The Policy Elasticity

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Welfare Analysis and Marginal Excess Burden

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- Done properly, MEB/MDWL requires a decomposition of behavioral responses into income and substitution effects.
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Done properly, MEB/MDWL requires a decomposition of behavioral responses into income and substitution effects.

- Only the compensated effect matters.
Growing literature estimating causal effects of these policies
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- Quasi-experimental methods / natural experiments / RCTs
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But moving from positive to normative analysis is difficult
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- Goolsbee (1999): “The theory largely relates to compensated elasticities, whereas the natural experiments provide information primarily on the uncompensated effects”
This paper clarifies how causal effects can be directly used in welfare analysis of government policy changes.
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Simple idea: Don’t calculate MEB or MDWL (Harberger (1964), Feldstein (1999), Kleven and Kreiner (2005), etc.)

Measure people’s marginal willingness to pay for policy changes (Mayshar 1990, Slemrod and Yitzhaki 1996, 2001, Kleven and Kreiner (2006)).

In the broad class of models where taxes are the only distortion, the causal impact of the policy on the government budget (a.k.a. “Fiscal Externality”) is sufficient for all behavioral responses.

Key message: Calculate the fiscal implications of behavioral responses. e.g. “The behavioral response to the EITC expansion increased government outlays by 5%.”

These readily nest into general normative framework (Even though they are not technically a measure of deadweight loss).
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**Key message:** Calculate the fiscal implications of behavioral responses.

- e.g. “The behavioral response to the EITC expansion increased government outlays by 5%”
- These readily nest into general normative framework
  - (Even though they are not technically a measure of deadweight loss)
1. Model

2. The Marginal Value of Public Funds

3. Applications to Top Tax Rate, EITC, Job Training, Food Stamps, Housing Vouchers
1 Model

2 The Marginal Value of Public Funds

3 Applications to Top Tax Rate, EITC, Job Training, Food Stamps, Housing Vouchers
Setup

- Goal: Measure people's marginal willingness to pay for government policy changes
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Set of individuals indexed by $i \in I$
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Set of individuals indexed by $i \in I$

- Choose vector of goods, $x_i = \{x_{ij}\}_{j=1}^{J_X}$

- Government publicly provided goods and services to agent $i$, $G_i = \{G_{ij}\}_{j=1}^{J_G}$

- Marginal cost of $G_{ij}$ is $c_{G_{ij}}$

- Taxes on goods, $\{\tau_{x_{ij}}\}_{j=1}^{J_X}$, and $\{\tau_{l_{ij}}\}_{j=1}^{J_L}$

- Transfers to agent $i$, $T_i$ includes virtual income of nonlinear schedules
Goal: Measure people’s marginal willingness to pay for government policy changes

Set of individuals indexed by $i \in I$

1. Choose vector of goods, $x_i = \{x_{ij}\}_{j=1}^{X}$
2. Engage in labor supply activities, $l_i = \{l_{ij}\}_{j=1}^{L}$
Goal: Measure people’s marginal willingness to pay for government policy changes

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Government
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Government

4. Publicly provided goods and services to agent $i$, $G_i = \{G_{ij}\}_{j=1}^{J_G}$
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   - Marginal cost of $G_{ij}$ is $c_{jG}^G$
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Agent’s Problem

- One unit of goods produced by one unit of labor supply
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- Budget Constraint

\[
\sum_{j=1}^{J_X} (1 + \tau_{ij}) x_{ij} \leq \sum_{j=1}^{J_L} (1 - \tau_{ij}) l_{ij} + T_i + y_i
\]
Agent’s Problem

• One unit of goods produced by one unit of labor supply
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\sum_{j=1}^{J_X} (1 + \tau_{ij}^X) x_{ij} \leq \sum_{j=1}^{J_L} (1 - \tau_{ij}^L) l_{ij} + T_i + y_i
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• \(y_i\) is non-labor income
Agent’s Problem

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  - Budget Constraint
    \[
    \sum_{j=1}^{J_X} \left( 1 + \tau_{ij} \right) x_{ij} \leq \sum_{j=1}^{J_L} \left( 1 - \tau_{ij} \right) l_{ij} + T_i + y_i
    \]
  - \( y_i \) is non-labor income
- Utility of type \( i \)
  \[ u_i (x_i, l_i, G_i) \]
Indirect Utility:

\[ V_i \left( \{ \tau_{ij}^l \}_j, \{ \tau_{ij}^x \}_j, T_i, G_i, y_i \right) = \max_{x, l} u_i (x, l, G_i) \]

\[ \text{s.t. } \sum_{j=1}^{J_X} (1 + \tau_{ij}^x) x_{ij} \leq \sum_{j=1}^{J_L} \left(1 - \tau_{ij}^l\right) l_{ij} + T_i + y_i \]
Indirect Utility:

\[ V_i \left( \{ \tau_{ij}^l \}_j, \{ \tau_{ij}^x \}_j, T_i, G_i, y_i \right) = \max_{x, l} u_i (x, l, G_i) \]

subject to

\[ \sum_{j=1}^{J_x} \left( 1 + \tau_{ij}^x \right) x_{ij} \leq \sum_{j=1}^{J_l} \left( 1 - \tau_{ij}^l \right) l_{ij} + T_i + y_i \]

Let \( \lambda_i \) denote marginal utility of income
Social Welfare

Social welfare, $W$, given by:

$$W \left( \left\{ \{ \tau_{ij}^l \}_j, \{ \tau_{ij}^x \}_j, T_i, G_i, y_i \right\}_i \right) = \sum_i \psi_i V_i \left( \left\{ \tau_{ij}^l \}_j, \{ \tau_{ij}^x \}_j, T_i, G_i, y_i \right\}_i \right)$$
Social Welfare

- Social welfare, $W$, given by:

$$W \left( \left\{ \{ \tau_{ij} \} \right\}_j, \left\{ \tau_{ij}^{x} \right\}_j, T_i, G_i, y_i \right) = \sum_i \psi_i V_i \left( \left\{ \tau_{ij} \right\}_j, \left\{ \tau_{ij}^{x} \right\}_j, T_i, G_i, y_i \right)$$

- $\{ \psi_i \}$ Pareto weights for each type $i$
Social Welfare

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\{\psi_i\} Pareto weights for each type $i$

What is the welfare impact of local changes to taxes, transfers, or publicly-provided goods?
Define a “Policy Path” to trace out changes to government policy, \( P(\theta) \):

For any \( \theta \in (-\epsilon, \epsilon) \):

\[
P(\theta) = \{ \hat{\tau}_{l_{ij}}(\theta), \{ \hat{\tau}_{x_{ij}}(\theta) \}, \hat{T}_i(\theta), \hat{G}_i(\theta)\}
\]

Two assumptions:

1. \( \theta = 0 \) is status quo:

\[
\{ \hat{\tau}_{l_{ij}}(0), \{ \hat{\tau}_{x_{ij}}(0) \}, \hat{T}_i(0), \hat{G}_i(0)\} = \{ \tau_{l_{ij}}, \{ \tau_{x_{ij}} \}, T_i, G_i \}
\]

2. \( P(\theta) \) is continuously differentiable in \( \theta \),

\[
d\hat{\tau}_{x_{ij}} d\theta, d\hat{\tau}_{l_{ij}} d\theta, d\hat{T}_i d\theta, d\hat{G}_{ij} d\theta\] exist and are continuous.
Define a “Policy Path” to trace out changes to government policy, $P(\theta)$:

For any $\theta \in (-\epsilon, \epsilon)$

$$P(\theta) = \left\{ \{\hat{\tau}_{ij}^l(\theta)\}_j, \{\hat{\tau}_{ij}^x(\theta)\}_j, \hat{T}_i(\theta), \hat{G}_i(\theta) \right\}_i,$$

Two assumptions:

1. $\theta = 0$ is status quo:

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2. $P(\theta)$ is continuously differentiable in $\theta$, $d\hat{\tau}_{ij}^x d\theta$, $d\hat{\tau}_{ij}^l d\theta$, $d\hat{T}_i d\theta$, and $d\hat{G}_{ij} d\theta$ exist and are continuous in $\theta$. Should the government follow the policy path and increase $\theta$?

Need to measure how welfare changes with $\theta$...
Define a “Policy Path” to trace out changes to government policy, $P(\theta)$:

1. For any $\theta \in (-\epsilon, \epsilon)$

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Define a “Policy Path” to trace out changes to government policy, $P(\theta)$:

- For any $\theta \in (-\epsilon, \epsilon)$

$$P(\theta) = \left\{ \left\{ \hat{\tau}_{lj}(\theta) \right\}_j, \left\{ \hat{\tau}_{xj}(\theta) \right\}_j, \hat{T}_i(\theta), \hat{G}_i(\theta) \right\}_i,$$

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$$\frac{d\hat{\tau}^x_{ij}}{d\theta}, \frac{d\hat{\tau}^l_{ij}}{d\theta}, \frac{d\hat{T}_i}{d\theta}, \text{ and } \frac{d\hat{G}_{ij}}{d\theta} \text{ exist and are continuous in } \theta$$
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- Should the government follow the policy path and increase $\theta$?
Define a “Policy Path” to trace out changes to government policy, \( P(\theta) \):

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Should the government follow the policy path and increase \( \theta \)?

Need to measure how welfare changes with \( \theta \)
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Should the government follow the policy path and increase $\theta$?

- Need to measure how welfare changes with $\theta$
- First, start with the positive questions...
Positive Impact of Policy Change

- Agents optimally choose $x_i$ and $l_i$ facing policy $P(\theta)$
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\[ \hat{x}_i(\theta) = \{\hat{x}_{ij}(\theta)\}_j \text{ and } \hat{l}_i(\theta) = \{\hat{l}_{ij}(\theta)\}_j. \]
Positive Impact of Policy Change

- Agents optimally choose \( x_i \) and \( l_i \) facing policy \( P(\theta) \)
  - \( \hat{x}_i(\theta) = \{\hat{x}_{ij}(\theta)\}_j \) and \( \hat{l}_i(\theta) = \{\hat{l}_{ij}(\theta)\}_j \)
  - These are “potential outcomes” in world \( P(\theta) \)
Positive Impact of Policy Change

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- These are “potential outcomes” in world \( P(\theta) \)

- Net government resources towards individual \( i \),

\[
\hat{t}_i(\theta) = \sum_{j=1}^{J_G} c_j^G \hat{G}_{ij}(\theta) + \hat{T}_i(\theta) - \sum_{j=1}^{J_X} \hat{\tau}_{ij}^X(\theta) \hat{x}_{ij}(\theta) - \sum_{j=1}^{J_L} \hat{\tau}_{ij}^L(\theta) \hat{l}_{ij}(\theta)
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Positive Impact of Policy Change

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  - $\hat{\mathbf{x}}_i(\theta) = \{\hat{x}_{ij}(\theta)\}_{j}$ and $\hat{\mathbf{l}}_i(\theta) = \{\hat{l}_{ij}(\theta)\}_{j}$
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  $$\hat{t}_i(\theta) = \sum_{j=1}^{J_G} c^G_{ij} \hat{G}_{ij}(\theta) + \hat{T}_i(\theta) - \sum_{j=1}^{J_X} \hat{\tau}^X_{ij}(\theta) \hat{x}_{ij}(\theta) - \sum_{j=1}^{J_L} \hat{\tau}^L_{ij}(\theta) \hat{l}_{ij}(\theta)$$
- Budget neutrality would be $\sum_i \frac{d\hat{t}_i}{d\theta} = 0 \quad \forall \theta$
Positive Impact of Policy Change

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- Budget neutrality would be $\sum_i \frac{d\hat{t}_i}{d\theta} = 0 \ \forall \theta$
  - $\frac{d\hat{t}_i}{d\theta}$ captures distributional impact
Agents optimally choose $\mathbf{x}_i$ and $\mathbf{l}_i$ facing policy $P(\theta)$

- $\hat{x}_i(\theta) = \{\hat{x}_{ij}(\theta)\}_{j}$ and $\hat{l}_i(\theta) = \{\hat{l}_{ij}(\theta)\}_{j}$

- These are “potential outcomes” in world $P(\theta)$

Net government resources towards individual $i$,

$$\hat{t}_i(\theta) = \sum_{j=1}^{J_G} c_j^G \hat{G}_{ij}(\theta) + \hat{T}_i(\theta) - \sum_{j=1}^{J_X} \hat{t}_{ij}^x(\theta) \hat{x}_{ij}(\theta) - \sum_{j=1}^{J_L} \hat{t}_{ij}^l(\theta) \hat{l}_{ij}(\theta)$$

Budget neutrality would be $\sum_i \frac{d\hat{t}_i}{d\theta} = 0 \quad \forall \theta$

$\frac{d\hat{t}_i}{d\theta}$ captures distributional impact

Behavioral response affects budget

$$\frac{d}{d\theta} \left( \sum_{j=1}^{J_X} \tau_{ij}^x(\theta) \hat{x}_{ij}(\theta) + \sum_{j=1}^{J_L} \tau_{ij}^l(\theta) \hat{l}_{ij}(\theta) \right) = \left( \sum_{j=1}^{J_X} \frac{d\hat{t}_{ij}^x}{d\theta} \hat{x}_{ij}(\theta) + \sum_{j=1}^{J_L} \frac{d\hat{t}_{ij}^l}{d\theta} \hat{l}_{ij}(\theta) \right)$$

Mechanical Impact on Govt Revenue

Behavioral Impact on Govt Revenue
Normative question: How much are people willing to pay to move along the policy path?
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Person $i$’s marginal willingness to pay to move along the policy path

$$\frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} \lambda_i$$
Normative question: How much are people willing to pay to move along the policy path?

Person $i$’s marginal willingness to pay to move along the policy path

\[ \frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} \]

\[ \lambda_i \]

Money metric utility measure
Normative question: How much are people willing to pay to move along the policy path?
Person $i$’s marginal willingness to pay to move along the policy path

\[ \frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} \]

- Money metric utility measure
- Equivalent to marginal EV and marginal CV
The envelope theorem implies:

\[
\frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} = \sum_{j=1}^{J_G} \frac{\partial u_i}{\partial G_{ij}} \frac{d\hat{G}_{ij}}{d\theta} + \frac{dT_i}{d\theta} + \sum_{j} \frac{d\hat{\tau}_{ij}^x}{d\theta} x_{ij} + \sum_{j} \frac{d\hat{\tau}_{ij}^l}{d\theta} l_{ij}
\]

where the RHS is evaluated at \(\theta = 0\).
Characterization of Marginal Willingness to Pay for Policy

- The envelope theorem implies:

\[ \frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} = \sum_{j=1}^{J_G} \frac{\partial u_i}{\partial G_{ij}} \frac{d\hat{G}_{ij}}{d\theta} + \frac{dT_i}{d\theta} + \sum_{j} \frac{d\hat{t}^x_{ij}}{d\theta} x_{ij} + \sum_{j} \frac{d\hat{t}^l_{ij}}{d\theta} l_{ij} \]

- Behavioral responses matter in keeping track of net resources

\[ \frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} = \frac{d\hat{t}_i}{d\theta} + \sum_{j=1}^{J_G} \left( \frac{\partial u_i}{\partial G_{ij}} \frac{d\hat{G}_{ij}}{d\theta} - c_j^G \right) \frac{d\hat{G}_{ij}}{d\theta} + \left( \sum_{j} \tau_{ij}^x \frac{d\hat{x}_{ij}}{d\theta} + \sum_{j} \tau_{ij}^l \frac{d\hat{l}_{ij}}{d\theta} \right) \]

where the RHS is evaluated at \( \theta = 0 \).
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\[ \frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} = \frac{\lambda_i}{\lambda_i} \sum_{j=1}^{J_G} \frac{\partial u_i}{\partial G_{ij}} d\hat{G}_{ij} + \frac{dT_i}{d\theta} + \sum_{j} \frac{d\hat{T}_{ij}^x}{d\theta} x_{ij} + \sum_{j} \frac{d\hat{T}_{ij}^l}{d\theta} l_{ij} \]

- Behavioral responses matter in keeping track of net resources

\[ \frac{d\hat{V}_i}{d\theta} \bigg|_{\theta=0} = \frac{d\hat{T}_i}{d\theta} + \sum_{j=1}^{J_G} \left( \frac{\partial u_i}{\partial G_{ij}} - c_j \right) \frac{d\hat{G}_{ij}}{d\theta} + \left( \sum_{j} \tau_{ij} \frac{d\hat{x}_{ij}}{d\theta} + \sum_{j} \tau_{ij} \frac{d\hat{l}_{ij}}{d\theta} \right) \]

where the RHS is evaluated at \( \theta = 0 \).

- Behavioral responses matter to the extent to which individuals impose resource costs for which they don’t pay.
What types of elasticities are needed for this welfare measurement?
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- *Causal impact* of the policy on taxable behavior
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  - Policy Response: \( \frac{d\hat{x}_{ij}}{d\theta} \) and \( \frac{d\hat{l}_{ij}}{d\theta} \)
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Causal impact of the policy on taxable behavior

Policy Response: \( \frac{d\hat{x}_{ij}}{d\theta} \) and \( \frac{d\hat{l}_{ij}}{d\theta} \)

Policy Elasticity: \( \frac{d\log(\hat{x}_{ij})}{d\theta} \) and \( \frac{d\log(\hat{l}_{ij})}{d\theta} \)

If government taxation is only wedge between social and private costs, a single causal effect is sufficient.
What types of elasticities are needed for this welfare measurement?

- *Causal impact* of the policy on taxable behavior
  - Policy Response: \( \frac{dx_{ij}}{d\theta} \) and \( \frac{dl_{ij}}{d\theta} \)
  - Policy Elasticity: \( \frac{d\log(x_{ij})}{d\theta} \) and \( \frac{d\log(l_{ij})}{d\theta} \)

- If government taxation is only a wedge between social and private costs, a single causal effect is sufficient
  - Impact on government revenue is sufficient for all behavioral responses
The marginal willingness to pay calculation differs from the MEB/MDWL calculations often provided by textbooks and handbook chapters.
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- Tax policy: Auerbach and Hines 2002 (PE Handbook)
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Common to follow Harberger (1964) and compare policies to individual-specific lump-sum taxes.
Marginal Excess Burden (MEB)

- The marginal willingness to pay calculation differs from the MEB/MDWL calculations often provided by textbooks and handbook chapters
  - Tax policy: Auerbach and Hines 2002 (PE Handbook)
- Common to follow Harberger (1964) and compare policies to individual-specific lump-sum taxes
  - How much additional revenue could the government obtain if the policy is implemented but individuals’ utilities are held constant using lump-sum transfers?

Alternative MEB Definitions
Marginal Excess Burden (MEB)

- Can define MEB/MDWL in this framework
Marginal Excess Burden (MEB)

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  - Let $\mathbf{v}$ denote a vector of pre-specified utilities (e.g. status quo $\leftrightarrow$ “equivalent variation” MEB in Auerbach and Hines 2002)
Can define MEB/MDWL in this framework

- Let \( \mathbf{v} \) denote a vector of pre-specified utilities (e.g. status quo \( \leftrightarrow \) “equivalent variation” MEB in Auerbach and Hines 2002)
- Define an augmented policy path:

\[
P^\mathbf{v} = \left\{ \left\{ \hat{\tau}_{ij}^l (\theta) \right\}_j, \left\{ \hat{\tau}_{ij}^c (\theta) \right\}_j, \hat{T}_i (\theta) + \hat{C}_i (\theta; \mathbf{v}), \hat{G}_i (\theta) \right\}_i
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where \( \hat{C}_i (\theta; \mathbf{v}) \) holds utilities constant at \( \mathbf{v} \).
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      where \( \hat{C}_i(\theta; \mathbf{v}) \) holds utilities constant at \( \mathbf{v} \).
  - MEB is defined as
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$$ P^\mathbf{v} = \begin{cases} \left\{ \hat{\tau}_{ij}^l (\theta) \right\}_j, \left\{ \hat{\tau}_{ij}^c (\theta) \right\}_j, \hat{T}_i (\theta) + \hat{C}_i (\theta; \mathbf{v}), \hat{G}_i (\theta) \end{cases}_i $$

where $\hat{C}_i (\theta; \mathbf{v})$ holds utilities constant at $\mathbf{v}$.

MEB is defined as

$$ MEB^\mathbf{v}_i = \left. \frac{d\hat{t}_i^\mathbf{v}}{d\theta} \right|_{\theta=0} $$

Measures additional revenue government could obtain if it implements the policy but then holds people’s utility constant using individual-specific lump-sum transfers.
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where \( \hat{C}_i (\theta ; \mathbf{v}) \) holds utilities constant at \( \mathbf{v} \).

MEB is defined as

\[
MEB_{vi}^\mathbf{v} = \frac{d\hat{t}_i^v}{d\theta} \bigg|_{\theta=0}
\]

Measures additional revenue government could obtain if it implements the policy but then holds people’s utility constant using individual-specific lump-sum transfers

Depends on compensated elasticities (by definition)
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    \]
    - Measures additional revenue government could obtain if it implements the policy but then holds people’s utility constant using individual-specific lump-sum transfers
    - Depends on compensated elasticities (by definition)
    - Conceptually, it’s a reasonable measure of welfare; just hard to estimate...
Model

The Marginal Value of Public Funds

Applications to Top Tax Rate, EITC, Job Training, Food Stamps, Housing Vouchers
Motivating a Particular MVPF Measure

- Many real-world policies are not budget neutral
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- One definition is particularly useful: no need to decompose any causal effects into income and substitution effects
Motivating a Particular MVPF Measure

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- There are a lot of different definitions (Ballard and Fullerton, 1992; Dahlby, 2008)
- One definition is particularly useful: no need to decompose any causal effects into income and substitution effects
- Calculate a “benefit cost ratio” as in Slemrod and Yitzhaki (1996, 2001) and Mayshar (1990)
Consider a policy $P(\theta)$ that has mechanical spending of $\theta$ per beneficiary
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Marginal cost equals mechanical cost + fiscal externality

$$MVPF = \frac{\text{Benefit}}{\text{Cost}} = \frac{\frac{\partial u}{\partial G}}{\lambda} \frac{1}{1 + FE}$$
MVPF Formulas

- Consider a policy $P(\theta)$ that has mechanical spending of $\theta$ per beneficiary
  - Market goods / transfers (e.g. taxes, EITC): marginal benefit = 1
  - Non-market goods / transfers (e.g. food stamps): marginal benefit = $\frac{\partial u}{\partial G} \lambda$
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  - Section 8 Housing Vouchers
    - Lotteried access to Section 8 in Illinois (Jacob and Ludwig 2012)
Top Tax Rate Increases

- Large literature studying causal impact of top tax rate increases / decreases
  - Saez, Slemrod, and Giertz (2012) provide review
    - Many estimates of causal effect of changes to top income tax rate
    - Tax-weighted taxable income elasticity
  - Suggests 25-50% of mechanical revenue lost (lots of disagreement/uncertainty!)
    - Fiscal cost is $0.50-$0.75 for $1 in transfer
  - Suggests MVPF of $1.33-$2

\[
MVPF = \frac{1}{1 - .25} = 1.33
\]
EITC Expansions

- Large literature studying causal impact of EITC expansions (Hotz and Scholz 2003, Chetty et al 2013)
  - Intensive + extensive calculations suggest fiscal cost of EITC is ~14% higher because of labor supply impacts
  - Fiscal cost is $1.14 for $1 in mechanical EITC benefits
  - Suggests MVPF of $0.88

\[
MVPF = \frac{1}{1 + .14} = 0.88
\]
Food Stamps

- Hoynes and Schanzenbach (2012) use variation across counties in introduction of food stamp program (1960-70s)
  - Tax impact of earnings reduction equal to ~51% of the size of the mechanical transfer (albeit imprecisely estimated)
  - Total fiscal cost is $1.51 for $1 in food stamps (using 1970s tax rates)

\[ MVPF = \frac{\frac{\partial u}{\partial G}}{\lambda} \left(1 + \frac{\lambda}{.51}\right) = 0.66 \times \frac{\frac{\partial u}{\partial G}}{\lambda} \]

- Food stamps are in-kind, “G”
  - May be that \( \frac{\partial u}{\partial G} < c^G \) because goods are in kind
  - Smeeding (1982) estimates 0.97; Moffitt (1989) estimates ~1
  - Whitmore (2002) estimates 0.80 for marginal/distorted recipients

- Assuming food stamps valued as cash, MVPF is 0.66
  - Also, causal effect in 1970 = causal effect now?
Job Training Partnership Act of 1982 provided job training services to low income youth and adults.

Bloom et al (1997) report results from RCT (I focus on adult women impact)

- Increased labor supply + reduction in welfare benefits (Food stamps + AFDC) reduce costs by $0.34 for every $1 in direct program cost
- Implies $MVPF = \frac{1}{1-0.34} = 1.52$ if program costs are valued at its costs

No estimates of $\frac{\partial u}{\partial G} \lambda$ for the program

- Bloom et al (1997) implicitly assume earnings is fully valued
  - Earnings increase of $1,683 for marginal cost of $1,381 -> $\frac{\partial u}{\partial G} \lambda = 1.22$
  - Suggests MVPF of 1.85 if increase was entirely productivity
- But could be MVPF = 0 if no one valued it
Section 8 Housing Vouchers

- Section 8 is largest low-income housing program in US
- Jacob and Ludwig (2012) exploit excess applications in Illinois
  - Allocated via lottery
  - Estimate significant impact on labor supply and welfare take-up
    - Earnings decrease implies fiscal externality of $129 per voucher
    - Welfare programs increase sum to $432 (mostly medicaid)
    - But vouchers are a lot of money ($8,400/yr)
    - Voucher cost $1.05 for every $1 of vouchers

\[ MVPF = 0.95 \frac{\partial u}{\partial G} \frac{\lambda}{\lambda} \]

- Reeder (1985) suggests $1 vouchers valued at \( \frac{\partial u}{\partial G} \frac{\lambda}{\lambda} = 0.83 \)
- Suggests MVPF of 0.79
- ASIDE: Chetty, Hendren, and Katz (2015) suggests \( MVPF \approx \infty \) for MTO vouchers targeted to families with young children because of increased tax revenue when children grow up
Taking MVPF Top Tax Rate = 1.33, increasing EITC and top tax rate desireable iff $\eta_{Rich} \eta_{Poor} \leq 0.88 1.33 = 0.66$ to a poor person or $1$ to a rich person?

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Taking $MVPF^{Top\ Tax} = 1.33$, increasing EITC and top tax rate desirable iff

$$\frac{\eta^{Rich}}{\eta^{Poor}} \leq \frac{0.88}{1.33} = 0.66$$

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- Taking $MVPF^{Top\text{Tax}} = 1.33$, increasing EITC and top tax rate desirable iff
  $$\frac{\eta^{Rich}}{\eta^{Poor}} \leq \frac{.88}{1.33} = 0.66$$

- $0.66$ to a poor person or $1$ to a rich person?
Summary

- Causal effects can readily be translated into a canonical welfare framework (but not MEB)
- No need to decompose the response into substitution and income effects
- If government is only distortion, a single causal effect is sufficient:
  - Impact of behavioral response on government budget
  - Remains sufficient in cases when ETI is not
- Model motivates particular benefit-cost ratio (MVPF) for non-budget neutral policies (Mayshar 1990) that relies only on causal effects
- In contrast to MEB, can compare across people using social marginal utilities of income ("Okun’s Bucket")
Previous literature implicitly suggests normative analysis of government policies is difficult because it requires compensated (Hicksian) elasticities.

While decisions on the appropriate size of government must be left to the political process, economists can assist that decision by indicating the magnitude of the total marginal cost of increased government spending. That cost depends on the structure of taxes, the distribution of income, and the compensated elasticity of the tax base with respect to a marginal change in tax rates. (Feldstein, 2012)

Graduate textbooks teach that the two central aspects of the public sector, optimal progressivity of the tax-and-transfer system, as well as the optimal size of the public sector, depend (inversely) on the compensated elasticity of labor supply with respect to the marginal tax rate. (Saez, Slemrod, and Giertz, 2012)
Feldstein (2012, JEL)

Despite the centrality of the concept of excess burden, the Mirrlees Review fails to provide a clear explanation that the excess burden is the difference between the loss to taxpayers caused by the tax (e.g., the amount that taxpayers would have to receive as a lump sum to be as well off as they were before the imposition of the tax) and the revenue collected by the government. There are instead several alternative definitions at different points in the text, some of which are vague and some of which are simply wrong. For example, the Mirrlees Review states “it is the size of this revenue loss that determines the ‘excess burden’ of taxation” (61). That is not correct since the excess burden depends only on the substitution effects while revenue depends also on the income effects.


**Compensated (Hicksian) Elasticity**

- Equivalent Variation MEB from Auerbach (1985) handbook
  - Hypothetically close each individual’s budget constraint using individual-specific lump-sum transfers
  - Define an augmented policy path:

\[
P^{1985} = \left\{ \{ \hat{\tau}^l_{ij}(\theta) \}_j, \{ \hat{\tau}^x_{ij}(\theta) \}_j, \hat{T}_i(\theta) - \hat{t}(\theta), \hat{G}_i(\theta) \right\}_i
\]

where individual is forced to pay for net resources, \( \hat{t}_i(\theta) \)
- Still requires individual-specific lump-sum transfers to close the resource constraint
- MEB is defined as

\[
MEB_i^{1985} = \left. \frac{d\hat{V}_i P^{1985}}{d\theta} \right|_{\theta=0}
\]

- Depends on compensated elasticities (but not “fully” compensated)
Three measures of welfare:
Three measures of welfare:

1. Equivalent variation, $EV_i(\theta)$, of policy $P(\theta)$:

$$V_i \left( \left\{ \tau_{ij}^l \right\}_j, \left\{ \tau_{ij}^x \right\}_j, T_i, G_i, y_i + EV_i(\theta) \right) = \hat{V}_i(\theta)$$
Measures of Welfare

- Three measures of welfare:
  1. Equivalent variation, $EV_i(\theta)$, of policy $P(\theta)$:

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  - Marginal equivalent variation, $\frac{d[EV_i]}{d\theta} \bigg|_{\theta=0}$
Measures of Welfare

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  1. Equivalent variation, $EV_i (\theta)$, of policy $P (\theta)$:
     \[
     V_i \left( \left\{ \tau_{ij}^l \right\}_j , \left\{ \tau_{ij}^x \right\}_j , T_i , G_i , y_i + EV_i (\theta) \right) = \hat{V}_i (\theta)
     \]
   
   - Marginal equivalent variation, $\frac{d[EV_i]}{d\theta}|_{\theta=0}$
  2. Compensating variation, $CV_i (\theta)$, of policy $P (\theta)$:
     \[
     V_i \left( \left\{ \hat{\tau}_{ij}^l (\theta) \right\}_j , \left\{ \hat{\tau}_{ij}^x (\theta) \right\}_j , \hat{T}_i (\theta) , \hat{G}_i (\theta) , y_i - CV_i (\theta) \right) = \hat{V}_i (0)
     \]
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   - Marginal compensated variation, $\frac{d [CV_i]}{d \theta} \big|_{\theta=0}$
Measures of Welfare

Three measures of welfare:

1. Equivalent variation, $EV_i(\theta)$, of policy $P(\theta)$:

$$V_i \left( \left\{ \tau_{ij}^l \right\}_j, \left\{ \tau_{ij}^x \right\}_j, T_i, G_i, y_i + EV_i(\theta) \right) = \hat{V}_i(\theta)$$

- Marginal equivalent variation, $\frac{d[EV_i]}{d\theta}|_{\theta=0}$

2. Compensating variation, $CV_i(\theta)$, of policy $P(\theta)$:

$$V_i \left( \left\{ \hat{\tau}_{ij}^l(\theta) \right\}_j, \left\{ \hat{\tau}_{ij}^x(\theta) \right\}_j, \hat{T}_i(\theta), \hat{G}_i(\theta), y_i - CV_i(\theta) \right) = \hat{V}_i(0)$$

- Marginal compensated variation, $\frac{d[CV_i]}{d\theta}|_{\theta=0}$

3. $\frac{d\hat{V}_i}{d\theta}|_{\theta=0} \frac{1}{\lambda_i}$
How Many Elasticities Required?

1. Ignore untaxed goods

\[ \tau_1 dx_1 d\theta + \tau_2 dx_2 d\theta = \tau_1 (d(x_1 + x_2) d\theta) \]

Aggregate across those with same social marginal utility of income

(More subtle) aggregate impacts on budget from those to whom policy does not change,

\[ d\hat{t} d\theta = -\left( J_X \sum_j \tau x_{ij} d\hat{x}_{ij} d\theta + J_L \sum_j \tau l_{ij} d\hat{l}_{ij} d\theta \right) \]

Behavioral Impact on Govt Revenue

With one tax rate on income and equal social marginal utility of income, taxable income elasticity is sufficient (Feldstein (1999))

In general, need to know responses to capital income, SSDI, etc.

Impact of behavioral response on government budget remains sufficient

Nathaniel Hendren (Harvard)
How Many Elasticities Required?

1. Ignore untaxed goods
2. Aggregate goods with same marginal tax rate

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MCPF Expression

\[
\frac{\partial \hat{V}_i^P}{\partial \theta} \bigg|_{\theta=0} = \frac{d\hat{t}_i}{d\theta} + \left( \sum_j \tau_{ij}^x \frac{d\hat{x}_{ij}}{d\theta} + \sum_j \tau_{ij}^l \frac{d\hat{l}_{ij}}{d\theta} \right)
\]

\[
= \sum_j \frac{d\hat{x}_{ij}}{d\theta} x_{ij} + \frac{d\hat{l}_{ij}}{d\theta} l_{ij}
\]

and

\[- \int \frac{d\hat{t}_i}{d\theta} \, di = \sum_j \left( \frac{d\hat{x}_{ij}}{d\theta} x_{ij} + \frac{d\hat{l}_{ij}}{d\theta} l_{ij} \right) + \int_i \left( \sum_j \tau_{ij}^x \frac{d\hat{x}_{ij}}{d\theta} + \sum_j \tau_{ij}^l \frac{d\hat{l}_{ij}}{d\theta} \right) \, di \]

so that

\[
MCPF_P = \frac{1}{1+x}
\]
We have

\[
\frac{\eta^{Rich}}{\eta^{Poor}} = \frac{\frac{d\hat{W}}{dy_i}|_{\theta=0}}{\frac{d\hat{W}}{dy_j}|_{\theta=0}} \quad \forall i \in Rich, \ j \in Poor
\]
Non-Marginal Analysis

- General equivalent variation formula:

\[
EV(1) = \int_0^1 \frac{\lambda (\hat{P}(\theta), y)}{\lambda (P, y + EV(\theta))} \left[ \left( \frac{\partial \hat{u}}{\partial G} \right) \frac{d\hat{G}}{d\theta} + \frac{d\hat{t}}{d\theta} + \sum_j \hat{\tau}_j \frac{d\hat{x}_j}{d\theta} \right] d\theta
\]

- Suppose:

  - Causal effects are linear in \( \theta \).
  - Marginal utility of income under the policy = marginal utility of income if instead of policy you get the EV:

\[
EV(1) = \sum_j \Delta\hat{G}_j \ast D_j + \Delta\hat{t} + \sum_j \hat{\tau}_j^x \Delta\hat{x}_j + \sum_j \hat{\tau}_j^l \Delta\hat{l}_j
\]

where \( \Delta\hat{x}_j = \hat{x}_j(1) - \hat{x}_j(0) \) are the non-local causal effects and \( D_j \) is the avg net WTP for \( G \).
Suppose the policy affects wages, \( w_i(\theta) \).

Need to keep track of resource transfers induced by GE effects.

Replace \( \frac{d\hat{t}}{d\theta} \) with

\[
\frac{d\hat{t}}{d\theta} + \frac{d\hat{w}_i}{d\theta} l_i
\]

Require causal effects of policy on prices and implied resource transfers.

No need for income and substitution effects conditional on causal effect.
Marginal social welfare impact of a policy in units of \( \hat{i} \)'s income:

\[
SMCPF_P^{\hat{i}} = \frac{\int_i \eta_i \frac{d\hat{V}_P}{d\theta} |_{\theta=0} \, di}{\int_i \frac{d\hat{t}_P}{d\theta} \, di}
\]

Translating benefits to \( i \) into units of \( \hat{i} \) requires \( \frac{\eta_i}{\eta_{\hat{i}}} \).

If programs have some non-overlapping beneficiaries, then ok to have some programs with lower MCPF iff they have higher social marginal utilities of income.

- Difference in MCPF reveals implicit ratio of social marginal utilities

Any added cost of getting resources to people should be socially worthwhile.
Ratios of MCPF reveals implicit social welfare weights on different subsets of population

\[ \eta^{Rich} = 0.44\eta^{Poor} \] to someone indifferent to status quo tax policy

Can use ratio of social welfare weights to re-weight government programs based on distributional incidence (Kaplow, 2008)

- R&D subsidies increase incomes of rich vs. poor
- Welfare impact of allowing Walmart to expand? (*need to expand model for pecuniary externalities)
- Incidence of benefits matters (e.g. R&D increase incomes of rich vs. poor?)
- Can use ratio of social welfare weights to re-weight government programs based on distributional incidence (Kaplow, 2008)
Nothing required $\theta$ to be a government policy

Evaluate welfare impact of GDP growth

- Use $\eta^{rich} = 0.44 \eta^{Poor}$ to construct “Inequality Deflator”
  - Existing tax policies suggest social value of GDP growth is much higher if accrues to the poor

- Can collapse changes in income distribution over time into single number representing welfare impact to social planner
  - Instead of mean GDP growth + distributional measures (e.g. GINI)
$P(\theta)$ transfers $\theta$ dollars from rich to poor.

Taxable income of individual $i$, $\hat{l}_i(\theta)$, top rate threshold, $\bar{l}$, tax rate $\hat{\tau}$. Rich ($\theta$).

Classify individuals, $i$, into two (non-exhaustive) groups:
- $i \in \text{Rich}$, for whom $\hat{l}_i(0) \geq \bar{l}$, where $\bar{l} \approx$ $400K$.
- $i \in \text{Poor}$, who are low-income single mothers currently eligible for EITC benefits, generally $\hat{l}_i(0) \leq$ $40$K.

Simplifying assumptions:
- Social marginal utility of income of EITC recipients is constant, $\eta_{\text{Poor}}$.
- Social marginal utility of income rich earning above $\bar{l}$ is constant, $\eta_{\text{Rich}}$. 

Precise Definition

Setup

- $P(\theta)$ transfers $\theta$ dollars from rich to poor
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Setup

- Setup
  - \( P(\theta) \) transfers \( \theta \) dollars from rich to poor
  - Taxable income of individual \( i \), \( \hat{l}_i(\theta) \)
  - Top rate threshold, \( \bar{l} \), tax rate \( \hat{t}^{Rich}(\theta) \).
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Setup

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- Taxable income of individual $i$, $\hat{I}_i(\theta)$
- Top rate threshold, $\bar{I}$, tax rate $\hat{\tau}^{\text{Rich}}(\theta)$.
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MVPF Implementation

- Each policy induces a MVPF:
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  - Welfare impact on poor per unit of government revenue, $MVPF^\text{Poor}_{P^{EITC}}$

Note: Such a relationship does not hold if one were instead to use MEB instead of MVPF.
Each policy induces a MVPF:

- An increase in EITC generosity by \( \theta \), \( P^{EITC} \), that is financed out of government revenue
  - Welfare impact on poor per unit of government revenue, \( MVPF_{Poor}^{P^{EITC}} \)

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- An increase in the top marginal income tax rate, $P^{Tax}$, that is used to increase government revenue by $\theta$.
  - Welfare impact on rich per unit of government revenue, $MVPF_{PTax}^{Rich}$

\[ \frac{d\hat{W}_P}{d\theta} \bigg|_{\theta=0} \geq 0 \text{ if and only if } \left( \frac{\eta^{Rich}}{\eta^{Poor}} \right) \leq \frac{MVPF_{PEITC}^{Poor}}{MVPF_{PTax}^{Rich}} \]
MVPF Implementation

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  - An increase in the top marginal income tax rate, $P^{Tax}$, that is used to increase government revenue by $\theta$.
    - Welfare impact on rich per unit of government revenue, $MVPF_{Rich}^{P^{Tax}}$
  - \( \frac{d\hat{W}_P}{d\theta} \bigg|_{\theta=0} \geq 0 \) if and only if
    \[
    \frac{\eta^{Rich}}{\eta^{Poor}} \leq \frac{MVPF_{Poor}^{P^{EITC}}}{MVPF_{Rich}^{P^{Tax}}}
    \]

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Ideally, need causal impact of policy changes on budget from EITC expansion and increase in top tax rate
Simplifications

- Ideally, need causal impact of policy changes on budget from EITC expansion and increase in top tax rate
  - Causal impacts on taxable behavior (e.g. labor supply) more common

Two implementation assumptions

1. No response amongst those not directly affected
   - No response to tax increase by those with \( l \leq 40 \text{K} \)
   - No response to EITC expansion by those not directly affected (\( l > 40 \text{K} \))

2. Only response is contemporaneous labor earnings
   - No income shifting (e.g. no impact on capital gains)
   - If income shifted to other bases, labor earnings response over-states impact on budget

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MVPF of Raising Taxes on Rich

- MCPF simplifies to

\[ \text{MVPF}_{\text{Po}^\text{T}ax}^{\text{Rich}} = \frac{1}{1 + r}, \quad \text{MVPF}_{\text{Po}^\text{EITC}}^{\text{Poor}} = \frac{1}{1 + p} \]

where

\[ r = \frac{\int_{i \in \text{Rich}} \tau_i \frac{d l_i^\text{T}ax}{d \theta} \, di}{\int_{i \in \text{Rich}} \frac{d \hat{\tau}^\text{T}ax}{d \theta} (l_i^\text{T}ax - \bar{l}) \, di} \]

\[ p = \frac{\int_{i \in \text{Poor}} \tau_i \frac{d l_i^\text{EITC}}{d \theta} \, di}{\int_{i \in \text{Poor}} \left( \frac{d \hat{T}^\text{EITC}}{d \theta} + \frac{d \hat{\tau}^\text{EITC}}{d \theta} l_i \right) \, di} \]
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where

\[ r = \frac{\int_{i \in \text{Rich}} \tau_i \frac{d_i^{\text{Tax}}}{d\theta} \, di}{\int_{i \in \text{Rich}} \frac{d\hat{\tau}^{\text{Tax}}_{\text{Rich}}}{d\theta} \left( \hat{l}_i^{\text{Tax}} - \bar{l} \right) \, di} \quad , \quad p = \frac{\int_{i \in \text{Poor}} \tau_i \frac{d_i^{\text{EITC}}}{d\theta} \, di}{\int_{i \in \text{Poor}} \left( \frac{d\hat{\tau}^{\text{EITC}}_i}{d\theta} + \frac{d\hat{\tau}^{\text{EITC}}_{ij}}{d\theta} l_i \right) \, di} \]

- \( r \) is the fraction of mechanical income tax revenue lost from behavioral responses to the tax increase (generally, \( r < 0 \))
- \( p \) is the fraction of the mechanical credit that is increased due to behavioral distortions in taxable labor income
Evidence on Behavioral Responses

- Evidence on $r$

Large literature (often called “marginal excess burden” – but only true with no income effects)

JEL review by Saez, Slemrod, and Giertz (2012) suggest midpoint of $r = -25\% - 50\%$

Giertz (2009) also suggests range of 20-70% (others >100%)

Evidence on $p$

Large literature on extensive margin response (Hotz and Scholz, 2003) Suggests refunds increased by 9% (7-11%) because of extensive margin responses

Recent literature finds evidence of intensive margin response

Chetty et al (2013) suggests refunds increased 5% using variation in knowledge of marginal incentives

Extensive + intensive responses = 14% (12-16%)
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  - Large literature (often called “marginal excess burden” – but only true with no income effects)


Giertz (2009) also suggests range of 20-70\% (others >100\%).

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Large literature on extensive margin response (Hotz and Scholz, 2003) suggests refunds increased by 9\% (7-11\%) because of extensive margin responses.

Recent literature finds evidence of intensive margin response (Chetty et al. 2013) suggests refunds increased 5\% using variation in knowledge of marginal incentives.

Extensive + intensive responses = 14\% (12-16\%).
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