogenous developments, fertility transitions could instead be the result of changing preferences and norms regarding parental investments in children, themselves driven in part by changes in the returns to investments in child quality. While one can view many recent transitions as a response to the exogenous influences of economic downturns or family planning programs (NAS 1993; Bongaarts 1994; Tsui 2001), at least some of these declines may also reflect change in parental quantity/quality tradeoffs (Becker 1960; Pritchett 1994; Galor and Weil 2000). In the latter case, the observed changes in children's resources should be viewed at best as *accompanying* –rather than stemming from– transitions.

Other caveats are empirical. First, we used total fertility rates (TFR) rather than family size. Although this measure focuses attention on the effects of changing fertility, a more complete account of change in children's sibship experiences must consider changes in child mortality and, perhaps, fosterage. Our analysis thus only addresses the changes in children's resources associated with changes in fertility and family structure, rather than all aspects of family background. Likewise, our list of families types (based on maternal marital status and parental employment and residence) could be modified to include other criteria such as parenting experience, child fosterage, or family extension. We considered another typology that combined maternal age, marital status and residence. The results (available on request) showed substantively similar conclusions. Finally, there are questions about the best way to capture resource dilution. Using school dropout as a metric

and the regression coefficients associated with family size (structure, respectively) is not unproblematic. Research in this area acknowledges the difficulty in making causal inferences about the effects of family size or structure (Ginther and Pollack 2004; Moffit 2005). Despite control for many covariates (grade level, child's ability, birth order, maternal birth cohort, sex, and selection), estimates of these coefficients can be biased if other family-level and supply-side determinants are missing. At the other end, over-control for covariates –some of which could be mediator variables– can obscure the total relationship between these family factors and schooling outcomes (see Psacharapoulos and Patrinos (2003) in the case of earning returns to education). We presented both the gross and net dilution coefficients but used only the gross coefficients. Analyses based on net coefficients yield similar conclusions. However, the relative contributions of family size and structure depend on how adjustment for covariates affects their respective dilution coefficients.

A third general caveat is about generalization. Since our empirical study is based on a single country, the question arises how the patterns noted in this study apply elsewhere. As Figure 1 indicates, recent national transitions in developing countries vary in their makeup. One would therefore expect cross-country variation in the bonus and divergence that accompany fertility transitions. To study this variation, our future research will use DHS data and extend analysis to a sample of countries with contrasting transition experiences.

5.   Acknowledgement

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Appendix

Table A1: Logistic regression results for the effects of selected variables on the risk of school dropout, Cameroon

	B	Exp(B)	B	Exp(B)
Ln Family Size	1.059	2.88***	0.317	1.37***
Family type	1.057	2.88***	0.914	2.50***
Rural unmarried mother	0.906	2.47***	0.945	2.57***
Rural married mother	0.683	1.98***	0.381	1.46***
Urban unmarried mother	0.452	1.57***	0.495	1.64***
Urban married mother with unemployed partner	ref		ref	
Urban married mother with employed partner				
Child is female	0.197	1.22***	0.257	1.29***
Rank in birth order	-0.208	0.81***	-0.098	0.91***
Maternal birth cohort				
Pre 1940 (reference)	ref		ref	
1940-49	-0.301	0.74***	-0.191	0.83***
1950-59	-0.801	0.45***	-0-494	0.61***
1960+	-1.685	0.19***	-0.927	0.40***
Grade level				
Kindergarten			-0.846	0.43***
Grade 1 (reference)			ref	
Grade 2			1.636	5.13***
Grade 3			2.015	7.50***
Grade 4			2.608	13.58***
Grade 5			2.885	17.90***
Grade 6			4.293	73.19***
Grade 7			3.490	32.78***
Grade 8			3.778	43.72***
Grade 9			3.514	33.58***
Grade 10			4.147	63.24***
Grade 11			3.600	36.61***
Grade 12			3.645	38.29***
Grade 13			3.881	48.46***
Grade 14			3.216	24.92***
Grade 15			3.867	47.81***
Grade 16			5.283	196.88***
Grade 17+			4.083	59.34***
Child repeats current grade			1.185	3.27***
Child repeats current grade for nth time (n>1)			1.149	3.16***
Index of inordinate ability			0.355	1.43
Constant	-4.522	0.01***	-4.366	0.01***
N person years=63,338; N events=2,684				
Nagelkerke R square	0.07		0.29	