

Institute for
Fiscal Studies

MEXTAX: a tax micro-simulator for Mexico and its application to the 2010 tax reforms

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Outline

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- The MEXTAX simulator
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 - Assumptions
- How do we measure living standards?
 - Expenditure versus income
- Distributional impact of the 2010 reforms
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 - Accounting for missing income
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Introduction

- Growing interest in understanding distributional and behavioural effects of taxes in low and middle income countries
 - Inefficient and/or inequitable tax systems stymie development
 - Need to raise revenue or switch to new revenue streams
 - Mexico faces decline in oil revenues and hence will need to increase non-oil revenue
- Develop a tax microsimulation tool and investigate methodological issues for simulating tax reform for Mexico
 - Calculates tax payments for each household
 - Aggregate to produce revenue estimates and summary distributional analysis
- Important methodological decisions to make
 - Account for behavioural response or not?
 - Whether to, and if so, how to adjust for misreporting of income or spending?
- Apply it to simulate the impact of 2010 Mexican tax reform

The 2010 tax reforms

Initially proposed in 2009 (Proposed)

- introduction of 2% expenditure tax (the **CCP**) on all goods and services
- increase in the **IEPS** tax rate
 - on alcohol drinks +20%, modelled as increase in rate from 50% to 53%
 - on beer from 25% to 28%
 - on tobacco, modelled as increase in rate from 160% to 164%
 - on lottery games from 20% to 30%
 - on telecommunications services from 0% to 4%
- increase in the top three rates of income tax (ISR)
 - from 28% to 30%, 21.95% to 23.52% and 19.94% to 21.36%. Reduce 16% threshold
 - Only the part of tax paid on employment income is considered

Approved and implemented in 2010 (Approved)

- increase in **VAT** rate from 15% to 16%, abstracting from differences in border areas
- increase in the **IEPS** tax rate
 - on alcohol drinks +20%, modelled as increase in rate from 50% to 53%
 - on beer from 25% to 26.5%
 - on tobacco, modelled as increase in rate from 160% to 164%
 - on lottery games from 20% to 30%
 - on telecommunications services from 0% to 3%
- increase in the top three rates of income tax (ISR)
 - from 28% to 30%, 21.95% to 23.52% and 19.94% to 21.36%
 - Only the part of tax paid on employment income is considered

MEXTAX: Data and structure

- MEXTAX is a simple but flexible tax micro-simulator developed in Stata
 - Uses ENIGH (2008) as its source of individual-level income and household-level expenditure data
 - ENIGH files are processed to obtain gross income by category (e.g. salary, bonus), indicators of tax evasion (informality) , and household demographics
- Based on a modular approach
 - User amends “interface” module which contains settings on the type of analysis to be performed and certain assumptions to be made
 - And the “parameter” modules which include tax rates, thresholds etc. under the base and reform systems
 - Tax calculations and distributional analysis modules are not ‘system specific’ and need not be amended for a large number of reforms
 - Easy to do actual and counterfactual reforms
- Includes the following taxes
 - Income tax (ISR) (modelled for employment income only so far)
 - Employees’ social security contributions (IMSS and ISSSTE)
 - Value Added Tax (IVA)
 - Excise duties (IEPS)

MEXTAX: The parameters modules

```
Untitled1.do  params_2008.do

*****
***** INCOME TAX *****
*****

***** INCOME TAX EXEMPTIONS *****

scalar NUMSOURCES = 20

**** MONETARY AMOUNTS ****

scalar EXEMPT1 = 0
scalar EXEMPT2 = 0
scalar EXEMPT3 = 1577.7
scalar EXEMPT4 = 1577.7
scalar EXEMPT5 = 788.85
scalar EXEMPT6 = 788.85
scalar EXEMPT7 = 1000000000
scalar EXEMPT8 = 0
scalar EXEMPT9 = 100000000
scalar EXEMPT10 = 1000000000

foreach X of numlist 11(1)20 {
    scalar EXEMPT`X' = 1000000000
}

**** PERCENTAGES ****

scalar PEXEMPT1 = 0
scalar PEXEMPT2 = 0.5

foreach X of numlist 3(1)20 {
    scalar PEXEMPT`X' = 0
}

scalar MPEXEMPT1 = 0
scalar MPEXEMPT2 = 13673.4

foreach X of numlist 3(1)20 {
    scalar MPEXEMPT`X' = 0
}
```

```
Untitled1.do  params_2008.do

***** INCOME TAX THRESHOLDS *****

scalar NUMBANDS = 8

scalar BANDO = 0
scalar BAND1 = 5952.84
scalar BAND2 = 50524.92
scalar BAND3 = 88793.04
scalar BAND4 = 103218.00
scalar BAND5 = 123580.20
scalar BAND6 = 249243.48
scalar BAND7 = 392841.96
scalar BAND8 = 1000000000

***** INCOME TAX RATES *****

scalar RATE1 = 0.0192
scalar RATE2 = 0.064
scalar RATE3 = 0.1088
scalar RATE4 = 0.16
scalar RATE5 = 0.1792
scalar RATE6 = 0.1994
scalar RATE7 = 0.2195
scalar RATE8 = 0.28

***** INCOME SUBSIDY LIMITS *****

scalar NUMCREDS = 11

scalar LCREDO = 0.01
scalar LCRED1 = 21227.52
scalar LCRED2 = 31840.56
scalar LCRED3 = 41674.08
scalar LCRED4 = 42454.44
scalar LCRED5 = 53353.80
scalar LCRED6 = 56606.16
scalar LCRED7 = 64025.04
scalar LCRED8 = 74696.04
scalar LCRED9 = 85366.80
scalar LCRED10 = 88587.96
scalar LCRED11 = 1000000000
```

MEXTAX: standard assumptions

- We make the following assumptions in ALL of our analysis
 - Members of state government SS schemes face national government SS schedule
 - Formal workers comply with tax law on all income
 - Formal workers paid at least the Mexico City minimum wage
 - Income Tax and employees' SS contributions incident fully on the worker
- We make the following assumptions in our baseline analysis
 - Workers are considered to be formal if covered by an SS health scheme through own their work
 - Expenditure is considered to be formal (and subject to VAT and duties) unless the type of vendor is a street market or stall
 - VAT and duties are fully incident on the consumer
 - No adjustment is made for under-reporting of income or expenditure
 - No change in behaviour in response to tax changes

Key issue: rich or poor? (I)

- Income is typically used as the measure of living standards to define “rich” and “poor” when looking at the distributional effects of a tax reform
- But many people with measured low incomes do not necessarily have low living standards
 - Measurement error
 - Temporarily low incomes
 - Lifecycle issues (retired or students)
- In general, those with the lowest reported incomes report spending more than their income, and those with the highest reported incomes report spending less.
- Those with the lowest reported spending typically report earning more, those with the highest reported spending typically report earning less than they spend
- Assessing the progressivity of reforms to indirect taxes by looking at losses/gains as a fraction of income can give misleading results, and vice versa.

Key issue: rich or poor? (II)

- Imagine a uniform expenditure tax
 - E.g. the 2% tax initially proposed for the 2010 Budget
 - Over a lifetime this must be distributionally neutral
- But it will look regressive as a fraction of income over the income distribution
 - Income is less than spending (on which 2% tax is levied) for low income, and more than spending for high income
- And it will look progressive as a fraction of income over the spending distribution
 - Income is more than spending (on which 2% tax is levied) for low spenders, and less than spending for high spenders
- A similar problem when looking at the impact of direct taxes as a proportion of spending
- When tax reforms combine both indirect and direct tax changes it is important to use both income-based and expenditure-based analysis

Analysis of the 2010 tax reforms

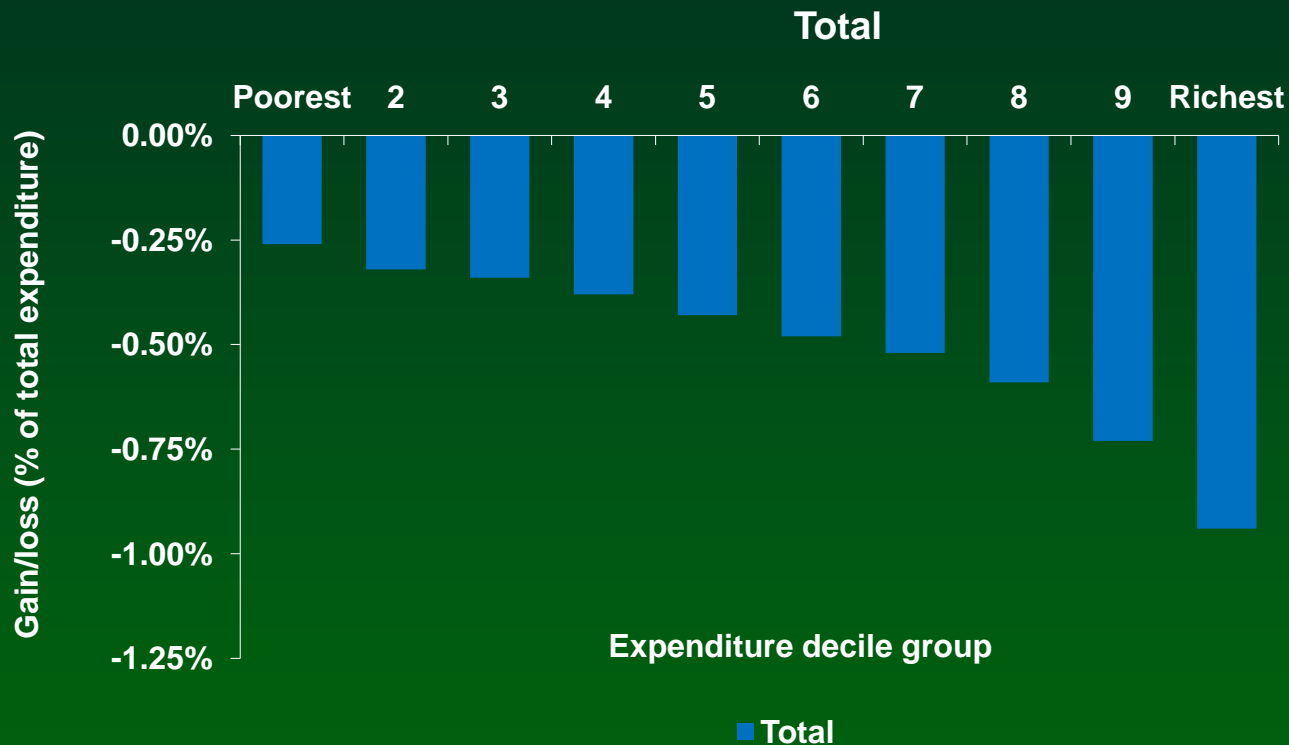
Baseline: Losses to households as a % of income (I)



Baseline: Losses to households as a % of income (II)



Baseline: Losses to households as a % of expenditure



Methodology: sensitivity to missing income (I)

- Major problem of under-reporting of income and spending in the ENIGH survey

Income Source	Altimir Factor	Implied % Recorded
Employment	1.470	68.0%
Self Employment	2.290	43.7%
Capital	23.677	4.2%
Transfer	1.295	77.2%
Other	1.000	100%

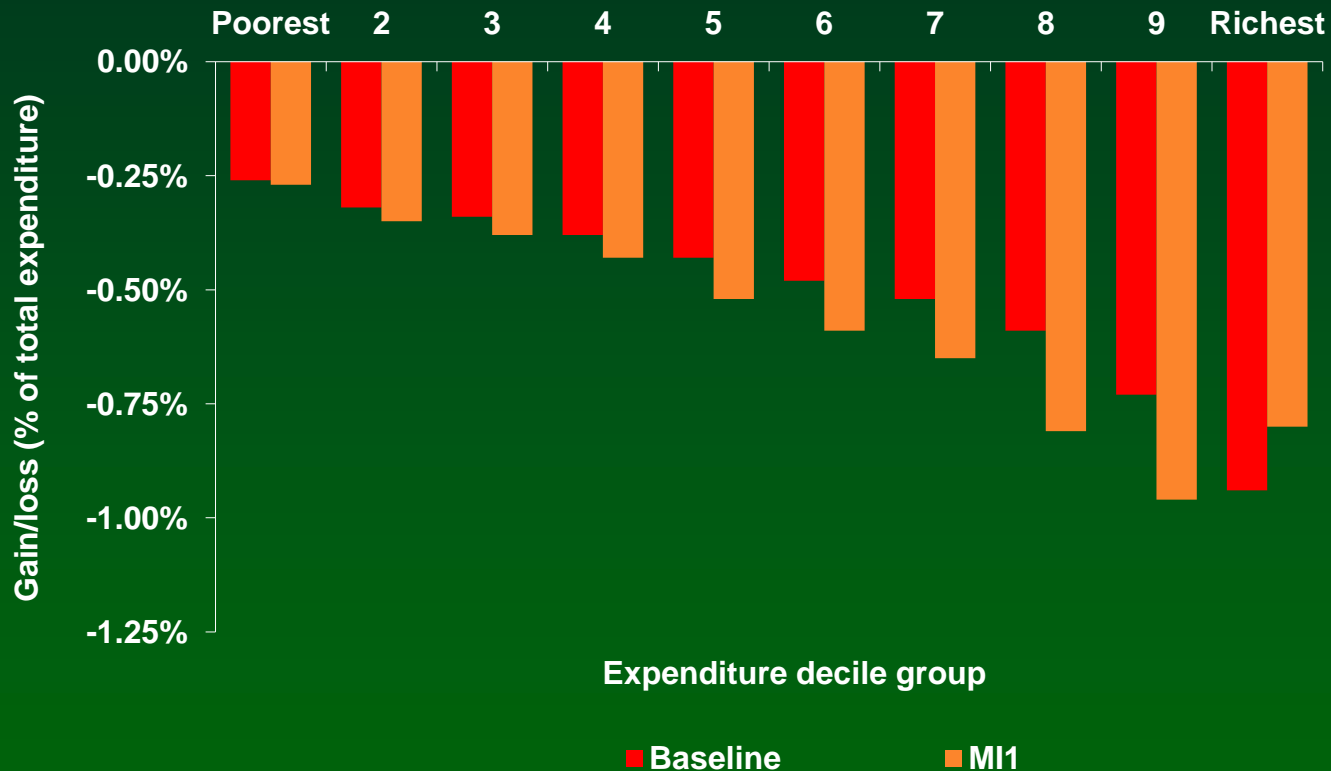
Based on 1998 ENIGH and National Accounts

- Important to adjust income and spending in order to obtain accurate revenue estimates
 - And to obtain distributional impacts for non-linear income and social security taxes

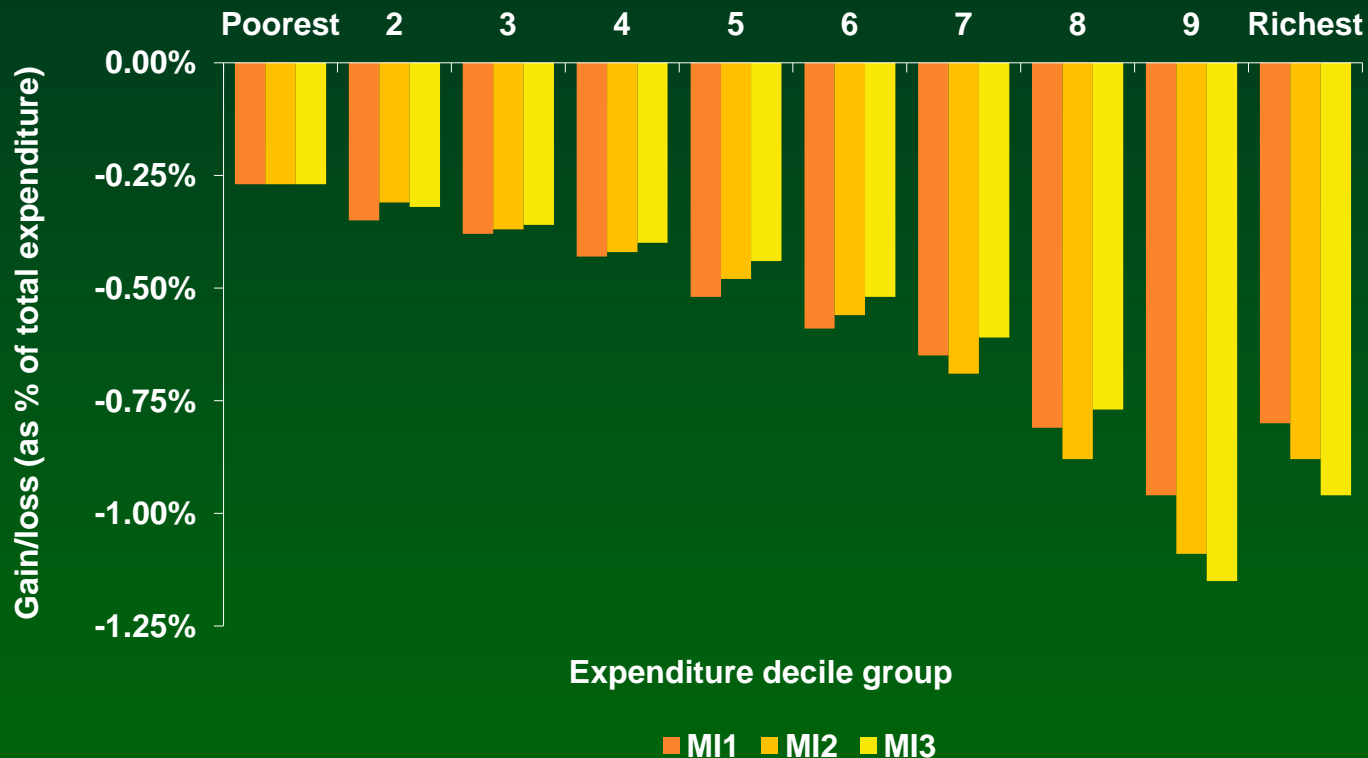
Methodology: sensitivity to missing income (II)

- Previous research has multiplied incomes from each source by a constant factor
- But it is unlikely that everyone under-reports income by the same constant factor
- We look at following assumptions on missing income/expenditure
 - Income source-specific constant factors based on national accounts aggregates (MI1)
 - Employment income factor that increases smoothly as employment income increases (MI2, MI3)
 - Random allocation of missing income according to characteristics of households (MI4)
 - Expenditure is adjusted in all instances by same factor as a household's income

Comparing baseline with MI1 results



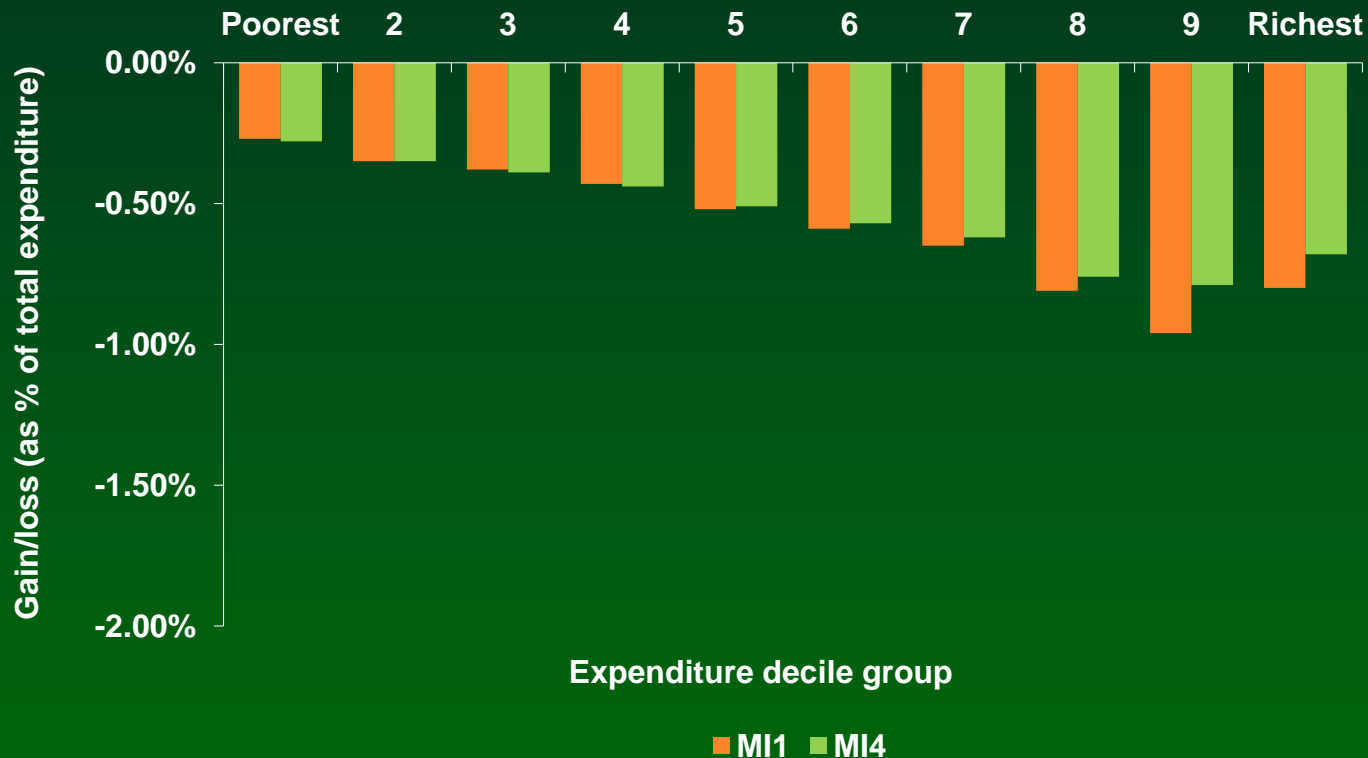
Comparing MI2 and MI3 with MI1 results results



Methodology: sensitivity to missing income (III)

- Allowing for complete omission of income sources by households is the biggest departure from existing work in Mexico
- We first decide what fraction of individuals are under-reporting the income source (by either under reporting the amount or complete omission) relative to the number reporting they receive that source in the survey.
- Based on the characteristics of those reporting an amount we predict who this fraction of individuals are (allowing for prediction error)
- We then predict the amount of under-reported income for each of these individuals (allowing for prediction error and drawing from the actual distribution of reported amounts to avoid imposing normality of predictions)
- We scale up these amounts so that the total income by source matches national accounts figures

Comparing baseline with MI4 results



Methodology : sensitivity to missing income (IV)

- How correct for missing income affects revenue estimates:

<i>Reform</i>	Baseline	MI1	MI2	MI3	MI4
Approved					
ISR	5,990	13,100	17,800	20,400	12,100
IVA	10,900	30,200	30,200	30,100	34,200
IEPS	3,060	8,260	8,210	8,150	9,890
Total	19,950	51,560	56,200	58,650	56,190

Methodology: Behavioural response

- Taxes paid by specific individuals and households and revenue can be calculated holding behaviour fixed
- But changes in taxes affects incentives to work, to declare income, what items to buy, etc
- Program allows one to look separately at 3 margins of response
 - Changes in pre-tax commodity prices, wages and profits for indirect tax
 - Changes in consumer spending patterns
 - Labor supply (formal employment income elasticities)
- Ideally would want to estimate models of these responses
 - But lack of identification means we use assumption-driven sensitivity tests

Methodology : Behavioural response – labor (I)

- Increases in tax may discourage work and increase incentive for informal work
- Ideally estimate a structural model of working decisions and tax evasion
 - Exogenous variation in incentives?
 - Accurate data on incomes and labor supply?
- Reduced-form model “formal employment income” income elasticities
 - Not differentiate between “real” and “shifting” response but does include both
 - Decisions to shift out of formal sector completely – participation tax rate and elasticity
 - Decisions to change formal income at margin – marginal effective tax rate and elasticity
- Allows us to look at revenue and changes in taxable employment income
 - But not changes in revenue by tax or welfare effects

$$Gross_{new} = Gross_{old} * \left(\frac{1 - METR_{new}}{1 - METR_{old}} \right)^{IntElast} * \left(\frac{1 - PTR_{new}}{1 - PTR_{old}} \right)^{ExtElast}$$

Methodology : Behavioural response – labor (II)

Type of individual	“Low” (B1)	“Medium” (B2)	“High” (B3)
<i>Intensive margin</i>			
Bottom 90% of employment income distribution	0.05	0.1	0.2
91 st to 99 th percentile or women with children aged < 12	0.1	0.2	0.4
100 th percentile of the distribution	0.2	0.4	0.8
<i>Extensive margin</i>			
Top 40% of the employment income distribution	0.05	0.1	0.2
41 st to 60 th percentile	0.1	0.2	0.4
21 st to 40 th percentile	0.15	0.3	0.6
1 st to 20 th percentile	0.2	0.4	0.8

Methodology : Behavioural response – labor (III)

- Degree of behavioural response affects revenues from tax reforms:

<i>Reform</i>	Baseline	“Low” (B1)	“Medium” (B2)	“High” (B3)
Approved				
ISR	5,990	-	-	-
IVA	10,900	-	-	-
IEPS	3,060	-	-	-
Total	19,950	18,850	17,760	15,620

Summary and Conclusion

- Mextax is a simple tax-microsimulator that can be used to calculate revenue and distributional impact of reforms
 - Includes simple stylised behavioural response
- Thinking about methodological issues in tax analysis is very important
 - How to determine measure of living standards
 - How to account for the uncertainty driven by poor quality data
 - How to account for the uncertainty around behavioral response
- Importance of improving the micro-data
 - Improvements to ENIGH and access to administrative data
- Importance of further research on the effects of taxes on labor supply and on informal sector