

Urbanization and fertility in developing world: Is the relationship causal or a mere association?

Urbanization and fertility in developing world: Is the relationship causal or a mere association? Evidence from 174 Demographic Health Surveys (1990-2011)

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Abstract

Previous research found lower fertility levels in urban areas compared with rural areas. However, the answered question remained whether this relationship is a mere association or causal, especially due to the cross-sectional nature of data used in previous studies. This paper examines the relationship between urban place of residence and fertility levels, measured as the number of children ever born (CEB), using 174 Demographic Health Surveys from developing countries and matching techniques to account for the heterogeneity between rural and urban areas. Overall, we found a negative and significant effect of urbanization on fertility. Additionally, we examined the trends of the effect of urbanization on fertility and we found that it varies over time. These variations are categorized as “enhancement effect”, “constancy effect”, or “diminishing effect” depending upon the fact that the observed effect of urbanization from previous was lower, almost equal, higher than the actual period.

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Background

There is a large literature analyzing the effect of urbanization on fertility declines; research generally reports negative and significant effects. However, I identified two main drawbacks in these studies that limit the generalization of findings. On a theoretical point, studies on the links between urbanization and fertility lack a clear delineation between the effect of rural-urban migration and urbanization as a structural factor on fertility. In fact, these studies draw interchangeably on the same theories to explain the effect of migration and urbanization on fertility. Recent examples include White and colleagues (White, Tagoe, Stiff, Adazu, & Smith, 2005; White et al., 2008) in which rural-urban migration appears as a major explanation of the differentials in fertility levels between rural and urban areas. Methodological issues include the fact that most studies on urbanization-fertility links have ignored individual and structural factors that may explain lower levels of fertility in urban areas. Indeed, those studies rely on the homogeneity assumption¹ between urban and rural areas may lead to an over- (or under-) estimation of the effect of urbanization on fertility. For instance, it is well known that urban women are more educated, have greater access to contraception, medias, medical care, and are more likely to have low levels of fertility preference, paid work or to be assisted by a qualified medical personnel than rural women. Most factors have been found to be associated with low levels of child mortality which thereafter affects the levels of fertility in developing countries.

Research objectives

This paper investigates the heterogeneity assumption to test the effect of urbanization on fertility. Indeed, due to rural-urban differences concerning most of the aforementioned factors, I assume that using a *dichotomy* urban-rural in modeling the effect of urbanization on fertility may be misleading for policies and social workers. I use matching techniques to account for rural deprivation.

¹ The homogeneity assumption ignores the differences between urban and rural areas: “urban women are alike rural areas”. Yet many studies show that rural areas are very different from urban on many factors (e.g., education, access to contraception, etc.) which are strongly associated with fertility levels.

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Analytical strategy: *Poisson regression with endogenous treatment effects*

I implemented a poisson regression with endogenous treatment effects. As I said earlier, living in urban areas is not exogenous and previous research pinpointed that urban residence is advantaged with regards to many factors correlated with fertility. Also, researchers have examined the endogeneity of urbanization and fertility (Angeles, 2010; Eckstein & Wolpin, 1985; Jaffe, 1942; Morand, 1999; Sato & Yamamoto, 2005). The endogenous binary variable (rural vs. urban) allows for a specific correlation structure between the unobservables that affect the treatment and the unobservables that affect the potential outcomes (Terza, 1998).

Data

I use data from 174 Demographic and Health Surveys (DHS) collected in 70 countries around the world between 1990 and 2011. Geographically, the 70 countries include 36 countries in sub-Saharan Africa, 11 countries in North Africa/West Asia/Europe, 11 countries in Latin America and Caribbean, nine countries in South and South East Asia, and three countries in Central Asia. Some countries have more than one DHS; I use these countries to assess the trends over time of the effects of urbanization on the lifetime children ever born and during the last five preceding years. Data, survey instruments, and document are freely available on the MEASURE DHS website (www.measuredhs.com). The DHS are standardized and comparable across countries and years for most variables. In each survey, a two-stage probabilistic sampling technique is used to select primary sampling units (PSU), which are clusters or census enumeration areas at the first stage, and then select households at the second stage. The DHSs represent around the world a clear improvement in terms of data collection and dissemination. However, they also present serious challenges and limitations concerning cross-country analyses. For instance, the educational systems are not the same in all countries; yet education is a key factor to understand fertility levels. Instances of these discrepancies are the Islamic countries where the proportion of Koranic schools is increasing but are not taken into account in the formal schooling (André & Demonsant, 2013).

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In this paper, the woman is the unit of analysis and the outcome of interest is “woman’s fertility” measured by children ever born. Therefore, I used the individual record files for each country and available years. I constructed a unique file contained the 174 datasets; however analyses were performed separately for each country and year. Variables of interest include children ever born, childhood place of residence, migration, and the duration at the current place of residence, women’s education, age at marriage, the marriage duration, number of sons, number of daughters, and fertility preferences.

Variables measurement

Outcome variable. Children Ever Born (CEB), the total number of children to whom the woman has ever given birth, is the outcome of interest in this paper. In the DHS, information was collected to measure the lifetime fertility (CEB) and fertility in the last five years (CEB-5). I chose these two variables because of the cross-sectional nature of the data. While the lifetime CEB may represent the complete picture of fertility in a given population, CEB-5 is more realistic assuming that the woman was living in her current place of residence.

Treatment variable. The type of current place of residence is the treatment variable. It is a binary variable: rural *versus* urban. The basic idea in using place of residence as the treatment variable as I mentioned earlier relies on the heterogeneity between rural and urban women. Therefore I use a quasi-experiment to correct for the bias of the selection-on-observables between rural and urban women.

Other variables included in the estimations. The variables included in the models: woman’s education (in completed years), age and age-squared (due to the fertility curves), migration status and the duration at current place of residence, age at marriage, and marriage duration, child mortality measured by the total number of sons who died and the total number of daughters, and the ideal number of children as a measure of fertility preferences.

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Findings

Effects of urbanization on fertility

The goal of this paper is to examine the effect of urbanization on the lifetime fertility (CEB) and the most recent fertility levels (CEB in the last five years preceding the survey). Furthermore, it addresses the constancy of the effects of urbanization in countries with two DHSs or more. Figures 1 and 2 present the effects of urbanization by geographic regions on (i) children ever born (CEB); and (ii) children ever born in the last five years, respectively. Overall, **findings indicate a statistically negative effect of urbanization on fertility levels** considered in this study. There are a few exceptions in which I observe a positive effect. They include, for CEB, Mauritania (2000) and Senegal (1992) in Western Africa; Madagascar (2003), Malawi (1992), and Mozambique (1997, 2003) in Eastern Africa; Cameroon (1991), Central Africa Republic (1994), Chad (1996, 2004), Democratic Republic of the Congo (2007), and Gabon (2000) in Central Africa; Yemen in North Africa, Western Asia, and Europe; Pakistan (1990) in South & South Asia; and Guyana (2009) in Latin America and the Caribbean. For CEB in the last years, exceptions include Niger (1992) in Western Africa, Pakistan (1990) in South & South Asia; Central Africa Republic (1994) and Chad (2004) in Central Africa.

Analyzing trends of the effects of urbanization on fertility

The trends of the effects of urbanization on fertility levels are presented in Figures 3 and 4 by geographic regions. We identified three patterns of the trends of urbanization on fertility levels. They are the “constancy”, “enhancement”, and “lowering” zones in which the effects of urbanization remain almost identical over time, increase or diminish, respectively. To get this pattern, I compute the difference between the effects of urbanization for the most recent DHS minus the effects from the previous DHS. If the difference is nil, the effect of urbanization is constant. Otherwise, I observe enhancing or diminishing effects of urbanization.

For the lifetime fertility, we compute 101 differences for the available data. Findings indicate that out of 101 differences, there is an enhancement effect in 45.5%. In 9.9% of cases, the effect on urbanization on fertility was constant while there is a diminishing effect in 44.6% of cases. Finally, we analyzed the trends of the effects of

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urbanization on fertility in the last five years preceding the survey. We found that the effect of urbanization was constant in 9.7% of cases. Mostly we observe either an enhancement (41%) or a diminishing effect (49.5%) of urbanization of the recent fertility.

Discussion and Conclusion

The goal of this paper was to examine whether the relationship between urbanization and fertility is a mere association or causal using 174 Demographic and health Surveys from developing countries and matching techniques. The findings of this article consolidate earlier evidence on the connection between urbanization and lifetime/current fertility. While many early studies have noted the association between urbanization and fertility, the present analysis takes us beyond that well-known observation in many respects. First, the paper provided an innovative approach which accounts for the heterogeneity between rural and urban areas. Indeed, previous studies have regressed urban residence on fertility. Although there are justifiable reasons to do that, the underlying assumption of homogeneity between rural and urban areas is misleading because we know that rural and urban areas significantly differ from many factors (education, access to contraception, fertility preferences, occupation, age at marriage) which are strongly associated with fertility levels. Second, while relationship observed in previous studies is a mere association, this paper highlights that it exists a causal relationship between urbanization and fertility levels. Overall, we observed a significant negative effect of urbanization on lifetime/current fertility. Third, the effect of urbanization is not constant over time. We found that this effect varies in some countries. In fact, we found an enhancement effect in some countries when the effect of current period is higher than the one from previous period. We also observed a diminishing effect in which the effect of urbanization in the current period is lower compared with the past period. More interestingly, the differences in which the effect of urbanization was constant in consecutive periods were marginal: 10% for the lifetime and actual fertility levels. Therefore, in-depth analysis is required to understand why the effects of urbanization vary over time.

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References

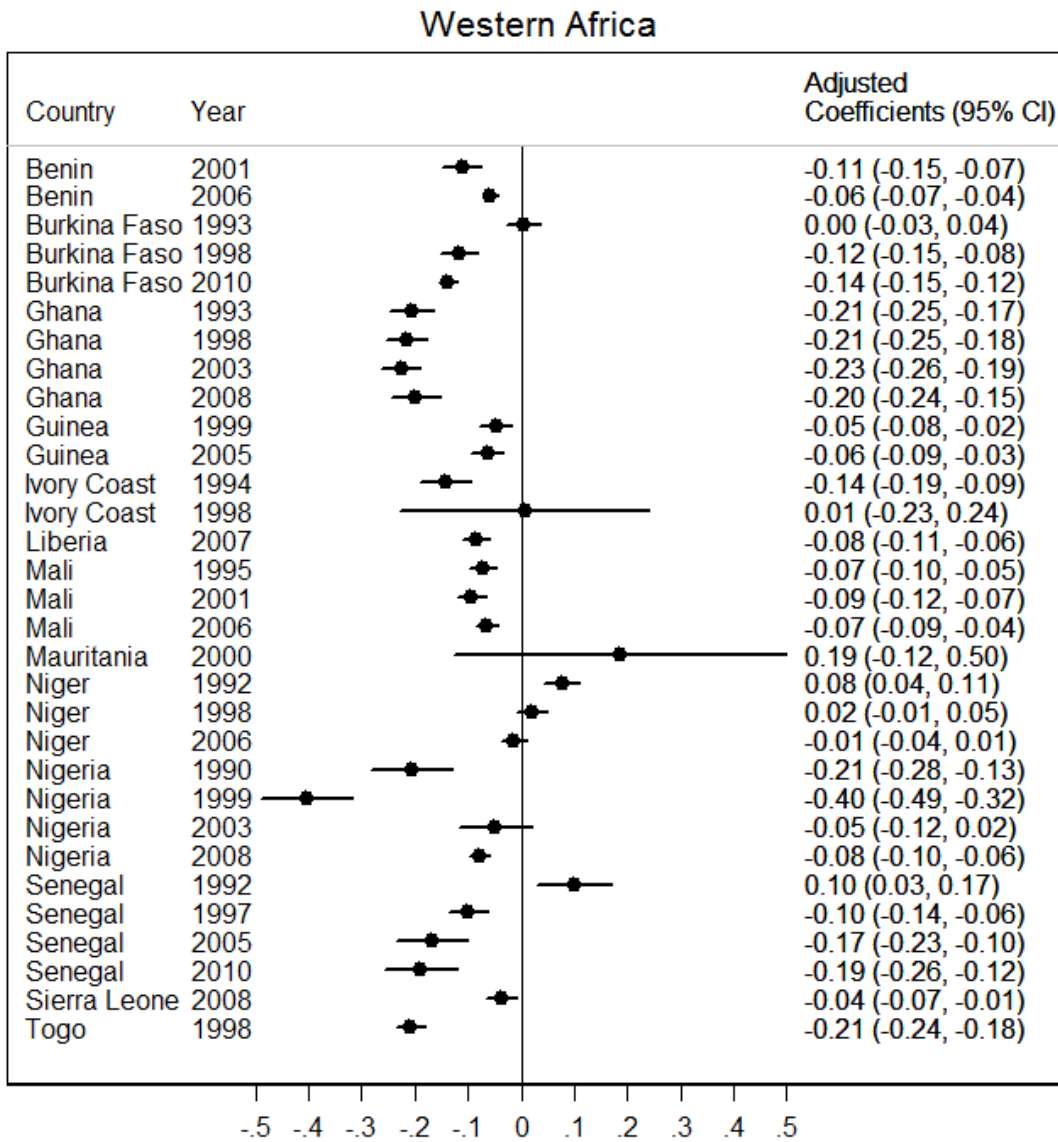
- André, P., & Demonsant, J. (2013). *Koranic schools in Senegal : A real barrier to formal education?* ().
- Angeles, L. (2010). Demographic transitions: Analyzing the effects of mortality on fertility. *Journal of Population Economics*, 23, 99-120.
- Eckstein, Z., & Wolpin, K. I. (1985). Endogenous fertility and optimal population size. *J Public Econ*, 27(1), 93-106.
- Jaffe, A. J. (1942). Urbanization and fertility. *American Journal of Sociology*, 48(1), 48-60.
- Morand, O. F. (1999). Endogenous fertility, income distribution, and growth. *Journal of Economic Growth*, 4(3), 331-349.
- Sato, Y., & Yamamoto, K. (2005). Population concentration, urbanization, and demographic transition. *Journal of Urban Economics*, 58(1), 45-61.
- Terza, J. V. (1998). Estimating count data models with endogenous switching: Sample selection and endogenous treatment effects. *Journal of Econometrics*, 84(1), 129-154.
- White, M. J., Muhidin, S., Andrzejewski, C., Tagoe, E., Knight, R., & Reed, H. (2008). Urbanization and fertility: An event-history analysis of coastal Ghana. *Demography*, 45(4), 803-816.
- White, M. J., Tagoe, E., Stiff, C., Adazu, K., & Smith, D. J. (2005). Urbanization and the fertility transition in Ghana. *Population Research and Policy Review*, 24(1), 59-83.

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Figure 1: Urbanization and Children Ever Born

Panel A: Sub-Saharan Africa

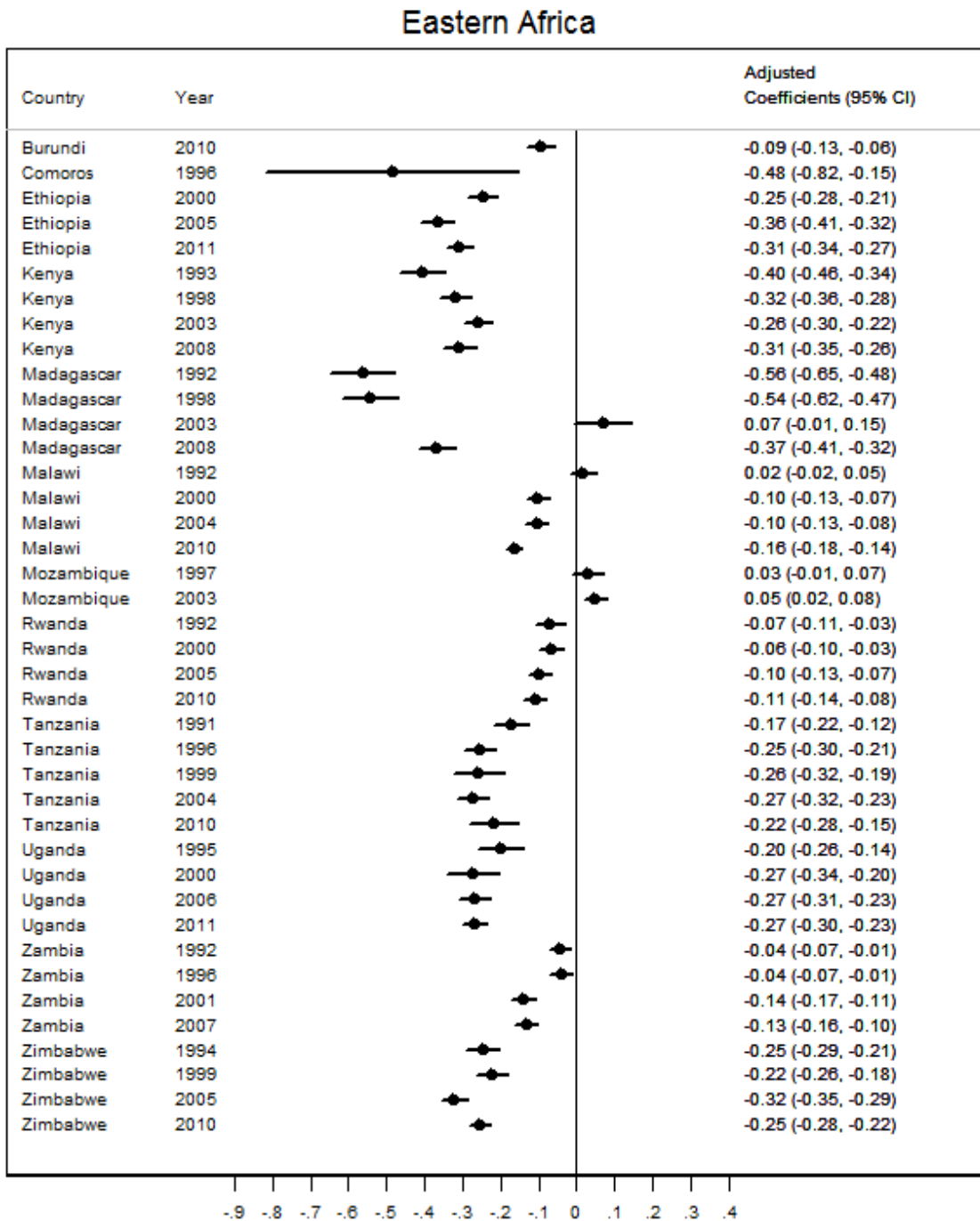
Panel A.1. Western Africa



Source: Demographic and Health Survey

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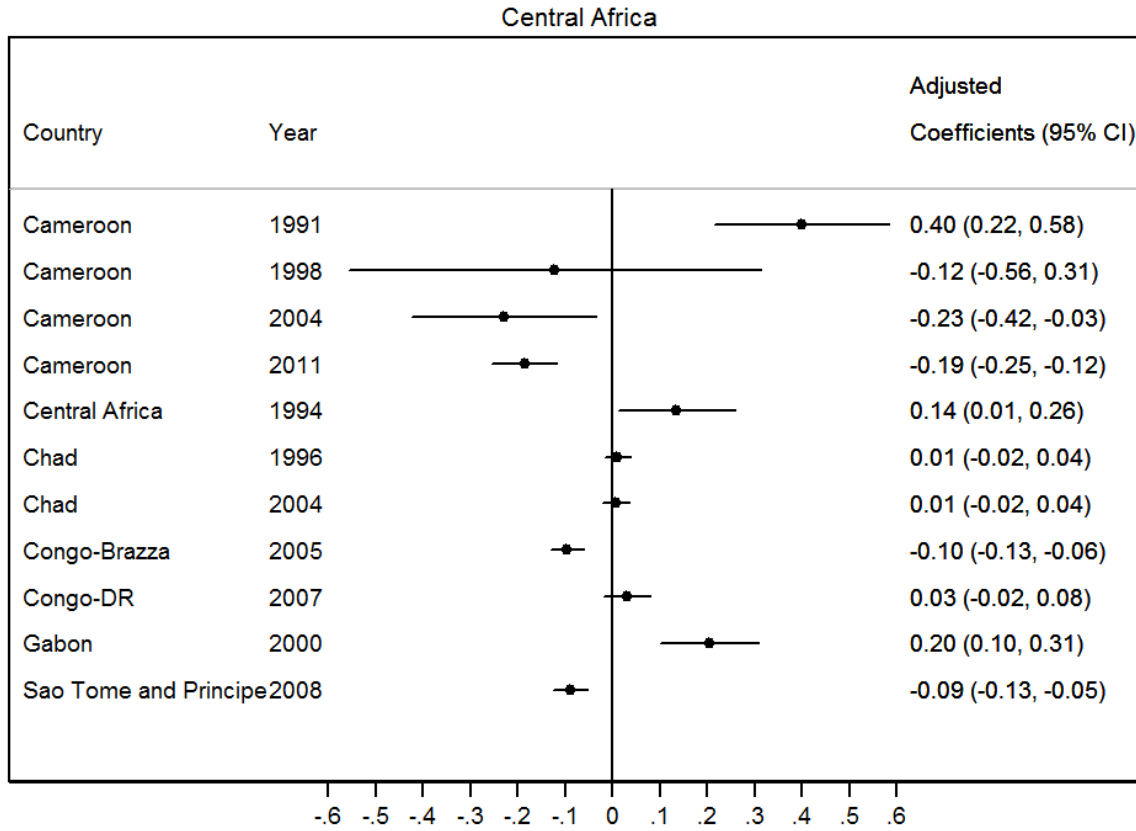
Panel A.2 Eastern Africa



Source: Demographic and Health Survey

Urbanization and fertility in developing world: Is the relationship causal or a mere association?

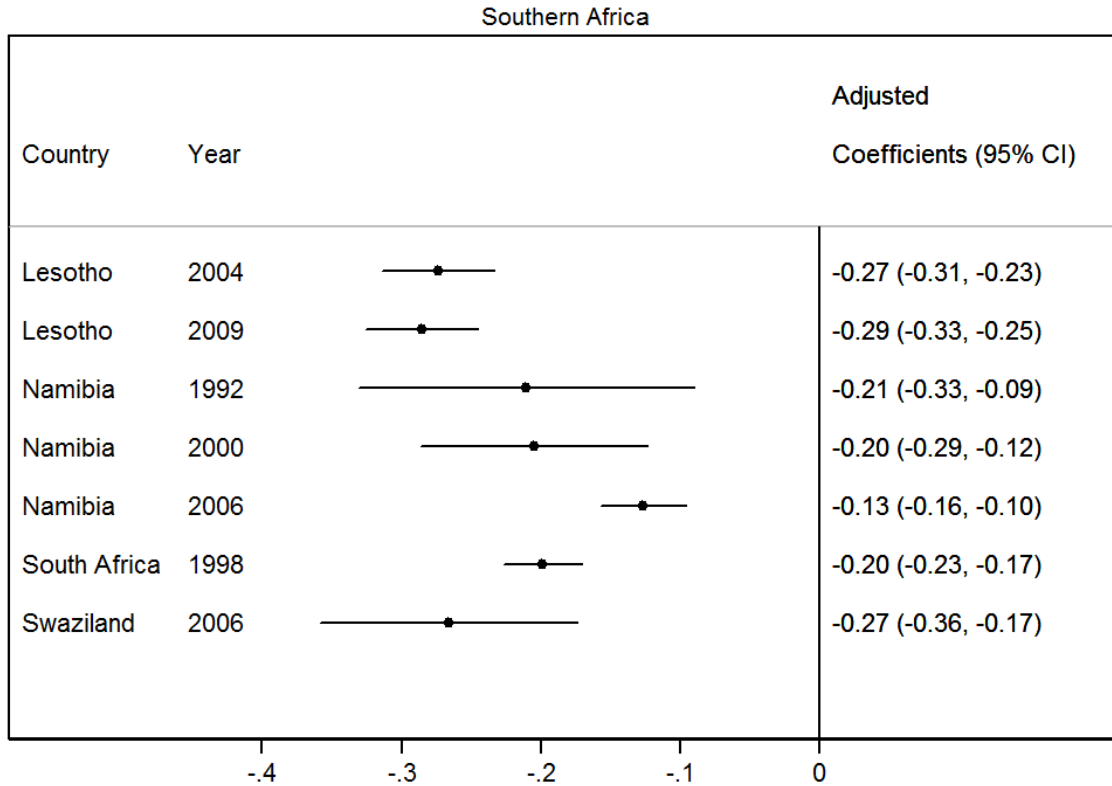
Panel A.3 Central Africa



Source: Demographic and Health Survey

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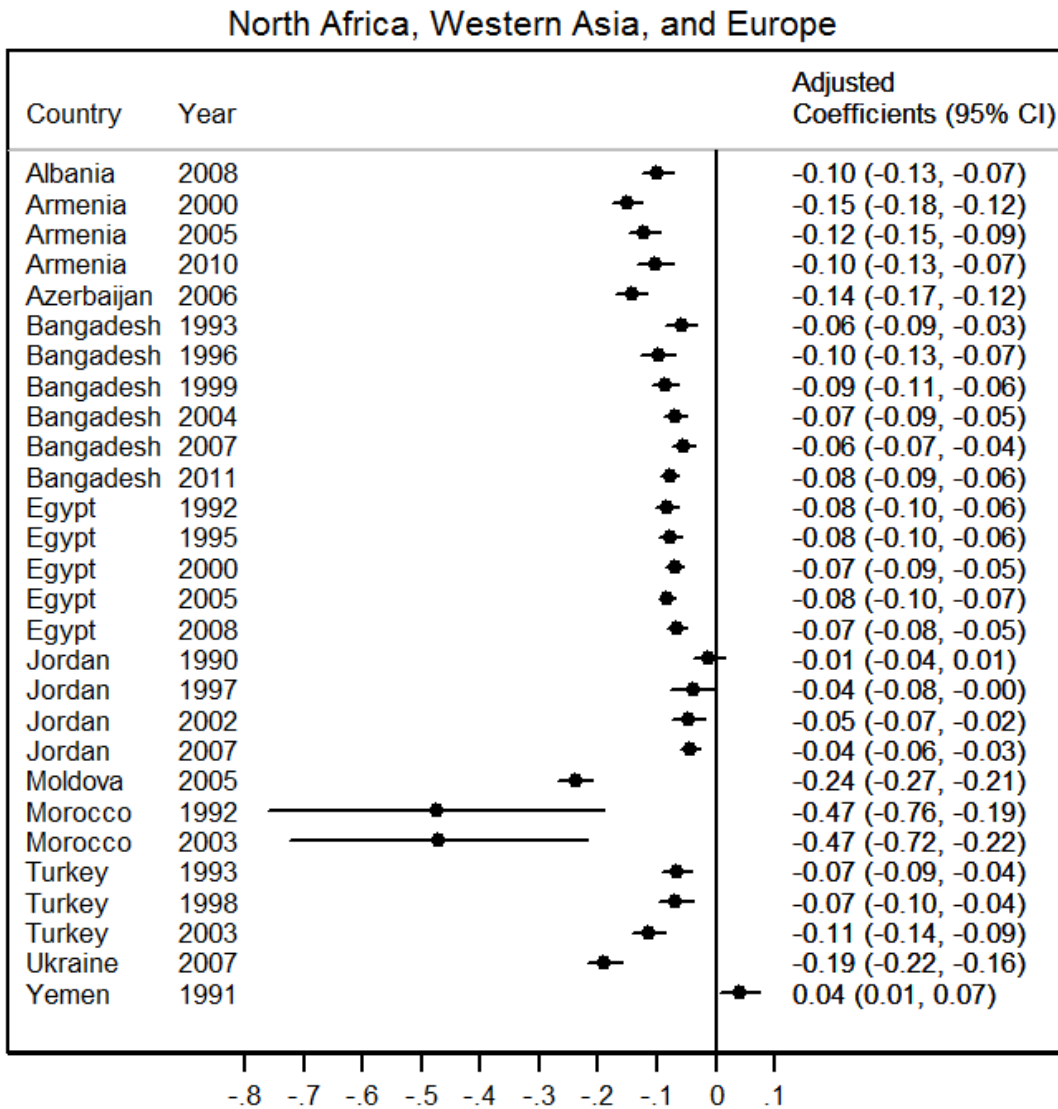
Panel A.4 Southern Africa



Source: Demographic and Health Survey

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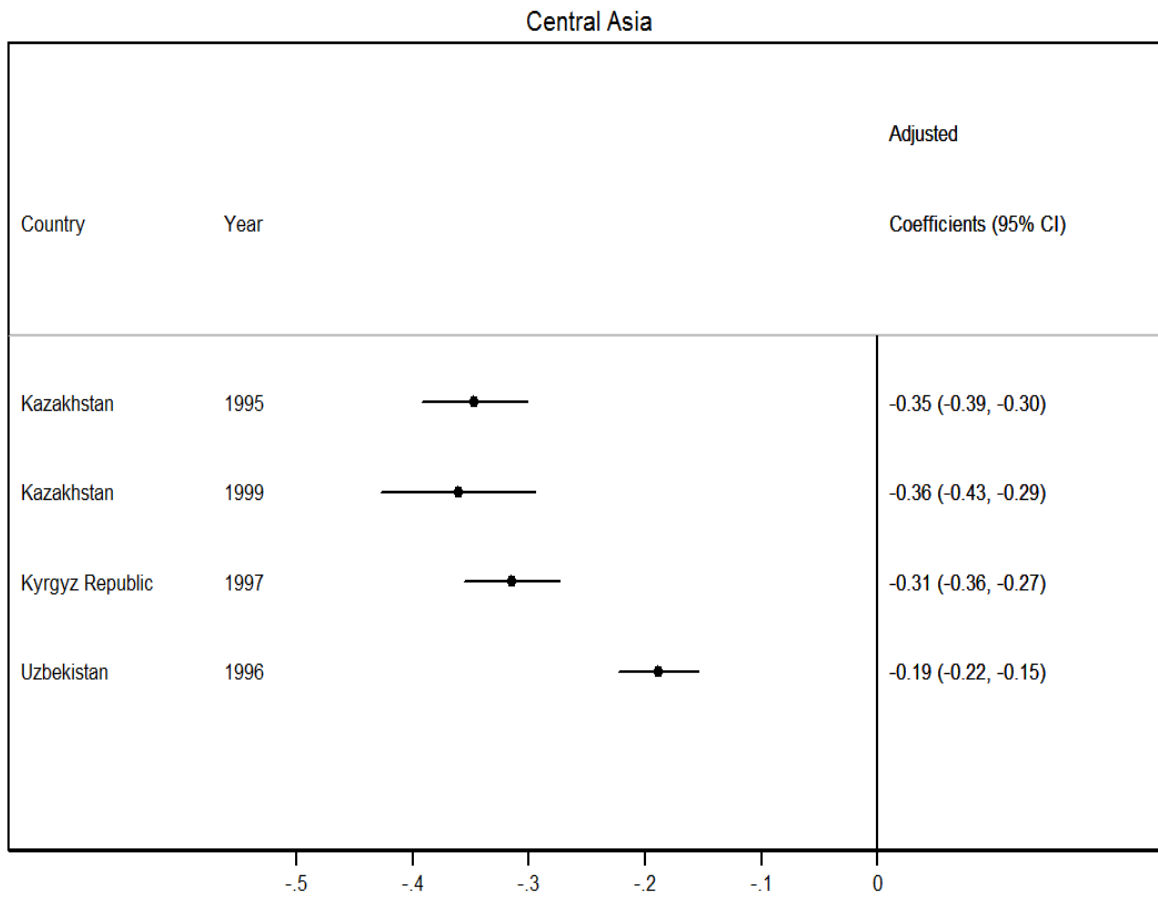
Panel B: North Africa, Western Asia, and Europe



Source: Demographic and Health Survey

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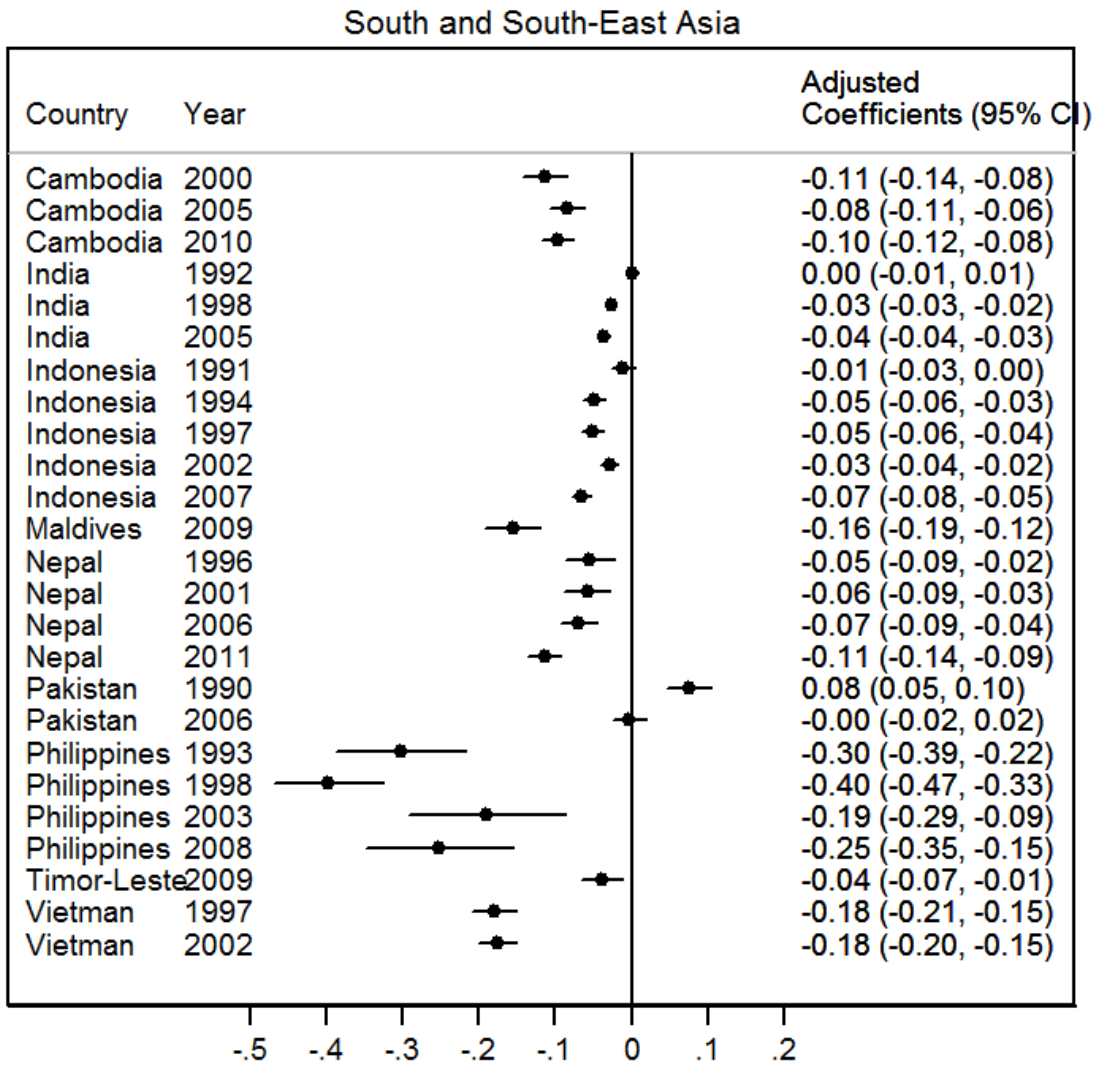
Panel C: Central Asia



Source: Demographic and Health Survey

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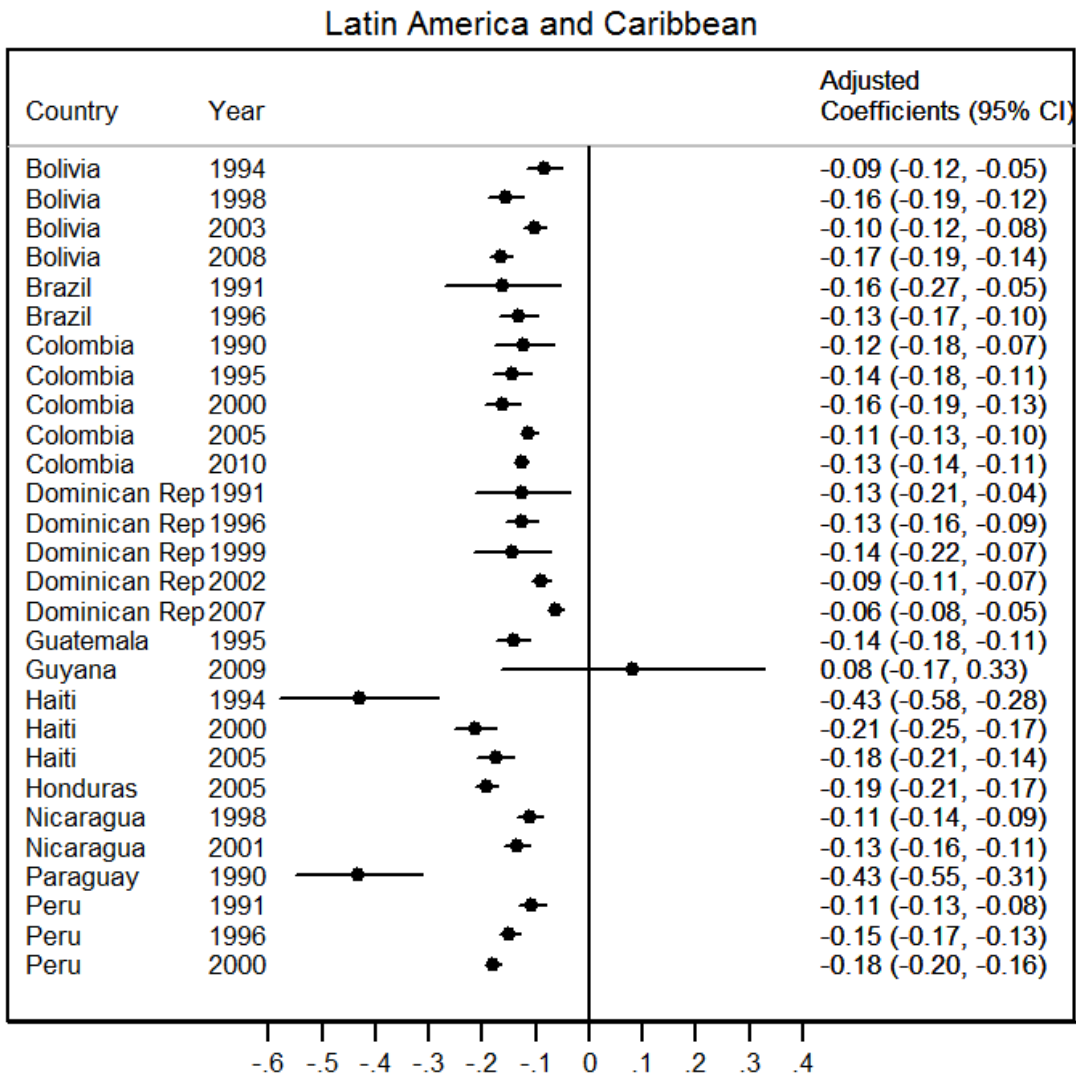
Panel D: South & South-East Asia



Source: Demographic and Health Survey

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Panel E: Latin America & Caribbean



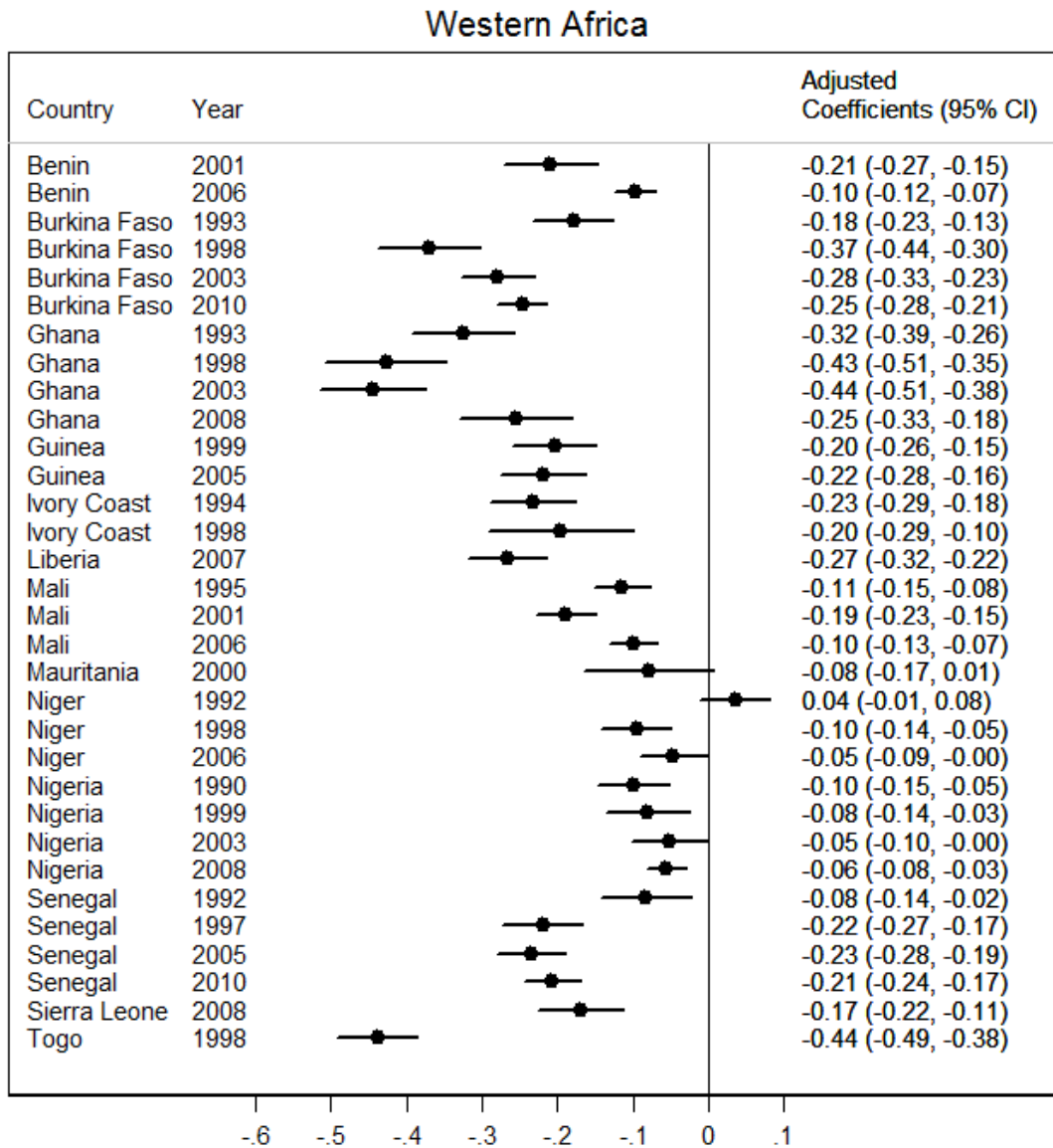
Source: Demographic and Health Survey

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Figure 2: Urbanization and Children Ever Born in the Last Five Years

Panel A: Sub-Saharan Africa

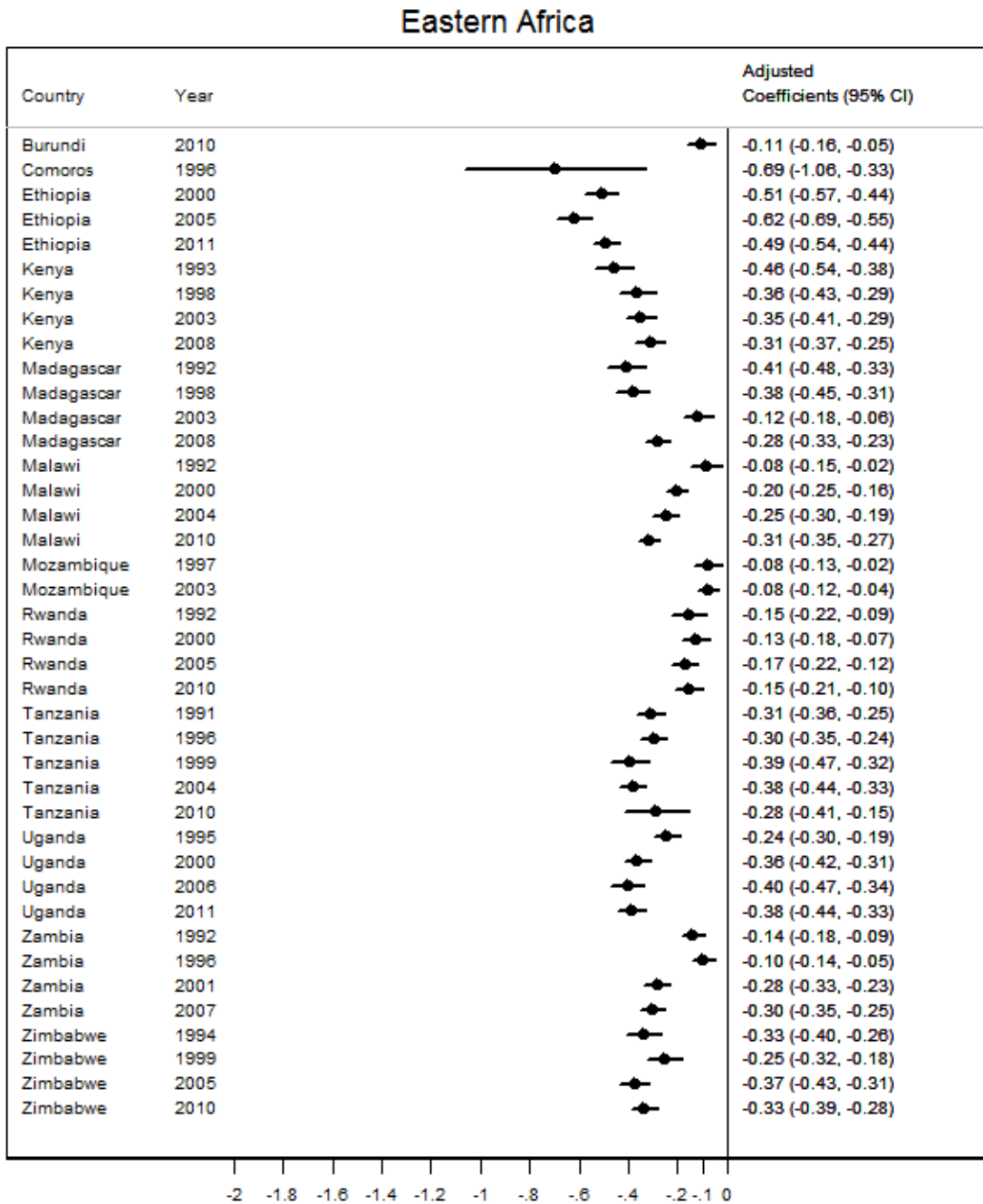
Panel A.1. Western Africa



Source: Demographic and Health Survey

Urbanization and fertility in developing world: Is the relationship causal or a mere association?

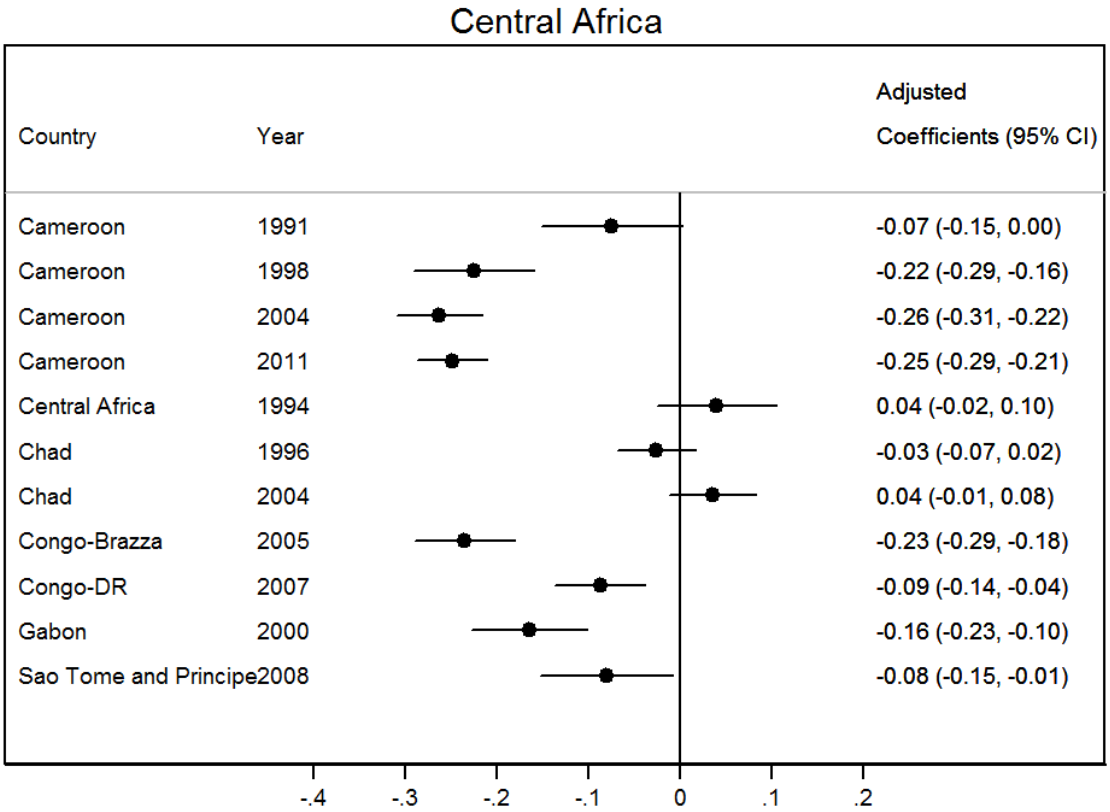
Panel A.2 Eastern Africa



Source: Demographic and Health Survey

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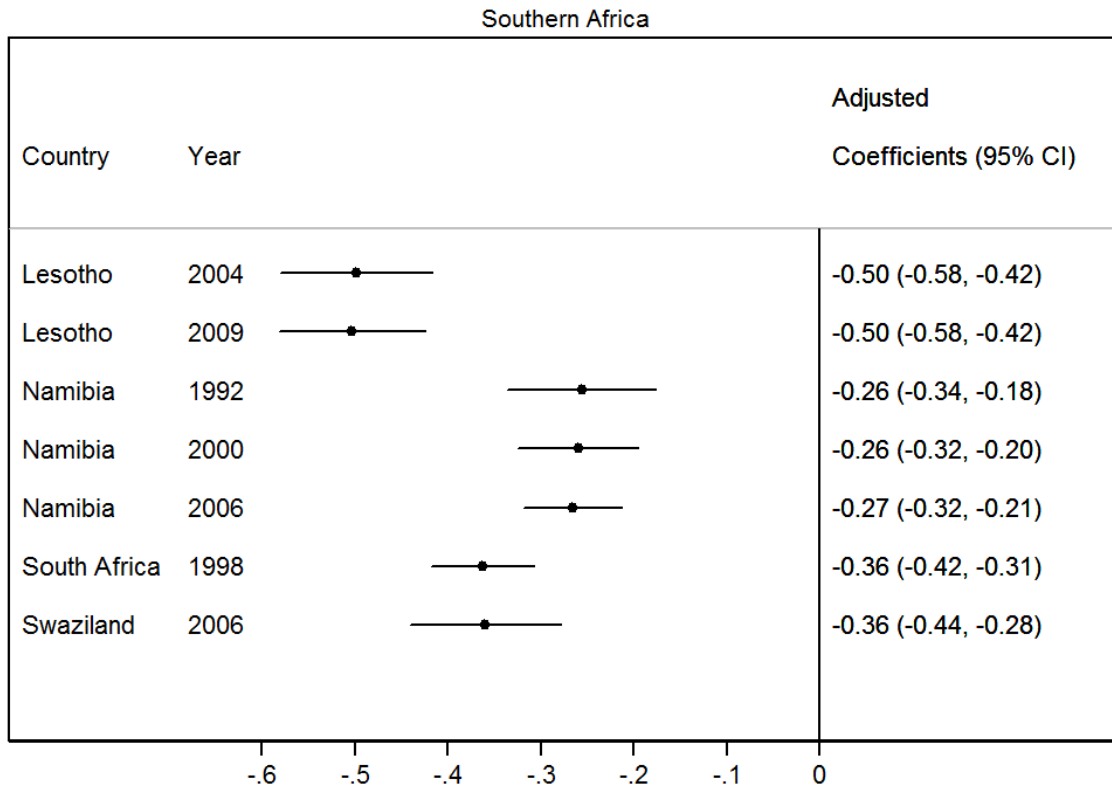
Panel A.3 Central Africa



Source: Demographic and Health Survey

Urbanization and fertility in developing world: Is the relationship causal or a mere association?

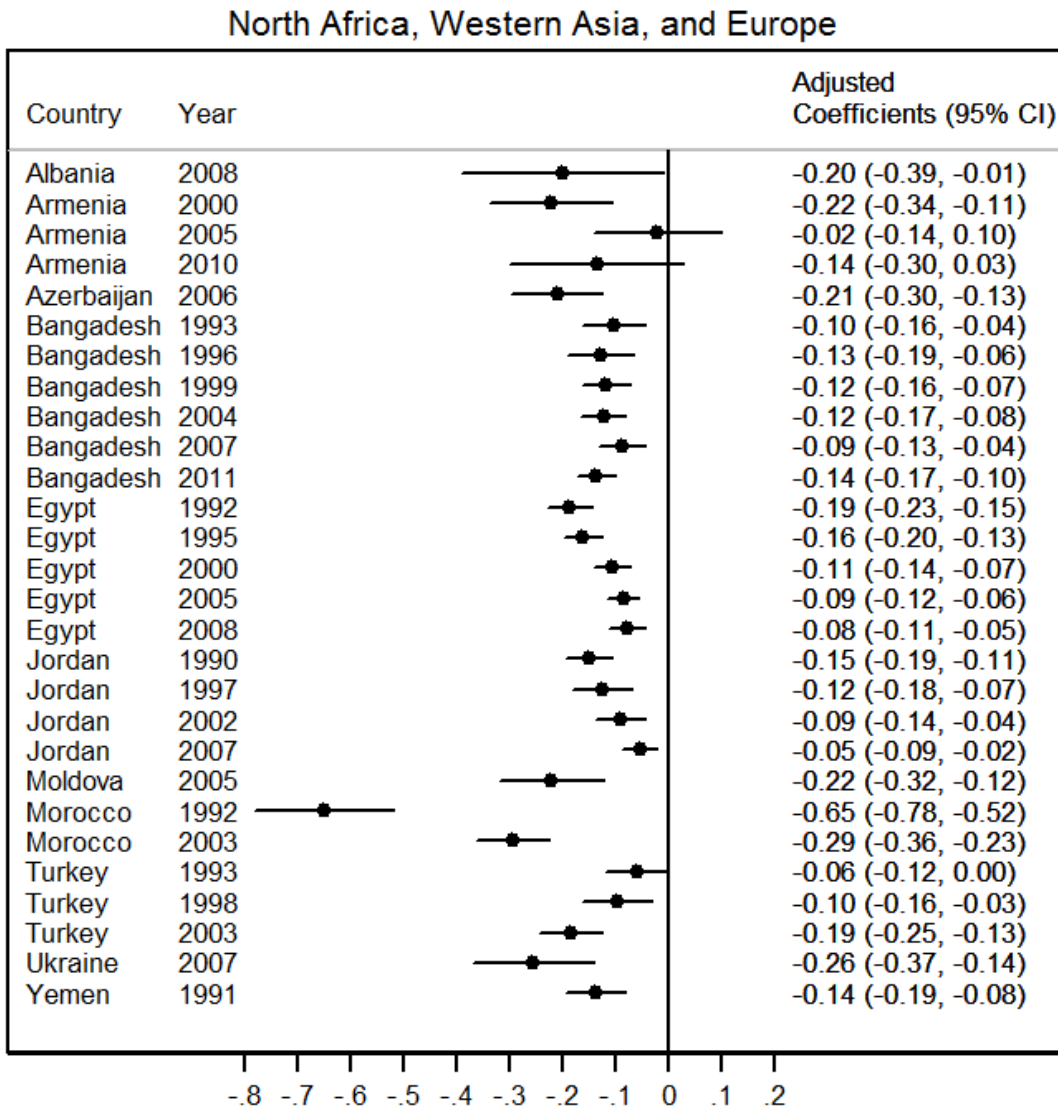
Panel A.4 Southern Africa



Source: Demographic and Health Survey

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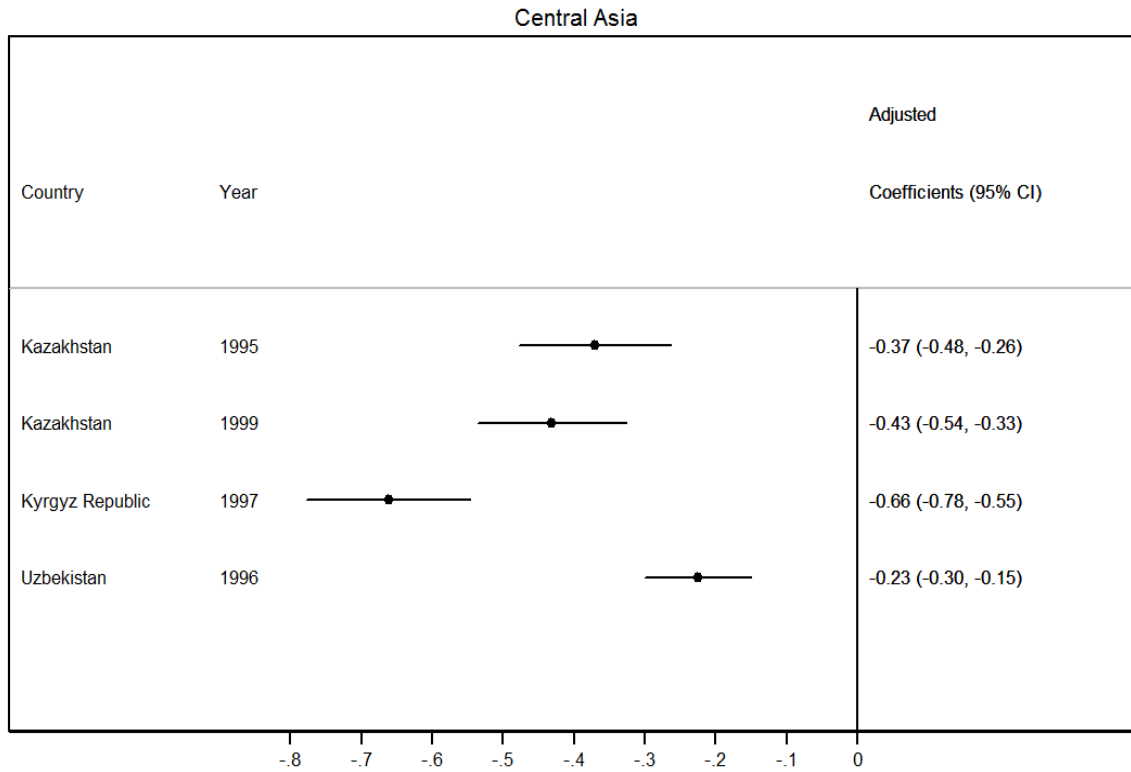
Panel B: North Africa, Western Asia, and Europe



Source: Demographic and Health Survey

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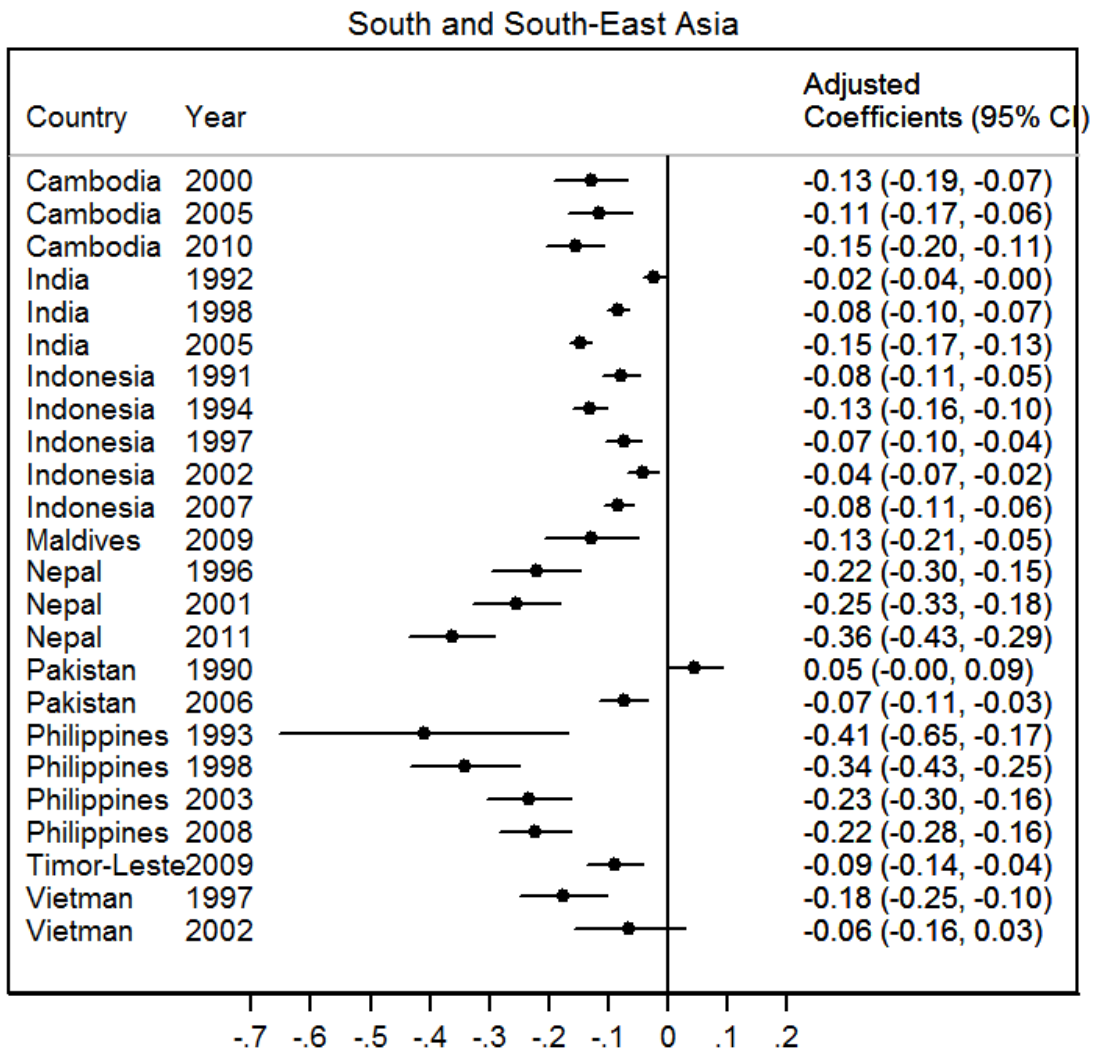
Panel C: Central Asia



Source: Demographic and Health Survey

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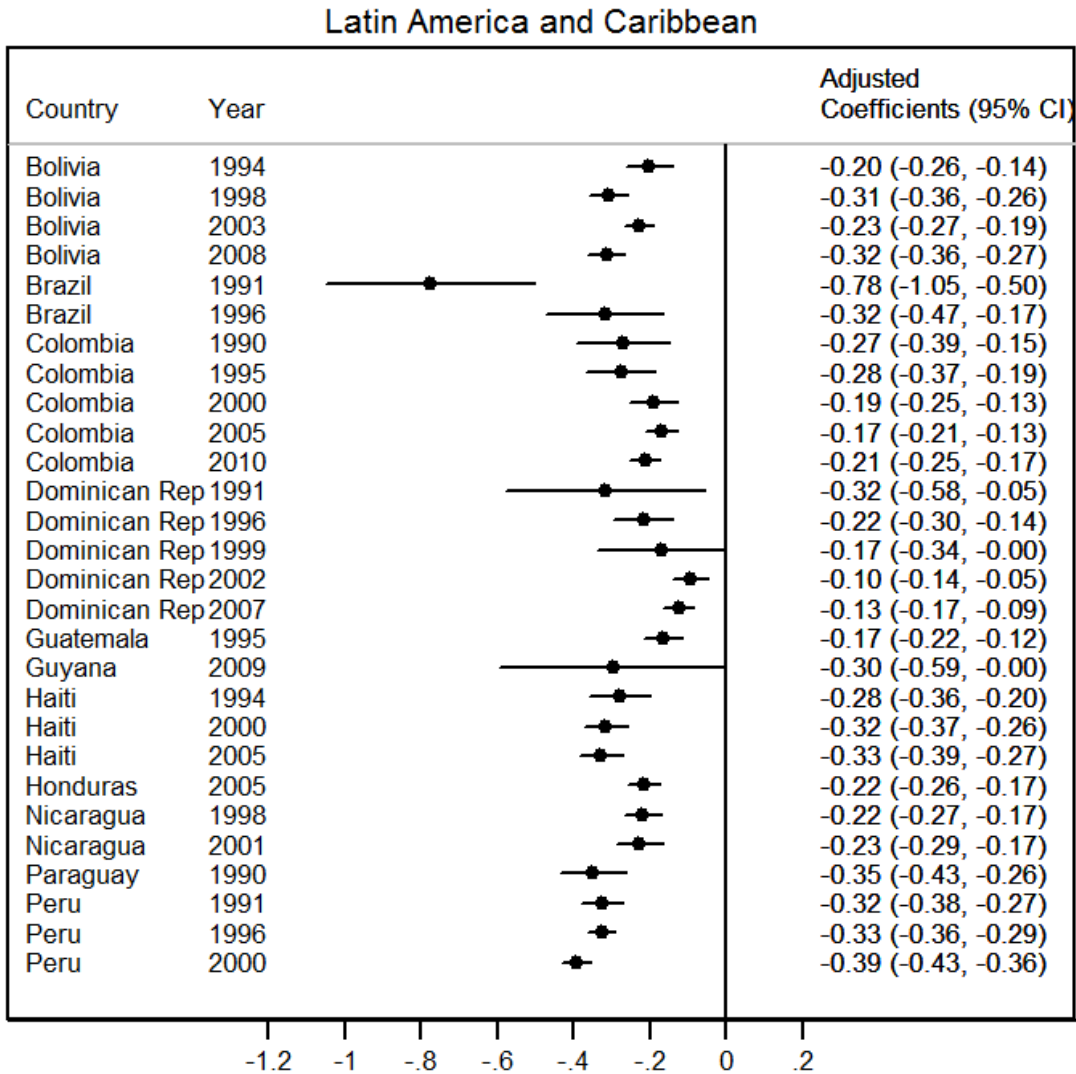
Panel D: South & South-East Asia



Source: Demographic and Health Survey

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Panel E: Latin America & Caribbean



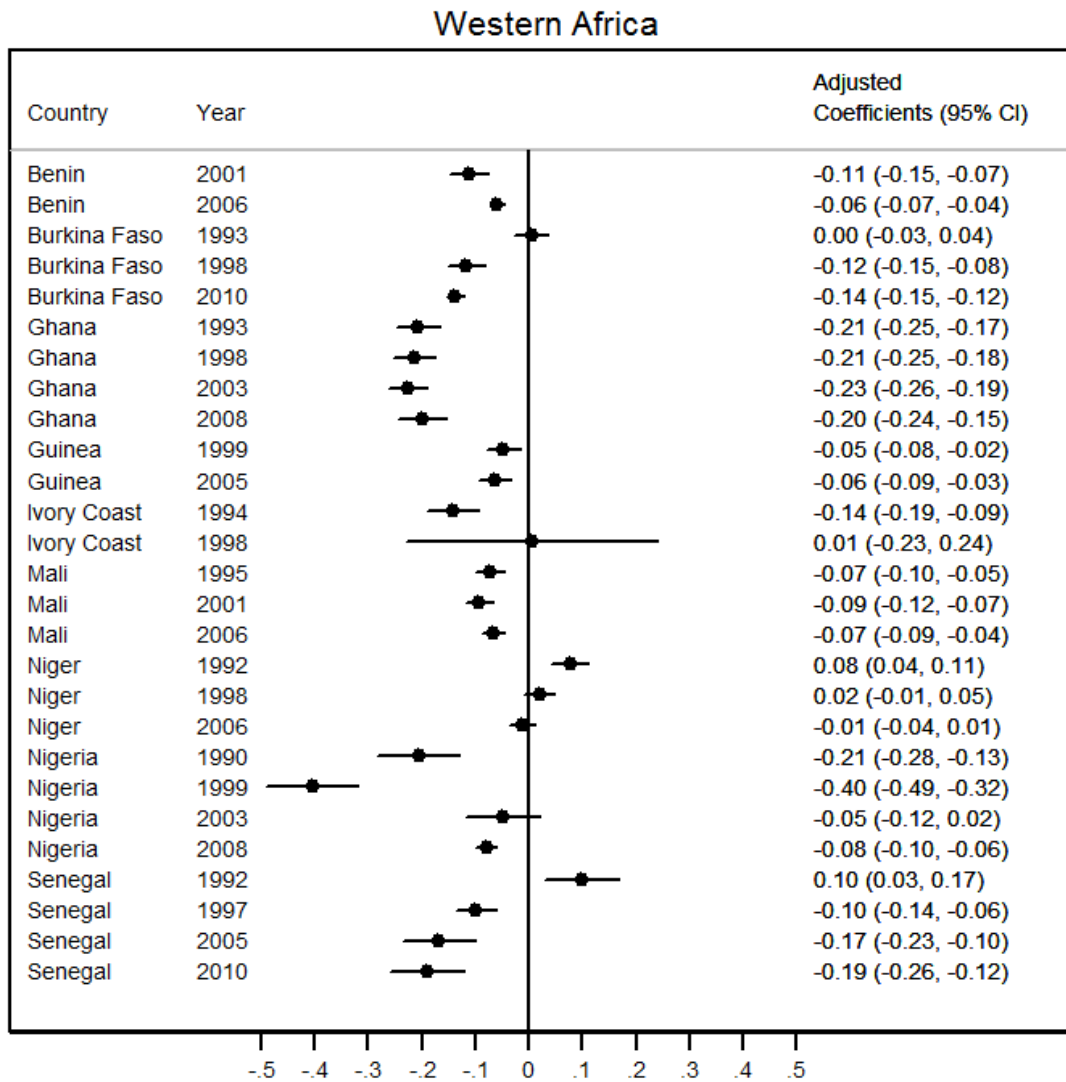
Source: Demographic and Health Survey

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Figure 3: Trends of the effects of urbanization on Children Ever Born

Panel A: Sub-Saharan Africa

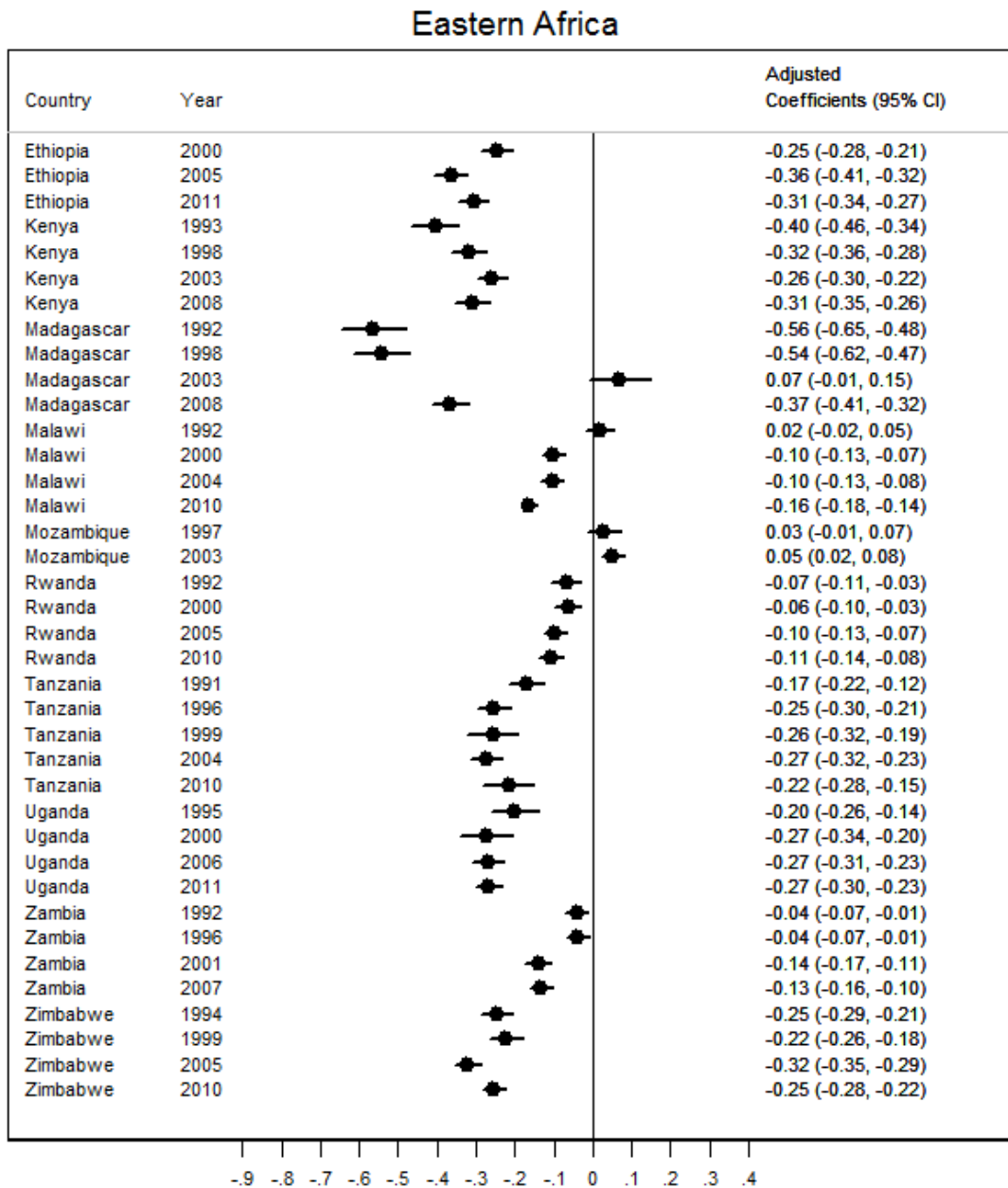
Panel A.1. Western Africa



Source: Demographic and Health Survey

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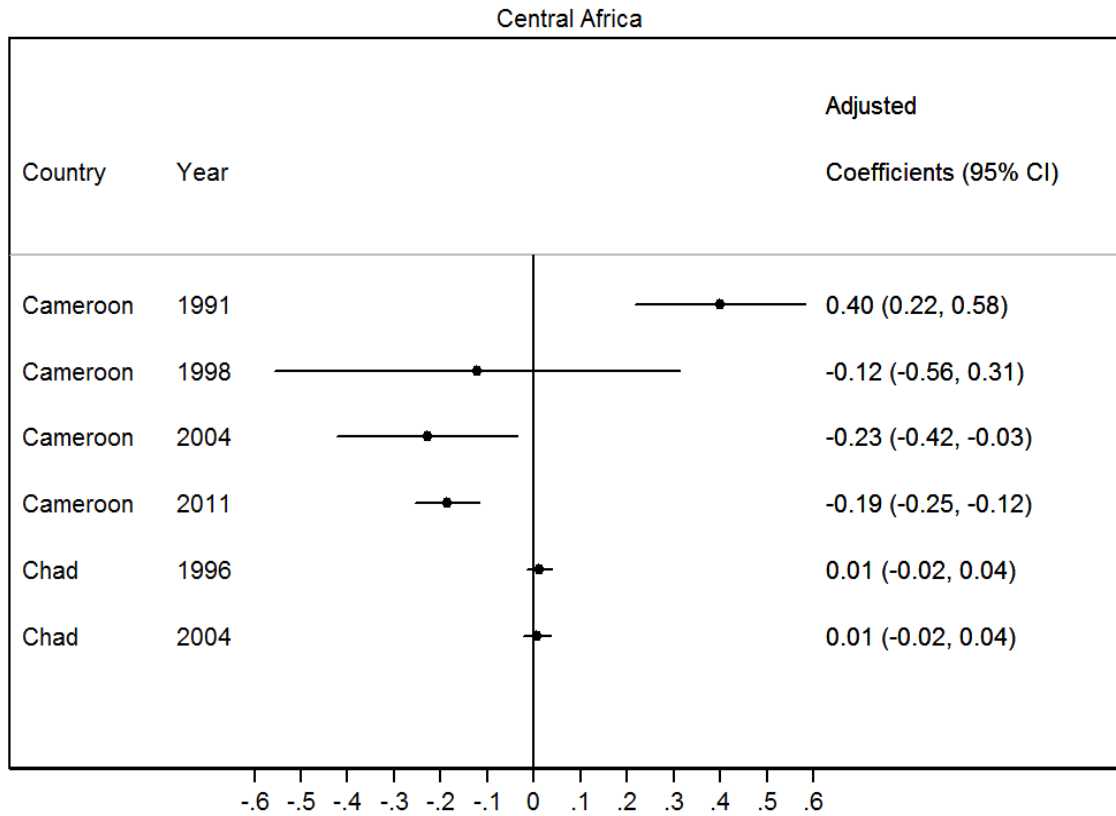
Panel A.2 Eastern Africa



Source: Demographic and Health Survey

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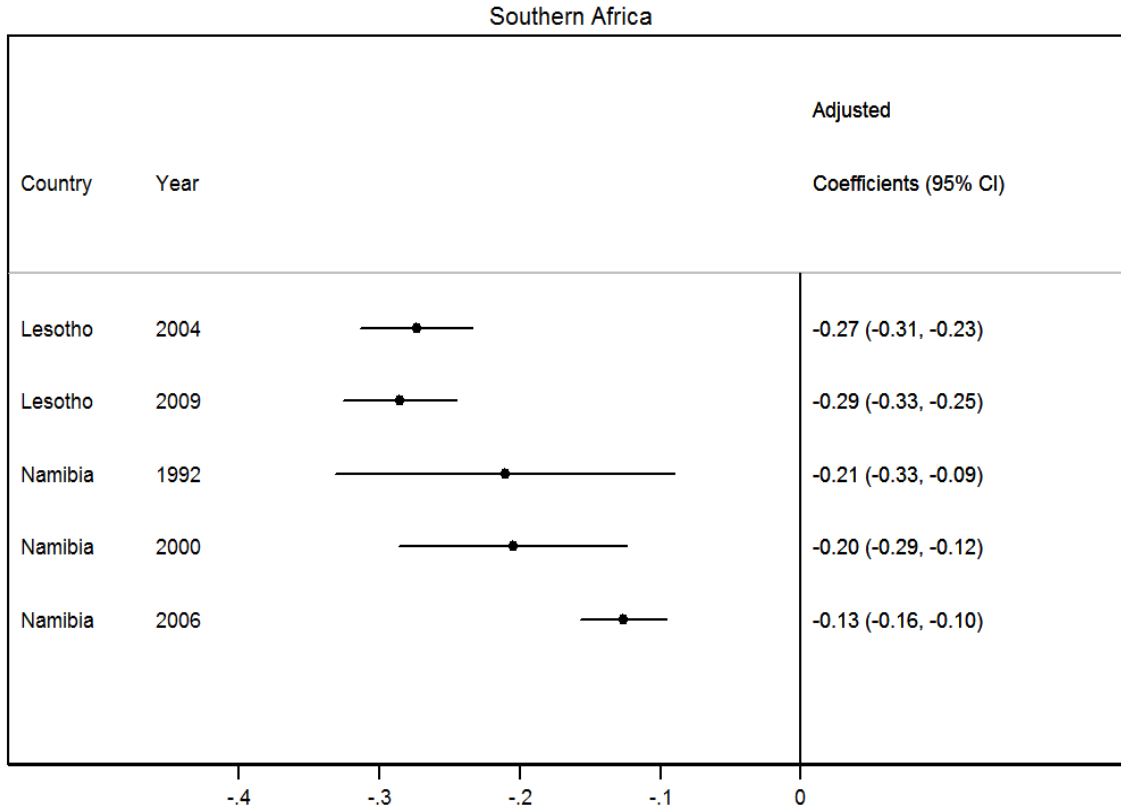
Panel A.3 Central Africa



Source: Demographic and Health Survey

Urbanization and fertility in developing world: Is the relationship causal or a mere association?

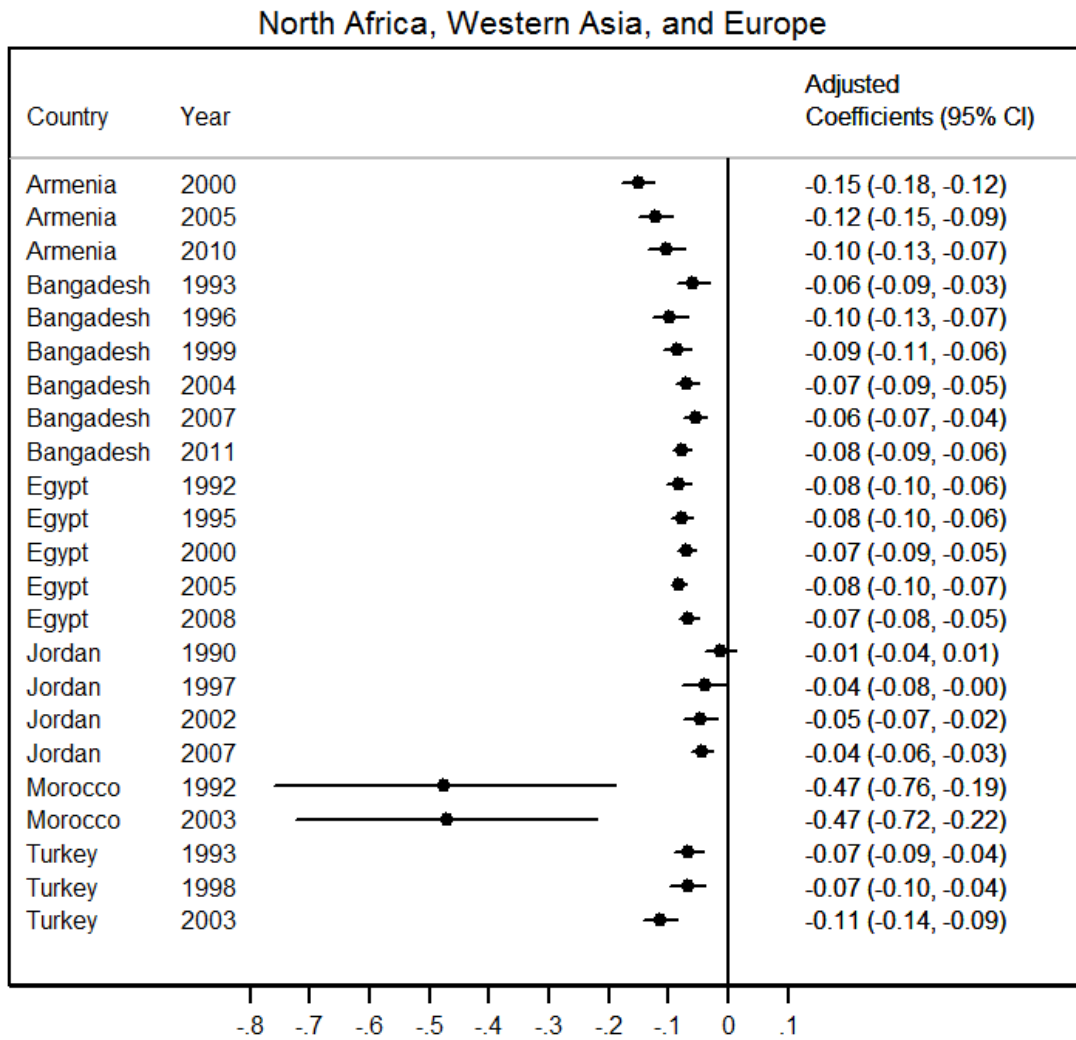
Panel A.4 Southern Africa



Source: Demographic and Health Survey

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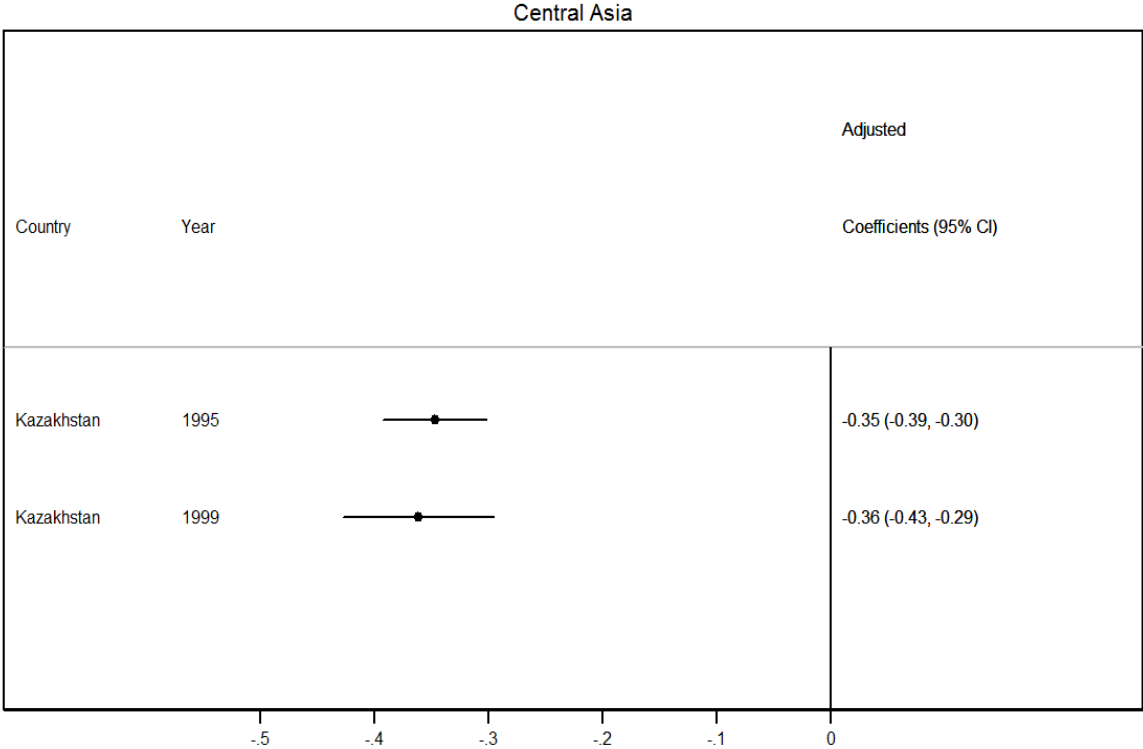
Panel B: North Africa, Western Asia, and Europe



Source: Demographic and Health Survey

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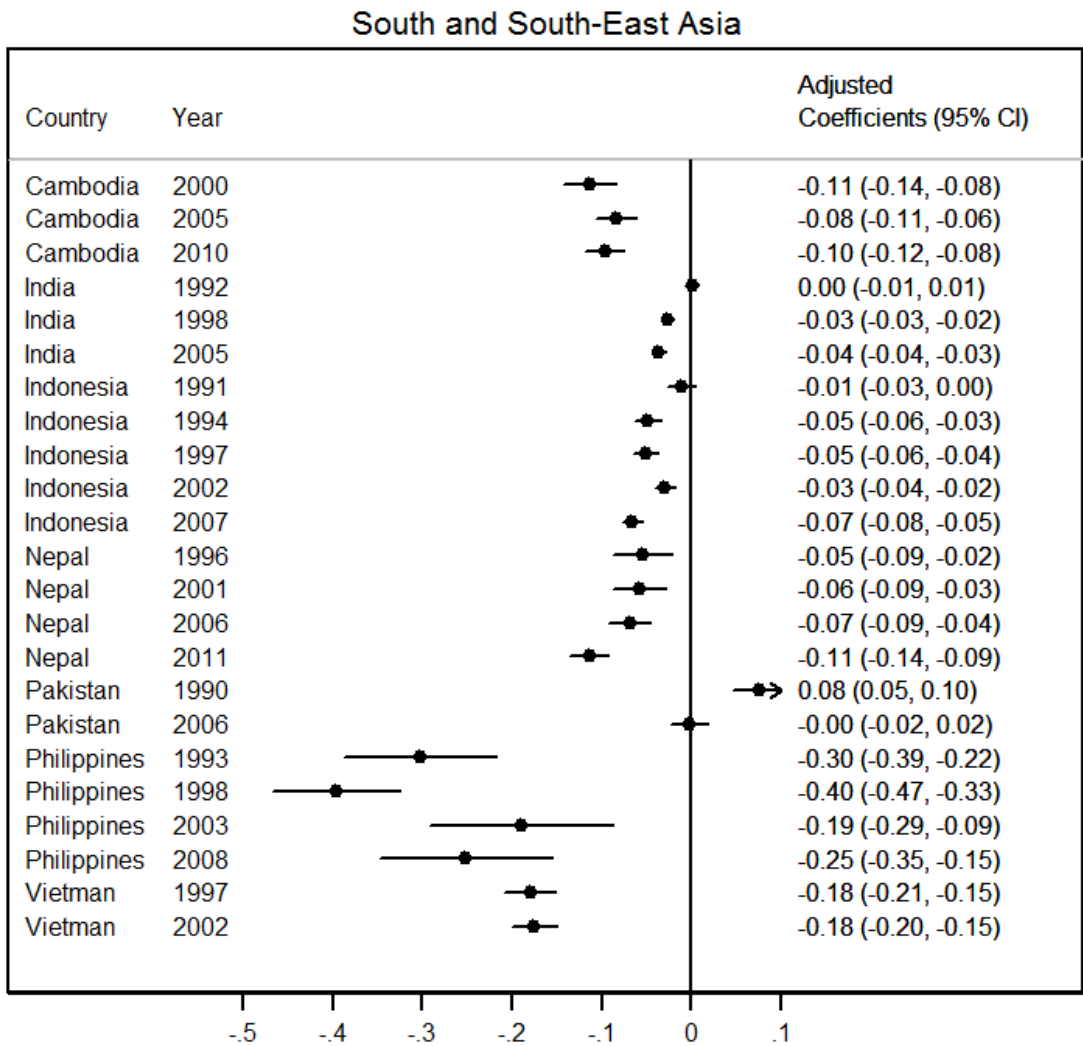
Panel C: Central Asia



Source: Demographic and Health Survey

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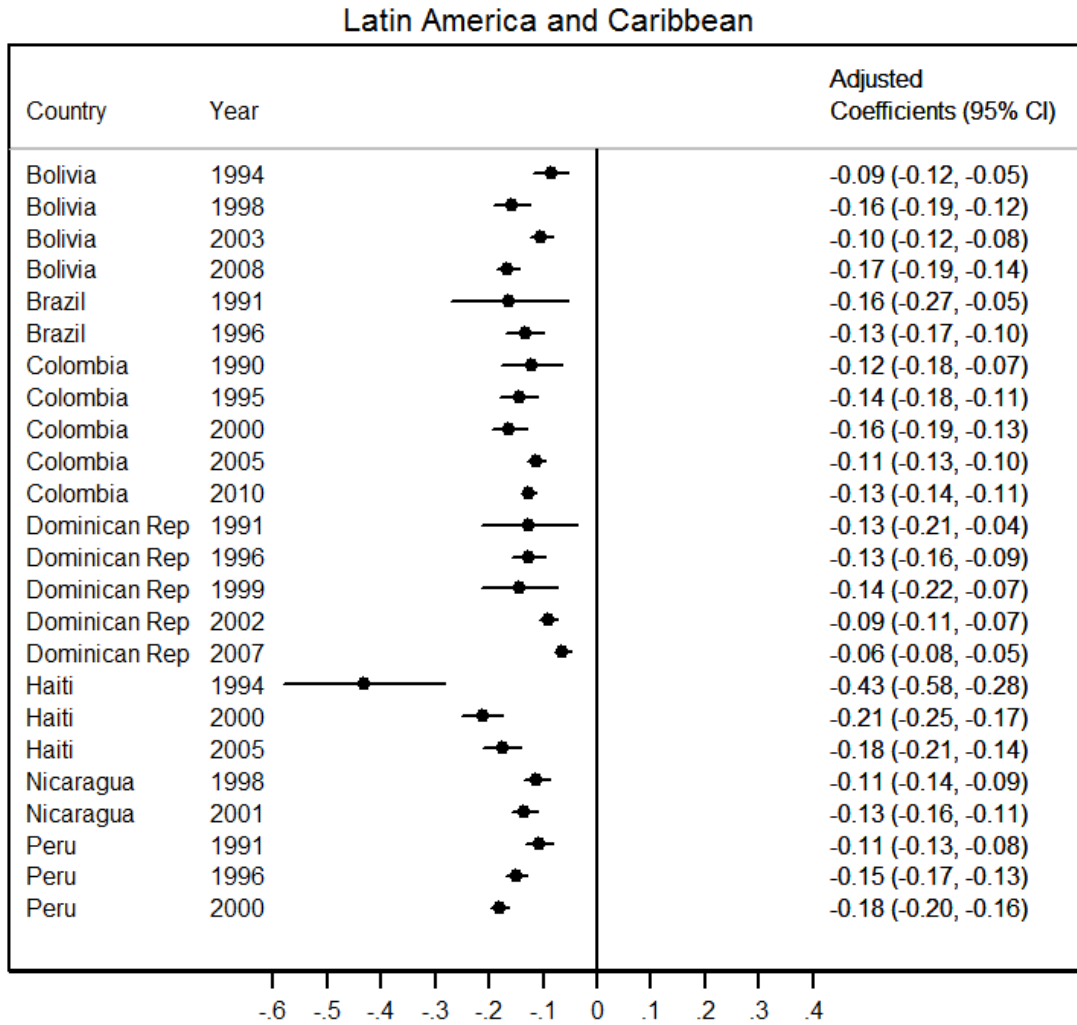
Panel D: South & South-East Asia



Source: Demographic and Health Survey

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Panel E: Latin America & Caribbean



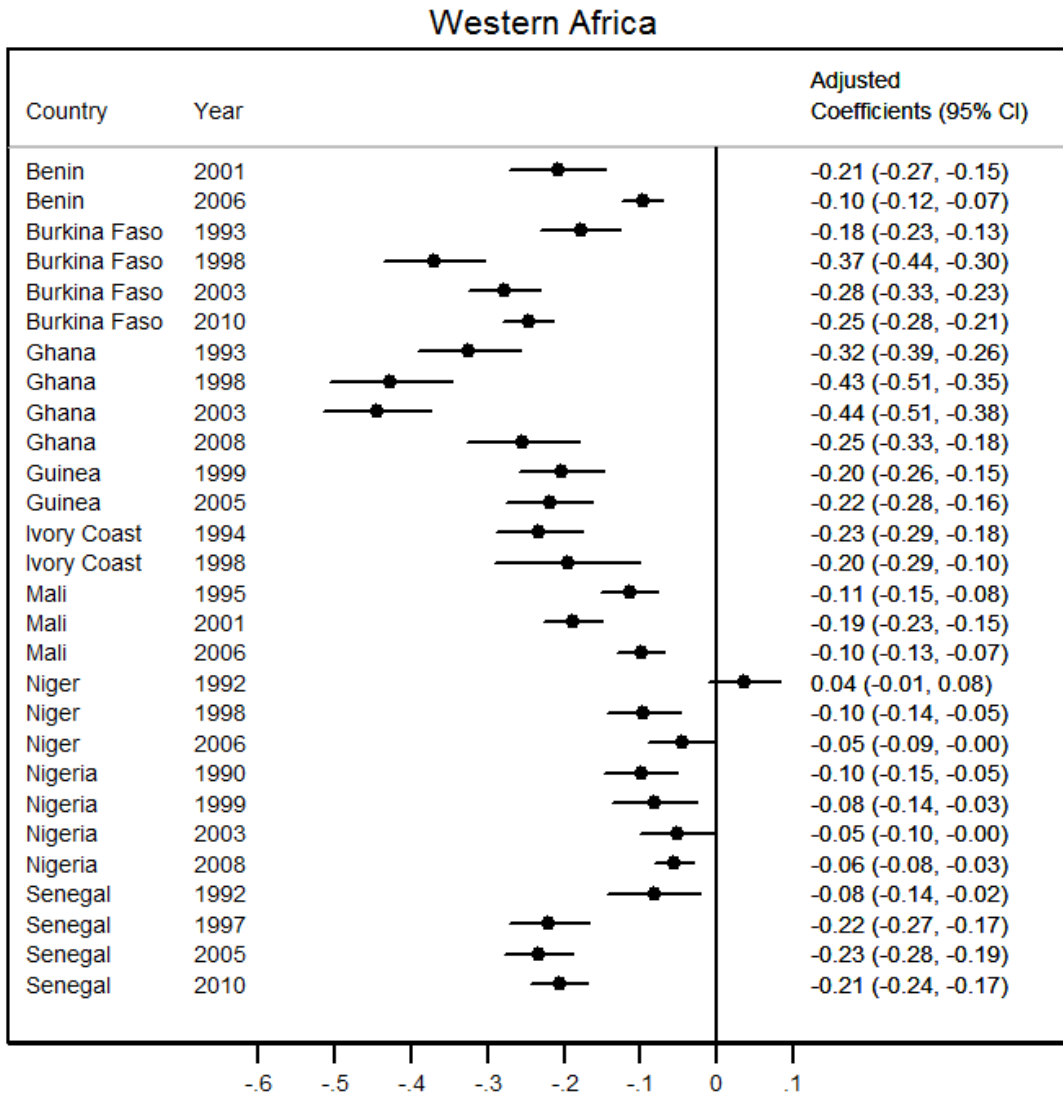
Source: Demographic and Health Survey

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Figure 4: Trends of the effects of urbanization on Children Ever Born in the Last Five Years

Panel A: Sub-Saharan Africa

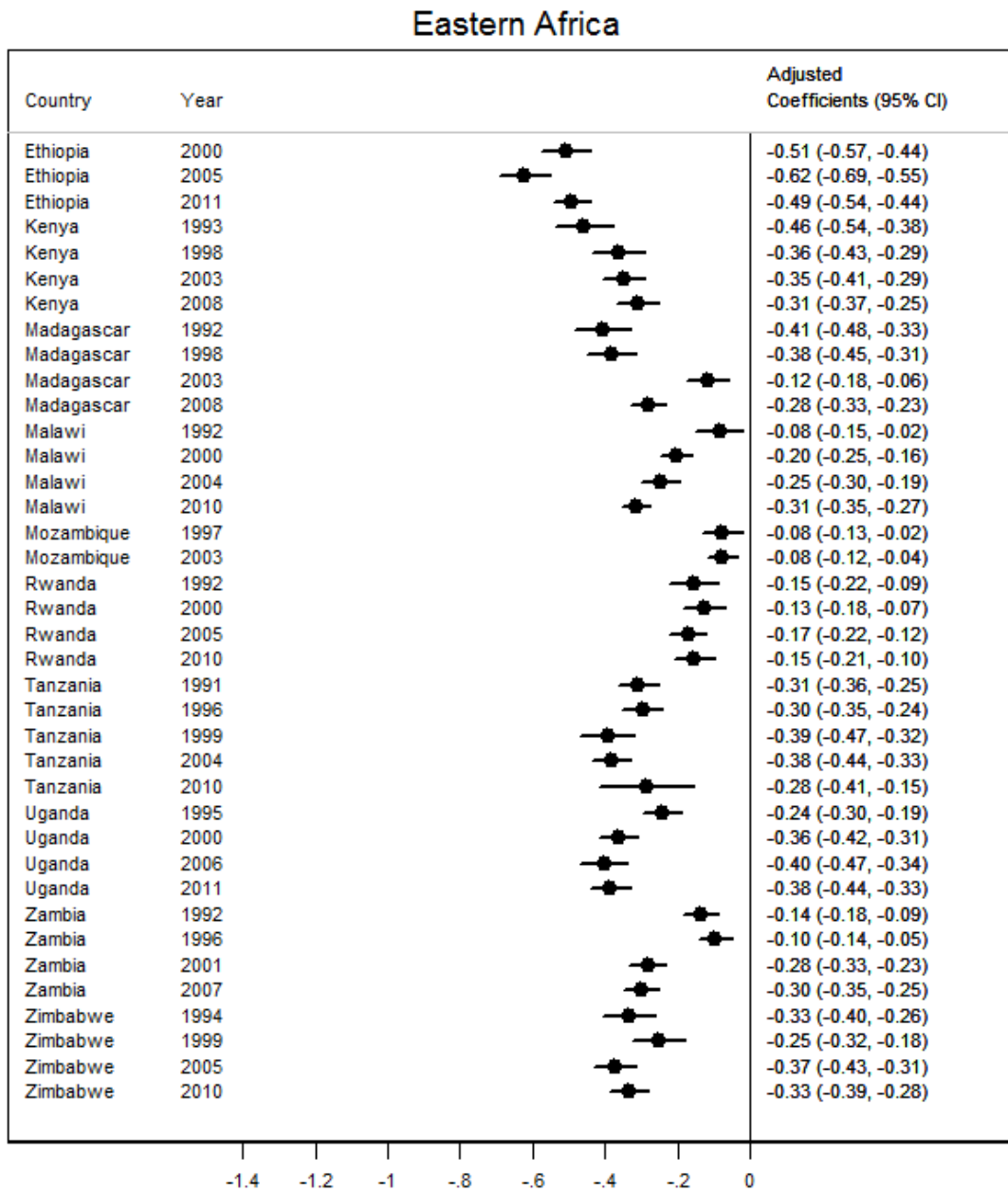
Panel A.1. Western Africa



Source: Demographic and Health Survey

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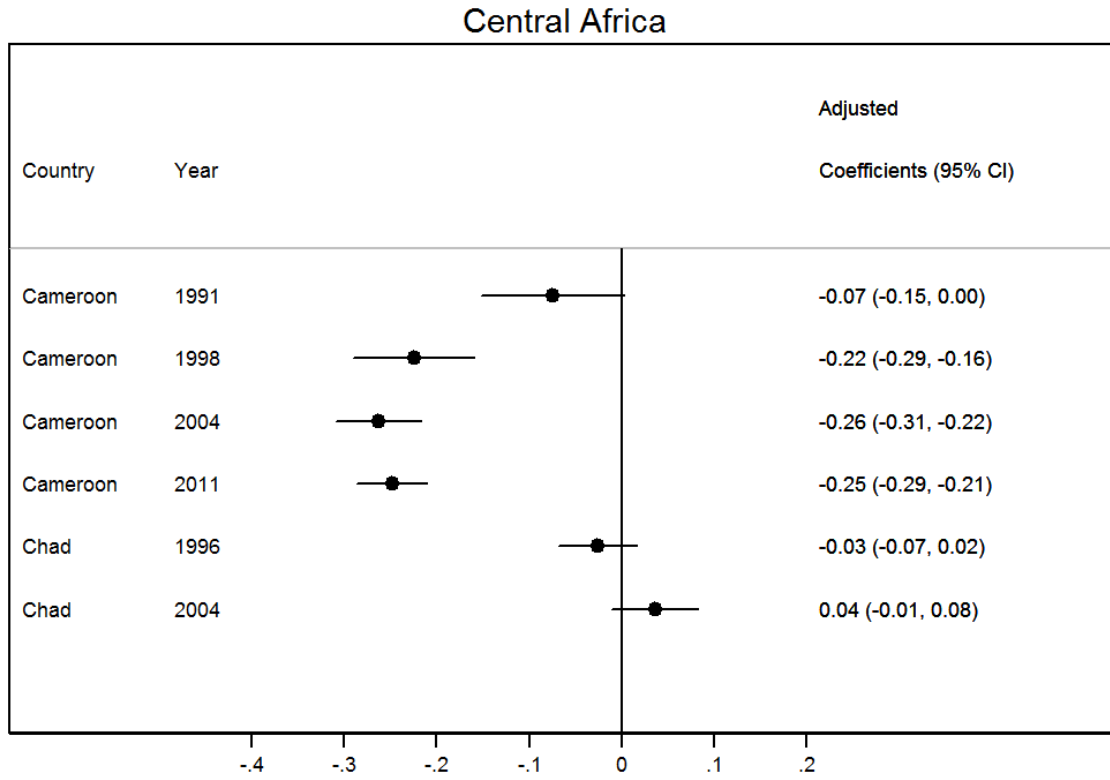
Panel A.2 Eastern Africa



Source: Demographic and Health Survey

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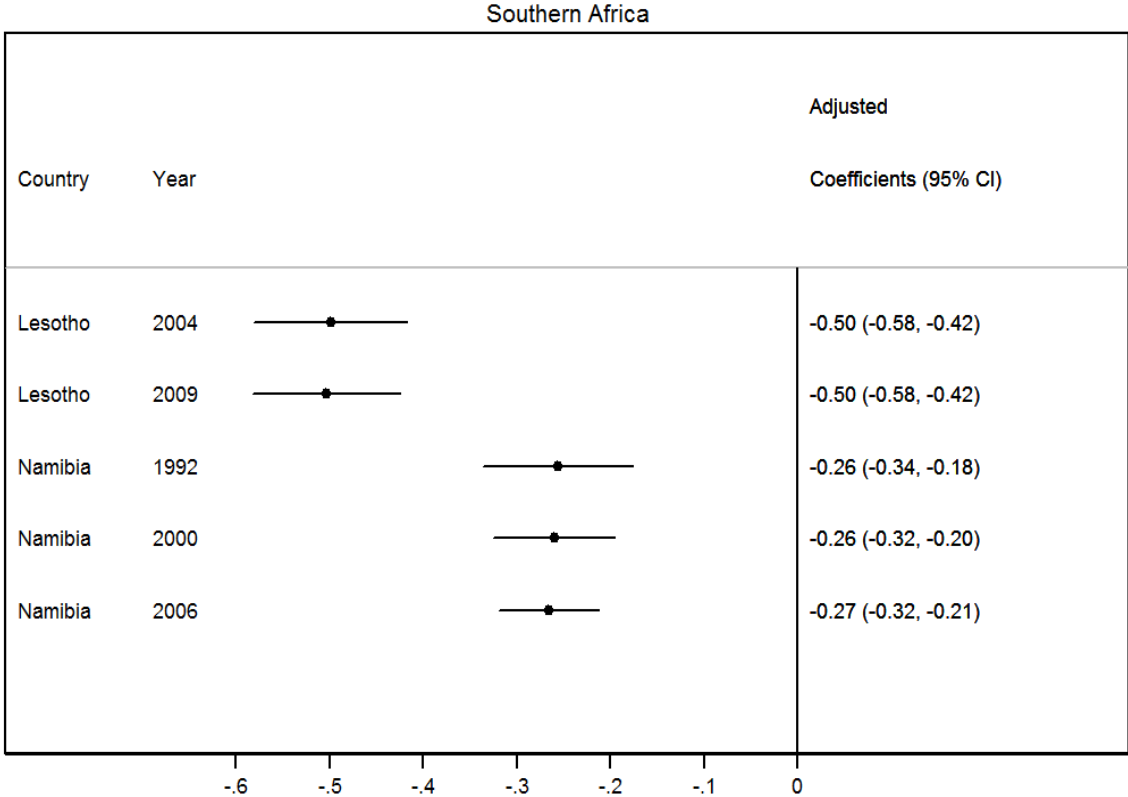
Panel A.3 Central Africa



Source: Demographic and Health Survey

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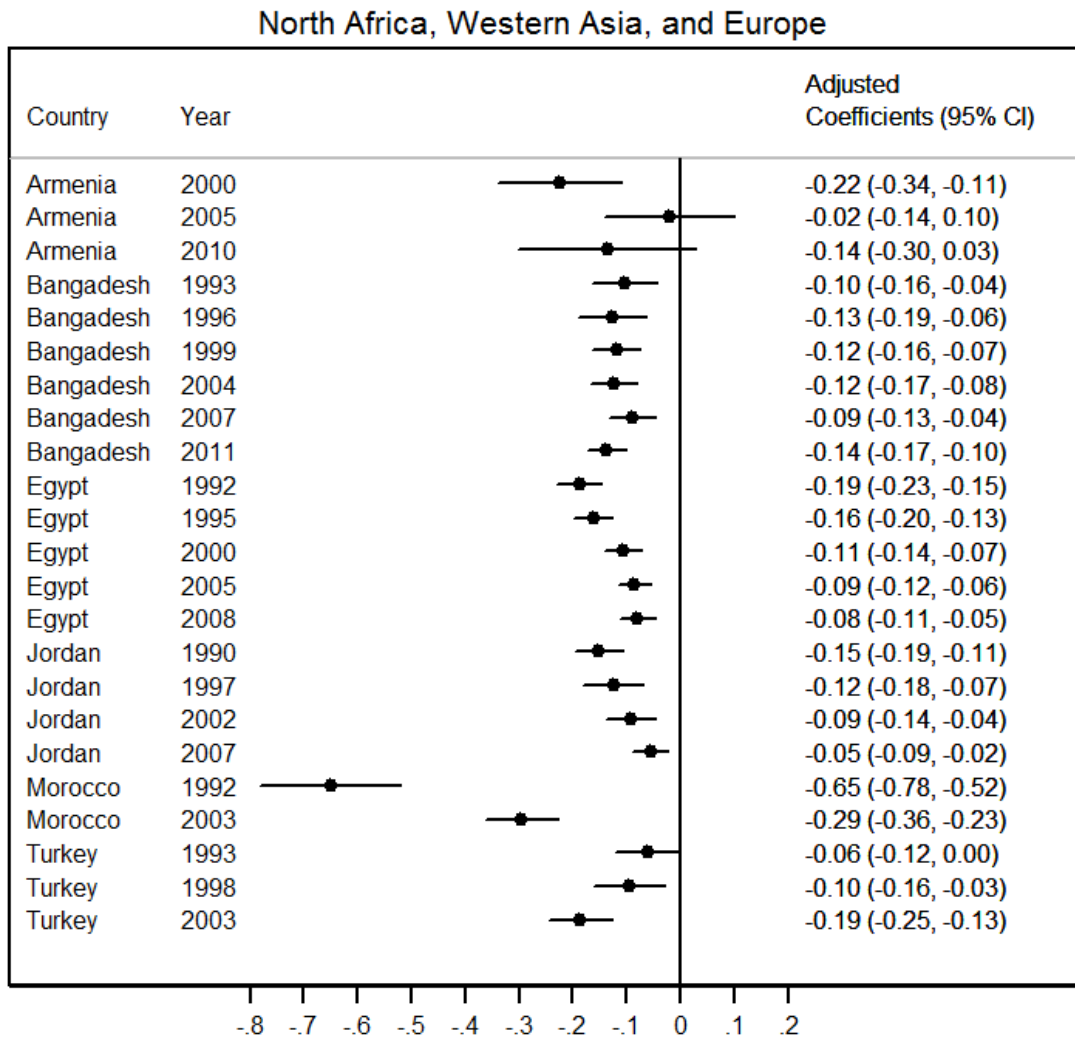
Panel A.4 Southern Africa



Source: Demographic and Health Survey

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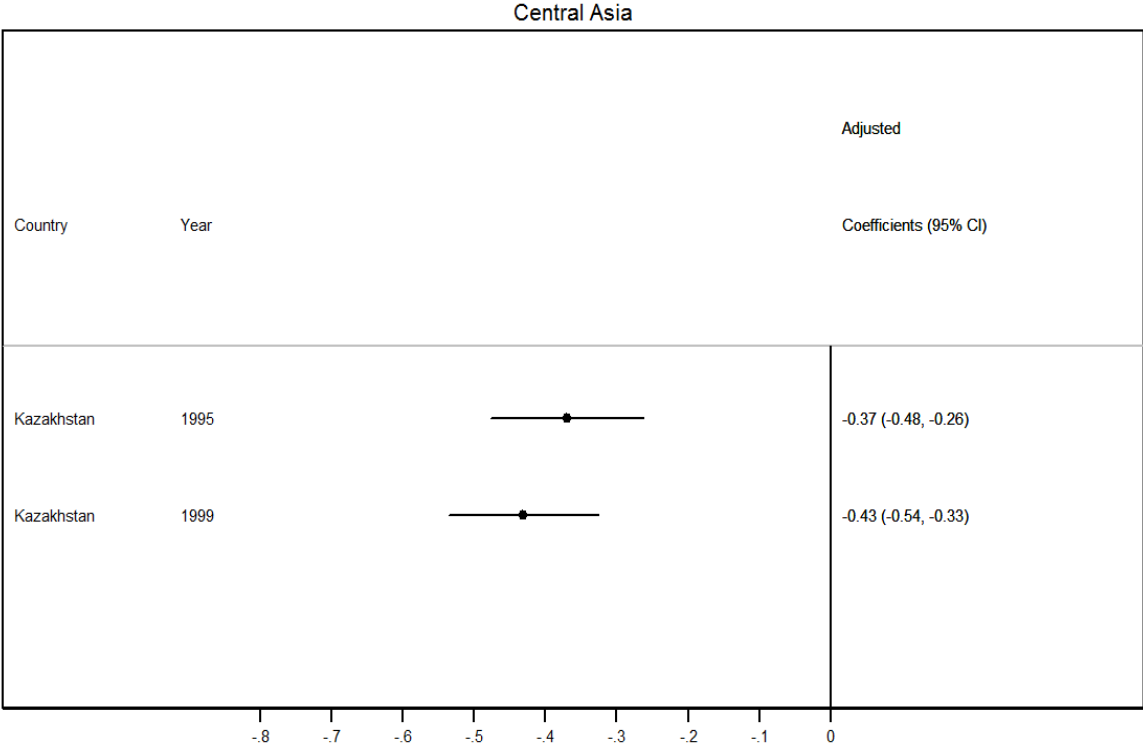
Panel B: North Africa, Western Asia, and Europe



Source: Demographic and Health Survey

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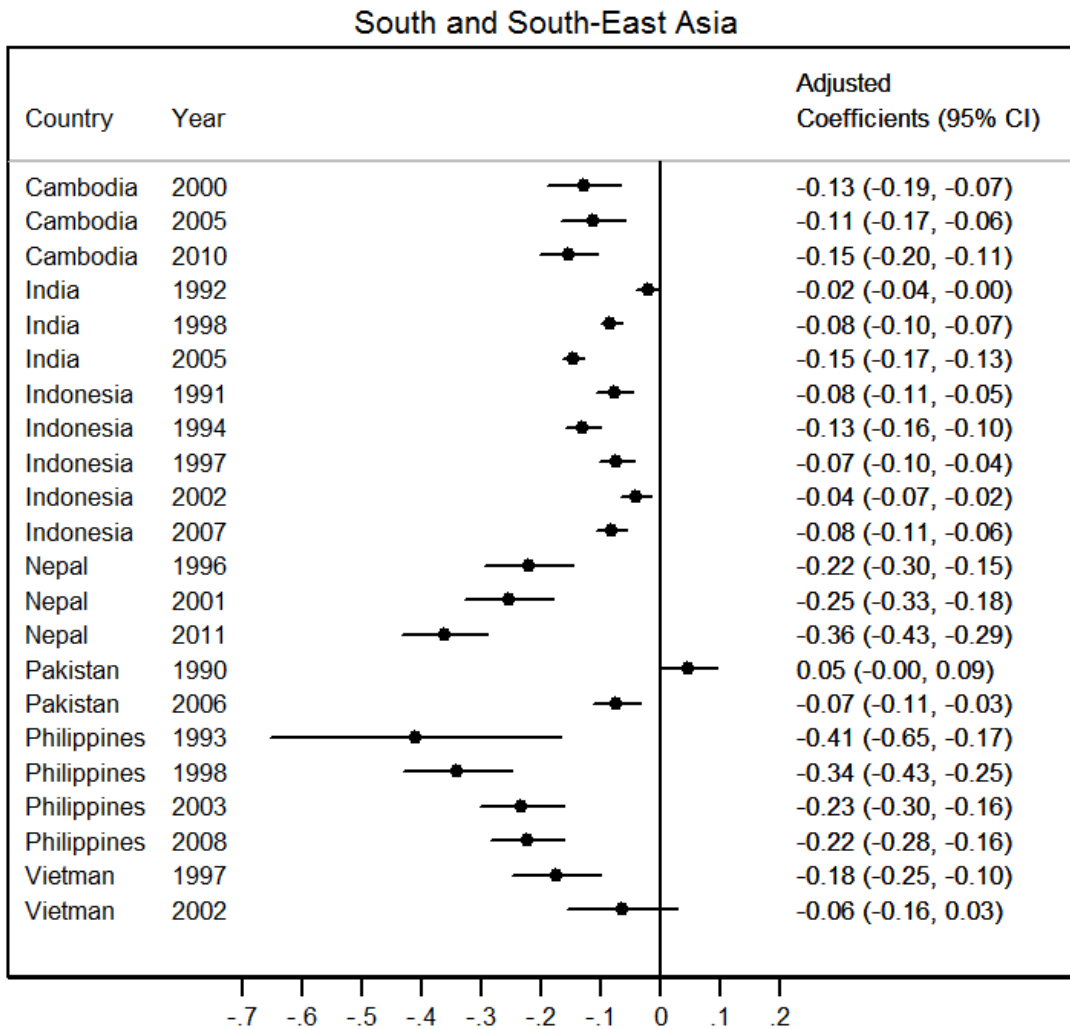
Panel C: Central Asia



Source: Demographic and Health Survey

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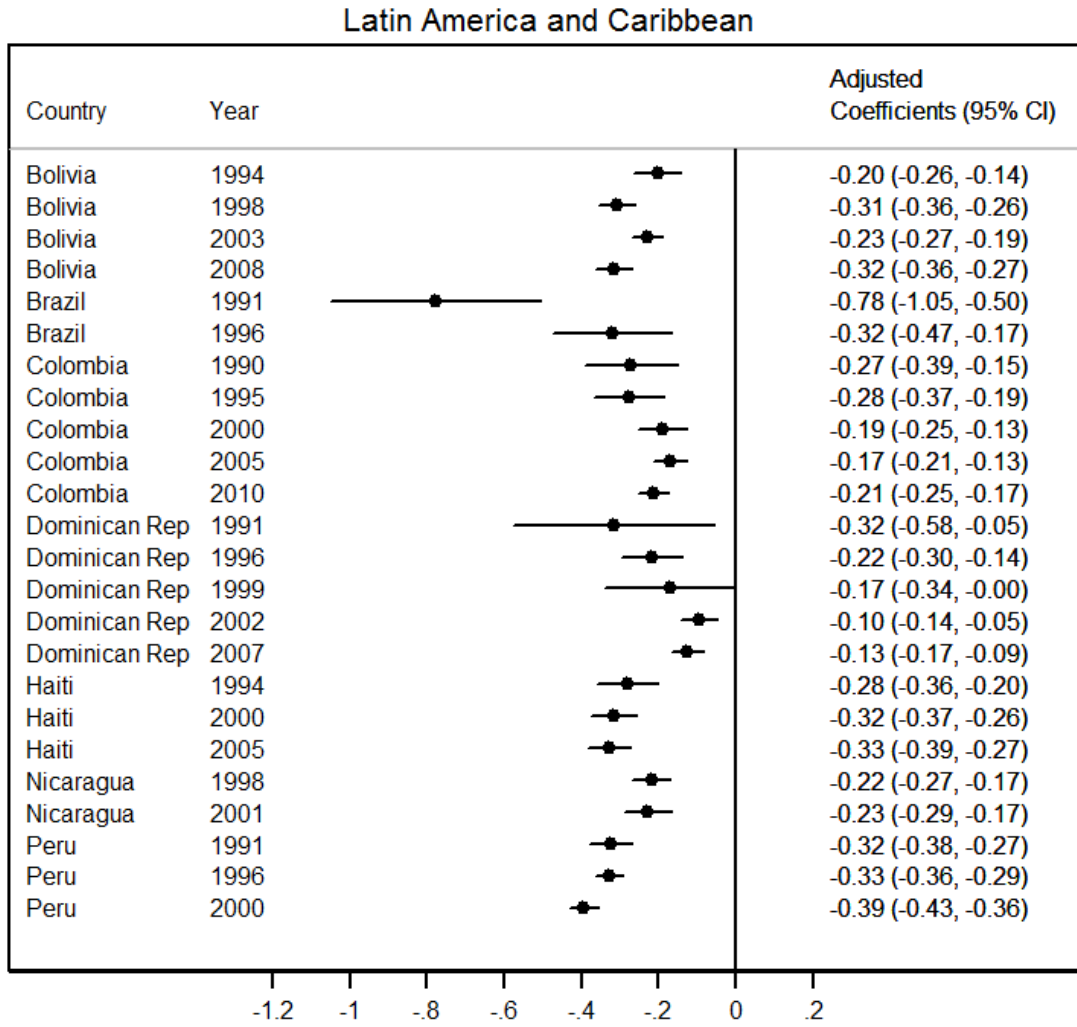
Panel D: South & South-East Asia



Source: Demographic and Health Survey

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Panel E: Latin America & Caribbean



Source: Demographic and Health Survey