

The distributional impact of reforms to direct and indirect tax in El Salvador

Analytical Report and Results*

Laura Abramovsky[♦], Orazio Attanasio^{*},

and David Phillips[♦],

June 2012

Abstract:

In an effort to improve its' public finances and rationalise the tax system, a range of significant reforms were approved in 2009 and 2011. In this context, the World Bank has commissioned the IFS to develop a tax simulator for El Salvador, with an aim of increasing capacity for the distributional and revenue analysis of tax reforms in this country. This is the final paper of this project.

We develop a new multi-country tax micro-simulation model (LATAX) for the analysis of VAT, excise duties, income tax and social security contributions, as well as (non means-tested) price subsidies, which is based on our micro-simulation model for Mexico (MEXTAX). LATAX can quantify the revenue and distributional impact of tax reforms under both the assumption that individuals do not change their behavior as a consequence of changes in taxes, and the assumption that individuals react to these changes along specific margins.

In this paper we assess the distributional and revenue impact under the assumption of no behavioral response of one actual and three hypothetical reforms. The first is the actual reform made to the income tax system in 2011. The three hypothetical reforms are: a reduction in the rate of VAT rate on food consumed at home to 0% as in nearby Mexico; an increase in the rate of VAT from 13% to 14%; and setting the specific duty on alcohol to \$12.00 per litre of pure (100%) alcohol for all alcohol variants.

Careful analysis of the most suitable household survey data available in El Salvador (EHPM 2010) shows that households significantly under-report incomes and expenditures relative to National Accounts and other administrative data (such as tax revenues). Adjusting reported incomes and expenditure is crucial in order to obtain sound and reasonable distributional and revenue estimates for tax reforms, especially for those to excise duties, as alcohol and tobacco expenditure is particularly under-reported. Our results are highly sensitive to the correction for under-recording, particularly the analysis of the income tax reform. But it is not clear that the particular adjustments we have made properly 'correct' for under-reporting. This was identified as a big obstacle to robust analysis of tax reforms at the start of this project and we believe that the work we have done in this paper reinforces that view. In addition, difficulties in obtaining suitable data from the survey has led us to conclude that the EHPM could be improved considerably by re-designing the structure and organisation of the survey questionnaire and the user instructions.

This project has made useful first steps in improving the capacity to analyse tax reforms in El Salvador and, we hope, will spur further development going forward: there is ample room for improvement in both the data and the model. In particular, we feel that it is important that more effort is exerted in improving the quality of surveys and provisions should be made for the linking of the survey data to administrative data such as anonymised tax record micro-data from El Salvador. We stress that this should be a priority: otherwise the results obtained from the LATAX model – and, indeed, any tax microsimulation model – will not be of the high quality needed to accurately assess the distributional impacts of past and potential reforms to the tax system.

* The authors would like to thank José Andrés Oliva Cepeda at FUSADES for his invaluable help in explaining the tax and transfer system in El Salvador and information on the data available for use in the micro-simulation model.

[♦]Institute for Fiscal Studies. Contacts: labramovsky@ifs.org.uk and david_p@ifs.org.uk (corresponding author)

^{*} University College London, Institute for Fiscal Studies and NBER. Contact: o.attanasio@ucl.ac.uk

Executive summary

Introduction

In an effort to improve its' public finances and rationalise the tax system, a wide range of significant reforms were approved in 2009 and 2011. In this context, the World Bank has commissioned the IFS to develop a tax simulator for El Salvador, with an aim of increasing capacity for the distributional and revenue analysis of tax reforms in El Salvador. This is the final paper of this project.

We develop a new multi-country tax micro-simulation model (LATAX) for the modelling of VAT, excise duties, income tax and social security contributions, as well as simple price subsidies, and apply it to El Salvador. LATAX, developed from our earlier model for Mexico (MEXTAX), can quantify the revenue and distributional impact of tax reforms under both the assumption that individuals do not change their behavior as a consequence of changes in taxes, and the assumption that individuals react to these changes along specific margins.

The tax reforms analysed in this paper

In this report we analyse the distributional and revenue impacts of four tax changes:

- The actual reforms made to the income tax system in 2011
- A reduction in the rate of VAT rate on food (excluding restaurants, canteens, etc) to 0% as in nearby Mexico
- An increase in the rate of VAT from 13% to 14%
- Setting the specific duty on alcohol to \$12.00 per litre of pure (100%) alcohol for all alcohol variants

LATAX: Data, methods and assumptions

The LATAX model is a static microsimulation model which examines the distributional and revenue impacts of tax reforms at one point in time (in this instance, 2010). It has the capabilities to simulate the labour supply impact of reforms (using suitable assumptions on elasticities of participation and hours of work), and can allow for different assumptions on the extent to which indirect taxes are passed on from firms to consumers in the form of higher prices. *These features are not utilised in this report* (see Abramovsky et al, 2011 and 2012, and forthcoming LATAX manual for more detail on these behavioural 'models' and the simulator more generally).

The data we use in this study comes from different sources:

- The main 'raw' data used for analysis in this report is a data set combining EHPM 2010 with ENIGH 2005-06.
- The main survey is the *Encuesta de Hogares de Propósitos Múltiples* (EHPM) 2010. This contains detailed demographic, income and expenditure data for approximately 21,000 households in El Salvador for the 2010 calendar year.
- EHPM significantly under-records expenditure on alcohol and tobacco, in part because the items are not listed in the survey questionnaire and respondents must actively opt-in to providing such information (as opposed to opting out with most other categories of expenditure). We use data from the *Encuesta Nacional de Ingresos y Gastos de los*

Hogares (ENIGH) 2005-06 to impute expenditure on alcohol and tobacco at the household level in EHPM 2010.

- EHPM, as is common with other household surveys in many countries, also significantly under-records expenditures and incomes more generally. We use simple methods to correct for the under-reporting of income and expenditure. We adjust income by a constant factor so that total incomes from EHPM (gross up using sampling weights) match National Accounts totals. We adjust expenditure by category-specific factors so that expenditure in EHPM in each of the five categories we define matches expenditure from National Accounts. We perform a further adjustment to alcohol spending using administrative data on revenues collected from specific duties on alcohol and assumptions about the retail price and alcohol content for each type of alcohol. We present results with and without these corrections.

We use these data, together with a number of assumptions about how the raw variables translate into the variables necessary for our simulator (such as formality status) to create three model input datasets: a household file, an expenditure file and an individual file (that includes income and social security status). The main assumptions underlying our baseline results are as follows:

- Informal consumption is defined if good or service is purchased from informal vendors (e.g. stalls, hawkers, etc)
- A formal worker is defined as having social security coverage through their own work
- Formal workers are assumed to comply with the tax law on all their income. Deductions for certain expenses (e.g. education and health expenses) are not accounted for
- Working-age adults contribute to the new system of social security (defined contribution scheme) as opposed to the old scheme
- Income tax is fully incident on the worker
- VAT and duties are fully incident on the consumer

To assess the impact of a reform we look at whether the reform is progressive or regressive and the revenue changes. A reform is considered progressive (regressive) when as a result of the tax reform the poorer households lose less (more) as a proportion of their income/expenditure than the richer households. Total changes in revenues are also estimated by type of tax (income tax, VAT and specific duties).

Distributional and revenue impact of tax reforms: quantitative results

- The distributional and revenue impact of the actual reform to income tax in 2011 is highly sensitive to whether households' incomes are adjusted by a constant ('Altimir') factor to match National Accounts or not. Distributional patterns change dramatically and a giveaway reform becomes a takeaway after the adjustment. However, our way of adjusting for under-recording is basic and results should be treated with caution.
- A reduction in the rate of VAT rate on food consumed at home to 0% as in nearby Mexico seems relatively distributionally neutral when households are ranked using expenditure. If anything households towards the middle of the expenditure distribution seem would gain the most proportionally and richer households would be the biggest gainers in cash terms; this indicates that such a policy is a poor redistributive tool.

- When assessed as a proportion of expenditure, an increase in VAT to 14% would result in the biggest lossess for households towards the top of the expenditure distribution both before and after adjustment for under-recording of expenditure. In other words, the VAT system in El Salvador seems to be progressive even though necessities such as food are taxed. This is because poorer households spend more of their budgets in the informal economy – which is not taxed – and rely more on home-production and other non-monetary expenditure relative to richer households.
- When analysing the hypothetical reform to specific alcohol duties it does seem clear households towards the bottom of the expenditure distribution will be least affected by this reform: they do not purchase much alcohol. But whether the reforms are more broadly progressive is not clear: the results differ substantially depending on the adjustments one makes to account for the under-reporting of alcohol expenditure. Again this demonstrates the need for attempts to improve the quality of the household survey data. In this instance this could involve the introduction of a more detailed question-block on alcohol (and tobacco).

Summary and discussion

This project has made useful first steps in improving the capacity to analyse tax reforms in El Salvador and, we hope, will spur further development going forward: there is ample room for improvement in both the data and the model. In particular, we feel that it is important that more effort is exerted in improving the quality of surveys and provisions should be made for the linking of the survey data to administrative data such as anonymised tax record micro-data from El Salvador. We stress that this should be a priority: otherwise the results obtained from the LATAX model – and, indeed, any tax microsimulation model – will not be of the high quality needed to accurately assess the distributional impacts of past and potential reforms to the tax system.

Contents

1. Introduction	6
2. The tax reforms analysed in this paper	7
3. LATAX: Data, methods and assumptions	9
4. Distributional and revenue impacts: quantitative results	15
5. Discussion and conclusions	44
Bibliography	46
Appendices	
A. The LATAX data creation programs	47
B. The LATAX program and instructions	55

1. Introduction

El Salvador faces important challenges in achieving and sustaining a sound fiscal position, reducing poverty and inequality, and in generating economic growth. The country's effective tax burden remains lower than the average for Latin America,¹ at 14.5% in 2010², with total government revenue at 19.6%. Combined with public expenditure of 22.3% in that year, El Salvador faced a 2.6% government deficit, adding to a public debt that had already reached 45% in 2009.

In an effort to improve its public finances and rationalise the tax system, significant reforms were approved in 2009 and 2011. Increases in excises on alcohol, tobacco and carbonated beverages; a new vehicle registration tax; taxation of capital gains and interest income; and simplified VAT procedures were expected to yield 1% of GDP in 2010. Changes to the income tax schedule involved increasing the personal allowance (the amount of income on which no tax is levied), and removing the maximum average tax rate of 25%.

With further reforms and increases in tax revenue required, the World Bank has commissioned the IFS to develop a tax simulator for El Salvador, with an aim of increasing capacity for the analysis of tax policy. This is part of a broader agenda for developing tax modelling capacity in Latin America and follows previous IFS work for the World Bank which developed a microsimulation model for Mexico (MEXTAX). Indeed, the core architecture of our tax simulator for El Salvador is the same as that of MEXTAX, as is the approach we take to incorporating elements of behavioral response to taxation. This new multi-country simulator, called LATAX, allows for the modelling of VAT, excise duties, income tax and social security contributions, as well as price subsidies.

This paper is the second and final in a series of papers that describe this model and its uses, and apply it to the analysis of actual and counterfactual reforms to the El Salvadoran tax system. An earlier paper ("Methodological Issues and Approach" (Abramovsky, Attanasio and Phillips (2012)) set out the key principles of our methodology and our earlier work on MEXTAX set out the broader methodological issues for tax microsimulation in middle income countries (Abramovsky et al (2010) and Abramovsky et al (2011)).

The rest of this paper proceeds as follows. Section 2 describes the tax reforms considered in this paper. Section 3 presents and discusses the data and methods that will be used in this analysis, and the assumptions (such as regarding tax incidence) required to analyse the distributional and revenue impacts of changes in taxes using the LATAX model. The results of the analysis are presented in Section 4. Section 5 provides a summary and a discussion.

We include two appendices. Appendix A describes the processes and programs used to create the data used in the baseline analysis. Appendix B describes the structure and workings of our tax simulator, LATAX.

¹ See, for example, Trigueros Argüello (2007).

² See Ministerio de Hacienda de El Salvador (2011) "Estadísticas básicas sobre las Finanzas Públicas al 2010 y a Junio 2011", page 27.

2. The tax reforms analysed in this paper

In this report we analyse the distributional and revenue impacts of four tax changes:³

- The actual reforms made to the income tax system in 2011 (Section 2.1)
- A reduction in the rate of VAT rate on food (excluding restaurants, canteens, etc) to 0% as in nearby Mexico (Section 2.2)
- An increase in the rate of VAT from 13% to 14% (Section 2.2)
- Setting the specific duty on alcohol to \$12.00 per litre of pure (100%) alcohol for all alcohol variants (Section 2.2)

2.1 Income Tax Changes

Table 2.1 shows the marginal tax rates, tax band thresholds and ‘fixed quota’ under the baseline (2010) income tax system and the reform (2011) income tax system.

Table 2.1. Income tax rates, thresholds (US\$) and fixed quotas (US\$), 2010 and 2011

Marginal Income Tax Rate	Threshold (2010)	Fixed Quota (2010)	Threshold (2011)	Fixed Quota (2011)
0%	0	0	0	0
10%	2514.30	57.14	4064.00	212.12
20%	9142.90	57.14	9142.90	212.12
30%	22857.10	57.14	22857.20	212.12
25%	67870	57.14	N/A	N/A

Under the baseline tax system, no income tax was charged on the first \$2514.30 of taxable income⁴. Income above this point was charged at a set of increasing marginal tax rates (10%, 20% and 30%), with everyone with a taxable income of more than \$2514.30 also required to pay a flat amount of \$57.14 (the ‘fixed quota’) in addition to the amount liable under the marginal rate schedule. A rule limiting an individual’s average income tax rate to a maximum of 25% was in place which, in effect, led to a fall in the marginal tax rate of 30% to 25% at incomes above \$67870.

Under the reform system the tax-free allowance was increased to \$4064.00, and the fixed quota was increased to \$212.12. This means that anyone with a taxable income of between \$2514.30 and \$4063.99 gained at least \$57.14 (the previous fixed quota), with gains increasing in income to a maximum of \$212.12 for someone with a taxable income of \$4063.99. The increase in the fixed quota was designed so that individuals with an income of greater than \$4064.00 did not gain from this reform. The maximum average tax rate was also abolished meaning that individuals with taxable incomes greater than \$67870 pay more tax under the new system (their marginal rate increases by 5 percentage points).

There were also increases in the amount of medical and educational expenses that low-income taxpayers could deduct from their gross income. *These are not analysed in this report.*

³ See Abramovsky et al (2012) for a brief description of the main features of the tax system in El Salvador.

⁴ Taxable income is equal to the sum of all income components potentially subject to tax (e.g. wages and salaries, profits, rental income) minus deductions for social security contributions, healthcare

Figure 2.1 shows how the increase in the tax-free allowance affects net income for taxpayers with a taxable income between zero and \$6000 per year. This shows clearly how those with an income between \$2514.30 and \$4063.99 gain under the new system. Those with incomes less than \$2514.30 did not pay tax in the first place, while those with incomes of \$4064.00 and above see no gain due to the higher 'fixed quota'.

Figure 2.1. Net income (US\$), under 2010 and 2011 income tax systems

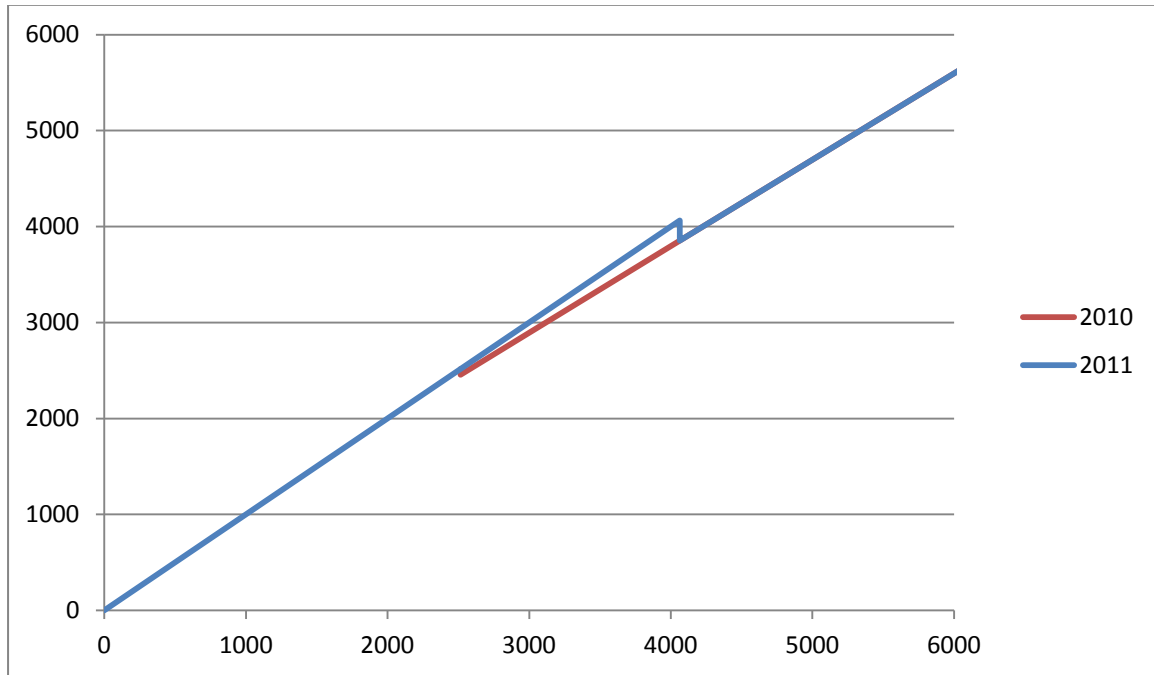


Figure 2.2. Income tax marginal rates, under 2010 and 2011 income tax systems

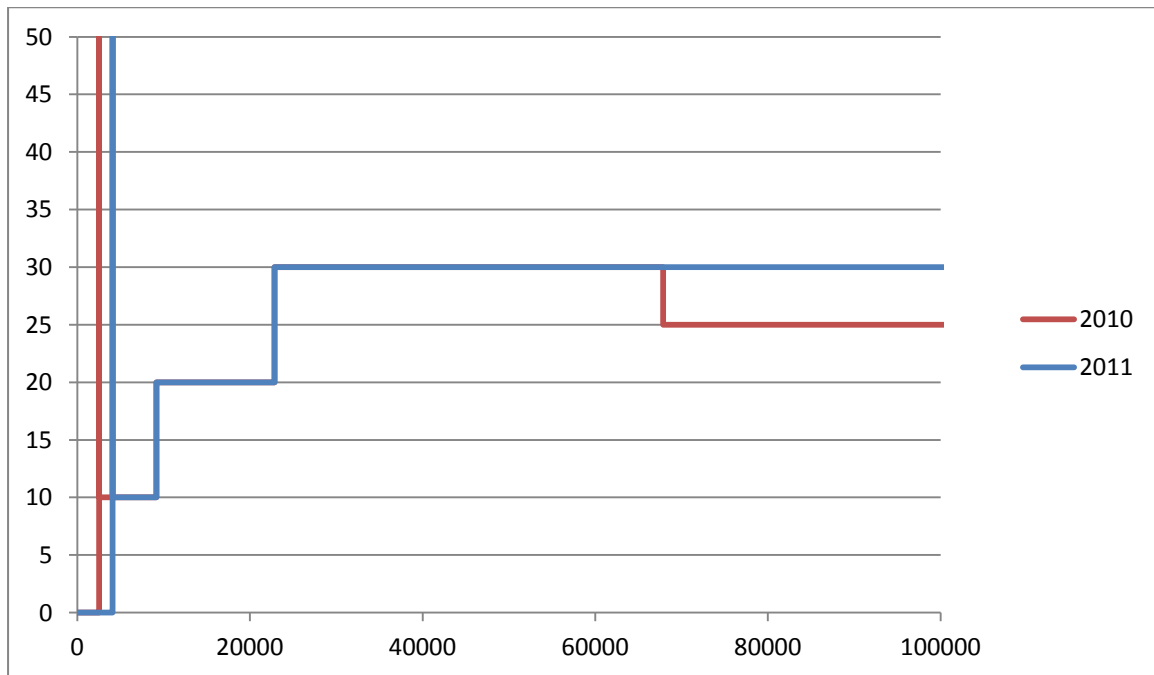


Figure 2.2 shows the marginal rate schedule under the 2010 and 2011 income tax systems. This shows the the increase in the tax-free allowance reduces the marginal rate from 10% to 0% for

incomes between \$2514.30 and \$4063.99. The large spikes show the point at which the 'fixed quota' becomes payable (which implies an incredibly high marginal rate at that point). Further up the distribution marginal rates increase from 10% to 20% and 20% to 30% as under the 2010 system. However with the removal of the maximum 25% average income tax rate, the marginal rate at incomes above \$67870 increased from 25% to 30%, reducing the net incomes of individuals with incomes higher than this.

2.2 Changes in indirect taxes

As well as simulating the actual changes to income tax that took place, we also simulate three hypothetical reforms to indirect taxes.

One is a giveaway: the reduction in the rate of VAT applicable on food purchased for consumption at home from 13% to 0% (the rate of VAT for restaurants, canteens and takeaways remains at 13%). This replicates the policy of nearby Mexico and much of the EU (where a reduced if not zero rate of VAT applies to food). As shall be seen, we do this not to encourage El Salvador to adopt such a policy but to demonstrate that it is unlikely to be a good way of achieving the redistributive aims for which it is usually adopted.

Two are net revenue raisers: an increase in the rate of VAT from 13% to 14%, and setting the specific duty on alcohol to \$12.00 per litre of pure (100%) alcohol for all alcohol variants. According to FUSADES, a small increase in VAT is being considered as a possible way to increase revenues, but that there are concerns that this might be regressive. Alcohol duties were last changed in 2009 but variation in the tax per unit of alcohol still varies somewhat across different kinds of alcohol beverage, and the amount of revenue raised is fairly small.

3. LATAX: methods, data and assumptions

The LATAX model is a static microsimulation model which examines the distributional and revenue impacts of tax reforms at one point in time (in this instance, 2010). See Appendix B for basic instructions on how to use the LATAX simulator. It has the capability to simulate the labour supply impact of reforms (using suitable assumptions on elasticities of participation and hours of work), and can allow for different assumptions on the extent to which indirect taxes are passed on from firms to consumers in the form of higher prices. *These features are not utilised in this report* (see Abramovsky et al, 2011 and 2012, and forthcoming LATAX manual for more detail on these behavioural 'models' and the simulator more generally).

In order to perform analysis of tax reforms in El Salvador (such as that presented in Section 4 of this report), household survey data is required on which LATAX can be run. The main survey used in the analysis is the *Encuesta de Hogares de Propósitos Múltiples* (EHPM) 2010. This contains detailed demographic, income and expenditure data for approximately 21,000 households in El Salvador for the 2010 calendar year. EHPM significantly under-records expenditure on alcohol and tobacco, in part because the items are not listed in the survey questionnaire and respondents must actively opt-in to providing such information (as opposed to opting out with most other categories of expenditure). We use data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH) 2005-06 to impute expenditure on alcohol and tobacco at the household level in EHPM 2010. The procedure to do this is described in section 3.1. The resulting data set combining EHPM 2010 with ENIGH 2005-06 is the main 'raw' data used for analysis in this report.

EHPM, as is common with other household surveys in many countries, also significantly under-records expenditures and incomes more generally. For example, there are very few individuals in EHPM with reported incomes high enough to be affected by the abolition of the ‘maximum’ average tax rate. If, as seems likely, a larger fraction of the population is affected by this measure than implied by the EHPM, our analysis using the raw data will under-estimate the amount of revenue raised from this, and will not capture the impacts of the reform on net incomes at the top of the income distribution. Section 3.2 describes the simple methods we use to correct for the under-reporting of income and expenditure. We show how these adjustments affect the results of the analysis for each tax reform analysed in this report in section 4.

We use these data, together with a number of assumptions (described in section 3.3) about how the raw variables translate into the variables necessary for our simulator (such as formality status) to create three model input datasets: a household file, an expenditure file and an individual file (that includes income and social security status). Testing the sensitivity of results to changes in how to account for the discrepancy between total income and expenditure as measured in the EHPM-ENIGH resulting data and in national accounts is done through adjusting the input files. Full details of this process, the files and the programs used to create them can be found in Appendix A.

3.1. Imputing expenditure on alcohol and tobacco in EHPM 2010 using ENIGH 2005-06

In order to improve upon the data on expenditure on alcohol and tobacco products in the EHPM 2010⁵ we impute expenditure on these items using the ENIGH 2005-06. This is a detailed survey of the demographic and socio-economic characteristics of Salvadoran households and covers, amongst other things, information regarding demographics, income, and, most importantly, higher-quality information on expenditure on different categories of alcohol and tobacco.

To carry out the imputation, we first pool the samples from the ENIGH 2005-06 and EHPM 2010 and adjust the earlier ENIGH data to account for 5 years of changes in nominal expenditure and income growth. Then, using a Stata routine called UVIS, (Univariate Imputation Sampling), we impute expenditure for different categories of alcohol and tobacco expenditure for households in the EHPM assuming that the link between household characteristics and alcohol expenditure is the same as in the ENIGH. In particular, we use UVIS to impute expenditure separately and independently for 7 kinds of alcohol (which are subsequently aggregated to 4 categories in the LATAX input data) and 2 kinds of tobacco products. UVIS first makes use of the ENIGH sample by regressing expenditure on each of these items on a set of explanatory household level variables. These variables are a set of regional dummies, a range of demographic variables (number of children, number of adults, age of head of household, education of head of household, occupation of head of household); the value of food consumption; and monetary income. The procedure then predicts expenditure for each item for each household in EHPM based on the same set of explanatory variables. The prediction is done via a matching process whereby households in the EHPM are allocated the *actual* spending of the household in the ENIGH that has the most similar *predicted* expenditure (where predictions include random

⁵ The EHPM is particularly poor at recording expenditure on alcohol and tobacco because the survey questionnaire does not list these items. Households wishing to report expenditure on these items must respond spontaneously – something which they are unlikely to do.

noise).⁶ Use of this matching procedure means we can avoid issues such as negative predicted values.

As discussed further below, ENIGH, while better than the EHPM, still significantly under-records expenditure on alcohol and tobacco.

3.2. Adjusting for general under-recording of income and expenditure in EHPM 2010

An important and worrying feature of surveys such as EHPM is the significant extent to which recorded aggregate income and expenditure (grossed-up using sample weights) is significantly lower than National Accounts aggregates. In this report, we adjust for under-recording of income and expenditure in EHPM data in a very simple way.

We allocate missing expenditure by increasing them by category-specific constant factors so that aggregate expenditure in each category in EHPM data match National Accounts aggregates. To do this we use National Accounts information on household expenditure by type of product obtained from Input-Output tables from 2006 (the last year this type of information is available for El Salvador)⁷ and compare with expenditure on the same product categories in the EHPM 2006, to calculate a factor of under-recording for each expenditure category in 2006. We classify each product or expenditure category in one of the five categories described in table 3.1 and obtain category-specific factors for 2006 (column c in table 3.1). We then adjust these factors to account for the changes in overall under-recording of expenditure in 2006 and 2010 (information on total household expenditure is available for 2010 as well as 2006) as shown in the same table.

Table 3.1. Factors to account for missing expenditure

	Total 2006 (a)	Total 2010 (b)	Category- specific 2006 (c)	Category-specific 2010 (d)=[(b)/(c)]*(c)
1. Food, drinks and tobacco	2.78	2.61	1.65	1.55
2. Textiles, clothing, and footwear	2.78	2.61	4.38	4.11
3. House-related expenditures	2.78	2.61	2.07	1.94
4. Other goods	2.78	2.61	5.34	5.01
5. Other services	2.78	2.61	4.09	3.84

Source: authors' calculation using National Accounts Input Output Tables for the year 2006, National Accounts total expenditure by households for the year 2010, EHPM 2006 and EHPM 2010.

We allocate missing gross incomes by increasing them by a constant factor so that aggregate incomes in EHPM match National Accounts aggregates. We use data on gross national disposable income from National Accounts for the year 2010⁸ and compare to the EHPM total which gives an Altimir factor⁹ of 2.6839 for total income.

⁶ More details on this imputation procedure can be provided by the authors upon request.

⁷ Fusades provided us with this information.

⁸ Table "IV.10 Ingreso Nacional Disponible y su Asignación. A Precios Corrientes", item 9 Producto Bruto Nacional Disponible, downloaded from <http://www.bcr.gob.sv/bcrsite/?cdr=23&lang=es>. Last accessed on the 14 June 2012. Note that this figure is total gross national disposable income for the whole economy, since there is not information of the portion of this that is perceived by households.

⁹ See Altimir (1987).

When analysing results obtained using this adjusted data, one has to take into account a number of limitations of the approach just described, particularly in relation to the adjustment of income. First, the factor of 2.6839 is likely to overestimate the under-recording of households' income in EHPM since the National Accounts figure used in the calculation of this factor is for income for the whole economy –no information on how much of this is received by households and how much is retained as un-distributed corporate profits is provided . Second, it is common for different sources of incomes to be under-recorded to a different extent. For example, in Mexico, monetary capital income is estimated to be under-recorded about 16 times more and monetary income from own-business is estimated to be under-recorded about 1.5 times more than employment income.¹⁰ El Salvador's National Accounts do not provide a breakdown of income into different components, and so we have to assume that under-recording of income is evenly distributed across different sources of income. Finally, it is not clear that the under-recording of income is distributed evenly across the population as assumed by the application of the Altimir factor. For instance, low and middle income households may be responding to the EHPM and reporting their incomes reasonably accurately, with the discrepancy in aggregate household income the result of high income households failing to respond to the survey or significantly under-reporting their income. If this were the case, one might want to adjust incomes at the top of the distribution much more than lower down.

We also make further adjustments to account for the particular under-recording of alcohol even after imputing expenditure from the ENIGH in certain sensitivity analyses (see the analysis of changes to alcohol duty in Section 4.4). To do this we use 2010 revenue figures on specific duties on beer and other alcohol products (provided by FUSADES) and compare them to the revenue figures implied by our simulator given the duty rates currently applicable, assumptions about alcohol content and typical retail prices (see table 3.2), and alcohol expenditure imputed from the ENIGH into the EHPM. We find that to match revenues, on top of the standard Altimir factor for food (1.545), expenditure on beer needs to be multiplied by an additional 5.904 ($9.12/1.545$), and other alcohol by 2.139 ($3.30/1.545$).

¹⁰ See presentation by Gerardo Leyva Parra from INEGI (2001). <http://www.eclac.cl/povertystatistics/documentos/leyvappt.pdf> Last accessed 18 January 2011. See table in slide 7.

Table 3.2. Duties rates and assumed retail prices for different types of alcohol

	Ad-valorem Duty Rate (%)	Duty Rate (per litre of pure alcohol)	Alcohol Content (%)	Assumed Post-Tax Retail Price (per litre)	Implied Overall Duty Rate (%)	Unadjusted LATAX Revenue (\$ million)	Official Revenue Estimate (\$ million)	Factor
Beer	8	\$9.00	4.5	\$1.70	48	3.35	30.6	5.904
Wine	8	\$9.00	15	\$8	33			2.139
Rum	8	\$9.00	37.5	\$16	42			2.139
Gin	8	\$16.00	37	\$16	86			2.139
Whisky	8	\$16.00	45	\$35	41	5.84	19.3	2.139
Vodka	8	\$9.00	37	\$22	30			2.139
Aguardiente	8	\$3.25	45	\$8	36			2.139
Other liquors	8	\$9.00	15	\$8	33			2.139

Notes: 'Factor' is $[(\text{Office Revenue})/(\text{LATAX Revenue})]/1.545$, where 1.545 is the general Altimir factor used to adjust all expenditure on food, alcohol and tobacco.

Source: authors' calculation using administrative tax rates and alcohol contents and retail prices suggested by Fusades.

3.3. Assumptions

A number of assumptions on tax incidence, formality and under-recorded income and expenditure need to be made. Table 3.3 provides details of the baseline assumptions used in the analysis in this final report for El Salvador. See Abramovsky et al. (2011, 2012) for a discussion about these assumptions.

Table 3.3. Assumptions in LATAX for El Salvador

Type of assumptions	LATAX assumptions
Informal monetary consumption	Informal consumption if purchased from informal vendors (e.g. stalls, hawkers, etc), defined as EHPM 2010 variable R807=3, 10, 11 or R807OTR=3, 10, 11
Formal workers	<p>Formal worker if social security coverage through their own work, defined as EHPM 2010 variable R422=1, if in employment in the last period</p> <p>Formal workers are assumed to comply with the tax law on all their income. Deductions for certain expenses (e.g. education and health expenses) are not accounted for</p> <p>Assume that working-age adults contribute to the new system of social security (defined contribution scheme) as opposed to the old scheme.</p>
Missing income	No correction for under-reporting of income (Baseline only)
Missing expenditure	No correction for under-reporting of expenditure (Baseline only)
Incidence of income tax levied on employment income	Income tax is fully incident on the worker
Incidence of indirect taxes	VAT and duties are fully incident on the consumer

In sensitivity analysis we use Altimir factors to account for missing income and missing expenditure (see section 3.2).

4. Distributional and revenue impact of tax reforms: a quantitative analysis

In this section we report and explain the distributional and revenue impact of the tax reforms described in section 2 as estimated by LATAX using household microdata for El Salvador. For each of the reforms to income tax and VAT we report two sets of results: one that uses the raw data from the household microdata, and another that adjusts this data for under-reporting of income and expenditure using the Salvadoran National Accounts (see section 3.2). For the hypothetical reform to alcohol duty we also show these variants plus two others based on adjusting the alcohol expenditure reported by households so that revenues match official estimates of revenues from alcohol duties (again, see section 3.2). For all reforms, we show the distributional impact across the household net income distribution and the expenditure distribution, and show both the average cash gains/losses and the average gains/losses as a proportion of income and expenditure. Box 4.1 discusses whether income or expenditure should be used to rank households, and whether gains or losses should be presented as a fraction of income or expenditure. The main upshots are that:

- It is not clear whether ranking households by income or expenditure is more appropriate
- Gains/losses from changes to direct taxes (such as income tax) should be presented as a fraction of income, while gains/losses from changes in indirect taxes (like VAT) should be presented as a fraction of expenditure.

Box 4.1 Income or expenditure to assess the distributional impact of tax reforms?

The literature on tax reform analysis has noted that whether income or expenditure is used to rank households and to calculate proportional gains/losses can have a major impact on the assessed distributional impacts (Abramovsky et al (2011), IFS et al (2011)). For instance, the VAT systems operating in most countries look regressive when VAT paid is expressed as a fraction of income over the income distribution, but slightly progressive when VAT paid is expressed as a fraction of expenditure over the income (or expenditure) distribution. This would appear to present significant difficulties to the analyst: results are highly sensitive to how one decides to calculate the proportional burden of a tax. But can economic reasoning guide us to the *right* way to analyse reforms?

First up, it is not simply a question of using income or expenditure. There are two distinct questions which may have different answers:

- How should one rank households as rich or poor?
- How should one assess the proportional change in tax payments resulting from a reform?

The answers to both are strongly linked to the long-term or 'life-time' distributional impact of a tax change, but in different ways.

First, how should households be ranked?

The issue at stake here is whether a household's position in the income distribution or expenditure distribution gives a better indication of whether they are rich or poor. In order to

assess this, one must first understand that household surveys generally pick up a 'snapshot' measure of income or expenditure (e.g. income in the last month, or spending on different types of items in periods ranging from one week to one year). But such a short-term measure might not accurately reflect the living standards of the household in either the short or long run. For instance, households with low incomes may be able to use borrowings, savings or previously purchased durable goods to maintain their living standards, at least in the short run.

Many economists have argued that households should be ranked by their consumption as this takes account of such 'smoothing' of income shocks (Porterba, 1989; Meyer and Sullivan, 2003, 2004, 2008, 2011). The argument for using consumption is particularly persuasive if we believe households smooth their consumption over long periods of time and we are concerned with the long-term distributional impact of a policy change.

This might suggest a preference for using expenditure to rank households. But expenditure is not the same as consumption: expenditure captures the purchase costs of durable goods like cars, whereas consumption captures the flow of benefits from these goods. Like income, expenditure may be volatile, with households purchasing certain items infrequently, especially larger durable goods such as motor vehicles or new kitchens (but also food if they bulk-purchase). Excluding durable goods from the measure of expenditure removes much of this problem but introduces a new one: you may rank households incorrectly if they devote different proportions of their budgets to durable goods.

It is therefore not clear whether expenditure represents a better measure of a household's living standards than income: both are volatile, and furthermore, both suffer significant measurement error in surveys. For this reason it is worthwhile conducting analysis ranking households both according to their position in the income distribution and in the expenditure distribution.

Second, how should we assess proportional gains or losses?

The best way to understand why gains or losses should be expressed as a fraction of income for direct taxes and as a fraction of expenditure for indirect taxes is to use some hypothetical tax changes. As this issue most often comes up when analysing changes to indirect taxes, we use examples for VAT that demonstrate how presenting results as a fraction of expenditure is most appropriate (but analogous examples can be used to show how income should be used for direct changes).

Consider the case of a uniform VAT on all goods and services. Over a lifetime, if lifetime income and lifetime expenditure are equal, this can be clearly seen as distributionally neutral^a: as it is imposed on all goods and services at the same rate, it has the same proportional effect on the purchasing power of rich and poor households. VAT payments under such a system would be the same fraction of both lifetime income and lifetime expenditure for rich and poor households. But suppose, as in reality, we only have information on current income and spending. If VAT payments are presented as a fraction of current expenditure, this distributionally neutral pattern of payments would be found. However, because households with low current income tend to spend more than their income, and those with high current income tend to spend less, showing payments as a fraction of net income will make the uniform VAT look regressive if households are defined as rich or poor based on their current income. On the other hand, if

households are defined as rich or poor based on their current expenditure, because households with the lowest spending tend to report incomes that are higher than their spending, and those with high spending tend to report incomes that are lower than their spending, showing VAT payments as a fraction of net income will make the uniform VAT look progressive. That is, a distributionally neutral uniform VAT can be misleadingly labelled progressive or regressive if VAT payments are expressed as a proportion of net income. For this reason, analysis showing VAT payments as a proportion of household expenditure should be considered more informative and will be the focus of discussion in the remainder of this chapter (although results will be presented as a proportion of income in Annex I for the purpose of completeness).

The argument that showing VAT payments as a fraction of income may give a misleading impression of the lifetime distributional impact of VAT is driven by the potential for households to borrow and save, but it does not rely on households being able to borrow freely or have large amounts of savings to draw-down. Neither does it rely on consumers being rational and forward-looking or engaging in optimal consumption smoothing.

To see this, consider a poor household with a long-run income of 100 euros per week but who is currently spending 200 euros per week, funded by drawing down the last of their savings. Furthermore, suppose that the rate of VAT is 25% on all goods and services. The household would pay 40 euros per week in VAT, equal to 20% of their current spending but 40% of their current income. The question is, which measure is a better reflection of the impact of VAT on the household? It is true that their current income is a better measure of their long-run purchasing power than their current expenditure is. But it does not follow that expressing VAT payments as a proportion of current income gives a better measure of the impact of VAT on that long-run purchasing power. This is because when the household is forced to cut their spending back to the level of their long-run income (100 euros per week), the amount of VAT they would pay falls to 20 euros per week. This is equal to 20% of their current and long-run income, and their long-run expenditure of 100 euros per week.

Measuring VAT payments as a percentage of current spending thus gives a more meaningful measure of VAT's distributional impact than measuring payments as a percentage of current income, even in cases where current income is the better measure of long-run living standards. This demonstrates a key point: the best measure of lifetime living standards might be current income for some households, and current spending for other households. This is a separate issue from the arguments in favour of expressing VAT as a percentage of expenditure instead of income.

- a. The assumption that lifetime income and expenditure are equal means that we abstract from gifts and bequests. This is for ease of exposition only: the argument with bequests is more complicated but conclusions are unchanged. For example, when assessing the proportional impact of VAT on households that are recipients of gifts and bequests, it seems clear that we would want to take into account those gifts and bequests when measuring their lifetime resources. We would not, for instance, wish to say that a household with zero income but large expenditures funded by gifts and bequests is hit infinitely hard by VAT. Including bequests and gifts in the lifetime resources of the recipient makes subtracting them from the resources of the giver attractive to avoid the double counting of gifts and bequests. Adding and subtracting gifts and bequests when calculating lifetime resources in this manner means a uniform VAT would be found to be a constant fraction of both lifetime resources (income) and lifetime expenditure, i.e. it would be distributionally neutral as in the case with no gifts and bequests.

The rest of this section proceeds as follows. Results for the reforms to income tax can be found in Section 4.1. Section 4.2 presents the results for the VAT zero-rating of food, and Section 4.3 shows the impact of increasing the rate of VAT by 1 percentage point. Section 4.4 shows results for the changes to alcohol duty.

4.1. Income tax changes

As shown in Section 2, individuals with relatively taxable incomes between \$2514.30 and \$4063.99 gained from the income tax reforms, those with taxable incomes between \$4064 and \$67870 were unaffected, and those with taxable incomes of greater than \$67870 lost. This section shows how these individual-level effects translate into effects across rich and poor households, both before and after we adjust for the fact that our survey data under-records income and expenditure.

Tables 4.1 and 4.2 show the distributional impact of the reforms before applying the adjustment to income and expenditure to account for under-recording. Table 4.1 shows the average gain and loss for each decile group based on total income (monetary and non-monetary) and shows gains and losses in annual cash terms and as a percentage of total income. It also shows the percentage of total net income accruing to each decile group. Table 4.2 shows the average gain and loss for each decile group based on total expenditure (monetary and non-monetary) and shows gains and losses in annual cash terms and as a percentage of total expenditure. It also shows the percentage of total net expenditure accruing to each decile group.

What do the unadjusted results show?

Households in the 5th to 9th decile groups of the total income distribution have the largest cash gains, on average (\$25 – 30 per year), with the largest percentage gains going towards those in the 5th decile group (0.47%). It is important to note that these figures are averaged over both beneficiary and non-beneficiary households. Those actually benefiting see considerably larger cash and proportional gains (many households, even towards the middle and top of the distribution, contain no taxpayers according to data on formality in the EHPM). Households towards the bottom of the distribution gain much less, on average, because most households contain no one with an income high enough to pay tax under the original system (the few that do are large households with many members that find themselves at the bottom of the distribution after their income is adjusted for household size). Households in the richest income decile group gain much less on average because most taxpayers have taxable incomes above the new tax threshold, and some lose out from the abolition of the 25% maximum average tax rate. The pattern is very similar when comparing households in different parts of the expenditure distribution.

In general the income tax reforms seem to benefit those in the middle and upper-middle part of the income distribution most. This may reflect the fact that lower down the distribution individuals are less likely to be taxpayers (for instance, they may be informal-sector workers) and are more likely to have taxable incomes below the pre-existing tax-free allowance. Furthermore, households with several members gaining from the reform will gain more and are likely to have total household incomes high enough to raise them towards the middle of the income distribution. Households towards the top do not gain as much, on average, because the main earners are likely to have incomes in excess of \$4064, and a small number lose from the abolition of the 25% maximum average tax rate.

Table 4.1. Average gains and losses due to reforms by total income decile group – 2011 income tax reform, not adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)
			ISR (3)	VAT (4)	Duties (5)	Total (6)	
Poorest Decile	2,321	3.55%	1	0	0	1	0.06%
Decile Group 2	3,256	4.98%	7	0	0	7	0.22%
Decile Group 3	3,937	6.02%	12	0	0	12	0.31%
Decile Group 4	4,611	7.04%	19	0	0	19	0.41%
Decile Group 5	5,367	8.21%	25	0	0	25	0.47%
Decile Group 6	6,032	9.22%	26	0	0	26	0.44%
Decile Group 7	6,685	10.22%	27	0	0	27	0.40%
Decile Group 8	7,780	11.93%	28	0	0	28	0.36%
Decile Group 9	9,285	14.16%	29	0	0	29	0.31%
Richest Decile	16,137	24.66%	15	0	0	15	0.09%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06 and authors' calculations using LATAx

Table 4.2. Average gains and losses due to reforms by total expenditure decile group - 2011 income tax reform, not adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)
			ISR (3)	VAT (4)	Duties (5)	Total (6)	
Poorest Decile	2,074	4.24%	3	0	0	3	0.14%
Decile Group 2	2,703	5.53%	9	0	0	9	0.34%
Decile Group 3	3,118	6.38%	14	0	0	14	0.45%
Decile Group 4	3,599	7.36%	22	0	0	22	0.61%
Decile Group 5	3,943	8.07%	23	0	0	23	0.57%
Decile Group 6	4,388	8.97%	25	0	0	25	0.57%
Decile Group 7	4,863	9.97%	25	0	0	25	0.52%
Decile Group 8	5,736	11.72%	29	0	0	29	0.51%
Decile Group 9	6,929	14.16%	24	0	0	24	0.35%
Richest Decile	11,529	23.59%	15	0	0	15	0.13%

Notes: 100/80/50 equivalence scale, total expenditure includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06 and authors' calculations using LATAx

But, under-reporting of incomes is significant and may not affect only the quantitative results but also the qualitative distributional pattern. Tables 4.3 and 4.4 show the distributional impact of the reforms after applying the Altimir adjustment to households' income and expenditure to account for under-recording (see Section 3.2). How do the results differ?

Dramatically. Looking first at the impact over the income distribution, average annual gains are no higher than \$3 per household for any decile group, and households in the top decile group lose on average (by \$44 per year). The 'biggest' gainers in cash terms and as a proportion of income are households in the poorest decile group, although average gains of \$3 per year or 0.05% of net income are hardly large! Looking at the impact over the expenditure distribution, the picture is a little more complicated with losses, on average, in the 7th, 9th and top decile group, and very small gains, on average, among the other decile groups.

This dramatic change is due to the fact that multiplying all incomes by the Altimir factor (2.6839) means that: (a) the income range where one individual taxpayers gain (between \$2514.30 and \$4063.99) is a much less dense part of the taxable income distribution than before applying the Altimir factor as individuals get moved above this range and far fewer get moved into the range to replace them; and (b), the number of individuals with incomes affected by the abolition of the 25% maximum average tax rate increases significantly.

The change in the distribution of taxable income after adjustment using the Altimir factors also has a major effect on the estimated revenues from the reform. Prior to adjustment, the reforms to income tax are estimated to *cost* the Treasury \$29 million, but after adjustment they are expected to *raise* a net \$4 million.

It is not clear which set of analysis gives more accurate results for the distributional impact of the tax change. On the one hand, aggregate household income in the EHPM household survey is only around 40% of aggregate income according to National Accounts, so it is likely that some form of adjustment is needed. On the other hand, it is not clear that the under-recording of income is distributed evenly across the population and across all sources of income as assumed by the application of the Altimir factor. For instance, low and middle income households may be responding to the EHPM and reporting their incomes reasonably accurately, with the discrepancy in aggregate household income the result of high income households failing to respond to the survey or significantly under-reporting their income. If this were the case, one might want to adjust incomes at the top of the distribution much more than lower down. And the distributional effects of the tax reforms may look quite different to either scenario shown here.¹¹ This clearly demonstrates that better micro-data, whether from an improved household survey or anonymised tax records, is needed to accurately model the distributional *and* revenue impacts of tax reforms in El Salvador, even on a qualitative basis.

¹¹ If the 'missing income' is mainly towards the top of the income distribution, it seems likely that the income tax reforms had the biggest cash and proportional gains for households towards the middle of the income distribution, with households at the top of the distribution seeing losses.

Table 4.3. Average gains and losses due to reforms by total income decile group – 2011 income tax reform, adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)
			ISR (3)	VAT (4)	Duties (5)	Total (6)	
Poorest Decile	5,506	3.38%	3	0	0	3	0.05%
Decile Group 2	7,911	4.86%	2	0	0	2	0.03%
Decile Group 3	9,667	5.94%	3	0	0	3	0.03%
Decile Group 4	11,413	7.01%	2	0	0	2	0.02%
Decile Group 5	13,403	8.23%	2	0	0	2	0.02%
Decile Group 6	14,891	9.15%	2	0	0	2	0.01%
Decile Group 7	16,814	10.33%	2	0	0	2	0.01%
Decile Group 8	19,362	11.90%	2	0	0	2	0.01%
Decile Group 9	23,366	14.43%	2	0	0	2	0.01%
Richest Decile	40,500	24.75%	-44	0	0	-44	-0.11%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

Table 4.4. Average gains and losses due to reforms by total expenditure decile group - 2011 income tax reform, adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)
			ISR (3)	VAT (4)	Duties (5)	Total (6)	
Poorest Decile	4,357	3.80%	3	0	0	3	0.06%
Decile Group 2	5,856	5.11%	2	0	0	2	0.03%
Decile Group 3	6,747	5.90%	3	0	0	3	0.04%
Decile Group 4	7,942	6.93%	2	0	0	2	0.03%
Decile Group 5	8,670	7.56%	2	0	0	2	0.03%
Decile Group 6	9,706	8.47%	2	0	0	2	0.02%
Decile Group 7	11,112	9.70%	-4	0	0	-4	-0.04%
Decile Group 8	13,115	11.45%	3	0	0	3	0.02%
Decile Group 9	16,633	14.52%	-17	0	0	-17	-0.10%
Richest Decile	30,408	26.54%	-18	0	0	-18	-0.06%

Notes: 100/80/50 equivalence scale, total expenditure includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

4.2. Reducing the rate of VAT on food

Tables 4.5 and 4.6 show the distributional impact of removing VAT on food before adjustments are made to account for the under-recording of income and expenditure.

Measured as a percentage of income, gains are largest towards the bottom of the income distribution and smallest towards the top. That is, such a reform would look quite strongly progressive. However, as discussed in Box 4.1, analysing the distributional impact of indirect changes using changes in tax payments as a percentage of income is liable to give misleading results. Measured more appropriately as percentage of expenditure, this pattern is not evident, and if anything, households towards the middle of the expenditure distribution seem to gain the most proportionally. This reflects the fact that non-monetary expenditure (home-production and imputed-rent from housing) make up a larger part of total expenditure for households for poorer households, and a larger part of their monetary expenditure takes place in the informal economy and so already avoids VAT (and does not gain from the abolition of VAT on food). Households in the middle of the distribution gain relatively large amounts because a large fraction of their total expenditure goes towards food, which is less likely to be home-produced or informally purchased than for poorer households.

Tables 4.7 and 4.8 show the distributional impact of the reforms after applying the Altimir adjustment to households' income and expenditure to account for under-recording (see Section 3.2). How do the results differ?

The basic distributional pattern is similar: when assessed as a proportion of expenditure, the biggest gains go towards the households in the middle of the expenditure distribution. Gains are a lower fraction of expenditure right across the distribution following adjustment. This is because food is under-recorded by less than other types of expenditure and makes up a smaller fraction of total expenditure post-adjustment: a reduction in tax on food is therefore relatively smaller post-adjustment.

What is notable is that both pre- and post- adjustment for under-recording, the largest cash gains from the zero-rating of food are richer households. For instance, around 17% of the gains go to the richest tenth of households versus less than 4% to the poorest tenth of households when expenditure is used to rank households. Together clearly demonstrates that reduced rates of VAT for food or other 'essentials' are a poorly targeted way of redistributing to poor or middle income households. El Salvador is wise to not follow Mexico in applying a zero rate of VAT to food: most of the cash spent on doing so would flow towards richer households, whilst targeted spending on cash transfers can be means-tested to ensure richer households do not benefit.

The estimated cost of making food zero-rated is \$137 million before adjustment and \$211 million after adjustment.

Table 4.5. Average gains and losses due to reforms by total income decile group – 0% rate of food on VAT, not adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total gain accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	2,321	3.55%	0	40	0	40	1.70%	4.57%
Decile Group 2	3,256	4.98%	0	60	0	60	1.85%	6.98%
Decile Group 3	3,937	6.02%	0	72	0	72	1.82%	8.30%
Decile Group 4	4,611	7.04%	0	80	0	80	1.74%	9.28%
Decile Group 5	5,367	8.21%	0	88	0	88	1.63%	10.11%
Decile Group 6	6,032	9.22%	0	94	0	94	1.56%	10.87%
Decile Group 7	6,685	10.22%	0	95	0	95	1.41%	10.93%
Decile Group 8	7,780	11.93%	0	101	0	101	1.30%	11.72%
Decile Group 9	9,285	14.16%	0	105	0	105	1.13%	12.09%
Richest Decile	16,137	24.66%	0	131	0	131	0.81%	15.15%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, and authors' calculations using LATAx

Table 4.6. Average gains and losses due to reforms by total expenditure decile group –0% rate of food on VAT, not adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total gain accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	2,074	4.24%	0	33	0	33	1.57%	3.76%
Decile Group 2	2,703	5.53%	0	51	0	51	1.90%	5.95%
Decile Group 3	3,118	6.38%	0	64	0	64	2.06%	7.41%
Decile Group 4	3,599	7.36%	0	77	0	77	2.15%	8.94%
Decile Group 5	3,943	8.07%	0	86	0	86	2.18%	9.91%
Decile Group 6	4,388	8.97%	0	93	0	93	2.12%	10.73%
Decile Group 7	4,863	9.97%	0	100	0	100	2.06%	11.58%
Decile Group 8	5,736	11.72%	0	104	0	104	1.81%	11.98%
Decile Group 9	6,929	14.16%	0	114	0	114	1.64%	13.11%
Richest Decile	11,529	23.59%	0	144	0	144	1.25%	16.63%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06 and authors' calculations using LATAX

Table 4.7. Average gains and losses due to reforms by total income decile group – 0% rate of food on VAT, adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total gain accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	5,506	3.38%	0	60	0	60	1.09%	4.51%
Decile Group 2	7,911	4.86%	0	92	0	92	1.17%	6.91%
Decile Group 3	9,667	5.94%	0	112	0	112	1.16%	8.40%
Decile Group 4	11,413	7.01%	0	121	0	121	1.06%	9.08%
Decile Group 5	13,403	8.23%	0	135	0	135	1.01%	10.12%
Decile Group 6	14,891	9.15%	0	145	0	145	0.98%	10.88%
Decile Group 7	16,814	10.33%	0	146	0	146	0.87%	10.89%
Decile Group 8	19,362	11.90%	0	155	0	155	0.80%	11.61%
Decile Group 9	23,366	14.43%	0	164	0	164	0.70%	12.33%
Richest Decile	40,500	24.75%	0	205	0	205	0.51%	15.27%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

Table 4.8. Average gains and losses due to reforms by total expenditure decile group –0% rate of food on VAT, adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total gain accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	4,357	3.80%	0	51	0	51	1.17%	3.81%
Decile Group 2	5,856	5.11%	0	80	0	80	1.36%	5.95%
Decile Group 3	6,747	5.90%	0	98	0	98	1.45%	7.33%
Decile Group 4	7,942	6.93%	0	123	0	123	1.54%	9.16%
Decile Group 5	8,670	7.56%	0	130	0	130	1.49%	9.68%
Decile Group 6	9,706	8.47%	0	141	0	141	1.45%	10.52%
Decile Group 7	11,112	9.70%	0	150	0	150	1.35%	11.23%
Decile Group 8	13,115	11.45%	0	160	0	160	1.22%	11.98%
Decile Group 9	16,633	14.52%	0	178	0	178	1.07%	13.35%
Richest Decile	30,408	26.54%	0	227	0	227	0.75%	17.00%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

4.3. Increasing the rate of VAT by 1 percentage point

Tables 4.9 and 4.10 show the distributional impact of increasing the rate of VAT by 1 percentage point before adjustments are made to account for the under-recording of income and expenditure.

Measured as a percentage of income, losses are slightly larger towards the bottom and middle of the income distribution than towards the top. However, as discussed in Box 4.1, analysing the distributional impact of indirect changes using changes in tax payments as a percentage of income is liable to give misleading results. Measured more appropriately as percentage of expenditure, losses are largest for richer households and smallest for poorer households. This reflects the fact that non-monetary expenditure (home-production and imputed-rent from housing) make up a larger part of total expenditure for households for poorer households, and a larger part of their monetary expenditure takes place in the informal economy and so avoids VAT. Households towards the top of the income distribution are hit relatively harder because imputed rent, home-produced goods and informally purchased goods make up a smaller fraction of their total expenditure than than for poorer and middle-rankd households.

Tables 4.11 and 4.12 show the distributional impact of the reforms after applying the Altimir adjustment to households' income and expenditure to account for under-recording (see Section 3.2). How do the results differ?

The basic distributional pattern is similar: when assessed as a proportion of expenditure, the biggest losses are for households in the top of the expenditure distribution. Losses are a higher fraction of expenditure right across the distribution following adjustment. This is because VATable expenditure is under-recorded by more than non-VATable types of expenditure (such as informal food purchases, home production or imputed rent) and makes up a larger fraction of total expenditure post-adjustment: an increase in VAT is therefore relatively larger post-adjustment.

The VAT in El Salvador therefore looks moderately progressive even though the standard rate is charged on necessities such as food: an increase in VAT would likewise be progressive. However, it should be noted that increases in income tax rates, especially those applying to higher incomes, are likely to be more progressive.

The estimated revenue from a 1 percentage point increase in VAT is \$32 million before adjustment and \$87 million after adjustment. Both estimates are somewhat lower than if one uses official revenue statistics to obtain an estimate (\$120 million).¹²

¹² Estimated VAT revenue was \$1566 million in 2010. With unchanged quantities purchased, VAT revenue would be \$1686 with a VAT rate of 14%.

Table 4.9. Average gains and losses due to reforms by total income decile group – 14% rate of VAT, not adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	2,321	3.55%	0	-8	0	-8	-0.33%	3.79%
Decile Group 2	3,256	4.98%	0	-11	0	-11	-0.35%	5.56%
Decile Group 3	3,937	6.02%	0	-13	0	-13	-0.33%	6.32%
Decile Group 4	4,611	7.04%	0	-15	0	-15	-0.33%	7.44%
Decile Group 5	5,367	8.21%	0	-17	0	-17	-0.32%	8.57%
Decile Group 6	6,032	9.22%	0	-19	0	-19	-0.32%	9.38%
Decile Group 7	6,685	10.22%	0	-20	0	-20	-0.30%	10.03%
Decile Group 8	7,780	11.93%	0	-24	0	-24	-0.30%	11.71%
Decile Group 9	9,285	14.16%	0	-28	0	-28	-0.30%	13.92%
Richest Decile	16,137	24.66%	0	-47	0	-47	-0.29%	23.28%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06 and authors' calculations using LATAx

Table 4.10. Average gains and losses due to reforms by total expenditure decile group –14% rate of VAT, not adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	2,074	4.24%	0	-6	0	-6	-0.30%	3.05%
Decile Group 2	2,703	5.53%	0	-9	0	-9	-0.34%	4.57%
Decile Group 3	3,118	6.38%	0	-11	0	-11	-0.37%	5.65%
Decile Group 4	3,599	7.36%	0	-14	0	-14	-0.38%	6.77%
Decile Group 5	3,943	8.07%	0	-16	0	-16	-0.41%	7.91%
Decile Group 6	4,388	8.97%	0	-18	0	-18	-0.41%	8.78%
Decile Group 7	4,863	9.97%	0	-21	0	-21	-0.42%	10.20%
Decile Group 8	5,736	11.72%	0	-24	0	-24	-0.42%	11.82%
Decile Group 9	6,929	14.16%	0	-31	0	-31	-0.44%	15.14%
Richest Decile	11,529	23.59%	0	-53	0	-53	-0.46%	26.12%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, , ENIGH 2005-06 and authors' calculations using LATAx

Table 4.11. Average gains and losses due to reforms by total income decile group – 14% rate of VAT, adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	5,506	3.38%	0	-22	0	-22	-0.39%	3.94%
Decile Group 2	7,911	4.86%	0	-29	0	-29	-0.37%	5.30%
Decile Group 3	9,667	5.94%	0	-33	0	-33	-0.34%	6.05%
Decile Group 4	11,413	7.01%	0	-38	0	-38	-0.33%	6.92%
Decile Group 5	13,403	8.23%	0	-44	0	-44	-0.33%	7.96%
Decile Group 6	14,891	9.15%	0	-49	0	-49	-0.33%	9.02%
Decile Group 7	16,814	10.33%	0	-51	0	-51	-0.31%	9.39%
Decile Group 8	19,362	11.90%	0	-61	0	-61	-0.31%	11.07%
Decile Group 9	23,366	14.43%	0	-77	0	-77	-0.33%	14.22%
Richest Decile	40,500	24.75%	0	-144	0	-144	-0.36%	26.14%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

Table 4.12. Average gains and losses due to reforms by total expenditure decile group –14% rate of VAT, adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	4,357	3.80%	0	-17	0	-17	-0.38%	3.04%
Decile Group 2	5,856	5.11%	0	-24	0	-24	-0.41%	4.43%
Decile Group 3	6,747	5.90%	0	-28	0	-28	-0.42%	5.19%
Decile Group 4	7,942	6.93%	0	-34	0	-34	-0.43%	6.22%
Decile Group 5	8,670	7.56%	0	-38	0	-38	-0.44%	6.95%
Decile Group 6	9,706	8.47%	0	-43	0	-43	-0.45%	7.92%
Decile Group 7	11,112	9.70%	0	-50	0	-50	-0.45%	9.08%
Decile Group 8	13,115	11.45%	0	-61	0	-61	-0.46%	11.12%
Decile Group 9	16,633	14.52%	0	-83	0	-83	-0.50%	15.14%
Richest Decile	30,408	26.54%	0	-169	0	-169	-0.56%	30.90%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

4.4. Reforming alcohol duties

Alcohol is subject to both an ad-valorem tax (8%), and specific duties related to the quantity of pure alcohol in a product. Presently, the duty rate is \$9.00 per litre of pure alcohol content for most types of alcohol, with an increased rate of \$16.00 per litre for Whisky and Gin, and reduced rates for low-alcohol rum (\$5.00 per litre) and sugar-cane aguardiente (\$3.25 per litre). Here we simulate a reform to set the tax equal to \$12.00 per litre for all types of alcohol, which results in a net increase in the amount of alcohol duty raised.

Tables 4.13 and 4.14 show the distributional impact of this reform before adjustments are made to account for the under-recording of income and expenditure. Note that changes in households' VAT payments are the result of an increase in the tax base for this tax. The VAT tax base includes the specific duties applied to each product, so when duties are increased, VAT payments increase as a result even if the VAT rate remains constant.

Measured most appropriately as percentage of expenditure, losses are largest in both cash and proportional terms for richer households and smallest for poorer households. For instance, households in the top decile of the expenditure distribution face an estimated increase in alcohol duties equal to 0.13% of total expenditure, while households in the bottom decile face an increase of 0.03% of total expenditure, on average. This reflects the fact that households towards the top of the expenditure distribution are more likely to report purchasing alcohol than those towards the bottom of the distribution.

Tables 4.15 and 4.16 show the distributional impact of the reforms after applying the Altimir adjustment to households' income and expenditure to account for under-recording (see Section 3.2). How do the results differ?

First, whilst those at the top of the expenditure distribution are still hit proportionally harder than those towards the bottom, the difference is considerably less: increases in duties equivalent to 0.07% of total expenditure for the top decile versus 0.03% for the bottom decile. Second, average estimated proportional losses are lower right across the expenditure distribution (most notably towards the top of the distribution) once one applies our standard adjustment for under-recording of income and expenditure. This is because spending on 'food, alcohol and tobacco' is under-recorded by less than other types of expenditure and makes up a smaller fraction of total expenditure post-adjustment. An increase in tax on alcohol is therefore relatively smaller post-adjustment, especially for higher-spending households who devote a larger fraction of their budgets to categories of expenditure subject to larger adjustments.

Table 4.13. Average gains and losses due to reforms by total income decile group – Reform to alcohol duties, not adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	2,321	3.55%	0	0	-1	-2	-0.06%	3.23%
Decile Group 2	3,256	4.98%	0	0	-3	-3	-0.10%	7.02%
Decile Group 3	3,937	6.02%	0	0	-1	-2	-0.04%	3.54%
Decile Group 4	4,611	7.04%	0	0	-3	-3	-0.08%	7.48%
Decile Group 5	5,367	8.21%	0	0	-3	-3	-0.06%	6.61%
Decile Group 6	6,032	9.22%	0	0	-3	-3	-0.05%	6.19%
Decile Group 7	6,685	10.22%	0	0	-3	-3	-0.05%	6.94%
Decile Group 8	7,780	11.93%	0	-1	-6	-7	-0.09%	14.22%
Decile Group 9	9,285	14.16%	0	-1	-7	-8	-0.09%	16.99%
Richest Decile	16,137	24.66%	0	-1	-11	-13	-0.08%	27.79%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06 and authors' calculations using LATAX

Table 4.14. Average gains and losses due to reforms by total expenditure decile group – Reform to alcohol duties, not adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	2,074	4.24%	0	0	-1	-1	-0.03%	1.44%
Decile Group 2	2,703	5.53%	0	0	-2	-2	-0.07%	4.13%
Decile Group 3	3,118	6.38%	0	0	-2	-2	-0.07%	4.59%
Decile Group 4	3,599	7.36%	0	0	-2	-2	-0.07%	5.04%
Decile Group 5	3,943	8.07%	0	0	-2	-2	-0.06%	4.90%
Decile Group 6	4,388	8.97%	0	-1	-5	-5	-0.12%	11.22%
Decile Group 7	4,863	9.97%	0	-1	-4	-4	-0.09%	9.50%
Decile Group 8	5,736	11.72%	0	0	-4	-4	-0.07%	8.86%
Decile Group 9	6,929	14.16%	0	-1	-8	-9	-0.13%	18.94%
Richest Decile	11,529	23.59%	0	-2	-13	-15	-0.13%	31.40%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, and authors' calculations using LATAx

Table 4.15. Average gains and losses due to reforms by total income decile group – Reform to alcohol duties, adjusted

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	5,506	3.38%	0	0	-3	-3	-0.06%	4.66%
Decile Group 2	7,911	4.86%	0	0	-3	-4	-0.05%	5.11%
Decile Group 3	9,667	5.94%	0	0	-3	-3	-0.03%	4.13%
Decile Group 4	11,413	7.01%	0	-1	-5	-5	-0.05%	7.21%
Decile Group 5	13,403	8.23%	0	-1	-5	-5	-0.04%	7.29%
Decile Group 6	14,891	9.15%	0	0	-4	-4	-0.03%	5.56%
Decile Group 7	16,814	10.33%	0	-1	-5	-6	-0.03%	7.64%
Decile Group 8	19,362	11.90%	0	-1	-10	-11	-0.06%	14.93%
Decile Group 9	23,366	14.43%	0	-1	-10	-11	-0.05%	15.65%
Richest Decile	40,500	24.75%	0	-2	-18	-20	-0.05%	27.83%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

Table 4.16. Average gains and losses due to reforms by total expenditure decile group – Reform to alcohol duties, adjusted

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	4,357	3.80%	0	0	-1	-1	-0.03%	1.64%
Decile Group 2	5,856	5.11%	0	0	-3	-4	-0.06%	5.09%
Decile Group 3	6,747	5.90%	0	0	-4	-4	-0.06%	5.64%
Decile Group 4	7,942	6.93%	0	0	-3	-3	-0.04%	4.24%
Decile Group 5	8,670	7.56%	0	-1	-4	-5	-0.06%	7.01%
Decile Group 6	9,706	8.47%	0	-1	-7	-8	-0.08%	10.46%
Decile Group 7	11,112	9.70%	0	-1	-5	-5	-0.05%	7.60%
Decile Group 8	13,115	11.45%	0	-1	-6	-6	-0.05%	8.78%
Decile Group 9	16,633	14.52%	0	-1	-11	-13	-0.08%	17.94%
Richest Decile	30,408	26.54%	0	-3	-20	-23	-0.07%	31.60%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts data and authors' calculations using LATAX

However, spending on alcohol is under-reported by considerably more than expenditure on the 'food, alcohol and tobacco' group as a whole. Using administrative data on alcohol duty receipts and assumptions on the price and strength of alcohol (see section 3.2), we adjust expenditure on beer and other alcohol so that estimates revenues match official revenues for 2010. This requires multiplying recorded beer expenditure by 9.122 and other alcohol expenditure by 3.304 instead of the 'food, alcohol and tobacco' group factor of 1.55.

Tables 4.17 and 4.18 show the distributional impact of the reforms after applying these adjustments to expenditure on alcohol in addition to the standard Altimir adjustments. Losses measured in both cash terms and as a proportion of expenditure are significantly larger right across the distribution of expenditure, but particularly towards the middle and top. Increases in duties are estimated to cost the equivalent of 0.22% of total expenditure for the top decile versus 0.04% for the bottom decile (compared to 0.07% and 0.03% when the standard Altimir factors were applied). In other words, the reform looks considerably more progressive than before once we account for the particular under-recording of alcohol expenditure.

But it is important to realise that the adjustments will affect not only a household's expenditure on alcohol but also their total expenditure and their position in the expenditure distribution. The adjustment factors for alcohol are so large that households who report purchasing alcohol can be raised quite significantly up the expenditure distribution following adjustment. In other words, more of the relatively small number of households who report purchasing alcohol are towards the top of the total expenditure distribution after the adjustment process which acts to *increase* average losses at the top (in addition to the direct effect of multiplying the losses), and *reduce* average losses at the bottom (offsetting, in part, the direct effect). But it seems likely that the under-recording of alcohol expenditure in the survey is largely the result of complete omission of expenditure by other households rather than reflecting under-counting by those who do report some expenditure. If this is the case, we would not want to adjust the total expenditure of those households who do report expenditure on alcohol, or re-rank them in the expenditure distribution: their very high levels of alcohol expenditure post-adjustment *does not* reflect what we think their expenditure is but proxies *other household's* missing expenditure. An adjustment for under-recording is clearly needed but we must carefully consider how to do this most appropriately.

Tables 4.19 and 4.20 show the distributional impact of the reforms after applying the adjustment to expenditure on alcohol, but *holding fixed* total expenditure and households' position in the total expenditure distribution. This shows that apart from the poorest decile group (who are least hard hit), there is no clear pattern of increasing or decreasing losses as a proportion of expenditure as one moves up the expenditure distribution. That is, the reform is neither clearly progressive or regressive.

Considering the results shown in tables 4.13 to 4.20, what can we learn? First, it does seem clear households towards the bottom of the expenditure distribution will be least affected by this reform: they do not purchase much alcohol. But whether the reforms are more broadly progressive is not clear: the results differ substantially on the adjustments one makes for under-reporting of alcohol expenditure. Again this demonstrates the need for attempts to improve the quality of the household survey data. In this instance this could involve the introduction of a more detailed question-block on alcohol (and tobacco).

Table 4.17. Average gains and losses due to reforms by total income decile group – Reform to alcohol duties, match revenues (V1)

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	5,506	3.38%	0	-1	-8	-9	-0.17%	4.84%
Decile Group 2	7,911	4.86%	0	-1	-9	-10	-0.13%	5.38%
Decile Group 3	9,667	5.94%	0	-1	-8	-9	-0.09%	4.44%
Decile Group 4	11,413	7.01%	0	-2	-13	-15	-0.13%	7.82%
Decile Group 5	13,403	8.23%	0	-2	-12	-14	-0.10%	7.12%
Decile Group 6	14,891	9.15%	0	-1	-10	-11	-0.08%	5.89%
Decile Group 7	16,814	10.33%	0	-2	-13	-15	-0.09%	7.88%
Decile Group 8	19,362	11.90%	0	-3	-24	-28	-0.14%	14.34%
Decile Group 9	23,366	14.43%	0	-3	-26	-29	-0.12%	15.16%
Richest Decile	40,500	24.75%	0	-6	-46	-52	-0.13%	27.13%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts, Revenue administrative data and authors' calculations using LATAx

Table 4.18. Average gains and losses due to reforms by total expenditure decile group – Reform to alcohol duties, match revenues (V1)

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	4,371	3.80%	0	0	-2	-2	-0.04%	0.89%
Decile Group 2	5,899	5.12%	0	0	-4	-4	-0.07%	2.26%
Decile Group 3	6,754	5.86%	0	-1	-7	-8	-0.12%	4.07%
Decile Group 4	7,964	6.92%	0	-1	-7	-7	-0.09%	3.86%
Decile Group 5	8,696	7.58%	0	-1	-8	-9	-0.11%	4.80%
Decile Group 6	9,785	8.47%	0	-2	-14	-16	-0.16%	8.45%
Decile Group 7	11,189	9.72%	0	-2	-19	-21	-0.19%	10.96%
Decile Group 8	13,217	11.47%	0	-2	-19	-21	-0.16%	11.10%
Decile Group 9	16,763	14.55%	0	-4	-31	-35	-0.21%	18.08%
Richest Decile	30,531	26.51%	0	-8	-60	-68	-0.22%	35.53%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts, Revenue administrative data and authors' calculations using LATAx

Table 4.19. Average gains and losses due to reforms by total income decile group – Reform to alcohol duties, match revenues (V2)

<i>Total Income Decile Group</i>	Average income (1)	% of total income accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net income (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	5,506	3.38%	0	-1	-8	-9	-0.17%	4.84%
Decile Group 2	7,911	4.86%	0	-1	-9	-10	-0.13%	5.38%
Decile Group 3	9,667	5.94%	0	-1	-8	-9	-0.09%	4.44%
Decile Group 4	11,413	7.01%	0	-2	-13	-15	-0.13%	7.82%
Decile Group 5	13,403	8.23%	0	-2	-12	-14	-0.10%	7.12%
Decile Group 6	14,891	9.15%	0	-1	-10	-11	-0.08%	5.89%
Decile Group 7	16,814	10.33%	0	-2	-13	-15	-0.09%	7.88%
Decile Group 8	19,362	11.90%	0	-3	-24	-28	-0.14%	14.34%
Decile Group 9	23,366	14.43%	0	-3	-26	-29	-0.12%	15.16%
Richest Decile	40,500	24.75%	0	-6	-46	-52	-0.13%	27.13%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts, Revenue administrative data and authors' calculations using LATAx

Table 4.20. Average gains and losses due to reforms by total expenditure decile group – Reform to alcohol duties, match revenues (V2)

<i>Total Expenditure Decile Group</i>	Average expenditure (1)	% of total expenditure accounted for by each decile (2)	<i>US\$ cash loss or gain due to reforms</i>				Change as a % of net expenditure (7) = (6)/(1)	% of total loss accruing to each decile (8)
			ISR (3)	VAT (4)	Duties (5)	Total (6)		
Poorest Decile	4,357	3.80%	0	0	-3	-4	-0.09%	1.98%
Decile Group 2	5,856	5.11%	0	-1	-9	-10	-0.18%	5.41%
Decile Group 3	6,747	5.90%	0	-1	-10	-11	-0.16%	5.67%
Decile Group 4	7,942	6.93%	0	-1	-9	-10	-0.13%	5.39%
Decile Group 5	8,670	7.56%	0	-2	-12	-14	-0.16%	7.29%
Decile Group 6	9,706	8.47%	0	-2	-17	-19	-0.20%	9.89%
Decile Group 7	11,112	9.70%	0	-2	-14	-16	-0.14%	8.08%
Decile Group 8	13,115	11.45%	0	-2	-15	-17	-0.13%	9.10%
Decile Group 9	16,633	14.52%	0	-4	-30	-33	-0.20%	17.45%
Richest Decile	30,408	26.54%	0	-7	-50	-57	-0.19%	29.73%

Notes: 100/80/50 equivalence scale, total income includes monetary and non monetary resources. Cash amounts are in US\$ 2010 per annum.

Source: EHPM 2010, ENIGH 2005-06, National Accounts, Revenue administrative data and authors' calculations using LATAx

Estimated revenues from the hypothetical reforms to alcohol duty are \$7.4 million using the 'raw' survey data, \$11.4 million after adjustment for general under-recording in income and expenditure and \$30.3 million after accounting for the particular under-recording of beer and alcohol expenditure.

5. Discussion and conclusions

This report has described the development and utilisation of a tax microsimulation model with specific application to El Salvador. We hope that this is the first step to its further use and refinement to allow improved tax policy analysis, and ultimately, improved tax policy-making. But there are important lessons from the development of the tool and the initial simulation exercises.

First, the under-reporting of income and expenditure in EHPM relative to National Accounts and other administrative data (such as tax revenues) was identified as a big obstacle to robust analysis of tax reforms at the start of this project and we believe that the work we have done in this paper reinforces that view.

For instance, the estimated distributional and revenue impact of the recent income tax reforms looks very different after one adjusts for under-reporting of income by multiplying all income for all households by a constant factor (an 'Altimir' factor). But it is not clear that under-reporting is constant across income sources or across the income distribution. This means that the use of constant Altimir factors to adjust for under-reporting of income should not be seen as a viable solution. Therefore we feel that it is important that more effort is exerted in improving the quality of surveys and provisions should be made for the linking of the survey data to administrative data. At the very least, the publishing of aggregate tabular data on reported gross income and taxable income (by source) would allow evidence-based adjustments to the EHPM data (either through the application of factors that vary across the income distribution and by individual characteristics, or through re-weighting the data). This would be a significant improvement on the status quo and, combined with an increase in the fraction of income captured by the EHPM itself, would mean quantitative micro-simulation of direct taxes could be performed with much more confidence.

Effort should also be invested in improving the EHPM data on households' expenditure which is also significantly under-recorded. In this paper, we have attempted to account for this under-recording using Altimir factors for five categories of goods and services. However, unlike most countries, including nearby Mexico, the National Accounts do not provide information on aggregate household expenditure by different commodity group. This means that we have had to use data from Input-Output tables for 2006, which is not ideal: this data is out-of-date and is organised around production as opposed to consumption categories.

There is a particular problem with expenditure on alcohol and tobacco, in large part, because these categories of expenditure are not listed in the questionnaire and therefore require optional 'write-in' responses by households. We have attempted to overcome this by (a) imputing and uprating data from the 2005-06 ENIGH, and (b), adjusting expenditure on these items using Altimir factors so that estimated duties revenue matches official revenue statistics. But as shown in Section 4.4 this is not a completely satisfactory solution. The problem is not unique to El Salvador: household surveys in many countries (e.g. the UK's Living Costs and Food

Survey) also suffer from under-recording of alcohol and tobacco purchases. But the degree of under-recording is very substantial and it may be possible to reduce it by asking all households about their alcohol and tobacco expenditure using a dedicated question block.

This last issue is related to more general issues in the design of the EHPM 2010 that make it more difficult to use than necessary and may contribute to the mismeasurement of income and expenditure. For example, some household expenditure is recorded in the expenditure section 8; whereas some other expenditure is recorded in the rest of the questionnaire in relation to education (section 2), housing (section 3), work (section 4), and health (section 6). The way monetary and non-monetary expenditures are recorded, the reference periods used and the way questions about expenditure are asked vary across sections and within sections across different goods and services. This makes the use of the data and its interpretation more difficult than needed. In addition, the current EHPM methodology is to adjust reported expenditure amounts and incomes for frequency of purchase which may result in the under-recording of expenditure on items which are purchased less frequently than the period about which respondents are asked to report expenditure for (a similar issue exists for infrequently received income sources such as annual bonuses).

The EHPM is a major undertaking and its detailed coverage and large sample size makes it an important asset, especially for a small country like El Salvador. It is important to recognise that this is a big achievement and provides more timely information on household expenditure and income than is available in many countries. But this success could be built on with additional investment in the questionnaire (even if sample sizes need to be reduced to fund this) to enable easier use and more accurate simulations. We stress that improvements in the survey data and better access to taxpayer micro-data should be a priority: otherwise the results obtained from the LATAX model – and, indeed, any tax microsimulation model – will not be of the high quality needed to accurately assess the distributional impacts of past and potential reforms to the tax system.

Bibliography

Abramovsky, L., O. Attanasio, C. Emmerson, D. Phillips and H. Villareal (2010), "The distributional impact of reforms to direct and indirect tax in Mexico: Methodological Issues and Approach", Institute for Fiscal Studies

Abramovsky, L., O. Attanasio, C. Emmerson, and D. Phillips (2011), "The distributional impact of reforms to direct and indirect tax in Mexico: Analytical Report and Results", Institute for Fiscal Studies

Abramovsky, L., O. Attanasio, and D. Phillips (2012), "The distributional impact of reforms to direct and indirect tax in El Salvador Methodological Issues and Approach", Institute for Fiscal Studies

Altimir, O. (1987), "Income Distribution Statistics in Latin America and Their Reliability." *Review of Income and Wealth*. Vol. 33 No. 2

IFS (in consortium) (2011), "A retrospective evaluation of the EU VAT system", Report prepared for the EU Commission

Meyer, B. and J. Sullivan (2003), "Measuring the Well-Being of the Poor Using Income and Consumption", *Journal of Human Resources* 38, S1180-1220.

Meyer, B. and J. Sullivan (2004). "The Effects of Welfare and Tax Reform: The Material Well-Being of Single Mothers in the 1980s and 1990s," *Journal of Public Economics*, 88, July, 1387-1420.

Meyer, B. and J. Sullivan (2008), "Changes in the Consumption, Income, and Well-Being of Single Mother Headed Families," *American Economic Review*, 98(5), December, 2221-2241.

Meyer, B. and J. Sullivan (2011), "Further Results on Measuring the Well-Being of the Poor Using Income and Consumption", *Canadian Journal of Economics*, 44(1), 52-87.

Poterba, J. (1989). "Lifetime Incidence and the distributional burden of excise taxes", *American Economic Review*, 79, pp325-30.

APPENDIX A: The LATAX data creation programs

The main data used in the analysis carried out in this paper is from EHPM 2010, combined with ENIGH 2005-06 as explained in section 3. We use these data, together with a number of assumptions about how the raw variables translate into the variables necessary for our simulator (such as formality status, and gross incomes) to create three model input datasets: a household file, an expenditure file and an adult (individual) file (that includes income and social security status). In order to do this we use a program named `create_LATAX_ES_input.data_s0.do`.¹³ This appendix describes each of these files in more detail. To test the sensitivity of results to changes in assumptions about what income and expenditure is formal and how one accounts for the discrepancy between total income and expenditure as measured in the EHPM 2010 and in national accounts one would need to adjust these input files (see `create_LATAX_ES_input.data_s1.do` for general adjustment to expenditure and income, and `create_LATAX_ES_input.data_s2.do` for the extra adjustment to expenditure on beer and other alcohol products).

All figures are annual in US\$ 2010.

¹³ We also created intermediate files that feed into this program `'create_processed_data.do'`, `'create_imputed_data.do'`, `'create_processed_demos_data.do'` and `'create_processed_income_data.do'`.

Household file

Variables	Definition	EHPM 2010 file	Variable description
hhid	Household identifier	Sec01	Group variable based on original identifiers: lote, tipo, folio & viv
numren	Individual identifier	Sec01	This is just to be able to merge results from the adult file collapsed at the household level. There is only one observation for each household and numren=1 for all households.
residents	Number of household members	Sec01	
menores	Number of household members under 12 years old	Sec01	
mayores	Number of adult household members	Sec01	residentes-menores
eqsc_5030	Equivalence scale	Sec01	$1 + (\text{mayores}-1) \times (0.5) + \text{menores} \times (0.3)$
eqsc_8050	Equivalence scale	Sec01	$1 + (\text{mayores}-1) \times (0.8) + \text{menores} \times (0.50)$
eqsc_100100	Equivalence scale (income per capita)	Sec01	$1 + (\text{mayores}-1) \times (1) + \text{menores} \times (1)$
factor	Sampling weights		FAC00
estrato	Stratum		ESTRATO
geo_region	Region Identifier		REGION
area	Geographical area identifier		AREA
department	Department identifier		DEPARTMENT
hhtype	Household type	Sec01	
numfam	Number of families in the household	Sec01	
totexp	Annual total expenditure (monetary and non-monetary) in US\$ 2010	Multiple	Sum of all expnum categories defined in consumption file below + non-monetary expenditure as defined by consumption and expenditure classified as coming from autoconsumption or transfers + imputed rent
monexp	Annual monetary expenditure in US\$ 2010	Multiple	Sum of all expnum categories defined in consumption file below

totinc	Annual net total (current) income (monetary + non-monetary) in US\$ 2010	Calculated by LATAX	Income from different sources + non-monetary expenditure as defined above in totexp
moninc	Annual net monetary (current) income in US\$ 2010	Calculated by LATAX	Income from different sources

Consumption file

All expenditure categories 'exp' are annual figures in US\$ 2010 and refer to monetary expenditure only. When monetary and non-monetary expenditure cannot be distinguished, it is assumed that all expenditure is monetary.

Variables	Formal/ Informal	Tax classification 2010	Definition	EHPM 2010 file	Variable description
hhid			Household identifier	Sec01	Group variable based on original identifiers: lote, tipo, folio & viv
exp1	Formal	VAT exempted	Health services (provided by public institutions or NGOs)	Sec06	See create_processed_data.do
exp2	Formal	VAT exempted	Education services	Sec022	See create_processed_data.do
exp3	Formal	VAT exempted	Household good, services and related transfers	Sec03	See create_processed_data.do
exp4	Formal	VAT exempted	Transport (public)	Sec08B, Sec022, Sec04	See create_processed_data.do
exp5	Formal	VAT exempted	Lesisure goods and services (lottery)	Sec08D	See create_processed_data.do
exp6	Formal	VAT exempted	Transfers and other services	Sec08D	See create_processed_data.do
exp7	Formal	VAT taxed	Personal good and services (including education and health)	Sec08B, Sec08C, Sec022, Sec06	See create_processed_data.do
exp8	Formal	VAT taxed	Household goods and services	Sec08B, Sec08C, Sec08D, Sec03	See create_processed_data.do
exp9	Formal	VAT taxed	Transport	Sec08C	See create_processed_data.do

exp10	Formal	VAT taxed	Leisure goods and services	Sec08B, Sec0D	See create_processed_data.do
exp11	Formal	VAT taxed	Food and drinks out	Sec022, Sec04	See create_processed_data.do
exp12	Formal	VAT taxed	Food and drinks in	Sec08A	See create_processed_data.do
exp13	Formal	VAT taxed	Other non-food goods and services	Sec022, Sec04, Sec03	See create_processed_data.do
exp14	Formal	VAT taxed (and duties)	Soft and energy drinks	Sec08A	See create_processed_data.do
exp15	Formal	VAT taxed (and duties)	Cigarettes	Imputed	See create_imputed_data.do
exp16	Formal	VAT taxed (and duties)	Cigars	Imputed	See create_imputed_data.do
exp17	Formal	VAT taxed (and duties)	Beer	Imputed	See create_imputed_data.do
exp18	Formal	VAT taxed (and duties)	Wine and spirits	Imputed	See create_imputed_data.do
exp19	Formal	VAT taxed (and duties)	Aguardiente	Imputed	See create_imputed_data.do
exp20	Formal	VAT taxed (and duties)	Premium spirits	Imputed	See create_imputed_data.do
exp21	Formal	VAT taxed (and duties)	Fuel	Sec08B, Sec04	See create_processed_data.do
exp22	Informal	VAT exempted	Health services (provided by public institutions or NGOs)	n/a	
exp23	Informal	VAT exempted	Education services	n/a	
exp24	Informal	VAT exempted	Household and good services	n/a	
exp25	Informal	VAT exempted	Transport (public)	n/a	
exp26	Informal	VAT exempted	Lesisure goods and services (lottery)	n/a	
exp27	Informal	VAT exempted	Transfers and other services	n/a	

exp28	Informal	VAT taxed	Personal good and services (including education and health)	n/a	
exp29	Informal	VAT taxed	Household goods and services	n/a	
exp30	Informal	VAT taxed	Transport	n/a	
exp31	Informal	VAT taxed	Leisure goods and services	n/a	
exp32	Informal	VAT taxed	Food and drinks out	Sec08A	See create_processed_data.do
exp33	Informal	VAT taxed	Food and drinks in	Sec08A	See create_processed_data.do
exp34	Informal	VAT zero rate	Other non-food goods and services	n/a	
exp35	Informal	VAT taxed (and duties)	Soft and energy drinks	Sec08A	See create_processed_data.do
exp36	Informal	VAT taxed (and duties)	Cigarettes	n/a	
exp37	Informal	VAT taxed (and duties)	Cigars	n/a	
exp38	Informal	VAT taxed (and duties)	Beer	n/a	
exp39	Informal	VAT taxed (and duties)	Wine and spirits	n/a	
exp40	Informal	VAT taxed (and duties)	Aguardiente	n/a	
exp41	Informal	VAT taxed (and duties)	Premium spirits	n/a	
exp42	Informal	VAT taxed (and duties)	Fuel	n/a	

Adult file

All income categories 'inc' are annual figures in US\$ 2010.

Variables	Formal/ Informal	Description	Definition	EHPM 2010 file	Variable description
hhid			Household identifier	Sec01	Group variable based on original identifiers: lote, tipo, folio & viv
numren			Individual identifier	Sec01	
age			Age	Sec01	edad
sex			Sex	Sec01	sexo
education			Highest qualification achieved	Sec021	create_processed_demos_data.do

empstat		Whether in work	Sec04	create_processed_demos_data.do
formal_w		Whether covered by social security through work	Sec04	create_processed_demos_data.do
inc1	formal	Annual gross basic wage/salary from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc2	formal	Annual gross overtime pay from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc3	formal	Gross christmas bonus from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc4	formal	Gross annual incentive pay from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc5	formal	Annual gross holiday pay from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc6	formal	Annual gross tips from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc7	formal	Annual gross pensions	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc8	formal	Annual gross self-employment farming and garden income	Sec04 and Sec05	See create_processed_demos_data.do and create_processed_income_data.do
inc9	formal	Annual gross interest income and savings income	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc10	formal	Annual gross dividends received	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc11	formal	Annual gross corporate profits	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc12	formal	Annual gross rents on land, property and other income	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc13	formal	Annual Government transfers, redundancy pay,	Sec04	See create_processed_demos_data.do and create_processed_income_data.do

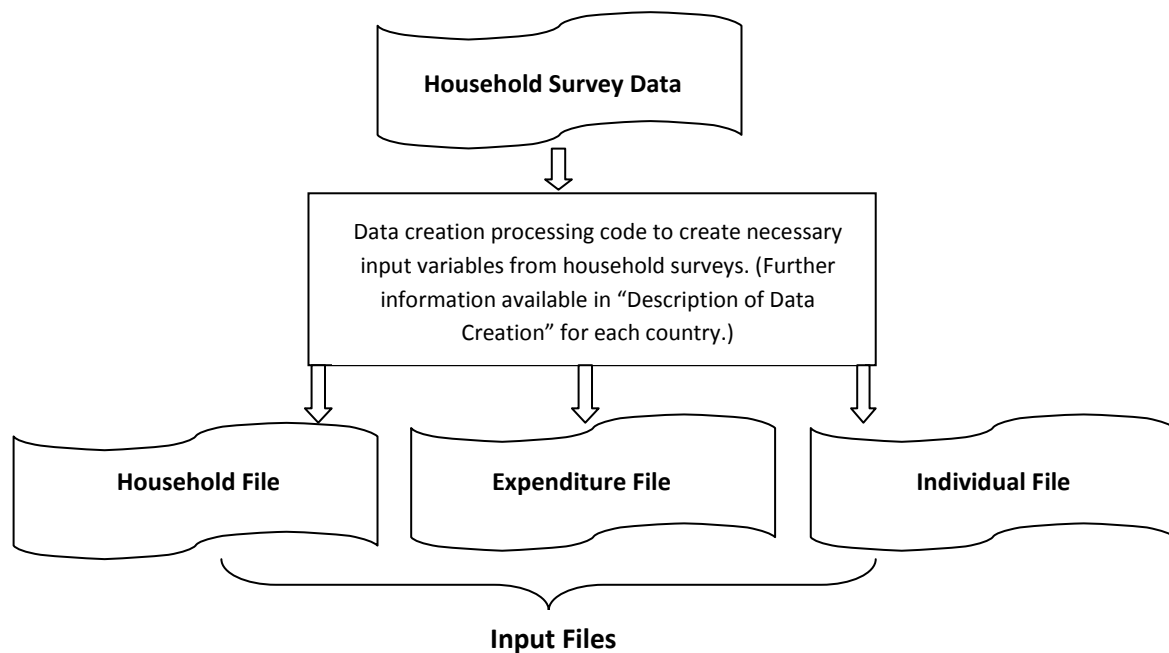
		depreciation and game winnings		
inc14	formal	Annual Alimony and remittances	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc15	formal	Annual employer-provided Food, clothing, merchandise, housing, transport and health insurance	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc16	informal	Annual gross basic wage/salary from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc17	informal	Annual gross overtime pay from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc18	informal	Gross christmas bonus from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc19	informal	Gross annual incentive pay from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc20	informal	Annual gross holiday pay from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc21	informal	Annual gross tips from main and secondary employment	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc22	informal	Annual gross pensions	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc23	informal	Annual gross self-employment farming and garden income	Sec04 and Sec05	See create_processed_demos_data.do and create_processed_income_data.do
inc24	informal	Annual gross interest income and savings income	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc25	informal	Annual gross dividends received	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc26	informal	Annual gross corporate profits	Sec04	See create_processed_demos_data.do and

				create_processed_income_data.do
inc27	informal	Annual gross rents on land, property and other income	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc28	informal	Annual Government transfers, redundancy pay, depreciation and game winnings	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc29	informal	Annual Alimony and remittances	Sec04	See create_processed_demos_data.do and create_processed_income_data.do
inc30	informal	Annual employer-provided Food, clothing, merchandise, housing, transport and health insurance	Sec04	See create_processed_demos_data.do and create_processed_income_data.do

APPENDIX B: THE LATAX PROGRAM

LATAX is written in Stata code and is designed so that users do not need to edit the main simulation code but can instead make changes to an interface main module (which defines input and output files and whether to run behavioral response modules) and system parameters modules (which define the basic structure and rates of the baseline and reform tax systems). Based on the data and the user-defined tax parameters, separate modules then calculate indirect tax payments, the direct tax base, and direct tax payments before calculating the revenue effects of the reforms and the impact of the tax changes across the income / expenditure distributions and by household types. Separate modules can then be turned on and off according to need to allow for less-than-full pass-through of changes in indirect taxes to changes in consumer prices, as well as to model labor supply (or more correctly, taxable income) and consumer demand responses to tax changes (if a demand system has been estimated for the country LATAX is being used for. At present this is only Mexico). It has been designed in this way so that users do not have to edit the main program code even if they wish to make fairly major changes to the tax system (e.g. introducing additional tax rates) or the input data (such as additional sources of income or expenditure categories). Figure B.1 shows the basic structure of the program. We then describe each module in turn.

Table B.1 A graphical representation of LATAX



The following provides basic information on the use of LATAX and the structure of the program. Fuller and more detailed instructions, including worked examples, will be available in the forthcoming “LATAX manual”, recently approved for funding by the World Bank.

main_module.do

This interface main module contains user-edited instructions on: the directories in which the simulation code, input and output data, and parameter code can be found; the name and location of logfiles; the names of input and output datasets; the existing and reform systems to be used in the analysis; and runs the tax simulator. There are options for whether one wants to conduct the behavioral analysis.

In order to run LATAX, the first thing necessary is to run *main_module.do*. Then the user must type in the following commands:

set_country followed by “elsalv” for El Salvador or “mexico” for Mexico
set_systems followed by the (numerical) name of 3 systems (e.g. 2010 2011 2012)
set_defaults
simulator which runs the program (calls *loadprogs.do*)

The default options for running LATAX are contained in ‘*main_module.do*’ and/or are imputed using the compulsory commands discussed above. However the user can also directly edit ‘*main_module.do*’ or use optional commands (see forthcoming “LATAX manual”) to change the following defaults:

taxsim - the directory of the LATAX do files
in - the directory that contains LATAX input data
out - the directory that LATAX output data will be written to
param - the directory containing the parameter definition do files

logfiledecile - the log file for cash and proportional tax changes by decile group
logfiledecile1 - the log file for proportion of change in tax revenues attributable to each decile
logfilehhtype - the log file for cash and proportional tax changes by household type
logfileincome - the log file for revenue changes from tax reforms

indata_hh - household data input file
indata_ad - individual and incomes data input file

indata_co - expenditure data input file

outdata_ad - individual level output file

outtdata_hh - household level output file

sys1 - baseline system number (e.g. 2010)

sys2 - reform system 1 number (e.g. 2011)

sys3 - reform system 2 number (e.g. 2012)

disttype - set equal to 1 to perform analysis with all equivalence scales, 2 for just 100/80/50 scale

netincometype - set equal to 1 to use net income calculated using LATAX, 2 to use a net income measure directly recorded in the input data

global identlist - the household identifier variable or set of variables

There are then a set of globals which are used to determine the type of behavioral analysis to be performed:

labmod - To run labor supply analysis set equal to 1 (2 otherwise)

logfilelabor - the log file for output of labor supply module

Settings related to consumer demand modelling are not relevant for El Salvador (no demand model has been estimated) and so are omitted here.

indir - To perform analysis with less-than-complete IVA pass-through set equal to 1

prop_prices - The extent of pass through (between 0 and 1)

prop_wages - The extent to which taxes not passed on in prices are born by wages (between 0 and 1)

Four globals (corresponding to logfiledecile, logfilehhtype, logfilerevenue and outdata_ad) are used to define output files for analysis when different assumptions about IVA and duties pass-through are made and should be changed for each scenario to avoid over-writing files.

The last global parameter is indic_incidence and this should **not** be edited by the user.

loadprogs.do

This module calls the programs that perform the tax, revenue and distributional calculations and that estimate the behavioral response to a particular set of reforms (given the assumptions provided to LATAX). This is done as follows:

- First, for each of the three tax systems chosen in *main_module.do* (sys1, sys2, sys3), load the parameters file (*params_X*) from the correct parameters folder, and then call *calc_indirtax.do*, *set_taxbase.do* and *calc_dirtax.do*.
- Then, call *do_household.do* and *do_distanalysis.do*
- Finally, if selected (using *consmo*, *indir* and *labmod* as set in *main_module.do*) call *quaid.do*, *indirect_incidence.do* and *labor.do*.

params_X.do

The user defines the parameters of the VAT, duties, income tax (ISR) and Social Security tax systems in the parameter do files. When naming the do files they should always be of the form *params_X.do*, where X is the name of the particular system (and corresponds to sys1, sys2 or sys3 as defined in *main_module.do*). Existing parameters modules should be used as templates and it is important that the names of scalars are not changed (although of course the values can be).

For indirect taxes the user needs to define the following scalars:

NUMGOODS	- The number of expenditure categories in the input data
OVAT[1-NUMGOODS]	- The standard VAT rate applicable to a particular category in the year the input data was collected. This should not be changed when changing the parameters of a reform or baseline system but only when the data used is from a different year (e.g. 2010).
OBVAT[1-NUMGOODS]	- If different VAT rates are applied in different parts of the country this allows a second rate of VAT to be set. It records the second rate applicable to a particular category in the year the input data was collected. This should not be changed when changing the parameters of a reform or baseline system but only when the data used is from a different year.
ODUTIES [1-NUMGOODS]	- The duties rate applicable to a particular category in the year the input data was collected. This should not be changed when changing the parameters of a reform or baseline system but only when the data used is from a different year.
VAT[1-NUMGOODS]	- The standard VAT rate applicable to a particular category in the tax system under consideration. This should be changed when changing the parameters of a reform or baseline system.
BVAT[1-NUMGOODS]	- If different VAT rates are applied in different parts of the country this allows a second rate of VAT to be set rate. This scalar defines the second VAT rate applicable to a particular category in the tax system under consideration. This should be changed when changing the parameters of a reform or baseline system.

DUTIES [1-NUMGOODS] - The duties rate applicable to a particular category in the tax system under consideration. This should be changed when changing the parameters of a reform or baseline system.

For income taxes the user needs to define the following scalars:

NUMSOURCES - The number of income sources in the input data

DEDUCTSOCSEC - Set equal to 1 if social security contributions are deducted from taxable income as they are in El Salvador

EXEMPT[1-NUMSOURCES] - The cash amount of a particular source that is exempt from income tax. For sources of income on which tax is not being simulated (e.g. capital income) this should be set to an amount higher than the largest observed value for that source.

PEXEMPT[1-NUMSOURCES] - The proportion of a particular source that is exempt from income tax.

MPEXEMPT[1-NUMSOURCES] - The amount of a source above which no additional proportion is exempt from income tax.

NUMBANDS - The number of income tax bands

BAND[0-NUMBANDS] - The upper-limit of each income tax band. The upper limit of the higher band should be higher than the largest observed value for gross income.

RATE[1-NUMBANDS] - Income tax rates (0 – 1)

MAXRATE - Maximum average tax rate if one applies

JUMP[1-NUMBANDS] - The discrete jump in tax liability that occurs when one enters a new tax band. This allows one to model 'entry fees' to the tax system (such as the minimum \$57.14 payment under the 2010 El Salvador system)

NUMCREDS - Number of bands of employment income subsidy.

LCRED[0-NUMCREDS] - Upper-limit of each employment-income subsidy band. The 0 band is to ensure that no subsidy is given to those with no earned income.

ACRED[1-NUMCREDS] - Amount of credit for those with an income in each subsidy band.

For social security the user needs to define the following scalars:

NUMSOCSECSYSTEMS - The number of systems with different rates and/or bands in operation

NUMSOCSEC[1-NUMSOCSECSYSTEMS]- The number of bands for each of the social security systems

For each of the social security systems $X = 1..[\text{NUMSOCSECSYSTEMS}]$ and for each of the bands under that system $Y = 1... \text{NUMSOCSEC}[1-\text{NUMSOCSECSYSTEMS}]$, the following parameter are also defined

LSOCSEC X _ Y	- The upper-limit of band Y for social security system X .
SOCSEC X _ Y	- The contribution rate applying to band Y for social security system X .
SSNUMSOURCES	- Number of sources of income for social security purposes
SSEXEMPT[1-SSNUMSOURCES]-	-The cash amount of a particular source that is exempt from social security. For sources of income on which tax is not being simulated (e.g. capital income) this should be set to an amount higher than the largest observed value for that source.
SSPEXEMPT[1-SSNUMSOURCES]	- The proportion of a particular source that is exempt from social security.
SSMPEXEMPT[1-SSNUMSOURCES]	- The amount of a source above which no additional proportion is exempt from social security.

calc_indirtax.do

This program first uses the VAT and duties rates that applied at the time of the survey underlying the expenditure input data (vectors OVAT, OBVAT and ODUTIES) to calculate pre-tax prices. Total pre-tax expenditure is also calculated. Next, the VAT and IEPS rates that apply under the system under consideration (vectors VAT, BVAT and DUTIES) are used to calculate the amount of VAT and IEPS due under that system. The calculation is done by good and then summed over goods to give a total per household.

set_taxbase.do

First, depending on the value of the global `indic_incidence`, either the standard input data is loaded (`indic_incidence = 1`) or the data adjusted for less than-full pass-through (`indic_incidence = 2` or `3`). Then using the amount of each income from each source and the exemptions (`EXEMPT`, `PEXEMPT`, `MPEXEMPT`, `SSEXEMPT`, `SSPEXEMPT`, and `SSMPEXEMPT`) the taxbase for income tax and social security contributions is calculated.

Sections allowing for deductions of certain expenses (such as medical insurance) are currently commented out as the inability to model income tax on capital and self employment income (partly due to poor data) means that one cannot calculate the maximum amount deductible (which is typically a fraction of taxable income).

calc_dirtax.do

The first part of the program calculates social security contributions using the social security bands and rates (`LSOCSEC X _ Y` , `SOCSEC X _ Y`) to calculate fixed quotas for social security contributions: that is the amount of contributions paid on income up to the start of each band. This means that when calculating the amount of social security contributions paid, this can be added on to the amount paid on income within the band an individual finds themselves in, simplifying calculations considerably. The same process is then done for income tax payments, after deducting the amount of social security contributions paid from the income tax base if `DEDUCTSOCSEC==1`.

The amount of subsidy for employment income is calculated using the tax base for income tax and the ACRED and LCRED amounts defined for the system.

Once income tax and social security payments are calculated, net income is calculated as (gross income) – (income tax) – (social security contributions).

Depending on the value of the global `indic_incidence`, the output is saved either as a standard file (`indic_incidence =1`) or as output data for the analysis of less-than-full pass-through (`indic_incidence =2` or `3`).

do_household.do

This module first loads the relevant variables from the input data (individual and household files) and then merges in the results of the indirect and direct tax calculations for the base system (`sys1`) and the two reform systems (`sys2` and `sys3`). Individual and household level changes in tax payments under the reform systems are then calculated.

Household net monetary and non-monetary income is calculated from the tax simulation outputs if `netincometype==1` in the interface main module.

Individual-level and household level output files are saved.

do_distanalysis.do

This program first calculates the revenue effects of each reform by summing (and appropriately grossing using sample weights) the changes in tax payments for each tax. This is saved in a log file.

The program then calculates equivalised incomes for each equivalence scale (100/100/100, 100/80/50 and 100/50/30) and equivalised income and expenditure decile groups.

The global `disttype` (defined in *main_module.do*) tells this module whether the full set of distributional analysis should be conducted (`disttype=1`) or only a partial analysis (`disttype=2`).

Average cash gains/losses per household by decile group are calculated as (minus) the sum of the change in tax payments in each particular decile group, divided by the number of households in each particular decile group. The average proportional gains/losses per household by decile group are calculated as (minus) the sum of the change in tax payments in each particular decile group, divided by the total income/expenditure of households in each particular decile group. In addition, the proportion of the increase (or decrease) in revenue attributable to each decile group is also calculated for each tax and in total, and compared to the proportion of total income/expenditure attributable to each decile group.

The results are displayed in tables which are saved in log files.

The process is repeated for gains/losses by household type.

indirect_incidence.do

This program allows one to carry out analyses assuming that indirect taxes are partly incident on wages and profits (instead of fully on prices).

The program first loads output data from the indirect tax calculations (performed in *calc_indirtax.do*) and input data from the files `indata_ad` and `indata_hh`. Calculations then proceed as follows.

First, post tax-reform consumer prices under the assumption of less-than-full VAT and duties pass through, and the associated direct effect of the change in VAT and duties on consumers are calculated using the assumed pass-through rate. Then new consumer prices are used to calculate pre-tax prices and the amounts of VAT and duties paid under the reform systems.

The next stage is to allocate the part of the burden not borne directly to consumers to gross formal sector employment income and (net) capital income according to the ratio assumed in *main_module.do*. It is assumed that the amount of income of each individual with these sources is reduced by the same proportion.

We recalculate the amount of tax paid and net income given the changed gross income calculated in the previous stage by recalling *set_taxbase* and *calc_dirtax*. When doing this we change the value of *indirect_incidence* to 2 so that *set_taxbase* and *calc_dirtax* know that they are being called by *indirect_incidence* rather than *load_progs*.

The module then performs the same functions as *do_household.do* and *do_distanalysis.do*, outputting to log files and an individual-level data file (*logfiledecile_ind*, *logfilehhtype_ind*, *logfilerevenue_ind* and *outdata_ad_ind*). It should be noted that the tables in the decile and household log files show the proportional changes in net income and expenditure (assuming fixed purchase quantities) rather than changes in taxes paid. This is because when pass-through is less than complete, the changes in taxes paid and the gain/loss to households differs.

labor.do

This program allows one to estimate how taxable employment income responds to changes in both direct and indirect taxes, given an assumed set of elasticities (on the intensive and extensive margin).

First, the household-level average tax rates on expenditure are calculated, accounting for informal transactions. These are then added to average income tax and social security rates to get the participation tax rates (PTRs), and to marginal income tax and social security rates to get marginal effective tax rates (METRs).

The user then defines the hours elasticities (intensive margin) and the participation elasticities (extensive margin), which may vary by demographic group. The changes in taxable employment income and the associated changes in tax revenues are then calculated using the calculated PTRs and METRs and the assumed elasticities.

Finally, demographic variables are created and the changes in taxable labor income and revenue are outputted in *logfilelabor*.

This module is currently in the process of being amended to allow its use in El Salvador (it was originally designed for MEXTAX and Mexican data). Further details will be available in the forthcoming “LATAX manual”.