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How incentives matter ? An illustration from the Targeted Subsidies reform in Iran*

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Abstract

We use the Targeted Subsidies Reform implemented in Iran in 2011 to recover empirically the social valuations of Iranian households relying on the assumption of optimal taxes. Unlike the existing literature, we do not restrict attention to a specific pattern for the incentive constraints associated with nonlinear income taxation. Instead we recover the Lagrange multipliers corresponding to these constraints. We find evidence of a significant redistribution toward the bottom three deciles of the income distribution before the reform. This redistribution is however limited by an incentive constraint where the rich envy the social treatment of the poor. At the outcome of the reform incentives no longer matter and the social welfare function of the government of Iran displays a Benthamite-like form.

JEL classification: D12, D82, H21, L51

Keywords: Principal-agent, incentive constraints, Iran, Targeted Subsidies, social valuations, AIDS.

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1 Introduction

Most theoretical models of public intervention into the economy rely on the principal-agent setup and so emphasize incentive considerations due to the presence of asymmetric information between the two parties. The regulator is assumed to deal with a firm better informed about its cost, and the tax authority has to design taxes observing neither labor skill nor effort of taxpayers. Asymmetric information limits the scope of public intervention. Large compensating transfers to high cost firms may lead more efficient firms to misreport their cost, and some high skilled taxpayers in the face of pro-poor income support programs may have an incentive to relax labor effort. Although incentive issues often seem theoretically sound, in practice little is known about how much they actually constraint public intervention.

The existing empirical literature is mostly aimed at detecting the presence of asymmetric information. The standard strategy relies on the hypothesis that agents differ according to a few dimension and have preferences satisfying a suitable version of the single-crossing condition. Under these assumptions only the local (downward) incentive constraints are relevant. One can then infer the presence of asymmetric information from the market outcome associated with this pattern of incentives. In insurance markets, for instance, this pattern corresponds to the situation where high risk insurees are ready to switch to the contract designed for low risk. If so, the optimal response of insurers consists to reduce the coverage of low risk. The offered contracts thus display a positive correlation between risk and coverage that reveals the presence of asymmetric information. This positive correlation test first proposed by Chiappori and Salanié (2000) yields 'decidedly mixed' evidence about asymmetric information (Finkelstein and Poterba, 2004).

The pattern of local downward incentive constraints is sometimes used directly as an identifying assumption that allows us to recover some underlying parameters of the economy. For instance the estimated weight put on firms' profits by the regulatory authority of the French water industry in Bontemps and Martimort (2014) is derived from first-order conditions for optimal contracts that are valid if low cost firms may choose the contract designed for the less efficient firms. In the public finance literature Bourguignon and Spadaro (2012) estimate the social valuations of various classes of taxpayers, who only differ according to labor skill, from first-order conditions for optimal income taxes assuming that conditions for the local downward neighboring incentive constraints are satisfied; see also, e.g., Immervoll et al. (2007), Eissa et al. (2008) or Blundell et al. (2009) for running similar exercises.

As stressed by Finkelstein and McGarry (2006) the reduction of individual heterogeneity to a few dimensions may be overly restrictive in insurance markets. This reduction is also problematic when agents are consumers who choose among many different consumption goods since we know from the econometrics of demand that a high number of free parameters is needed to achieve a flexible demand form. Finkelstein and Poterba (2013)

propose new empirical tests for detecting asymmetric information in the case where insurees differ according to several dimensions. Still, it remains unclear how the estimates of the underlying parameters that we recover depend on the additional theoretical restrictions introduced to deal with incentive constraints, e.g., single crossing conditions.

In our paper, unlike the main strand of the literature, we do not a priori restrict attention to some specific pattern of incentive constraints. Instead we rely on the assumption of an optimal public policy to recover this pattern. This is done by working with first-order conditions that still depend on the Lagrange multipliers associated with incentive constraints. These multipliers are estimated and, when found positive, the Kuhn-Tucker conditions imply that the associated constraints are binding. This strategy allows us to identify precisely the limits to redistribution due to asymmetric information, rather than simply detect whether asymmetric information operates or not in the market.

This methodology is illustrated on the Targeted Subsidies reform recently implemented in Iran. Until 2011 Iran was using the oil wealth to finance massive consumption subsidies. President Ahmadinejad launched in December 2010 a large reform that replaced the subsidies with a VAT-like scheme accompanied with compensating income transfers (see Guillaume et al., 2011). Gahvari and Taheripour (2011) and Gharibnavaza and Waschik (2015) discuss the redistributive impact of this reform abstracting from incentive issues. When taken into account, our results show that the reform has about equalized income class valuations. We find that incentive considerations matter before the reform, but no longer at its outcome. Before the reform, incentives only involve the rich and the poor: the redistribution toward the poor appears severely limited by the social desire to preserve a rich small elite. The middle income class households are never concerned by incentives, a feature that is inconsistent with the standard local downward pattern. In order to assess how our measures of the quantitative importance of incentives relate to incorrect assumptions about the pattern of incentive constraints, we run a counterfactual exercise where we a priori restrict attention to the familiar local downward pattern. The importance of incentives then is biased downwards.

The paper is organized as follows. Sections 2 and 3 derive necessary conditions for optimal consumption and income taxes that depend on Lagrangian multipliers associated with incentive constraints. Section 4 presents the Targeted subsidies reform and consumption data that we use. Section 5 finally gives the Lagrangian multipliers and the households' social valuations recovered from Iranian data.

2 Theoretical benchmark

The economy is populated with one government and a total unit size continuum of agents. There are n_i agents of type i $(i = 1, \ldots, I)$ whose preferences are represented by the utility function $u_i(\mathbf{x}, y)$, where $\mathbf{x}$ is a bundle of K consumption goods and y stands for before-tax income. The utility function is increasing quasi-concave in $(\mathbf{x}, -y)$. The (possibly

multidimensional) index i is private information to the agent.

The government has to finance an amount $G \neq 0$ of public expenditures. It can use linear consumption taxes $\mathbf{t}$ and nonlinear income taxes. Assuming fixed producer prices $\mathbf{p}$, the vector of consumer prices is $\mathbf{q} = \mathbf{p} + \mathbf{t}$. The income tax is $y - R(y)$ when the before-tax income is y.

Given y_i and the after-tax income $R_i = R(y_i)$ a type i agent consumes $\boldsymbol{\xi}_i(\mathbf{q}, y_i, R_i)$ that maximizes $u_i(\mathbf{x}, y_i)$ subject to her budget constraint $\mathbf{q}'\mathbf{x} \leq R_i$. Her indirect utility is $v_i(\mathbf{q}, y_i, R_i)$. Let (a_i) be the profile of exogenous social weights. Given (y_i) the government chooses $\mathbf{q}$ and (R_i) that maximize

$$\sum_i a_i n_i v_i(\mathbf{q}, y_i, R_i) \tag{1}$$

subject to the feasibility constraint

$$\sum_i n_i (\mathbf{q} - \mathbf{p})' \boldsymbol{\xi}_i(\mathbf{q}, y_i, R_i) + \sum_i n_i (y_i - R_i) \geq G, \tag{2}$$

and the incentive constraints

$$v_i(\mathbf{q}, y_i, R_i) \geq v_i(\mathbf{q}, y_j, R_j). \tag{3}$$

for all i and $j \neq i$.

Let ρ and (λ_{ij}) be the Lagrange multipliers associated with (2) and (3). The first-order condition for R_i to solve the government's program is

$$n_i a_i \alpha_{ii} + \rho n_i \left(\sum_\ell t^\ell \frac{\partial \xi_{ii}^\ell}{\partial R} - 1 \right) + \sum_{j \neq i} (\lambda_{ij} \alpha_{ii} - \lambda_{ji} \alpha_{ji}) = 0, \tag{4}$$

where

$$\alpha_{ji} = \frac{\partial v_j}{\partial R}(\mathbf{q}, y_i, R_i)$$

stands for the marginal utility of income of a type j agent endowed with (y_i, R_i). Using (4) and appealing to the Slutsky decomposition,

$$\frac{\partial \xi_{ii}^\ell}{\partial q^k} = \frac{\partial \hat{\xi}_{ii}^\ell}{\partial q^k} - \xi_{ii}^k \frac{\partial \xi_{ii}^\ell}{\partial R},$$

where $\hat{\xi}_{ij}^\ell$ is the compensated demand of good ℓ for a type i agent endowed with the income

bundle (y_j, R_j), the first-order condition in q^k can be written

$$\sum_i n_i \sum_\ell t^\ell \frac{\partial \hat{\xi}^\ell_{ii}}{\partial q^k} + \sum_i \sum_{j \neq i} \frac{\alpha_{ij}\lambda_{ij}}{\rho} \left(\xi^k_{ij} - \xi^k_{jj}\right) = 0. \tag{5}$$

Optimal consumption taxes are uniform if incentives do not matter, i.e., if λ_{ij} is 0 for every i and j. Otherwise they should be designed to relax incentive constraints: when type i mimics type j ($\lambda_{ij} > 0$), the consumption of good k should be discouraged when type i agents have a greater consumption of good k than the mimicked type j agents.

3 Targeted Subsidies reform

3.1 Empirical strategy

Our aim is to assess the relevant pattern of incentives and the redistributive stance over the period where the Targeted Subsidies reform was implemented in Iran. We rely on the assumption that the first-order conditions (4) and (5) for optimal taxes are satisfied. This system of $I + K$ first-order conditions is linear in the $I + I(I-1) = I^2$ ratios

$$a^*_i = a_i \frac{\alpha_{ii}}{\rho} \qquad \text{and} \qquad \lambda^*_{ij} = \frac{\alpha_{ij}\lambda_{ij}}{\rho}.$$

These are the parameters that we want to recover empirically. A 1 rial transfer toward one type i agent yields a^*_i rials to the society, which gives a measure for type i social valuation. Similarly, if the government were able to track type i agents when they mimic type j, a 1 rial tax paid by every such type i agents would yield λ^*_{ij} rials to the society. The relevant pattern of incentives is characterized by the constraints associated with the multipliers λ^*_{ij} that are positive. This pattern delineates the limits to redistribution implied by asymmetric information about agents' types: if $\lambda^*_{ij} > 0$ for some i, a greater transfer toward type j agents is socially valuable but it cannot be implemented because it would imply a violation of incentive requirements.

It is convenient to rewrite (4) and (5) in a form that is better suited for empirical purpose, switching to expenditures and demand elasticities,

$$n_i a^*_i = n_i \left(1 - \sum_\ell \frac{t^\ell_{\text{val}}}{1 + t^\ell_{\text{val}}} \frac{n_i q^\ell \xi^\ell_{ii}}{n_i R_i} \varepsilon^{\ell R}_{ii}\right) - \sum_{j \neq i} \left(\frac{\alpha_{ii}}{\alpha_{ij}} \lambda^*_{ij} - \lambda^*_{ji}\right), \tag{6}$$

$$\sum_\ell \frac{t^\ell_{\text{val}}}{1 + t^\ell_{\text{val}}} \sum_i n_i \frac{q^k \xi^k_{ii}}{q^k \xi^k} \hat{\varepsilon}^{k\ell}_{ii} + \sum_i \sum_{j \neq i} \frac{\lambda^*_{ij}}{n_i} \left(\frac{n_i q^k \xi^k_{ij}}{q^k \xi^k} - \frac{n_i}{n_j} \frac{n_j q^k \xi^k_{jj}}{q^k \xi^k}\right) = 0, \tag{7}$$

with ad valorem taxes (t^{ℓ}_{val}) defined by

$$\frac{t^{\ell}}{q^{\ell}} = \frac{t^{\ell}_{\text{val}}}{1 + t^{\ell}_{\text{val}}}.$$

The income and compensated price elasticity of demand $\varepsilon^{\ell R}_{ij}$ and $\hat{\varepsilon}^{k\ell}_{ij}$ of good ℓ apply to a type i agent earning y_j before tax and R_j after tax.

Once endowed with estimates for elasticities, our data leaves us with (a^*_i) and (λ^*_{ij}) as the only unknowns in (6) and (7). Since the profile (a^*_i) is absent from (7), one can recover these unknowns by proceeding in two steps. In the first step we recover the profile of the $I(I-1)$ multipliers (λ^*_{ij}) by minimizing the sum of the K squared left-hand side of (7). Second, we reintroduce these multipliers into the I equations (6) to get the I social valuations (a^*_i).

3.2 Data from Iran

The first-order conditions (6) and (7) involve consumption and tax data. Consumption data comes from the Household Income and Expenditure Survey (HIES) collected every year from 1388 to 1393 by the Statistical Center of Iran. The HIES provides us with household expenditures on COICOP categories of goods, as well as some households demographic variables. Our sample consists of urban literate households between the ages of 18 and 70.[1] They are allocated to three income classes: the poor consist of the bottom three deciles of the per consumption unit total (positive) expenditures distribution while the rich are in the top decile of this distribution. To deal with high inflation that prevails over the sample window, we build these classes referring to each year separately, e.g., the poor income class consists of the households that belong to the bottom three deciles in 1388, plus those in the same quantiles in 1389, and so on.

The HIES gives expenditures $q^k \xi^k_{ii}$ on category k and total expenditures R_i of each class i household. Categories of consumption goods are aggregated according to the 2-digit level of the COICOP international classification.[2] Appendix A shows that the main differences in the consumption of the various classes relate to Food, Clothing and Health. Food appears inferior whereas the budget shares of Clothing and Health are up to three times higher for the rich than the poor.

The consumption subsidies used in Iran before the Targeted Subsidies reform are difficult to assess because of hidden components that are not reflected in the official tax scale (Esfahani and Taheripour, 2002). In what follows we impute the subsidies used by Gahvari and Taheripour (2011) to year 1388 of the Iranian calendar (from March 21, 2009), which

[1] We remove observations in the bottom and top 1 percent of the income distribution, and those where more than 99 percent of the household budget is allocated to one consumption category only. Our final sample consists of 77,364 observations.

[2] Details about the COICOP classification are available at `http://unstats.un.org/unsd/cr/`.

constitutes our pre-reform period. Appendix A shows that the subsidies are concentrated on Transport and Food, with respective rates of subsidies 54 and 28 percent. We neglect the 1% standard rate of VAT applied in 1388 because we have no information about how it was interacting with subsidies. In our post-reform period, which is year 1393 of the Iranian calendar (from March 21, 2014), we have considered that the tax base is shaped by 7% rate of VAT.

The elasticities and the fictitious demand of a class i household adjusting labor effort to earn the before-tax income of class j households that appear in (6) and (7) obtain by estimating a complete AIDS for each class. The price indexes of the COICOP categories come from the Central Bank of Iran for every province of Iran and month from 1388 to 1393. Some details about the AIDS specification[3] and the relevant elasticities are given in Appendix B.

The name of the reform stems from the Targeted Subsidies, which are fixed income transfers paid to every person to compensate for the loss in purchasing power. At the completion of the reform, these transfers coexist with a progressive income tax ruled in Iran by the Direct Taxation Act. Our data provides us neither with household before-tax nor after-tax income. We treat the before-tax income as an unobserved component of household taste heterogeneity that is perfectly correlated with the income class by estimating the AIDS for every income class separately. This gives us demand functions conditional to the before-tax income. Final consumption expenditure is used as a proxy for the after-tax income.

4 Empirical results

4.1 Pattern of incentives

In order to recover (λ^*_{ij}) from (7), we need the fictitious consumption $\xi^k_{ij} = \xi^k_i(\mathbf{q}, y_j, R_j)$. However the data contains no information about household before-tax income. From now on, we approximate ξ^k_{ij} by the fitted AIDS of type i evaluated at the after-tax income of class j, i.e., ξ^k_{ij} is set to $\xi^k_i(\mathbf{q}, y_i, R_j)$. This approximation is exact when utility is separable in before-tax income, e.g.,

$$u_i(\mathbf{x}, y) = U_i(\mathbf{x}) - V_i(y). \tag{8}$$

Since the AIDS is log-linear in income, imputing the mean after-tax income of class j would bias the fitted demand upwards and thus dampen the estimated magnitude of the Lagrange multipliers in (7). To tackle this issue we have used a matching procedure to

[3]Since the AIDS budget share is log-linear in after-tax income (total expenditures), we have removed the bottom and top 1 percent of the income distribution to improve the quality of demand estimation (see footnote 1). We use family size as demographic control. The COICOP categories Alcoholic beverages, tobacco and narcotics (02), Housing, water, electricity, gas and other fuels (04), Recreation and culture (09) and Education (10) are considered as fixed expenditures and treated as individual controls.

impute to each household of class i, if mimicking some type j household, the after-tax income of the household of class j who has the nearest score.[4] Appendix C reports the resulting consumption ratio differences

$$\frac{n_i q^k \xi^k_{ij}}{q^k \xi^k} - \frac{n_i}{n_j} \frac{n_j q^k \xi^k_{jj}}{q^k \xi^k} \tag{9}$$

that appear in (7). The most significant differences (in bold in Appendix C) are concentrated on Clothing, Transport and Communication. They mostly involve the poor in 1388, while all the income classes are concerned in 1393. This might reflect a widening of between-class differences in consumption tastes over the sample time window.

Table 1: Incentive pattern in Iran

		Actual		Restricted	
	Tax system of year	1388	1393	1388	1393
Actual class	Imputed income				
Poor	Middle	4.68e-03	3.88e-02	0	0
		(1.71e-02)	(1.34e-01)		
	Rich	1.50e-08	1.04e-06	0	0
		(5.42e-08)	(3.58e-06)		
Middle	Poor	1.17e-04	3.31e-07	4.82e-09	3.24e-02
		(4.92e-04)	(1.41e-06)	(7.95e-09)	(3.29e-02)
	Rich	2.77e-10	1.10e-08	0	0
		(1.13e-11)	(4.65e-08)		
Rich	Poor	1.29	8.17e-10	0	0
		(5.44)	(3.37e-09)		
	Middle	1.06e-06	4.01e-06	7.06e-01	1.38e-09
		(4.47e-06)	(1.82e-05)	(7.46e-01)	(2.41e-09)

1. Poor (D1-D3); Middle (D3-D9); Rich (D9-D10).
2. Upper one-sided 1000-iteration bootstrap confidence interval at the 90 percent level.

The non negative per household multipliers (λ^*_{ij}/n_{ij}) solutions to (7) are those minimizing the sum of the K squared left-hand sides of (7) in 1388 and 1393. Over the 6 incentive constraints, few actually bind. In 1388 only the incentive constraint involving the rich mimicking the poor is binding. If the government could design a specific tax of 1 rial applying to one rich household when mimicking its matched poor, the social gain would

[4]The score is computed for each year 1388 and 1393 separately from a logit model that regresses the probability of belonging to class i rather than j on age, education, household size and province.

amount to 1.29 rial. We have computed (upper one-sided) confidence intervals using the non-Studentized pivotal bootstrap method. The multiplier associated with this binding incentive constraint should not exceed 5.44 rials, while all the remaining multipliers can be set to 0. This exercise allows us to identify precisely some limits to redistribution in Iran before the implementation of the Targeted Subsidies reform: the social desire to preserve the existence of the upper income class prevents the government of Iran to implement more generous income transfers toward the poor. This finding suggests political economy justifications to Ahmadinejad's Targeted subsidies program as a change in both consumption and income taxes suitably designed to favor the poor and/or hurt the rich.

In 1393 the Lagrange multipliers are very low in magnitude. The highest one is associated with the incentive constraint where the poor are ready to mimic middle income class households, with a 1 rial tax bearing on a poor yielding only 0.04 rial to the society.

We find no compelling evidence for the familiar local downward incentive pattern in our setup where agents differ according to consumption tastes and labor skill. In 1388 a non neighboring downward incentive constraint binds (the rich envy the poor but they do not envy the middle class). In 1393 the prevalent constraint is a neighboring upward constraint. To assess for the impact of the a priori restriction that only local downward incentive constraints can bind, we have reproduced the same minimization exercise under the additional requirement that the Lagrange multipliers associated with either non local or local upward incentive constraints are 0 in (7). The results reproduced in columns 3 and 4 of Table 1 show that the rich would then be mistakenly identified as mimicking the middle class in 1388. The magnitude of 0.7 rial of the multiplier associated with this incentive constraint is much lower than 1.29 rial: the standard pattern of local downward incentive constraints biases downwards the quantitative importance of incentives.

4.2 Redistributive impact of the reform

One can now get the profile (a_i^*) by reintroducing the multipliers (λ_{ij}^*) reported in Table 1 into (6). The results are given in columns 1 and 2 of Table 2. The marginal utility of income α_{ij} of class i mimicking class $j \neq i$ households is approximated by the fitted after-tax income derivative of the AIDS indirect utility for a class i household receiving the after-tax income R_j of its matched class j household,

$$\alpha_{ij} = \frac{\partial v_i}{\partial R}(\mathbf{q}, y_j, R_j) \simeq \frac{\partial v_i}{\partial R}(\mathbf{q}, y_i, R_j).$$

The approximation is exact for the class of separable preferences (8). The resulting ratios of marginal utilities of income α_{ii}/α_{ij} in (6) are given in Appendix C.

Following the Iran-Iraq war, the percentage of Iranians below the poverty line started to declined from 30% to below 10% in our pre-reform period (Salehi-Isfahani, 2017). However there is little agreement about the role played by the oil-financed consumption subsidies

Table 2: Social valuations in Iran (a_i^*)

Tax system	Actual		Restricted	
Year	1388	1393	1388	1393
Income class i[1]				
Poor	2.37	0.91	1.36	1.01
	(1.96 – 3.7)[2]	(0.84 – 0.99)	(1.36 – 1.36)	(1.01 – 1.01)
Middle	1.29	1.04	2.03	0.97
	(0.30 – 1.4)	(0.98 – 1.21)	(2.00 – 2.08)	(0.97 – 0.98)
Rich	0.95	0.98	0.95	0.98
	(0.41 – 1.43)	(0.88 – 0.98)	(0.94 – 0.97)	(0.98 – 0.98)

1: Poor (D1-D3); Middle (D3-D9); Rich (D9-D10).
2: Two-sided 1000-iteration bootstrap confidence interval at the 90 percent level.

in this decline. Indeed much of the decline occurs over a period of possibly confounding economic growth. Moreover pro-poor bread subsidies coexist with energy subsidies that tend to benefit richer households that have more cars and energy allowances (Guillaume and al., 2011; Salehi-Isfahani, 2016), which blurs the overall redistributive impact of the subsidies. The results reproduced in column 1 of Table 2 highlight a clear progressive design of taxes in line with the view of Mahmoud Ahmadinejad as a populist leader favoring the poor. We find that a 1 rial transfer to a poor household yields more than 2 rials to the society while the recovered social valuations of richer households do not exceed 1.4 rial. Note that the estimates of the social valuations in column 1 lack of precision, which possibly reflects high homogeneity of consumption tastes within income classes.

The economic situation of Iran is very different in 1393, at the outcome of the reform. The Rohani government then faces economic recession associated with dampened income inequality.[5] According to Salehi-Isfahani (2017), 'for the time being, delivering on the promise of greater equity seems to be low on the agenda of policy makers in Iran $[\cdots]$ and not much should be expected $[\cdots]$ other than what market forces make possible.' This analysis is closely aligned with the social valuations reported in column 2. All the valuations now are very precisely estimated around 1 rial: the social welfare function of the government of Iran displays the Benthamite (unweighted Utilitarian) shape valuing identically the various types of households.

Columns 3 and 4 give the valuations obtained in the counterfactual experiment where only the local downward incentive pattern can bind. The theoretical rule (6) for optimal

[5]International sanctions hurt top incomes while Targeted Subsidies transfers represent a larger share of the income of the poor. In our (urban) sample the Gini coefficient of total expenditures decreased from 0.33 in 1388 to 0.28 in 1393.

income taxes shows that the valuation of a mimicked type i ($\lambda^*_{ji} > 0$ for some $j \neq i$) is high compared to the situation where this type would be not envied ($\lambda^*_{ji} = 0$ for all $j \neq i$). Symmetrically the valuation of a mimicker type i ($\lambda^*_{ij} > 0$ for some $j \neq i$) is low compared to the situation where this type would envy nobody ($\lambda^*_{ij} = 0$ for all $j \neq i$). In 1388 the rich mimic the middle class in the counterfactual experiment while they actually mimic the poor. The valuation of the poor (middle income class) is accordingly adjusted downwards (upwards) from column 1 to 3. Thus the social importance of the poor is underestimated when restricting attention to the local downward incentive pattern.

5 Concluding comments

This paper proposes a simple new method to assess empirically the pattern of relevant incentive constraints. It relies on the estimation of the Lagrange multipliers associated with incentive constraints that appear in the first-order conditions for optimal taxes. By the usual complementary (Kuhn-Tucker) slackness conditions, an incentive constraint is binding if the associated multiplier is positive. An illustration on data from Iran over the period of the Targeted subsidies reform highlights the high social importance of the poor before the reform: a 1 rial income transfer toward a poor household yields at least 2 rials to the society. The redistribution toward the poor is however limited by the social concern of preserving a rich small elite: the incentive constraint where the rich are ready to mimic the poor appears binding before the reform. Pressures due to incentive constraints are about absent at the outcome of the reform. Greater equity then seems to be far from the concerns of the government of Iran. These findings appear consistent with political economy considerations stressed by, e.g., Salehi-Isfahani (2017).

1. Our database does not provide us with information about before-tax income. Under a suitable separability assumption on individual preferences, one can dispense from this information in the treatment of mimicking behavior. Separability sounds more plausible at the high level of aggregation of 2-digit COICOP consumption categories that we use: changes in labor supply may then mostly trigger within category substitutions, e.g., buying within the broad Clothing category some tailored-suit rather than casual wear when an individual is working. Our methodology however does not rely on separability assumptions. It would be worth to apply it on a richer database that contains before-tax income information.

2. There are two issues that would be worth to explore further in the specific case of Iran. First, anecdotal evidence suggests a weak enforcement of income taxes in the private sector. Our results should not change too much if the government of Iran designs taxes assessing accurately the induced tax leakage. Otherwise the amended first-order conditions for optimal taxes affect the recovered incentives and social valuations. The second issue concerns the production side of the economy. Our setup supposes that

this side is not affected by the reform. The part of the Reform Act stipulating that some revenues raised in the reform would take the form of direct transfers to firms was never implemented. Still energy subsidies benefited firms, which should influence producer prices.

References

[1] Blundell, R., M. Brewer, P. Haan and A. Shephard, 2009, Optimal income taxation of lone mothers: an empirical comparison for Germany and the UK., Economic Journal 119, 101-121.

[2] Bontemps, C. and D. Martimort, 2014, Identification and estimation of incentive contracts under asymmetric information: an application to the French water sector, working paper.

[3] Bourguignon, F. and A. Spadaro, 2012, Tax-benefit revealed social preferences, Journal of Economic Inequality 10, 75-108.

[4] Chiappori, P.A. and B. Salanié, 2000, Testing for asymmetric information in insurance markets, Journal of Political Economy 108, 56-78.

[5] Eissa, N., H. Kleven and C. Kreiner, 2008, Evaluation of four tax reforms in the United States: labour supply and welfare effects for single mothers, Journal of Public Economics 92, 795-816.

[6] Esfahani, H. and F. Taheripour, 2002, Hidden public expenditures and the economy in Iran, International Journal of Middle Eastern Studies 34, 691-718.

[7] Finkelstein, A. and J. Poterba, 2004, Adverse selection in insurance markets: policyholder evidence from the U.K. annuity market, Journal of Political Economy 112, 183-208.

[8] Finkelstein, A. and K. McGarry, 2006, Multiple dimensions of private information: evidence from the long-term care insurance market, American Economic Review 96, 938-958.

[9] Finkelstein, A. and J. Poterba, 2013, Testing for asymmetric information using 'unused observables' in insurance markets: evidence from the U.K. annuity market, MIT working paper available at `https://economics.mit.edu/files/9424`.

[10] Gahvari, F. and F. Taheripour, 2011, Fiscal reforms in general equilibrium: theory and an application to the subsidy debate in Iran, The B.E. Journal of Economic Analysis and Policy 11, 1935-1682.

[11] Gharibnavaz, M. and R. Waschik, 2015, Food and energy subsidy reforms in Iran: A general equilibrium analysis, Journal of Policy Modeling 37, 726-741.

[12] Guillaume, D., R. Zytek, and M. Reza Farzin, 2011, The chronicles of the Subsidy Reform, International Monetary Fund WP/11/167.

[13] Immervoll, H., H. Kleven, C. Kreiner, and E. Saez, 2007, Welfare reform in European countries: a microsimulation analysis, Economic Journal 117, 1-44.

[14] Salehi-Isfahani, D., 2016, Energy subsidy reform in Iran, in: Galal, A. and I. Diwan (Eds.), The Middle East Economies in Transition, International Economic Association Series, Palgrave Macmillan, 186-198.

[15] Salehi-Isfahani, D., 2017, Poverty and income inequality in the Islamic Republic of Iran, Revue Internationale des Etudes du Développement, 113-136.

A Taxes and expenditures

Table 3 gives the expenditures for the 8 COICOP categories that are considered as flexible, the total expenditures on these categories and the corresponding budget shares.

Table 3: TAXES AND EXPENDITURES[1]

	Food	Clothing	Furnishings	Health	Transport	Communication	Restaurants	Other	Total[2]
Taxes									
Year 1388[3]	-0.28	-0.14	-0.23	-0.26	-0.54	0	0	-0.09	
Year 1393	0	0.07	0.07	0	0.04	0	0.07	0.07	
Expenditures									
Poor[4]	66,699	5,100	4,105	5,897	9,645	7,172	1,143	4,630	104,394
	(63.9)[5]	(4.8)	(3.9)	(5.6)	(9.2)	(6.9)	(1.1)	(4.4)	
Middle[4]	79,245	12,036	5,465	9,705	12,886	8,461	2,203	5,905	135,909
	(58.3)	(8.9)	(4)	(7.1)	(9.5)	(6.2)	(1.6)	(4.3)	
Rich[4]	112,052	31,392	9,653	23,669	20,079	11,802	4,660	9,028	222,339
	(50.4)	(14.1)	(4.3)	(10.6)	(9)	(5.3)	(2.1)	(4)	

1. Expenditures are expressed in thousands of rials.
2. Average household expenditures (other than COICOP categories 02, 04, 09 and 10) used as a proxy for total net income.
3. Computed using subsidies in Gahvari and Taheripour (2011).
4. Poor (D1-D3); Middle (D3-D9); Rich (D9-D10).
5. Household budget share in percent.

B AIDS estimation

The elasticities and the marginal utility of income are derived from an AIDS specification estimated for different income classes, which allows for taste heterogeneity perfectly correlated with income. The AIDS specification assumes that the budget share of good k for a household h in income class i (which is her type of the theoretical setup) obeys

$$\frac{q^k \xi^k_{hh}}{R_h} = \delta^k_i + \zeta_i f_h + \sum_{k'} \gamma^{kk'}_i \log q^{k'} + \beta^k_i \log\left(\frac{R_h}{Q_i}\right),$$

where Q_i is a income class i consumer price index defined by

$$\log Q_i = \delta^0_i + \sum_{k'} \delta^{k'}_i \log q^{k'} + \frac{1}{2}\sum_{k,k'} \gamma^{kk'}_i \log q^k \log q^{k'}.$$

Household h living in a given province and surveyed during a given month faces consumer prices indexes (q^k) computed by the Central Bank of Iran for this province and this month. The demand functions are estimated using the number of consumption units and the household demand for COICOP categories 02, 04, 09 and 10 as household h demographic control included into the 5-dimensional vector f_h, and imposing the usual AIDS restrictions on parameters

$$\sum_{k'>0} \delta^{k'}_i = 1,\ \sum_k \gamma^{kk'}_i = \sum_{k'} \gamma^{kk'}_i = 0,\ \sum_k \beta^k_i = 0,\ \gamma^{kk'}_i = \gamma^{k'k}_i.$$

These restrictions ensure that budget shares sum to 1, and that homogeneity and symmetry properties of demand are satisfied. The demand functions are estimated for each income class using consumption data for every year from 1388 to 1393. The estimated demand functions yield the elasticities that appear in (6) and (7). These elasticities are computed separately for year 1388 and for year 1393. They are given in Table 4.

Table 4: Compensated price and income elasticities

Price of	Food	Clothing	Furnishings	Health	Transport	Communication	Restaurants	Other	Income
Rich									
1388									
Food	-0.48	0.33	0.12	0.08	-0.04	-0.08	0.07	0.01	0.74
Clothing	0.29	-0.46	0.20	0.33	-0.18	-0.16	-0.03	0.01	1.18
Furnishings	0.34	0.67	-1.08	0.33	-0.26	-0.12	0.07	0.05	1.05
Health	0.11	0.49	0.15	-0.80	0.04	-0.08	0.04	0.04	1.20
Transport	0.19	0.88	0.40	-0.15	-1.48	-0.07	0.06	0.17	1.20
Communication	0.37	0.82	0.18	0.28	-0.07	-1.58	-0.02	0.02	1.26
Restaurants	1.58	-0.76	0.56	0.72	-0.31	0.09	-1.35	-0.53	1.12
Other	1.88	1.52	2.77	5.35	-6.33	-0.91	-3.80	-0.49	-1.91
1393									
Food	-0.46	0.34	0.12	0.08	-0.05	-0.11	0.06	0.02	0.77
Clothing	0.35	-0.47	0.21	0.30	-0.17	-0.19	-0.04	0.01	1.18
Furnishings	0.39	0.65	-1.06	0.30	-0.25	-0.14	0.06	0.05	1.05
Health	0.14	0.49	0.16	-0.84	0.06	-0.11	0.04	0.05	1.23
Transport	0.24	0.90	0.41	-0.20	-1.50	-0.10	0.06	0.19	1.21
Communication	0.42	0.70	0.17	0.24	-0.07	-1.47	-0.01	0.03	1.19
Restaurants	2.27	-1.37	0.78	0.92	-0.42	0.16	-1.55	-0.80	1.18
Other	0.77	0.72	0.83	1.61	-1.74	-0.34	-1.00	-0.86	0.23
Middle									
1388									
Food	-0.41	0.34	0.10	0.00	0.01	-0.10	0.06	0.00	0.81
Clothing	0.30	-0.42	0.14	0.15	-0.11	-0.12	-0.01	0.07	1.14
Furnishings	0.44	0.73	-1.06	0.12	-0.24	-0.07	0.03	0.06	0.97
Health	0.00	0.56	0.09	-1.07	0.28	0.01	0.03	0.11	1.10
Transport	-0.11	1.11	0.47	-0.74	-1.29	0.14	0.07	0.36	0.79
Communication	0.58	0.80	0.09	-0.02	0.09	-1.54	-0.04	0.04	1.03
Restaurants	3.00	-0.52	0.28	0.40	-0.37	0.33	-1.75	-1.37	1.27
Other	0.07	1.72	0.27	0.70	-0.87	-0.15	-0.63	-1.11	0.73
1393									
Food	-0.40	0.36	0.10	0.00	0.01	-0.13	0.05	0.01	0.83
Clothing	0.35	-0.42	0.15	0.14	-0.11	-0.16	-0.02	0.08	1.14
Furnishings	0.48	0.72	-1.05	0.11	-0.23	-0.11	0.02	0.06	0.97
Health	-0.01	0.58	0.09	-1.11	0.31	-0.01	0.02	0.12	1.11
Transport	-0.08	1.13	0.47	-0.76	-1.29	0.11	0.07	0.37	0.78
Communication	0.56	0.70	0.09	0.01	0.05	-1.43	-0.03	0.04	1.02
Restaurants	7.78	-2.33	0.63	0.88	-0.96	1.03	-3.14	-3.88	1.75
Other	0.18	1.45	0.23	0.56	-0.68	-0.16	-0.49	-1.08	0.79
Poor									
1388									
Food	-0.34	0.29	0.10	0.07	-0.02	-0.18	0.06	0.01	0.91
Clothing	0.40	-0.56	0.12	0.18	-0.09	-0.19	0.02	0.12	1.12
Furnishings	0.57	0.50	-0.88	0.23	-0.18	-0.14	-0.11	0.01	0.98
Health	0.24	0.45	0.14	-1.01	0.21	-0.10	-0.01	0.09	1.05
Transport	0.18	0.72	0.35	-0.66	-1.00	0.01	-0.05	0.45	0.90
Communication	0.62	0.49	0.09	0.10	0.00	-1.37	0.04	0.04	1.06
Restaurants	1.19	0.34	-0.38	-0.05	0.09	-0.22	-0.58	-0.39	1.13
Other	0.20	1.30	0.02	0.37	-0.60	-0.15	-0.30	-0.84	0.92
1393									
Food	-0.32	0.30	0.10	0.07	-0.02	-0.21	0.06	0.02	0.91
Clothing	0.43	-0.56	0.12	0.17	-0.09	-0.22	0.02	0.13	1.12
Furnishings	0.60	0.50	-0.88	0.22	-0.18	-0.17	-0.11	0.01	0.98
Health	0.26	0.45	0.15	-1.03	0.22	-0.12	-0.01	0.10	1.05
Transport	0.20	0.72	0.36	-0.67	-1.00	-0.02	-0.05	0.46	0.90
Communication	0.64	0.47	0.09	0.10	-0.01	-1.36	0.04	0.04	1.05
Restaurants	1.27	0.34	-0.41	-0.08	0.10	-0.25	-0.55	-0.42	1.14
Other	0.27	1.18	0.03	0.33	-0.53	-0.18	-0.26	-0.85	0.93

C Mimickers' behavior

The demand of a household of class i that would mimic the behavior of a household of class j is computed from the fitted demand of class i evaluated at the after-tax income (total expenditures) of the nearest score household of class j. The differences (9) are given in Table 5. The last column of this table gives the corresponding differences in marginal utilities of income in the ratio formulation relevant in (6).

Table 5: Mimickers' fictitious demand

		$\frac{n_i q^k \zeta^k_{ij}}{q^k \xi^k} - \frac{n_i}{n_j} \frac{n_j q^k \zeta^k_{jj}}{q^k \xi^k}$ in (9)								$\frac{\alpha_{ii}}{\alpha_{ij}}$ in (6)
class i	income j	Consumption category k								
		Food	Clothing	Furnishings	Health	Transport	Communication	Restaurants	Other	
1388										
Poor	Middle	-0.04[1]	**0.88**	0.36	0.28	-0.54	**-1.16**	0.26	-0.04	1.86
Poor	Rich	-0.03	**1.56**	0.59	0.30	**-0.98**	**-2.15**	0.33	-0.07	3.25
Middle	Poor	-0.05	0.49	0.16	0.08	-0.28	-0.34	-0.03	-0.09	0.56
Middle	Rich	-0.12	**1.53**	0.43	0.09	**-0.79**	**-1.05**	-0.35	-0.29	1.75
Rich	Poor	-0.05	0.31	0.22	0.21	-0.29	-0.30	0.01	-0.14	0.55
Rich	Middle	-0.09	0.53	0.41	0.41	-0.51	-0.55	-0.04	-0.24	0.31
1393										
Poor	Middle	-0.06	**1.33**	0.47	0.38	-0.59	**-1.82**	0.26	-0.09	1.89
Poor	Rich	0.01	**2.12**	**0.79**	0.43	**-0.94**	**-2.99**	0.33	-0.10	3.03
Middle	Poor	-0.05	**0.79**	0.25	0.13	-0.28	-0.59	-0.08	-0.08	0.56
Middle	Rich	-0.08	**1.94**	0.59	0.11	**-0.71**	**-1.45**	-0.51	-0.26	1.62
Rich	Poor	-0.05	0.48	0.31	0.26	-0.26	-0.47	-0.01	-0.12	0.61
Rich	Middle	-0.08	**0.74**	0.49	0.45	-0.46	**-0.77**	-0.11	-0.22	0.33

Note 1: The difference between the Food budget share (in total Food expenditures) of a Poor household who would earn the income of a Middle class household and the Food budget share of a Middle class household is -0.04 percentage points in 1388.