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THE DISTRIBUTIONAL CONSEQUENCES  
OF ECONOMIC GROWTH AND PUBLIC SPENDING  
PROGRAMS IN IRAN

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Working Paper No. 891



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## Abstract

This paper employs a quantile regression method and household expenditure surveys to assess the general equilibrium effects of public spending and social protection programs on household expenditure distribution in Iran. The approach captures the broad consequences of programs, taking into account their direct and indirect effects through price changes, interpersonal transfers, demonstration effects, and the like. We also control for and assess the role of household characteristics and geographic and time fixed effects. The case of Iran is interesting and important because in recent decades the country has experimented with new institutional arrangements to address poverty and has been relatively successful in this regard, as our findings confirm. Our study covers the 1993-2006 period. For policy analysis we focus on 1998-2005, the so-called "reform period" in Iran. We find that growth has been unequalizing, but changes in education, government spending, and a unique agency established after the revolution of 1979 to provide social safety net have counteracted with that effect and raised the incomes of the bottom half of the population faster than the rest. The upper end of the distribution has also benefited somewhat, leaving those in the 50 to 85 percentiles behind.

**JEL Classification:** I38, O1, O53

**Keywords:** Income Distribution, Poverty, Social Programs, Government Spending, Growth, Iran

## ملخص

توظف هذه الورقة مسوحات إنفاق الأسرة وطريقة الانحدار الكمي لتقييم آثار التوازن العام لبرامج الإنفاق العام والحماية الاجتماعية في توزيع إنفاق الأسر في إيران. يلتقط هذا النهج عواقب واسعة من البرامج، مع مراعاة آثارها المباشرة وغير المباشرة من خلال التغيرات في الأسعار، ونقل الأشخاص، وآثار المظاهرات، وما شابه ذلك. ونقوم أيضا بالتحكم لتقييم دور خصائص الأسر والآثار الثابتة الجغرافية والوقت. حالة إيران هي مثيرة للاهتمام وهامة لأنه في العقود الأخيرة قد جربت البلاد مع وجود ترتيبات مؤسسية جديدة لمواجهة الفقر وحققنا نجاحا نسبيا في هذا الصدد، كما تؤكد النتائج التي توصلنا إليها. وتغطي دراستنا الفترة 1993-2006. لتحليل السياسات نقوم بالتركيز على 1998-2005، فيما يسمى بـ "فترة الإصلاح" في إيران. نجد أن النمو قد كان غير متعادل ولكن تصدى للتغيرات في التعليم، والإنفاق الحكومي، والوكالة الفريدة التي تأسست بعد الثورة عام 1979 لتوفير شبكة أمان اجتماعي مع هذا الغرض ورفع الدخل للجزء الأفقر من السكان بشكل أسرع. وقد استفاد الجزء الأغنى من السكان من التوزيع أيضا إلى حد ما، وترك تلك المجموعة الموجودة بين النسب المنوية من 50 إلى 85.

## 1. Introduction

Economic growth is often viewed as the most effective means of poverty alleviation. However, growth by itself may not be sufficient for addressing the problems of poverty and inequality.<sup>1</sup> As the debates and empirical evidence on the Kuznets hypothesis show, the growth-inequality nexus is complex and, in some situations, growth can be unequalizing (Frazer 2006; Ferreira et al. 2010; Datt and Ravallio, 2011). Moreover, sustaining growth requires effective social protection and redistribution mechanisms that alleviate the credit and insurance market failures for the poor and help control macroeconomic and social instability risks (OECD 2009). Thus, to better understand the growth process and to select policies more effectively, it is imperative to assess and compare the role of growth as well as public policies and household characteristics in income distribution.

The literature on economic growth, inequality, and public policy is vast. One part of this literature that focuses on the relationships among aggregate indicators has revealed the complexities of involved, but has not yet yielded clear patterns (Fosu 2011). In addition, the use of aggregate indicators masks the details of the distributional effects of growth and policy programs. Other parts of the literature are concerned with evaluating the impact of various social protection programs on their targeted groups through surveys or experimental and pilot projects. However, these studies typically deal with individual programs and do not show how they compare and interact with other programs and factors. Moreover, these micro studies rarely take account of the indirect and general equilibrium effects of public programs on the population at large (see Angelucci and De Giorgi 2009, for a rare exception). In this paper, we use a quantile regression method and micro data from Iran to estimate the broad effects of various social programs, government spending, economic growth, and household characteristics, on different quantiles of the expenditure distribution. We also apply the decomposition technique of Machado and Mata (2005) to assess the role of these factors on the 1998-2005 trends in household expenditure distribution. It should be pointed out that our focus in this paper is the direct effects of policy indicators on household expenditure, taking the trends in household characteristics as given. To the extent that the policies influence household characteristics, there are indirect effects that call for a much more extensive model. We leave that exercise for future research.

The case of Iran is interesting because in recent decades the country has experimented with new arrangements for addressing poverty concerns and has been relatively successful in this regard. In fact, the head count poverty rate in Iran declined robustly from about 40 percent in 1989 to well below 10 percent in the mid-2000s (Salehi-Isfahani 2009). This trend was partly driven by economic growth and partly by other factors such as large food and fuel subsidies, improved access to education and infrastructure, and expanded welfare services by the government, public foundations, and nongovernment organizations (Esfahani 2005; Abounouri and Khoshkar 2008; Salehi-Isfahani 2009). Changes in household characteristics, especially due to reduced fertility, are also likely to have influenced expenditure distribution. However, little is known about the effectiveness and the relative importance of such channels.

Of particular interest for policy purposes is the assessment of welfare and social security bureaucracies (Social Welfare Organization, SWO, and Social Security Organization, SSO) and Imam Khomeini Relief Foundation (IKRF). SWO is part of the Ministry of Welfare and Social Security. The Ministry also supervised SSO, but it acts as an autonomous organization financed by its investments and member contributions. IKRF, on the other hand, is a public foundation that receives public funding to address poverty, but has its own assets and operates independently of the government bureaucracy under the auspices of Iran's Supreme Leader.

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<sup>1</sup> For overviews of the large literature on growth, distribution, and poverty, see, for example: Ames et al. (2001), Dollar and Kraay (2002), World Bank (2001, 2004, and 2006), Fosu (2010), and Ravallion (2010, 2012).

These three organizations have different missions, but their activities overlap in some areas. All three organizations are believed to have major distributional consequences since they are large and each manages substantial resources. Yet, the effects of their programs on household expenditures have never been quantitatively assessed in ways that could be compared across programs or with other factors such as economic growth, government spending, and changes in household structure. This is the task that we take up in this paper.

Endogeneity of policy variables poses a challenge for our analysis, particularly in the context of quantile regressions, which are computationally very demanding. In fact, there is currently no quantile regression package that can handle more than one endogenous variable and yield reliable estimates. We address this problem by employing a two-stage process that produces consistent point estimates, but may yield inconsistent standard errors. We argue that the main results of the analysis are reasonably reliable because the biases in standard errors are likely to be relatively small. We provide support for this claim by comparing the results of the two-stage and full estimation procedures using restricted models that have only one endogenous variable.

The rest of this paper is organized as follows. In section 2, we review the relevant literature on poverty reduction and highlight the contributions of our paper. In section 3, we discuss the poverty trends and the social protection system in Iran and place them in the country's political economy context. Section 4 describes the data. Section 5 provides an overview of the trends in the macroeconomy, the social spending, and the household expenditure quantiles. Section 6 describes the quantile regression model and presents and analyzes the results. In section 8, we decompose the shifts in the household expenditure distribution to assess the role of various factors in the trends during 1998-2005. Section 9 concludes.

## 2. An Overview of the Related Literature

The vast literature on economic growth, inequality, and public policy has many sub-areas. One area focuses on measuring the changes in poverty rates and decomposes them into growth and redistribution components (see, for example, Foster et al. 1983; Maasoumi 1986; Ravallion 2004). The decomposition is useful, but it does not establish the sources of the shifts in the position and shape of the expenditure distribution. Indeed, many of the underlying factors may simultaneously affect both growth and redistribution.

Another major part of the literature on poverty has dealt with program evaluation. These studies typically estimate the effects of specific poverty relief programs on the targeted individuals, using "untreated" groups as controls. A prime example of the programs under study is the widely debated conditional cash transfers (CCT) and their comparison with the unconditional transfers. CT programs have been found effective in many cases such as support for poor households that ensure their children attend school or received needed vaccinations. However, the outcome depends crucially on the supply of pertinent infrastructure and public services.<sup>2</sup> In the absence of such complimentary services, CCTs have little impact on poor households' investment in their children's health and education (de Janvry and Sadoulet 2005). Examples are households in the remote, war-torn, or disaster-struck areas. Also, CCTs are often harder to design for poor households with no children or those with disabilities and disadvantages that impede their access to such programs (Das et al. 2005; de la Brière and Rawling 2006). Schubert and Slater (2006) further argue that the full costs and benefits of conditionality are

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<sup>2</sup> See, for example, Berhman and Hoddinott (2001) and Shultz (2003) show that Mexico's *Progres*a program has had positive impact on child growth and school attainment. Bourguignon et al. (2002) and Cardoso and Souza (2003) find that Brazil's *Bolsa Escola* has had positive effects on school enrollment, especially for poor households. Bourguignon et al. (2002) further demonstrate that alternative UCT programs do not influence child labor and school attendance. Khandker et al. (2003) study Bangladesh's Female Stipend Program, finding positive educational effects, especially among girls. Studying another CCT program executed in Bangladesh, Food for Education, Ravallion and Wodon (1999) show favorable effects on schooling and child labor. Similarly, Miguel and Kremer (2004) demonstrate that Kenya's Deworming Project has increased school attendance.

often difficult to assess, especially when the country lacks the institutional capability to execute the program efficiently. In such cases, unconditional transfers may work more effectively. Coady et al. (2006) review of the lessons and experiences of targeting attempts extensively and conclude that implementation details matter tremendously in the performance of CCT programs.

Given the limitation of CCT programs, providing safety nets and targeting them on the most vulnerable groups is often done via means testing (i.e., conditioning support on the individuals' socio-economic characteristics). The success of means testing hinges on the setup of the program, the quality of the collected data, and the efficacy of administrative and networking infrastructure.<sup>3</sup> Means testing seems to have contributed to the success of Brazil's Bolsa Familia and Mexico's Progresa. But, little is known about the conditions under which it can work in other contexts. Research on the match between the setup of the social protection programs and the institutional context in which they operate is still at early stages. Since Iran's social protection programs are generally based on means testing, our results could shed light on how well each one fits its institutional settings.

The literature on program evaluation has mostly focused on the impact of transfers and conditions on the targeted groups, treating the indirect and general equilibrium effects (e.g., through inter-personal transfers and relative price changes) as secondary. However, in many developing countries, where institutions are weak and market failures abound, transfers are likely to have major indirect effects on household members, relatives, acquaintances, and community members. In addition, slow supply response and limitations of trade and market integration often lead to price changes that could affect the real expenditures of the transfer recipients as well as others in the economy. This particularly matters for large, country-level programs. Therefore, in order to account for such general equilibrium effects, the impact of the program on the entire population needs to be assessed. But, this has often been overlooked. A notable exception is the work of Angelucci and De Giorgi (2009), who takes advantage of the experimental data on the treated and untreated households in Mexican villages where Progresa has been implemented. They show that the program led to higher loans and transfers to family and friends, raising the food consumption of untreated households by about 10%. This effect is quite sizable since the increase in the food consumption of the treated households is about 20%.

The broad effects of policies on income distribution and poverty have been the subject of two other lines of study. The first line has examined the consequences of growth and major policy shifts on the summary indicators of household expenditure distribution, such as the poverty rate, quintile shares, and the Gini coefficient. For example, Adams (2004) estimates the growth elasticity of poverty rate using 126 surveys from 60 countries. Another example is Datt and Ravallion (2011), who build aggregate indices based on 50 years of household surveys in India to assess the impact of economic growth and policy reforms on expenditure distribution in the country. They find that growth has generally helped reduce poverty, though it has been associated with increased inequality since the start of economic policy reforms in 1991. Similarly, Ferreira et al. (2010) measure the elasticity of poverty with respect to growth in Brazil, over time and across sectors and locations. Their results show that the growth-poverty relationship has varied across situations, but on the whole, growth has played a small role in poverty reduction. Rather, the improvement has been due to the taming of hyperinflation in 1994 and to the expansions in social security and social assistance transfers. Yet another example is a series of papers from Garuda (2000) to Oberdabernig (2013) that examine the effects of IMF programs on poverty and distributional indicators. In the case of Iran, Abounouri and Khoshkar (2008) examine the role of employment, inflation, and the government's tax

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<sup>3</sup>See Samson et al. (2006) and Samson (2009) for more details about the design of such programs.

revenue and social expenditure on the Gini Coefficient and the shares of different quintiles, using time series methods. They find that employment and social expenditure are associated with less inequality, lower shares of the top quintile, and higher shares of the bottom 60 percent. The exact opposite is found for the association of the distributional indicators with inflation tax revenue. None of these studies control for the variations in household characteristics.

The second line of research on the broad consequences of policies has taken a more detailed modeling approach, typically in the form of simulation via computable general equilibrium (CGE) models. Among the earliest use of CGE models with representative households to evaluate distributional impact of economic policies are Adelman and Robinson (1978), Dervish et al. (1982), and Gunning (1983). Later generation of CGE models included micro sub-models to take fuller account of the distributional effects. However, CGE models depend on a myriad of detailed assumptions and require immense amounts of data, hampering their reliable application, especially in the case of developing countries.

Over the past decade and a half, the conditional quantile regression method, pioneered by Koenker and Bassett (1978), has come to be recognized as an important tool for assessing the impact of various factors on the entire distribution, allowing for the effects to vary according to the position of each individual in the distribution. This method has been applied to a variety of issues concerning inequality, especially in the case of wage and firm size distribution.<sup>4</sup> This literature mainly focuses on how changes in the distribution of individual characteristics have shaped the shifts in outcome distributions.

In this paper, we use a quantile regression to estimate the effects of household characteristics as well as economic growth and policy factors on the sample of households included in the yearly household expenditure surveys in Iran. We take advantage of the data at the province level to enhance the amount of information on government and social program spending. The dependent variable in our model is household-level real expenditures, which is regressed on province level growth and policy variables, controlling for a battery of relevant household characteristics. Adding year and province fixed effects help deal with cross-sectional dependence and many unobservable factors.

### **3. Poverty Reduction, Social Protection, and Political Institutions in Iran**

Iran's 1979 revolution was based on a mass movement led by a charismatic figure, Ayatollah Khomeini. The process was facilitated by the activities of many small groups that were ideologically diverse and organizationally fragmented. However, almost all of them shared two key objectives. First, they opposed the Shah's authoritarian regime and its Western-oriented social and economic policies. Second, they resented the increased inequality under the Shah and favored redistribution and pro-poor policies. Although many of these organizations were wiped out in the power struggle that ensued after the revolution, the ideal of redistribution and poverty reduction remained a core principle of the new regime. Accordingly, the existing public organizations engaged in social protection were reshaped and reoriented and new ones were formed to address this objective.

The private and public foundations and NGOs that engage in various social support activities in Iran are numerous. Many of them are relatively small and are not focused on poverty alleviation or redistribution per se. For example, a number of public foundations support war veterans and the families of martyrs. Some foundations, including the sizable Astan Quds Razavi, are committed to religious and cultural goals. Most NGOs pursue causes such as support for cancer patients or for children or women in difficult circumstances. Many of the private entities that mainly deal with poverty issues are the traditional charity organizations,

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<sup>4</sup>See for example, Machado and Mata (2000 and 2005), Autor, Katz, and Kearney (2008), and Firpo, Fortin, and Lemieux (2007). Lemieux (2010) provides a recent survey of the wage inequality literature.



which are numerous and largely informal (Bahramitash 2013). The main public foundation that dominates the poverty alleviation activities is IKRF, which we include in our analysis below. Unfortunately, there is very limited data on other foundations, NGOs, and charities to allow us to assess as part of our estimations.

IKRF has its roots as a clandestine organization in support of families of religious political prisoners before the Islamic Revolution. It was led by a group of bazaar merchants and clergymen, who were follower of Ayatollah Khomeini. They developed a strong network to solicit funds for their cause, to identify the prisoners' families and their needs, and to deliver the necessary support to them. Shortly after the Revolution, the leaders of the organization decided to expand their network and use it for addressing poverty issues. They established IKRF as a public organization under the supervision of the Office of Supreme Leader. Since in Iran's political structure, the Supreme Leader is above all branches of the government, this setup allowed IKRF to receive funding and assets from the government, while enjoying a high degree of autonomy. The legislation establishing IKRF gives it a broad mission that includes: designing and implementing strategies to eliminate different aspects of poverty; providing the livelihood needs of the poor; enabling the poor to be self-reliant; offering insurance, legal consulting, counseling, pension, credit, education, and cultural services; and mobilizing private funds to support its activities and to promote the culture of private donation. It was also put in charge of the Rajaii Program, which was designed to offer pension to the elderly poor. This program was initially meant to target those in rural areas, but it was soon extended to urban areas as well. IKRF quickly expanded its network all around the country. By the 1990s, it covered, directly or indirectly, all cities, towns, and villages. In 2009, it operated 1365 units with 14,827 full-time employees and 117,957 part-time workers and volunteers.

The role of IKRF in Iran has been controversial (see Esfahani 2005; Harris 2012a). Critiques have argued that its autonomy from the executive makes it less accountable to the public. They have also claimed that it takes a traditional charity approach to poverty alleviation. In particular, some politicians and policy analysts in Iran's Reformist movement used to view NGOs as more effective mechanisms for social protection and tried to shift SWO's budget towards them, partly taking government funding away from IKRF. In addition, IKRF has been accused of using its resources for political purposes, mustering support for the conservative groups associated with its leadership. However, others have pointed to IKRF's potentials for fulfilling its mission. In particular, IKRF's autonomy gives it important institutional advantages. First, IKRF can avoid the rigidity of the government bureaucracy and act flexibly in the face of complexities involved in dealing with poverty cases. Second, it can act fast in response to unforeseen events and natural disasters because it controls its own budget and has assets to use if necessary. Third, IKRF can plan and invest in its activities on a long-term basis because it is relatively insulated from the policy swings induced by the political cycles in the executive and legislative branches. Finally, IKRF has changed its approach to poverty alleviation since its earlier years, moving towards enabling services that deal more comprehensively with the sources of each household's poverty. Despite these very contrasting views of IKRF activities, there has been little quantitative research on its performance (see Esfahani 2005, for a first effort in this direction). Our statistical analysis in this paper is an attempt to fill this gap.

In addition to IKRF, we focus on two government-run organizations that have major consequences for poverty alleviation and redistribution. The first one, SWO, manages a host of social protection programs dealing with poverty as well as disabilities, addiction, and personal and social traumas. As such, SWO's responsibilities go beyond poverty alleviation, but all its activities have clear consequences for reducing the risk of poverty for households in adverse conditions. SWO was initially formed as part of the Ministry of Health and then moved to the Ministry of Welfare and Social Security. Its budget is set annually as part of the supervising ministry's allocations. The second organization, SSO, operates as an autonomous

public corporation and offers pension plans and medical and unemployment insurance. It was initially attached to the Ministry of Labor and mostly covered formal sector workers and fixed-term government employees. Overtime, it has expanded its offering of optional insurance to many independent private-sector workers. SSO operations do not target the poor. Rather, they provide insurance and expenditure smoothing that should help a large part of the labor force employed in the formal sector of the economy. For this reason, SSO is likely to have most impact lifting up the household welfare broadly, except perhaps at the top and bottom of income distribution. [Harris (2012b) offers a detailed discussion of the activities of SSO]. The question is how much SWO, SSO, and IKRF activities contribute to the real incomes of various groups in the population.

The relative coverage of IKRF, SWO, SSO, and NGOs can be seen in Figure 1 along with the poverty rate in Iran. As the figure shows, the poverty rates in the late 1980s were very high. In the early 1990s, as the economy recovered from the war with Iraq, the poverty rate rapidly declined. At the same time, all three main welfare organizations started to expand quickly. SWO's coverage rate soon stabilized at the rate of 10 people per 100 households. The coverage rates of SSO and IKRF, on the other hand, reached their plateaus in the late 1990s. In recent years, SSO's coverage has begun to grow rapidly, while IKRF's has declined somewhat. It is clear from Figure 1 that SSO is the largest among the three by the number of individuals that it serves. Figure 1 further shows that IKRF has a much larger coverage than SWO, by a factor of four. The data for the coverage of NGOs starts in 2001, after SWO shifted part of its budget and some of its tasks toward them, following the policies of the reformist government of President Khatami. Indeed, as Figure 1 shows, the NGO coverage rate basically matches the decline in SWO coverage rate after 2001. For this reason, to assess the impact of SWO, it makes sense to include NGOs in its coverage rate. This is what we do in our econometric analysis below. We will also note the consequence of combining SWO and NGO coverage rates for the results.

A major driver of real incomes and their distribution in Iran is government expenditures and subsidies. In particular, food and fuel subsidies were large and had major consequences for households, at least until 2011. However, since these subsidies were in the form of price controls, they were not shown in the government budget data.<sup>5</sup> In this study, the role of such expenditures, which were uniformly offered to all provinces, will be captured by the year and province fixed effects. The same applies to other countrywide expenditures. The remainder, which is the budget allocated to provinces, will be used in our analysis to gauge how such public spending has shaped the distribution of household expenditures. The data on province-level government spending ends in 2006, when the government restructured its budgeting system and dismantled the Plan and Budget Organization to give the President a free hand in managing the budget. The government even stopped publishing the details of its budget data after 2008. For the period when data are available, the size of province-level government spending has been about an order of magnitude larger than that of IKRF (see Figure 2).

#### 4. The Data

The main source of our data is the annual Household Expenditure and Income Surveys (HEIS) carried out by the Statistical Center of Iran. The data is available from 1984 onward. However, for our statistical analysis, we focus on the 1991-2006 period for four reasons. First, IKRF and SWO data are not available for the years before 1991. Second, the process of establishment of the revolutionary government and the war in the 1980s made the circumstances in those years very different from the post-1990 period. Third, the quality of the data from the 1980s is lower

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<sup>5</sup> Esfahani and Taheripour (2002) show that during the 1980s and 1990s such implicit subsidies were quite large, amounting to about 25-30 percent of GDP.

than in the later years. Fourth, government spending classifications changed substantially after 2006 when the government reorganized the fiscal process.

HEIS collects data on household characteristics along with the details of income and expenditure information. The number of households included in the 1991-2006 surveys has been generally increasing over time, ranging from 18,671 in 1992 to 32,152 in 2002. The target population includes all private and collective settled households in urban and rural areas. HEIS uses a three-stage, cluster sampling method with strata. At the first stage, the census areas are classified and selected. At the second stage, the urban and rural blocks are selected, and at the final stage, households are sampled. The number of samples is optimized to estimate average annual income and expenditure of the sample household based on the aim of the survey. In order to obtain samples that are more representative of the whole year, the administration of the surveys is spread evenly over the twelve months.

We use the countrywide consumer price index (CPI) to estimate the real values of all nominal expenditures. To correct for CPI differences across provinces and between urban and rural areas, we employ province and urban dummy variables in our regressions. We calculate the total household expenditure of each household by summing up all expenditure items, except investment spending.

The data regarding on IKRF's activities and spending is available from IKRF Statistical Report (various years). Part of this data is also included in the Statistical Yearbook of Iran, published annually by the Statistical Center of Iran and placed on its website, [www.amar.org.ir](http://www.amar.org.ir). This Yearbook is also the source of province-level data on SWO, NGO, and SSO activities and on CPI and government current and development spending. For SWO, NGOs, and SSO, the Yearbook provides only the number of people covered by the activities of each in each province in each year. We scale all these province-level variables by the number of households in each province to make them comparable across provinces. The data on the number of households and population in provinces is available from the General Census of Population and Housing (various years), published by the Statistical Center of Iran.

There are two issues concerning the SSO data that need to be highlighted. While the Yearbook offers information on a number of different insurance schemes offered by the SSO, the extent of details and the categories reported change over time. We deal with this issue by defining three broad categories of beneficiaries that encompass all those covered: Mandatory coverage (those whose employment by law requires them to be part of SSO pension and healthcare plans), optional coverage (those who have the option to take advantage of the SSO insurance schemes, such as self-employed workers in fields of activity specified by law), and unemployment coverage (those who benefit from SSO's unemployment insurance).

The second issue regarding SSO data is that for 1993-1995, the Yearbook gives the number of workers covered by unemployment insurance only at the country level. We use the aggregate numbers and the shares of covered workers in each province in 1992 and 1996 to interpolate the data for 1993-1995. We will discuss the caveats concerning this interpolation in section 6.

In 1990, Iran had 24 provinces, including the capital district, Tehran. Overtime, some provinces have been divided into smaller ones. Also, occasionally some counties have been separated from one province and attached to another one. To deal with these shifts, we focused on the original 24 provinces and aggregated and adjusted the data appropriately to produce a consistent and balanced panel of province-level data during 1991-2006. These 384 province-year cells contain a total of 386,994 household observations. In our quantile regressions, the starting year is 1993 and the number of observations declined to 349,651 households over 336 province-year cells because we instrument government and welfare program spending with their second lagged values.

Table 1 presents the summary statistics of the variables used in our regressions. Note that the average number of households per province-year is 1041, but its minimum is 36, which is quite small. However, there are only four provinces that have sample sizes less than 100 they all belong to 1993. Dropping the observations from those provinces or all of 1993 data does not change the results in any tangible way.

## **5. Public Spending and Personal Expenditure Growth and Distribution**

In this section, we provide an overview of the key trends in the government and welfare agency spending as well as in the poverty rate and individual expenditure patterns. For calculating poverty rates, we estimate individual expenditure based on household spending, using the square root of household size as the scale. (Using other scaling methods such as household size or its log does not change the observed trends or our main conclusions here.)

Figure 2 shows the trend in the countrywide, real mean and median individual expenditures, along with the real per capita spending of the government and IKRF at the province-level since 1984. IKRF spending at the national level is essentially the sum of its province level spending plus its central office expenses. The government's total expenditure is much larger than the amounts that it allocates for province-level spending (about 5-6 times). The difference is the cost of central administration, defense, national projects, and subsidies. However, the trends in the national- and province-level public expenditures are very similar.

Figure 3 presents the trends in some key quantiles of the individual expenditure distribution. Figure 4 further highlights the way in which the key bottom quantiles have been moving relative to the median. As the trends in Figures 3 and 4 clearly show, Iran's economic conditions were deteriorating fast during 1984-1989 period due to the destructive war with Iraq, which ended in 1988. This was initially associated with deterioration in the relative position of the lower income groups during 1984-1986. However, as the economy plunged further in 1987-1988, the government's rationing and distribution policies protected the very poor at the cost of the richer households. After the war, the government launched a set of reconstruction and liberalization policies that helped the economy quickly bounce back during 1989-1993 (Figure 3). Although the initial benefits went largely to the middle and upper income groups, this was reversed in 1992-1993 and the poor regained their relative positions (Figure 4). However, in 1994, low oil revenues and some difficulties encountered in the liberalization process led to a foreign debt crisis, followed by severe a stagflation episode that was treated through austerity measures. As a result, mean and median private consumption stagnated until around 1997, when the government managed to address the debt problem. After 1998, oil revenues began to rise. Also, the reformist government that was in office during 1997-2005 lifted the austerity measures adopted in 1994 and implemented a series of market-oriented policies. These factors allowed the economy to expand steadily until 2007.

The growth rates of mean and median individual expenditures during 1990-2007 were 3.5 percent and 3.4 percent per year, respectively. Real government and IKRF grew even faster in those years, especially in the early 1990s, and registered average growth rates of 6.4 percent and 15.0 percent, respectively. Until 2003, this process, on the whole, favored the poor relative to the median and the rich. But, there was a significant reversal during 2003-2006. Although expenditures grew across the spectrum, the relative positions of the poor deteriorated, especially those in the second and third deciles. As Figure 4 shows, the impact of these fluctuations on the relative expenditures of those in the first decile was much milder, probably as a result of the operation of the country's social safety nets for the very low-income groups.

The new administration that took office in 2005 engaged in a massive redistribution from the top deciles towards the bottom ones, while stimulating the economy strongly to maintain the pace of growth. The redistribution did raise the relative expenditures of the lower quantiles for a while (Figure 4), but the policy proved highly inflationary. The government then had to adopt

contractionary policies, causing a recession during 2008-2009 (Figure 3). A decline in oil revenues in those years may have also contributed to the process, although it did not cause any depreciation of the exchange rate. Indeed, the nominal exchange rate was kept constant and the real exchange rate of the Iranian rial was allowed to appreciate significantly in those years.

The economy briefly recovered in 2010, but encountered a significant stagflation in 2011-2012 due to a combination of factors. One factor was the tightening of international sanctions on Iran. However, domestic expansionary policies were also responsible. In particular, the government had engaged in a monumental housing project and in December 2010 launched a major subsidy reform programs. Both projects contributed to huge budget deficits. The subsidy reform was initially sold as program that could help government finances by raising energy and food prices substantially, redistributing half of the proceeds as cash across the entire population, and using the rest to develop infrastructure and to support industries adjust to the energy price shock. However, the realized proceeds fell far short of the cash transfers. This miscalculation not only ruled out the planned support for industries and infrastructure, it led to significant deficit spending and ultimately to high inflation. The policy seems to have redistributed incomes in favor of the poor for a while. But, the value of the cash transfer was quickly eroded and the government's effort to contain inflation seems to have deepened the recession and unemployment problems that particularly hurt the poor.

We are interested in assessing the impact of economic growth and various forms of public spending on the level and distribution of household expenditures. In particular, we would like to know how these factors have affected the incomes of the poor in Iran. One way to perform this task is to estimate a model that relates the mean and some benchmark quantiles of expenditure to those variables. In essence, this approach is similar to the typical growth models, with expenditure quantiles replacing per capita income. A difficulty with this approach is that it makes no use of the available information about the characteristics of households in shaping the distribution. One can, of course, include summary measures of the distributions of household characteristics in the regression. But, that technique may not capture the connections between the households' characteristics and their places in the distribution. This is important because those characteristics matter not just for determining household expenditures, but they also influence the way policies affect the expenditure distribution. Indeed, government programs typically target households directly or indirectly based on their characteristics. Quantile regression method, which we discuss and apply in the next section, offers a way to deal with these concerns.

## 6. A Quantile Model of Household Expenditure, Growth, and Public Spending

In this section, we first describe the quantile regression that we use in our analysis. We then present the estimation results. The dependent variable of our model is the real expenditure of household  $i$  in province  $p$  in year  $t$ ,  $E_{ipt}$ , which is assumed to be distributed as  $F_E(r) = \Pr(E_{ipt} \leq r)$ . The  $\tau^{\text{th}}$  quantile of  $E_{ipt}$  is given by  $Q_E(\tau) = F_E^{-1}(\tau) = \inf\{r: F_E(r) \geq \tau\}$ . The real expenditure of household  $i$  depends on the vector of its characteristics,  $X_{ipt}$ , and the vector of province conditions,  $Y_{pt}$ , including public spending and social protection programs. However, the relationship may vary depending on the position of the household in the expenditure distribution. For example, IKRF spending is expected to be consequential for the expenditures at the lower tail of the distribution much more than elsewhere. If the relationships can be treated as linear and if household  $i$  is at quantile  $\tau$ , we can write

$$E_{ipt} = X'_{ipt} \cdot \alpha(\tau) + Y'_{pt} \cdot \beta(\tau) + \varepsilon_{ipt}(\tau) \quad (1)$$

where  $\varepsilon_{ipt}(\tau)$  is a random variable whose  $\tau^{\text{th}}$  quantile is zero:  $Q_\varepsilon(\tau) = 0$ . This means that the  $\tau^{\text{th}}$  quantile of  $E_{ipt}$  can be expressed as:  $Q_E(\tau) = X'_{ipt} \cdot \alpha(\tau) + Y'_{pt} \cdot \beta(\tau)$ . We use bootstrapping

to calculate the standard errors. Also, to take account of the possible interdependence of the observations, especially within each province in each year, we use a cluster approach.

There are many household characteristics that can be included in  $X_{ipt}$ . Most obviously, expenditure should rise with the size of the household. To take account of this factor, we first created a set of dummies for household sizes 1, 2, ..., 12, and 13 and more and included them in the regressions.<sup>6</sup> We then checked the coefficients of these dummies against various functions of household size. The pattern of coefficients came closest to the log of household size plus one, which we selected as a summary measure and used it in our regressions to avoid the dimension of the parameter space getting too big.

For other household characteristics, we selected a set of variables that we believed to be important and proved statistically significant in our regressions. We carried out a number of experiments with larger sets of household variables to check the sensitivity of the results with respect to this aspect of specification. Our main results regarding public policy variables proved robust to such variations. In the end, we limited the number of household characteristics to ensure estimation parsimony and to avoid multicollinearity and endogeneity as much as possible. The characteristics that we ultimately selected are as follows:

*Age of Head of Household:* Household income and, therefore, its expenditure are likely to be lower for households headed by very young or very old individuals. Therefore, we included the age of head of household and its square on the right-hand side of our regression. We expect the coefficient of the linear term to be positive and the coefficient of the square term to be negative. Since higher income households are typically in a better position to smooth their consumption over their lifetimes, the age effect on expenditure should be weaker for them. In other words, we should see much larger effects of the age variable and its square for the lower quantiles of the distribution.

*Female Headed Household:* This is a dummy variable that equals 1 if the head of household  $i$  is female and it is 0 otherwise. Since women generally tend to earn less than men of similar age and education, the coefficient of this variable is expected to be negative for the entire distribution. However, it is likely to have a larger magnitude for the households in lower quantiles because women's disadvantages are often exacerbated when they are among lower income social strata.

*Education of Non-Student Adults in the Household:* Education is typically associated with higher earning and expenditure capabilities. As a summary measure that takes account of the diminishing effect of the earning potential of all household members' education, we use the log of the total years of education of non-students adults in the household. The coefficient of this variable is expected to be positive for the entire distribution. The effect is likely to be larger for the lower expenditure quantiles because they are likely to have fewer other assets and, thus, can experience a bigger percentage change in their expenditures for the given rise in their education.

*Young Children in Household:* Log of one plus the number of children aged less than 16 years in the household  $i$ . This variable has been added to take account of the fact that, given household size, children tend to have lower expenditures than adults. It is difficult to tell *ex ante* how this effect changes among different expenditure quantiles.

*Teenagers in Household:* Log of one plus the number of persons aged 16 to 19 years in the household. The inclusion of this variable is meant to take account of the possibly larger amounts that household may spend for teenagers. This is a major consideration in Iran where many households recruit tutors for their teenagers to prepare them for the university entrance

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<sup>6</sup> Household sizes above 13 are rare and having additional dummies for them does not change our conclusion.

examinations. Based on this view, the effect is likely to be larger among upper quantiles of expenditure.

*Elderly in Household:* Log of one plus the number of anyone aged 65 years or more living in the household, other than the head of household and his/her spouse. The elderly may add to household expenditures due to their higher support and healthcare needs. They may also own some assets of their own to contribute to the household expenditures. As a result, their presence is likely to raise expenditure. It is difficult to say a priori whether this effect rises or declines with household expenditure quantiles.

*Urban Dummy:* Equals 1 if household  $i$  resides in urban areas and 0 otherwise. We expect the coefficient of this dummy to be positive and higher for the lower quantiles of expenditure. The latter hypothesis is based on the view that lower income households in rural areas face much bigger obstacles taking advantage of income generating opportunities in urban areas, while high income households are better connected with urban areas and benefit more from trade with urban areas.

We account for the role of economic growth in household expenditures by including in  $Y_{pt}$  the per capita real expenditure in each province. To control for the initial conditions and the remaining fixed characteristics of each province, we use province fixed effect. Also, to capture the role of countrywide factors over time, we use year dummies.

Policy variables that potentially influence household expenditures at a given locality and year certainly include the activities of the government, IKRF, SWO, NGOs, and SSO. For government activity level, we use the log of per household spending in the province. For IKRF, we have data on both spending and coverage per household for its various activities. Experimenting with various combinations of these measures, we found only the log of total spending per household and the log of the number of Rajahmundry Program beneficiaries per household in the province to be significant for some range of the household expenditure distribution. In case of SWO and NGOs, we only have data on total number of beneficiaries in each province. We combined the numbers for SWO and NGOs and calculate the log of the ratio of the total to the number of households as measure of the SWO+NGO coverage. Finally, for the SSO we use the log of the number of beneficiaries of mandatory, optional, and unemployment coverage scaled by the number of households in the province.

One key concern about public program activities is that they are endogenous. For example, IKRF spending is supposed to rise when poverty rises, thus inducing a positive correlation between the two. As a result, if we do not address this issue, the estimated coefficients may seem to indicate that IKRF spending reduces the economic conditions of the poor. The best way to deal with this problem is to employ instrumental variables (IV). A common option for this purpose, which we adopt, is to use the lagged values of endogenous variables.

IV quantile regression (IVQR) procedures are computationally very demanding and the statistical packages currently available for estimating IVQR handle only one endogenous variable.<sup>7</sup> In fact, the packages often fail to yield results when there is more than one endogenous variable and a few exogenous ones. This limitation precluded the use of such packages for our full model. Instead, we followed a two-pronged approach. For our main model, we used a two-step method, first predicting the values of the endogenous variables based on their lagged values, and then including the predicted values as regressors in quantile regressions. Although we calculated robust standard errors, this procedure may yield

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<sup>7</sup> There are two Stata procedures that employ IV quantile regression. One of them, `ivqte`, is strictly for a single endogenous treatment effect (0-1 variables). The other, `ivqreg`, contributed by Do Wan Kwak, allows for two endogenous variables, but it is still in the development process and has many limitations. It can be found at: <http://faculty.chicagobooth.edu/christian.hansen/research/ivqrstata.zip>.

inconsistent confidence intervals. Gauging the extent of this potential bias is the second prong of our approach. To this end, we experimented with abbreviated versions of our model, keeping one endogenous variable and a set of other regressors. For every endogenous variable, we estimated the abbreviated model in two ways: (1) using the two-step procedure as in the full model and (2) using the Stata code, `ivqreg`, which yields consistent estimates. We trimmed the set of regressors until the `ivqreg` procedure resulted in coefficient and standard error estimates. Comparing the results obtained in these two ways helped us assess the extent of the bias caused by the two-step procedure. The `ivqreg` results are not presented here to keep the length of this paper manageable. We found that the bias is generally small such that the main conclusions are not affected. Based on these results, we concluded that the bias in the full model estimates is likely to be limited.

Another concern about the policy variables is that their role may have changed over time. In particular, with the political turnover in the executive and the legislature in 1997 and 1998, it is possible that the role of government spending or the activities of IKRF, SSO, and SWO may have shifted. Another possibility is that each program's effect may have changed as they matured in the 1990s. For SWO unemployment coverage variable, there is an additional concern that interpolation data for the 1993-1995 may affect the results. To address these concerns, we entered economic growth and each of the public program variables during the entire period along with their interactions with a dummy for the 1993-1997 period to capture coefficient differences that may have prevailed before 1998. We did the same for household characteristics. However, for the latter set of variables the differences were virtually zero for the pre-1998 period. So, for the sake of parsimony, we did not include the interaction terms for the household characteristics in the results that we report below. We also examined the stability of the coefficients of within each sub-period by shifting the start and end of the period by a couple of years. The length of each period could not be too short because we use province and year fixed effects and the estimates of policy variables are based on their variations across provinces and over time. These experiments showed us that the estimates are reasonably robust. Hence, to ensure sufficient degrees of freedom in estimating the effects of policy variables, we did not breakdown the sub-periods further.

## 7. Quantile Regression Results

The results of our quantile regressions are shown in Figures 5-14. Figure 5 shows the effect of economic growth on the distribution of household expenditure. The left-hand-side panel is the graph of the marginal effect of one percent increase in economic growth on the log of household expenditures at different parts of the distribution. The estimates are quite precise and steadily rise from 0.7 for the poorest 5<sup>th</sup> percentile to about 1 for the 95<sup>th</sup> percentile. The right-hand-side graph shows that the unequalizing effect of growth may have been stronger during 1993-1997, significantly so for the bottom 10 percent and the top 20 percent. The differential effects on the rich and the poor in both periods are indeed large and mean that while the economic growth in Iran has been lifting all household expenditures, it has had a strongly unequalizing effect. However, as we will see below, this gap has been filled for the poor by economic policy and changes in household characteristics.

Figure 6 shows that the marginal effect of province-level government spending has been positive and strong on the bottom quintile, though only after 1998. The effect for the rest of households is virtually zero both before and after 1998. The effects of IKRF's expenditures, on the other hand, have gone further and reached the bottom 70 percent of the population before 1998 and the bottom 60 percent afterwards (Figure 7). The estimated effects of IKRF spending are quite high for the very poor and decline as income rises. The finding that the effect for the middle 40 percent had been stronger before 1998 is interesting because the Iranian economy had gone through a crisis during 1993-1997 and it seems that IKRF had kept its net wider at that time. In contrast, according to Figure 7, the marginal effects of IKRF's Rajaii program



have concentrated on the expenditure levels the middle three quintiles, despite its mission to help the lower quintiles. Also, the effect had been weaker before 1998. It is possible that the program's unconditional benefits and possibly its general equilibrium consequences may have made it beneficial mainly to the middle of the distribution.

Figure 8 indicates that SWO coverage has had significant positive effects on most of the population. The effect had been quite even across the entire distribution before 1988. But, it became somewhat smaller and lost its significance for the bottom and top deciles after 1988. The result is particularly notable because SWO is a relatively small program. But, its diverse mission seems to entail benefits for broad segments of the population. The change after 1998 seems to be due to the reorientation of SWO to support modern NGOs that mostly operated in major urban areas (Esfahani 2005).

Turning to the role of SSO activities, Figure 9 shows that after 1998, the mandatory and especially the optional SSO schemes have beneficial effects for a wide range of the population, especially the middle class. These programs do not seem to have been reaching the lowest decile of the distribution effectively. Furthermore, the optional insurance program does not appear to make much of a difference for the top decile. SSO's unemployment insurance, on the other hand, seems to have had positive effects for the bottom 60 percent of households, particularly the lowest three deciles.

The estimates of SSO variables for the pre-1998 period appear rather puzzling. In particular, the mandatory insurance program shows negative effects on the real expenditures of all households. This could be because of the data problems for 1993-1995 mentioned above in the discussion of data. It might also reflect the consequences of the economic crisis of 1994-1995, which caused a sharp and unexpected rise in inflation, with little adjustment in the benefits paid out by SSO. As a result, those who had expected to depend on SSO's mandatory program found themselves worse off. For the optional program, which began to expand in the 1990s, the initial benefits seem to have gone to the top half of the distribution. This may be due to the fact that in the earlier years, higher income groups had been in a position to take advantage of the program. The unemployment insurance program was also limited before 1998 and, naturally, its effect was small, though still positive for the poor. The effects grew stronger as these programs expanded after 1998.

The above results capture effects of public programs through their province-level variations. The only set of variables that provides us with a glimpse of the role of economy-wide factors is the year fixed effects, depicted in Figure 10. The pattern of these effects is indeed informative. The first four graphs in this figure capture the impact of the economic crisis of 1994-1995. They show that the episode drove down everyone's real expenditure more or less by the same percentage in 1994. However, soon its effects became strongly regressive as the expenditures of bottom 70 percent declined further in 1995, while the top decile experienced recovery. In 1996, the effect of the economy-wide factors on the bottom deciles started to rise in 1997 it was much higher than the effects of the same factors for the middle quintiles. In 1998, the effect of the economy-wide factors had more or less returned to their 1993 levels. In the following years, this effect started to drift down, especially for the top deciles, though always remaining statistically insignificant.

We now turn to the effects of household characteristics on the pattern of household expenditure in Iran. The marginal effects of being urban and female-headed household are presented in Figure 11. Note that as expected, urban households spend a lot more than the rural ones. Part of this is likely to be due to differences in urban and rural price indices. However, that effect alone cannot explain the large gap in expenditure and the downward slope of the effect as quantiles rise. The latter pattern is consistent with the relative mobility of upper income rural households compared to their lower income counterparts. The right-hand side graph in Figure

11 reveals that when the household is headed by a woman rather than a man, expenditure is significantly lower, especially for the lower quantiles: by more than 35 percent for the bottom decile and about 23 percent for upper decile. Disadvantages of being a female head of household seem to be less pronounced when they have other characteristics, such as innate abilities or other assets, that enable them to enjoy higher expenditures compared to their male counterparts.

Figure 12 presents the results for household size and education variables. Household size clearly matters a great deal for real expenditure. The effect turns out to be substantially larger for the lower expenditure quantiles, possibly because they have relatively smaller fixed costs and the presence of an additional person in the household raises expenditure by a larger percentage. Education of non-student adults also raises household expenditure, as expected. Interestingly, the effect of education is lower among upper quantiles. A plausible explanation for this finding is that in the upper ranges of the distribution, households possess larger amounts of other assets, reducing the marginal effect of education on their incomes and expenditures.

The estimated effects of age of head of household are shown in Figure 13. Household expenditure has an inverted-U relationship with age that is much more pronounced for lower quantiles than for the upper ones. Higher income household heads seem to be able to smooth their consumption and possibly their incomes over their life cycle. The peak of the overall age effect is also rising with the expenditure quantile, ranging from about age 49 for the lowest quantiles to about 54.6 for the top decline.

Finally, Figure 14 presents the effects of the number of children, teenagers, and elderly in the household. The results show that children are associated with lower household expenditure, while teenagers and elderly tend to raise it. The latter effects both turn out to be larger for the upper quantiles. As pointed out above, the pattern for the teenagers may be due to the higher expenditures (e.g., for private education) required for teenagers, especially among higher income households. For the number of children, the effect has a much smaller magnitude for the rich, possibly because of the fixed costs mentioned above, or due to relatively more resources that richer households can afford to allocate to their children.

## **8. Assessing the Model and Decomposing the Trends in Household Expenditure Distribution**

In this section, we first assess how well the fitted model represents the actual trends in household expenditure distribution. We then analyze the role that various factors have played in the past trends in the distribution. This is important because the effects that we have measured may have positive or negative consequences for each quantile depending on the direction and size of changes in the determinants of expenditure. For example, while the regression results show that the effect of SWO on a wide range of expenditures has been positive, the consequences could be nil or negative due to the reduction in the activities of the organization. To make the assessment task manageable and make the analysis more concrete, we focus on the 1998-2005 period when the reformist government of President Khatami stabilized the economy while changing the structure of social protection programs.

To identify the sources of shifts in expenditure distribution, we employ the Machado-Mata technique, which is an extension of Oaxaca decomposition to the case of distributional shifts. This technique requires simulating a sample from the estimated conditional distribution and then performing experiments with it by changing the distribution of various determinants. We start with the distribution of household characteristics and conditions in 1998 and calculate their predicted expenditures using the quantile regression results for every five percentile (0.05, 0.10, ..., 0.95). For every household, we get 19 estimates, depending on the segment of the distribution in which they may land. We then draw a random value from the uniform distribution between 0 and 1 to select a quantile for that household. We do the same for the

2005 household sample. Finally, we use the selected samples to analyze the simulated distributions. Resampling changes the outcome somewhat, but the broad characteristics of the simulated sample remain remarkably stable.

Figure 15 compares the actual shift in the distribution of household expenditures between 1998 and 2005 with the one based on the simulated samples for those two years. The predicted values are remarkably close to the actual shifts, giving us confidence that the model is a good estimate of the underlying situation. Note that the match between the predicted shift with the actual one is much more stringent than getting a good fit for the levels each year. There are of course gaps between the two curves in the middle and upper quantiles, but the overall shape of the shift is captured by the estimated coefficients and variable changes. Examining the factors that cause the simulated distributional shift to slope downward toward in the upper deciles and make it deviate from the actual distribution led us to notice that it is essentially driven by the shift in the year fixed effect, shown in Figure 16. We cannot be sure what factors caused this deviation, but subtracting the shift in the year fixed effect from the overall shift produces a curve (“benchmark shift”) that follows the pattern of the actual distribution more closely. This means that the variables included in the model seem to be the main drivers of the shift in the actual distribution.

To decompose the benchmark shift, we start with the 1998 simulated distribution and raise the per capita expenditure variable to its 2005 level in each province. Figure 17 shows that this causes a large shift in the 1998 distribution, with a significant upward tilt. Comparing this curve with the benchmark shift shows that growth explains the bulk of the shift. However, growth is associated with considerably greater inequality, contrary to the actual situation that has been far more favorable for the poor. To understand how this gap has been filled, we begin with two exercises. First, we calculate the shift in the simulated 1998 distribution if all policy variables are set equal to their 2005 levels, keeping the distribution of household characteristics constant. Second, we measure the shift in the distribution when household characteristics are set equal to the 2005 sample, but policies and per capita expenditure is kept the same as in 1998. The results of these two exercises, shown in Figure 17, suggest that the two sets of factors have had broadly similar roles in the distributional shift. However, household characteristics have been more uplifting for the bottom deciles and policy variables have helped the top decile somewhat more.

The next question is which policies account for the overall role that policies have played during 1998-2005. To address this question, we mapped the shift from the simulated 1998 distribution when each policy variable was updated to its 2005 level. Figures 18-20 present the results. It is clear from Figure 18 that a large part of the expenditure and distributional consequences of policies during the period can be attributed to province-level government expenditures. The SWO+NGO combination, which had been largely stagnant after 1998 had in fact had a small negative effect for the bottom 70 percent, while slightly helping the top quarter of the households! Figure 19 further reveals that the mandatory and optional schemes of the SSO had been beneficial to the population, but with opposite distributional consequences. The benefits of the mandatory program had been rising with quantiles, while the opposite is true for the optional program. This makes sense because the mandatory program tends to focus on the employees of large enterprises, especially the public and quasi-public ones, who happen to be among the better off segments of the population. The optional plan, on the other hand, has been creating options for household from other social strata and, consequently, has benefitted them. Figure 19 further shows that the unemployment insurances scheme of SSO has had virtually no effect on the expenditure distribution. This could be because the economy was rapidly expanding during 1998-2005 and few employed workers were losing their jobs to take advantage of the scheme. Of course, there were many unemployed young people in that period, but they had not found jobs to become eligible for the unemployment insurance program.

The distributional shift attributable to IKRF spending, mapped in Figure 20, follows the effect we have observed in the previous section. It has had a positive impact on the bottom half of the population, with the effect rising and becoming quite tangible for the lower quantiles. The overall impact of the Rajaii program, on the other hand, has been negative, except for the top and bottom deciles. The reason for this surprising finding is that the coverage and the pensions paid by the program were declining during 1998-2005, as the government was taking away resources from IKRF. This factor did not lead to negative outcome for the other IKRF programs because it could use its own revenues for those purposes and had an incentive to support the poor and elicit their loyalty to the system.

For decomposing the effects of household characteristics, we start with the 1998 joint distribution of all household characteristics and then shift the each percentile of the distribution of each characteristic separately to make it reach its 2005 level. This yields a new distribution for each variable that can be used to measure its marginal effect. The procedure assumes that one characteristic, say education, can be changed independently of other characteristics, while in reality such a neat separation may not hold. However, the exercise is still useful because one can combine the shifts in characteristics as needed to arrive at patterns that may be more realistic. In any case, for most household characteristics we found that they had not changed enough to make a difference (urbanization, age of head of household, female-headed households, and the number of teenagers and elderly in the household). The variables that have sizable impact are education, household size, and the number of children. The reduced household size has reduced household expenditure across the board, but this has been almost entirely due to the reduced number of children in the household, which has raised expenditure for each given household size. Since these two factors are closely interconnected, we shift them in tandem and report the net results in Figure 21. It turns out that the reduce number of children and household size jointly have reduced household expenditure with smaller effects for higher quantiles, except for the bottom 5 percent. This leaves education to explain the positive effect of household characteristics changes on expenditures and distribution. This observation is clearly born by the simulated shift shown in Figure 21.

## **9. Conclusion**

The quantile regression method and the household expenditure surveys that we have employed to assess the role of policy and household characteristics in distributional shifts in Iran have yielded novel and useful results. We find that economic growth in Iran has been unequalizing, but province-level government expenditures, a key agency providing social safety net (IKRF), and expansion of education have counteracted with that effect and, on the whole, have helped lower inequality in the 1990s and 2000s. This finding is important particularly because Iran has experimented with new forms of institutions such as IKRF to provide social protection. The success of these institutions makes it worthwhile to examine them more closely and to derive general lessons from them that can be useful in Iran and elsewhere.

There is, of course, much more to be done to fully understand the determinants of distributional shifts. Some important factors have been captured in cross-sectional and time fixed effects. Much more data with longer series is needed to discern those factors. Furthermore, some of the variables considered here are connected with each other and with other factors. Determining those connections could lead to better measurement of direct and indirect effects and to the identification of more fundamental factors that drive income distribution. Also, more work and more powerful statistical packages are required to deal with endogeneity and simultaneity issues. Nevertheless, the approach is very useful because it opens up possibilities for examining many other distributional issues. For example, with appropriate data, one may be able to assess the impact of infrastructure and other large projects across household. Other important issues in the case of Iran are: how and why those in the middle of the distribution were left out between

the early 1990s and mid-2000s, what roles they played in the rise of populism and reactions to it after the mid-2000s?

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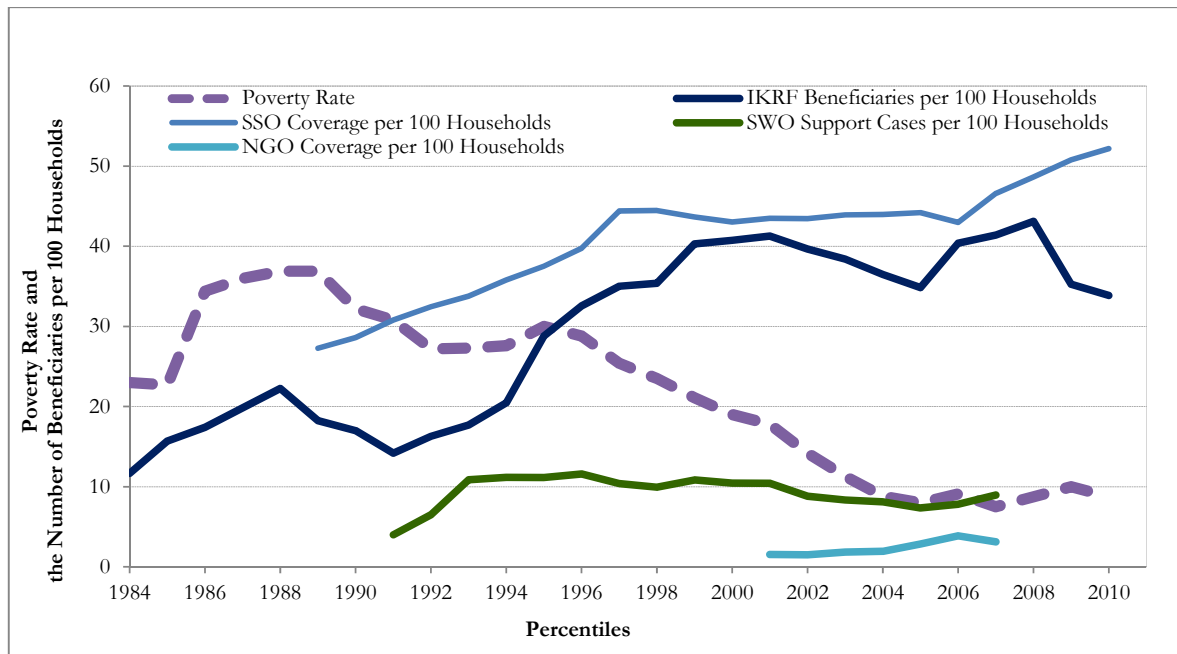
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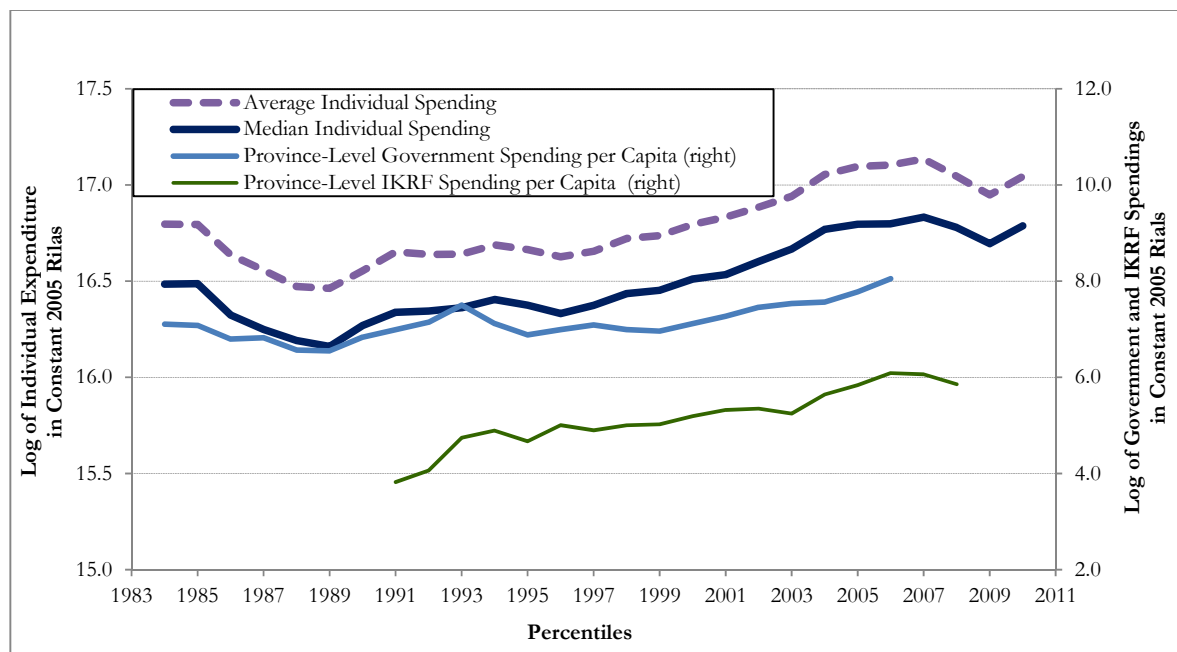


**Figure 1: Poverty Rate and the Coverage of the Main Social Protection Programs in Iran**



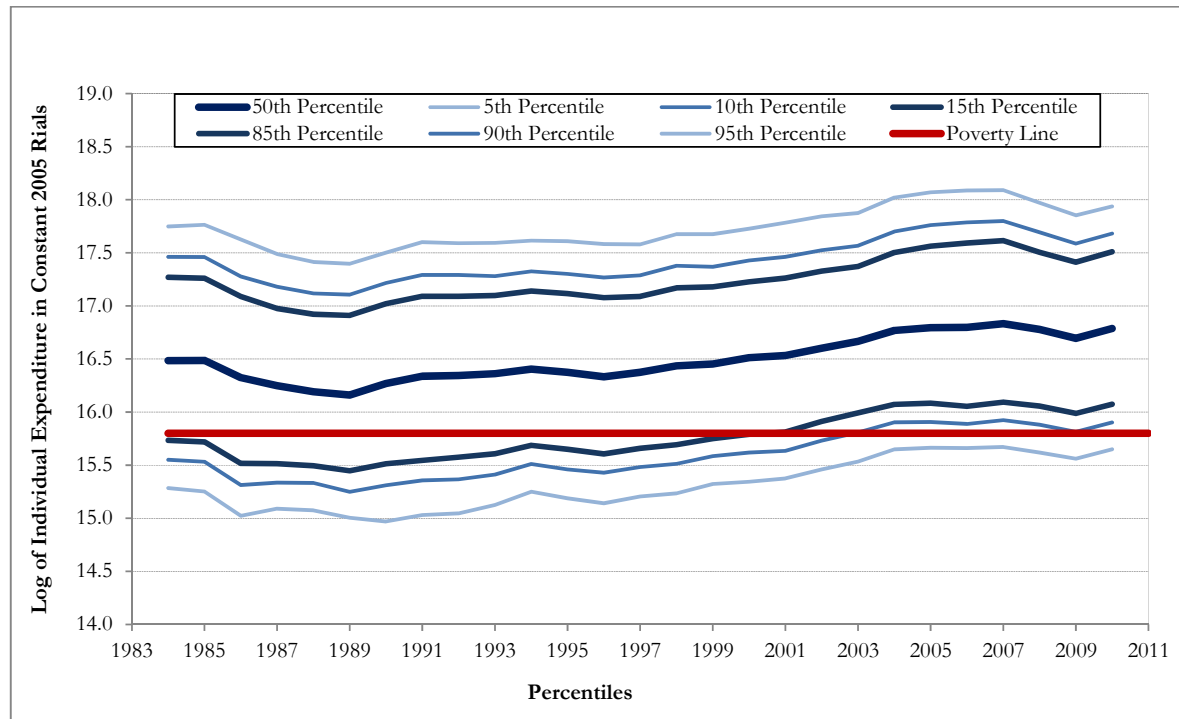
Source: Calculated based on data from IKRF Statistical Reports, the Statistical Yearbook of Iran, and the Household Expenditure and Income Survey Dataset.

**Figure 2: Mean and Median Individual Expenditure and per Capita Government and IKRF Spending in Iran**



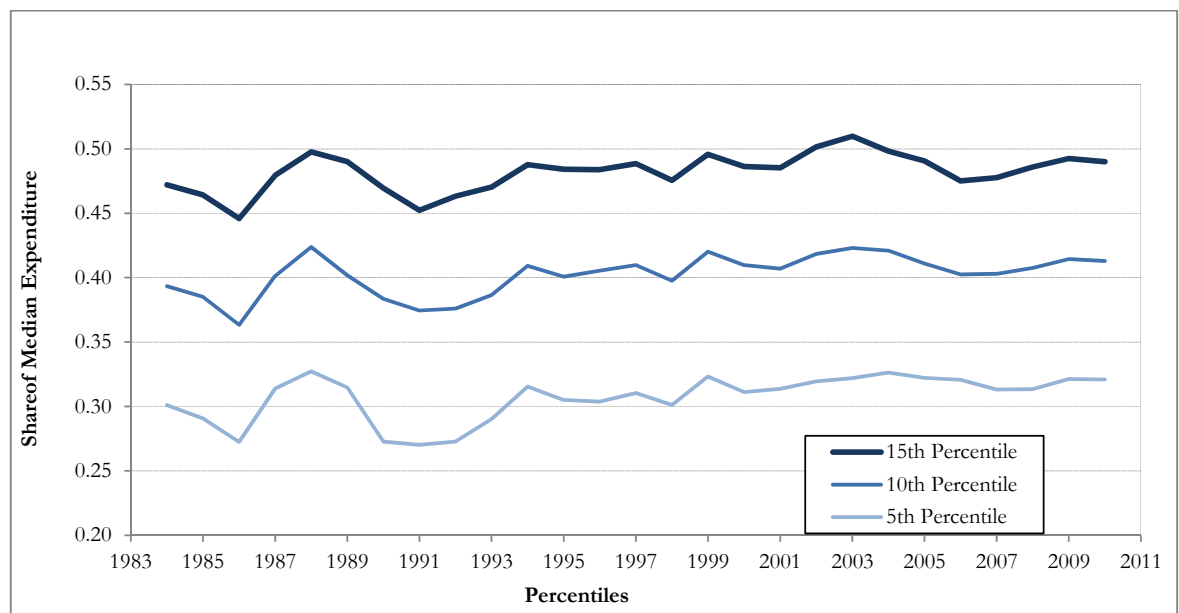
Source: Calculated based on data from IKRF Statistical Reports, the Statistical Yearbook of Iran, and the Household Expenditure and Income Survey Dataset.

**Figure 3: Evolution of Quantiles of Individual Expenditure Distribution in Iran**



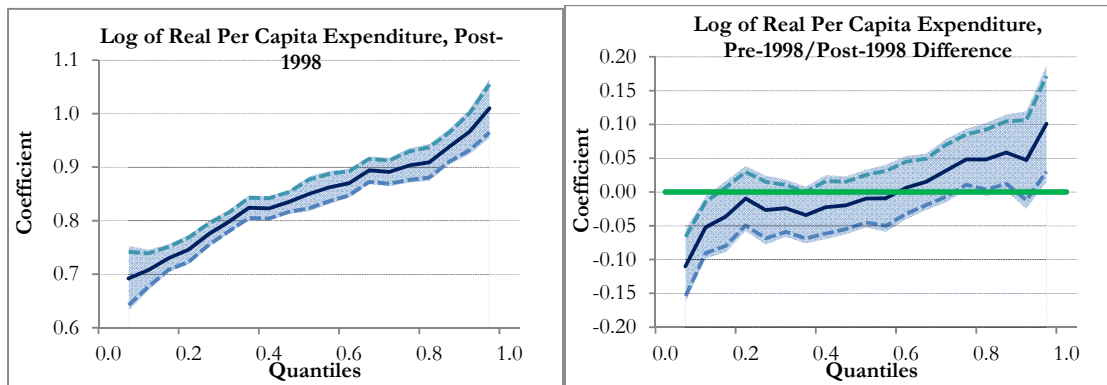
Source: Calculated based the Household Expenditure and Income Survey Dataset.

**Figure 4: The Bottom Quantiles of Individual Expenditure Distribution Relative to the Median**



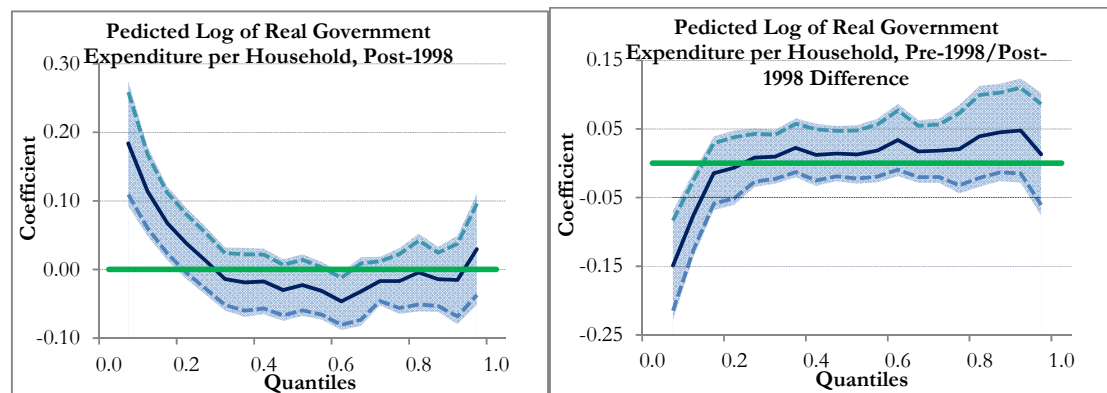
Source: Calculated based the Household Expenditure and Income Survey Dataset.

**Figure 5: Quantile Regression Results: Estimated Coefficients of Per Capita Expenditure\***



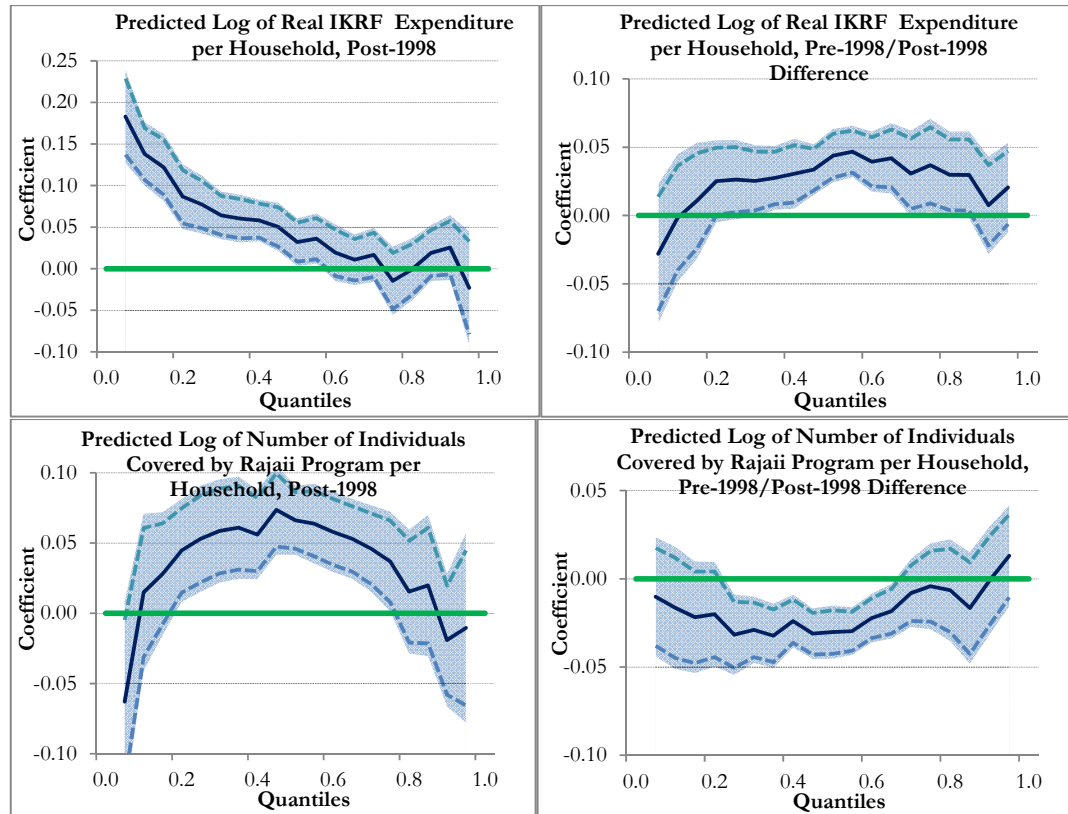
Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

**Figure 6: Quantile Regression Results: Estimated Coefficients of Government Spending per Household\***

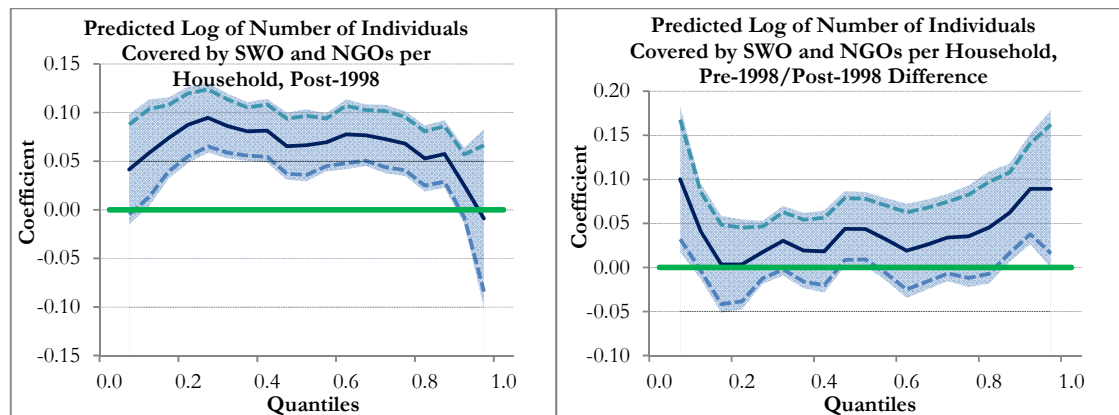


Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

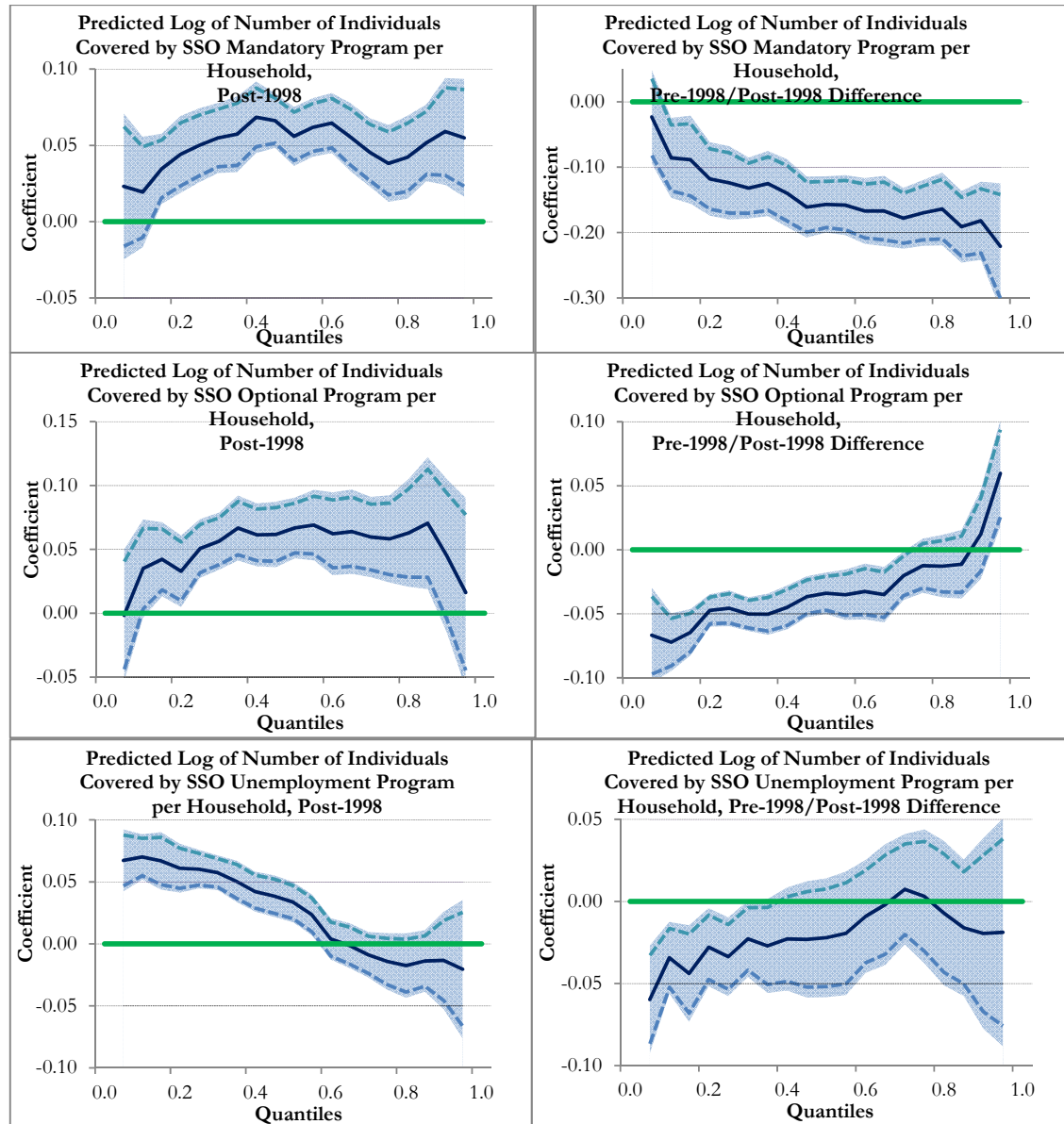
**Figure 7: Quantile Regression Results: Estimated Coefficients of the IKEF Activity Measures\***



**Figure 8: Quantile Regression Results: Estimated Coefficients of the Social Welfare Organization and NGO Coverage Rates\***

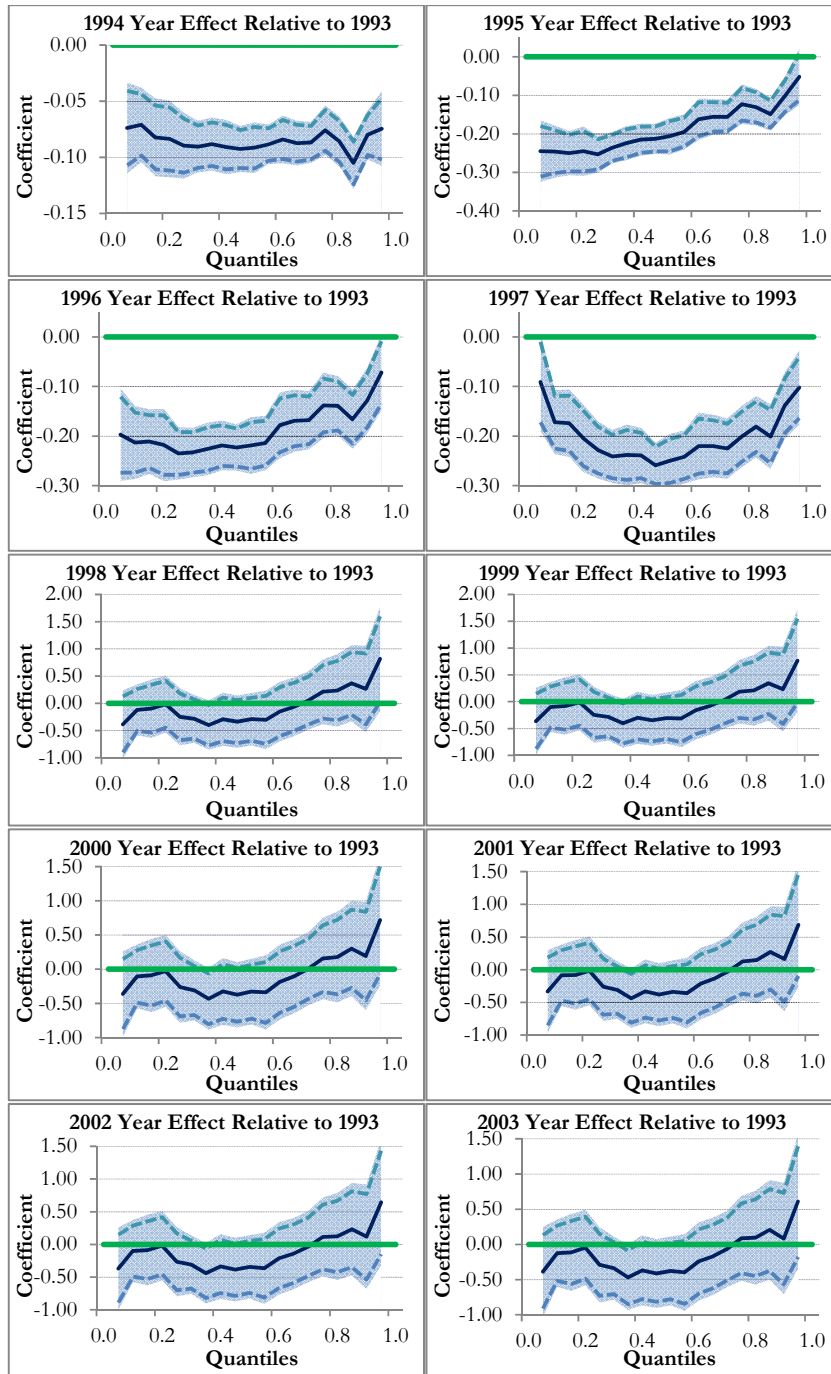


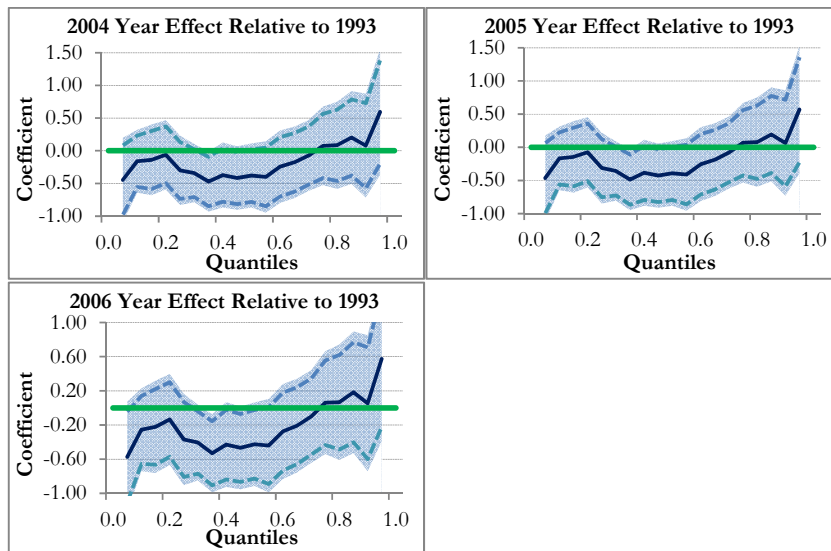
**Figure 9: Quantile Regression Results: Estimated Coefficients of the Social Security Organization Coverage Measures\***



Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

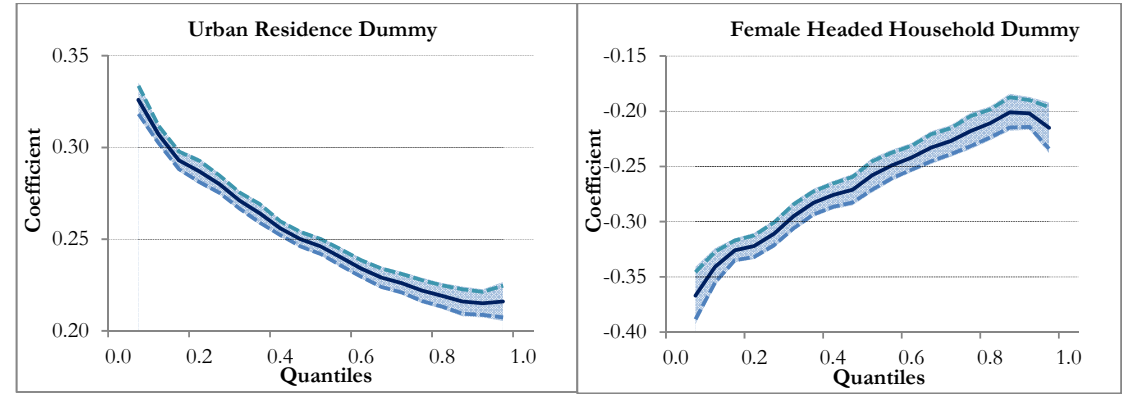
**Figure 10: Quantile Regression Results: Estimated Coefficients of Year Effect Relative to 1993\***





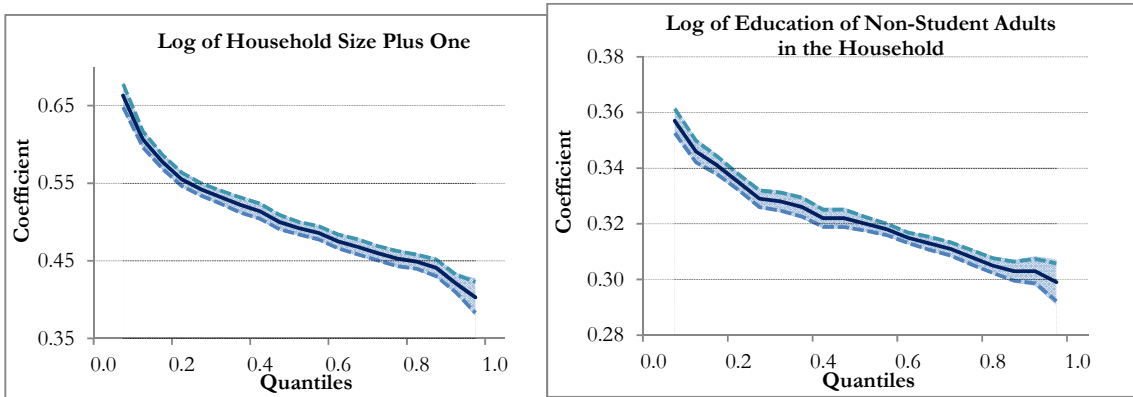
Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

**Figure 11: Quantile Regression Results: Estimated Coefficients of Residence Location and Gender of Head of Household\***



Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

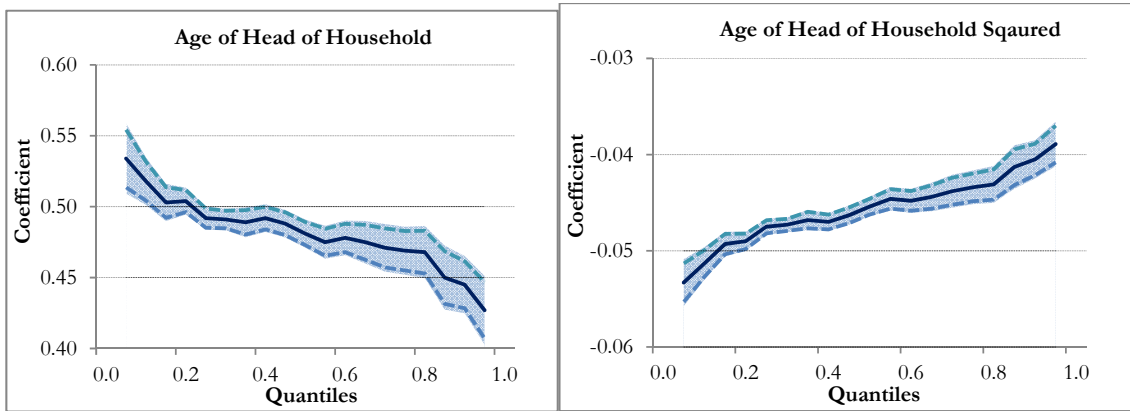
**Figure 12: Quantile Regression Results: Estimated Coefficients of Household Size and Education\***



Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

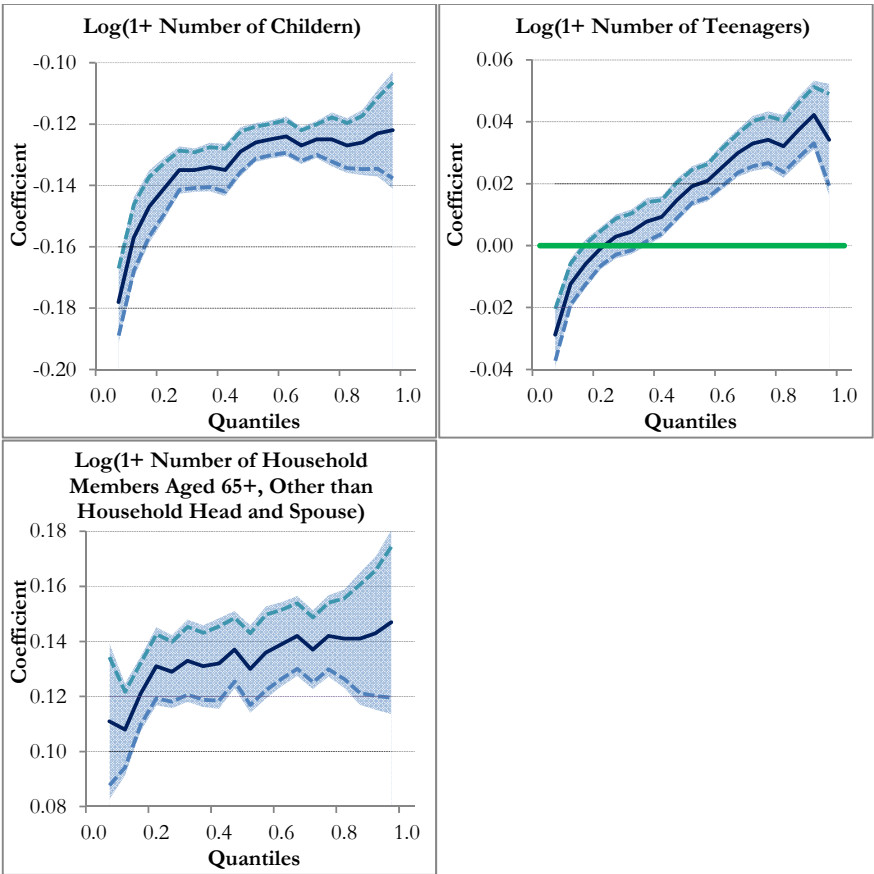


**Figure 13: Quantile Regression Results: Estimated Coefficients of the Age of Head of Household\***



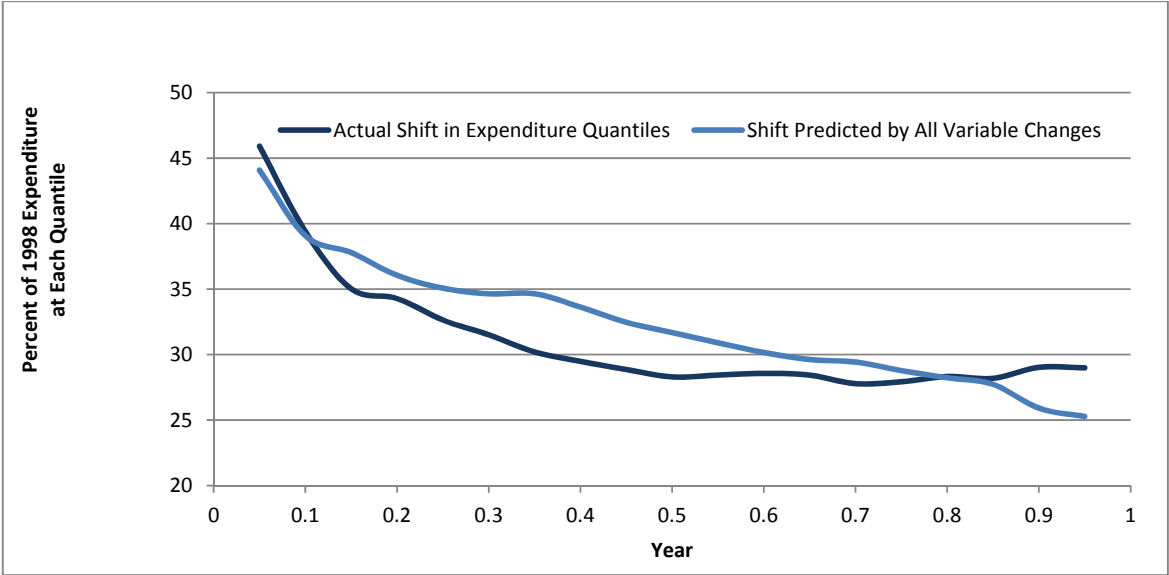
Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

**Figure 14: Quantile Regression Results: Estimated Coefficients of Household Structure Indicators\***

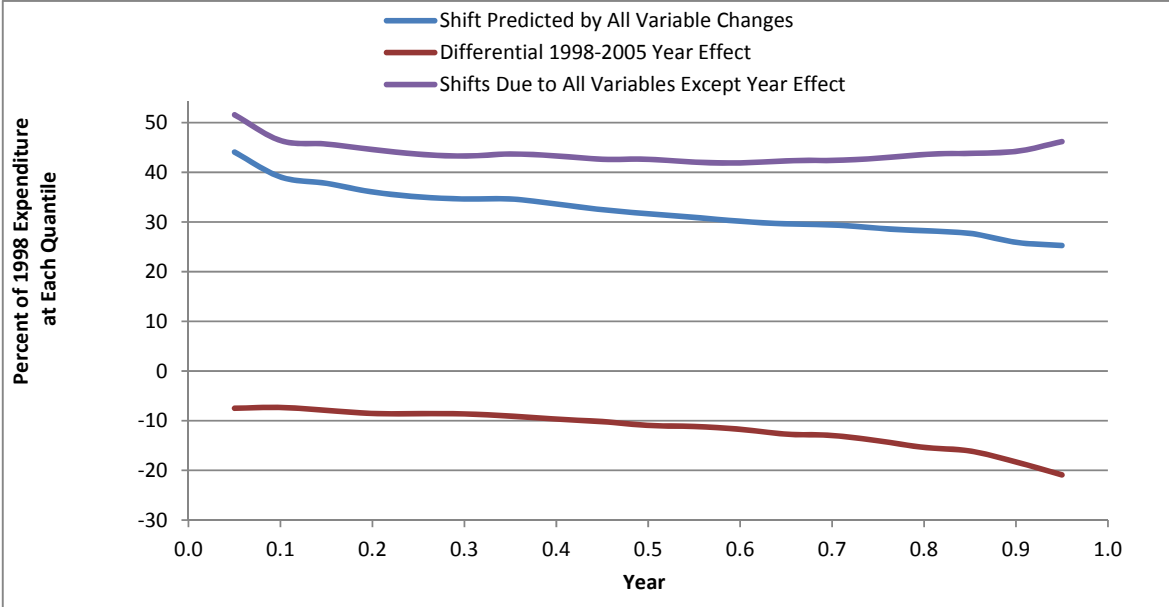


Notes: \*Shaded areas are the 95% confidence intervals based on bootstrapped standard errors. Dashed lines show the 90% confidence interval.

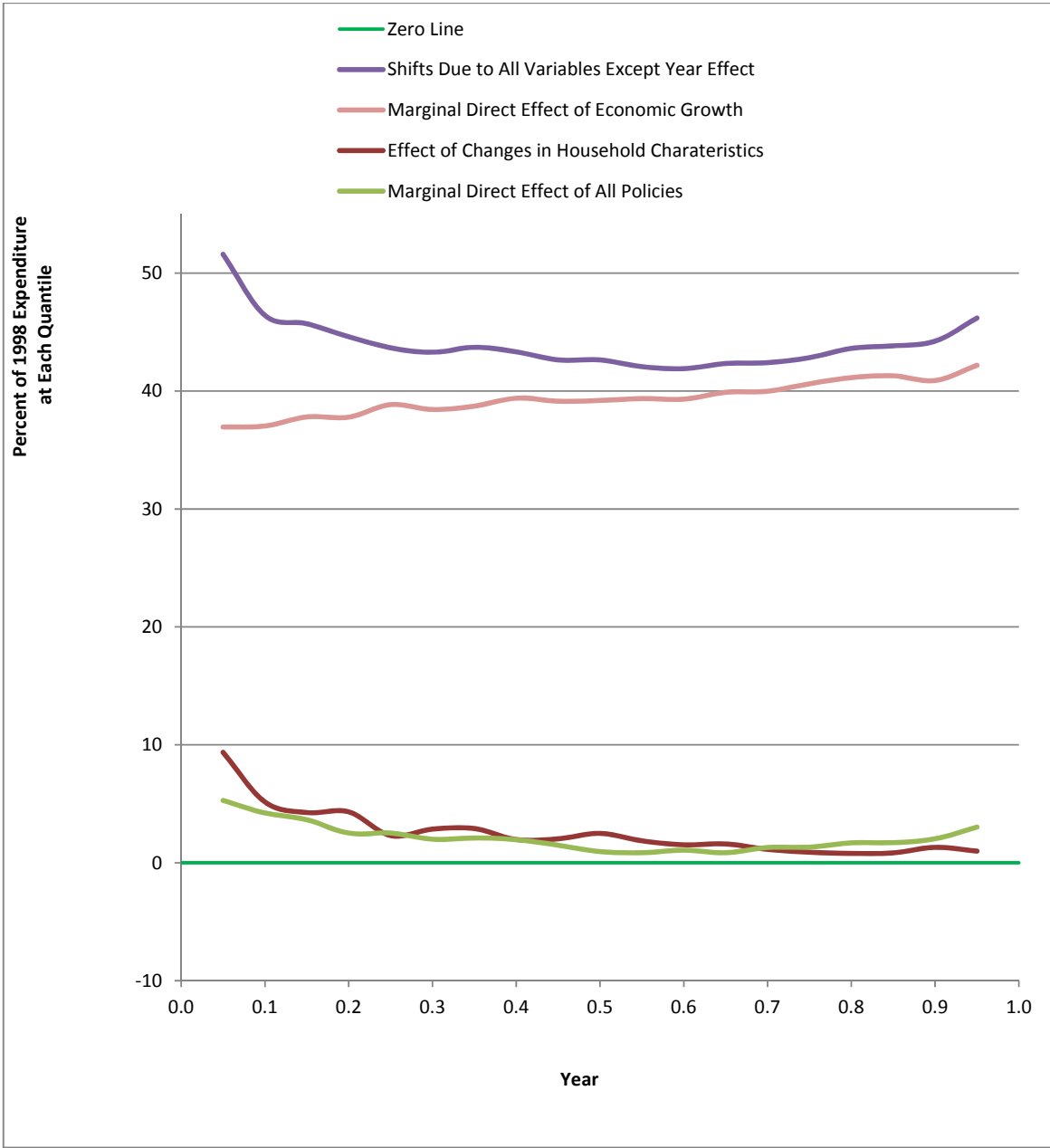
**Figure 15: Predicted vs. Actual Change in Quantiles of Household Real Expenditure between 1998 and 2005**



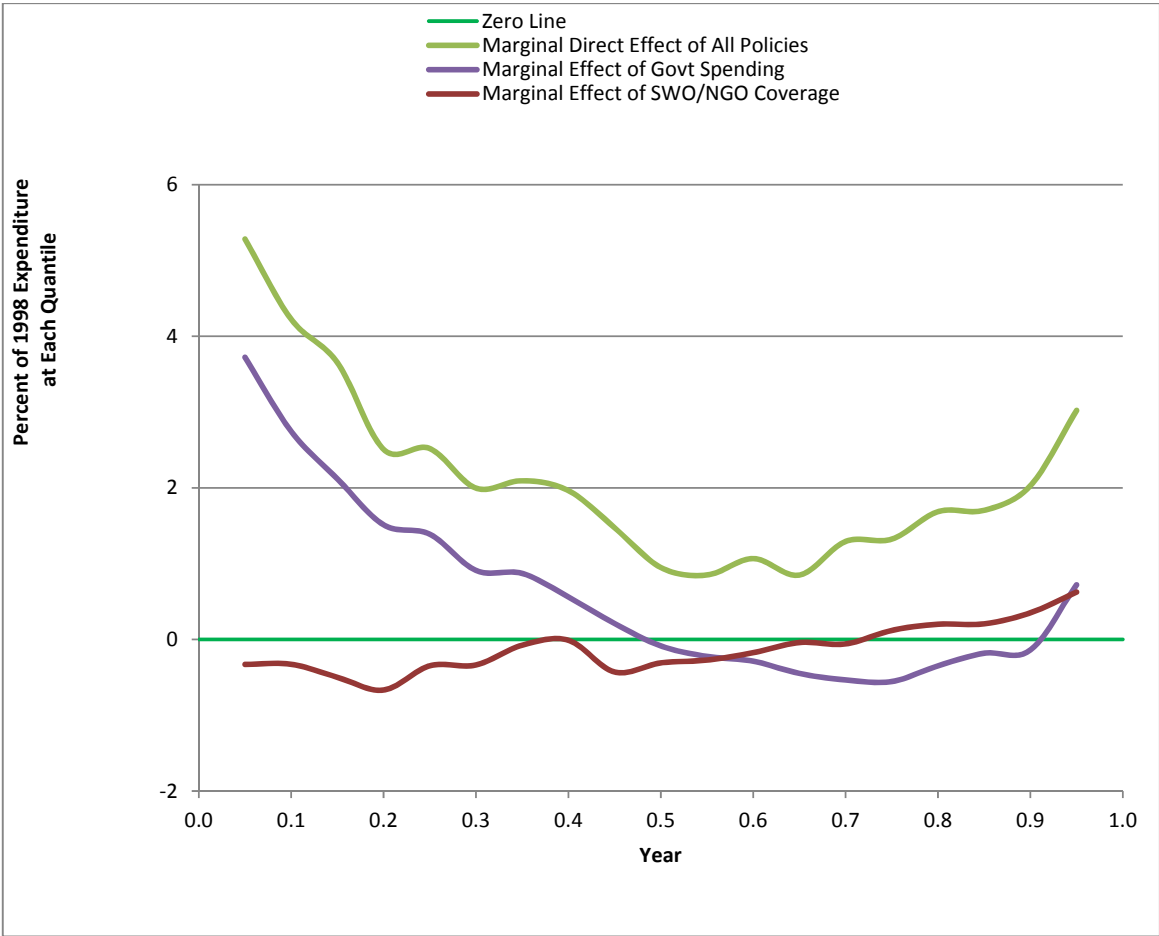
**Figure 16: Year Effect vs. All Other Factor Effects on Quantiles of Household Real Expenditure between 1998 and 2005**



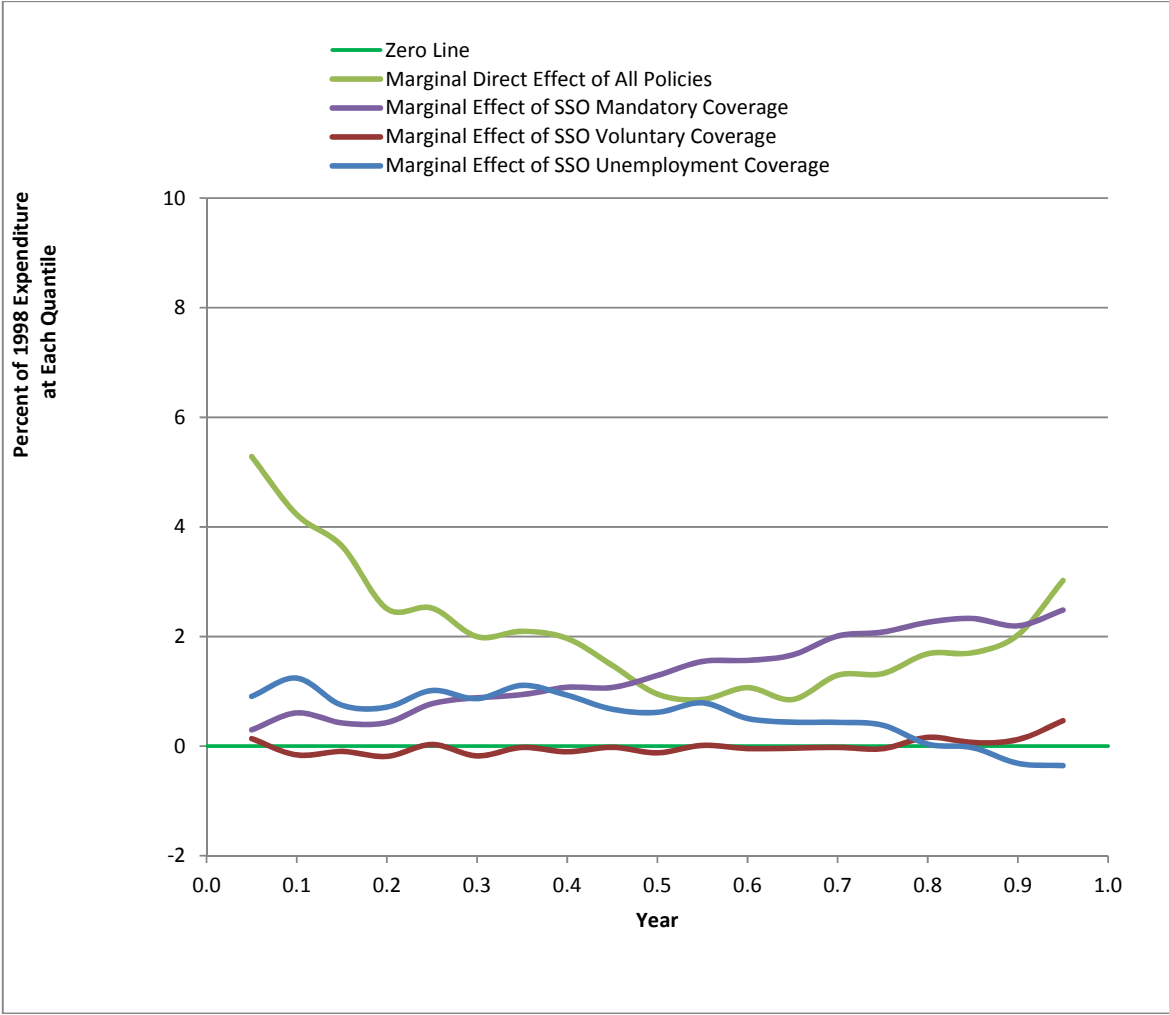
**Figure 17: The Effects of Growth vs. Changes in Policy and Household Characteristics on Quantiles of Household Real Expenditure Between 1998 and 2005**



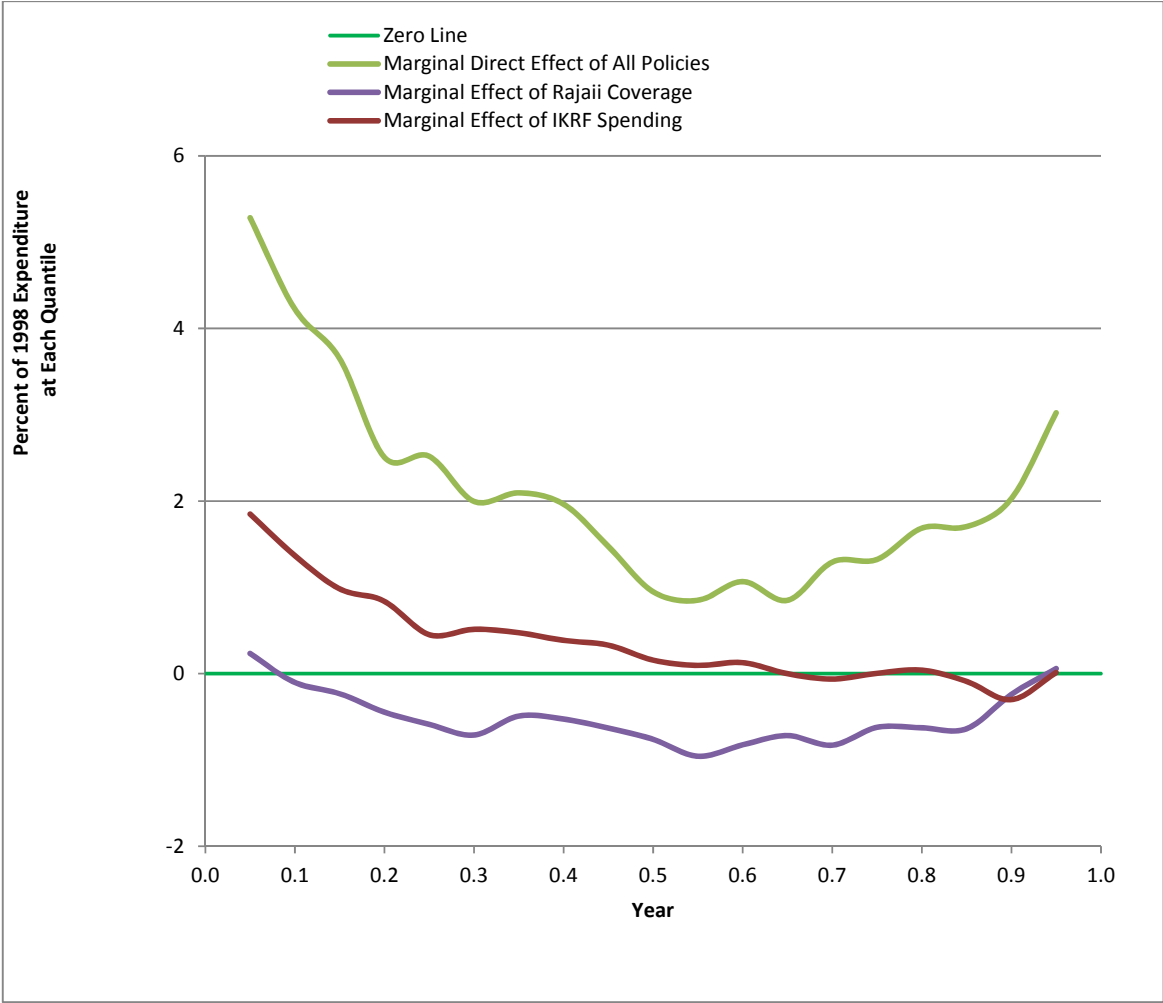
**Figure 18: The Effects of Province-Level Government Spending and SWO/NGO Activity on Quantiles of Household Real Expenditure between 1998 and 2005**



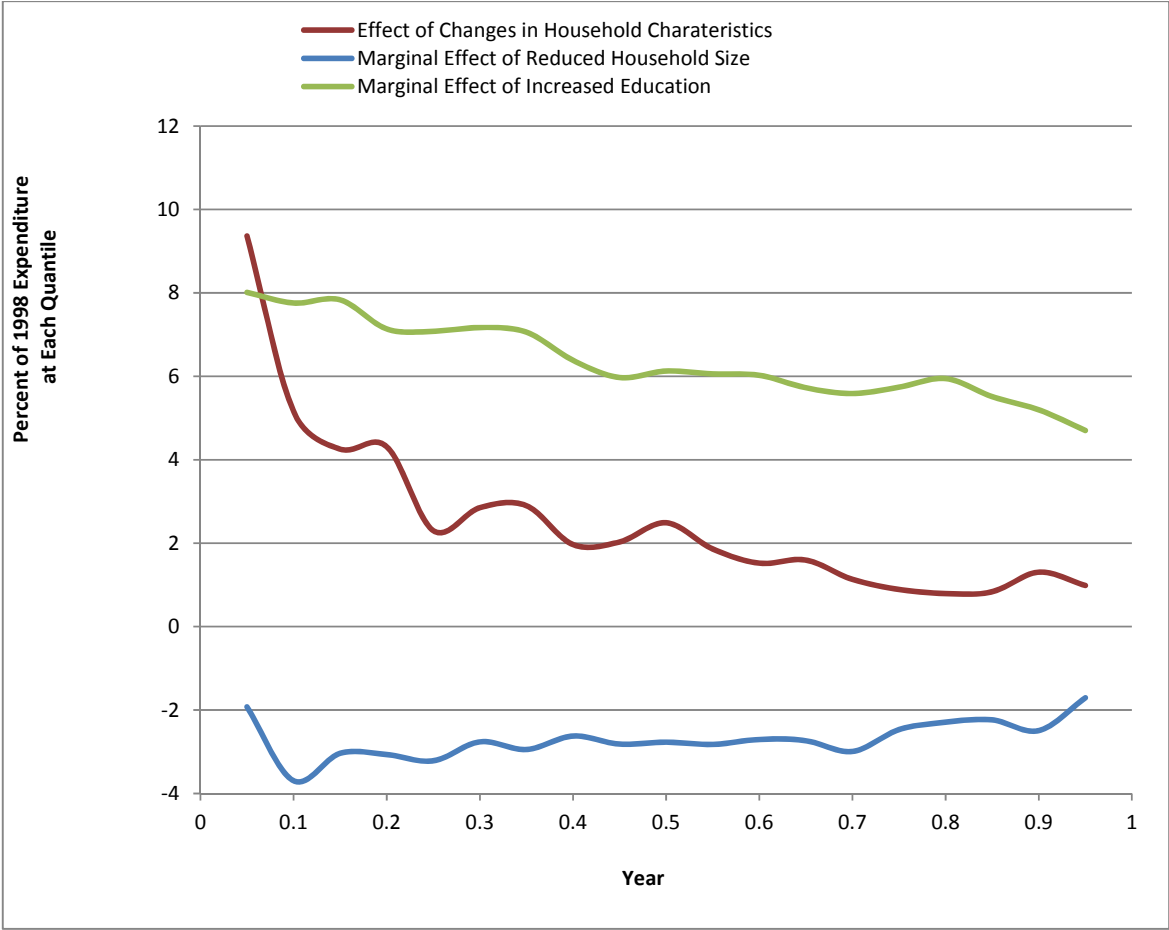
**Figure 19: The Effects of SSO Activities on Quantiles of Household Real Expenditure between 1998 and 2005**



**Figure 20: The Effects of IKRF Activities on Quantiles of Household Real Expenditure between 1998 and 2005**



**Figure 21: The Effects of Household Size and Education on Household Real Expenditure between 1998 and 2005**



**Table 1: Summary Statistics of the Variables Used in the Regressions**

	Mean	Standard Deviation	Minimum	Maximum
Province-Level Variables				
Log of Real Per Capita Expenditure in 1997 Rials	11.02	0.31	10.28	11.86
Log of Real Government Expenditure per Household in 1000s of 1997 Rials	-3.03	0.45	-4.28	-1.56
Log of Real IKRF Expenditure per Household in 1000s of 1997 Rials	-5.52	0.81	-7.80	-2.60
Log of Number of Individuals Covered by Rajaii Program per Household	-2.27	0.85	-5.19	-0.53
Log of Number of Individuals Covered by SWO per Household	-2.27	0.58	-5.71	-0.87
Log of Number of Individuals Covered by SSO Mandatory Program per Household	-1.23	0.47	-2.65	2.23
Log of Number of Individuals Covered by SSO Optional Program per Household	-3.40	0.93	-8.35	-2.09
Log of Number of Individuals Covered by SSO Unemployment Program per Household	-5.41	0.78	-9.79	-3.75
Number of Households per Province	1041	822	35	5372
Household-Level Variables				
Log of Real Household Expenditure in 1997 Rials	12.34	0.27	11.67	13.04
Log of 1 + Household Size	1.47	0.54	0.00	3.69
Log of Education of Non-Student Adults in the Household	1.38	0.88	0.00	3.09
Age of Head of Household	4.74	1.54	0.80	9.90
Female Headed Household Dummy	0.09	0.29	0.00	1.00
Log of 1 + Number of Young Child in Household	0.73	0.44	0.00	1.00
Log of 1 + Number of Teenager in Household	0.42	0.49	0.00	1.00
Log of 1 + Number of Household Members Aged 65+ (Except household head/spouse)	0.09	0.22	0.00	1.00
Urban Residence Dummy	0.49	0.50	0.00	1.00