

Draft of Data and Estimation Result

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0.1 National Survey of Tax and Benefit (NaSTaB)

- 2008 年から Korea Institute of Taxation and Finance が実施
- NaSTaB は家計の税負担や公的扶助などに関する年次パネルデータ
- 全国から 5,634 世帯を調査対象とする
 - 5,634 人の世帯主と 15 歳以上で経済活動をしている世帯員が調査に回答する
- 我々の研究では (1)2013 年から 2018 年かつ、(2)23 歳以下の回答者を除いたデータを使用する
 - 2012 年と 2013 年の所得税率は変化していないが、2011 年以前に所得税率の改正が何度か行われた (Table ??)
 - 2014 年の制度改革に着目するために、2013 年から 2018 年に限定する
 - 23 歳以下の回答者は所得や資産を十分に持っていない可能性が高いので、データから除外する

Table 1: Descriptive Statistics

| | N | Mean | Std.Dev. | Min | Median | Max |
|---|-------|---------|----------|-------|--------|-----------|
| Income and giving price | | | | | | |
| Annual taxable labor income (unit: 10,000KRW) | 36189 | 1747.26 | 2696.77 | 0.00 | 0.00 | 50 000.00 |
| First giving relative price | 36198 | 0.86 | 0.04 | 0.62 | 0.85 | 0.94 |
| Charitable giving | | | | | | |
| Annual charitable giving (unit: 10,000KRW) | 36199 | 35.64 | 153.20 | 0.00 | 0.00 | 10 000.00 |
| Dummy of donation > 0 | 36199 | 0.24 | 0.42 | 0.00 | 0.00 | 1.00 |
| Dummy of declaration of a tax relief | 36199 | 0.10 | 0.30 | 0.00 | 0.00 | 1.00 |
| Individual Characteristics | | | | | | |
| Age | 36199 | 53.45 | 16.22 | 24.00 | 51.00 | 103.00 |
| Female dummy | 36199 | 0.43 | 0.50 | 0.00 | 0.00 | 1.00 |
| University graduate | 36198 | 0.42 | 0.49 | 0.00 | 0.00 | 1.00 |
| High school graduate dummy | 36198 | 0.31 | 0.46 | 0.00 | 0.00 | 1.00 |
| Junior high school graduate dummy | 36198 | 0.27 | 0.44 | 0.00 | 0.00 | 1.00 |
| Wage earner dummy | 27394 | 0.56 | 0.50 | 0.00 | 1.00 | 1.00 |
| #Tax accountant / population | 36199 | 1.04 | 0.51 | 0.32 | 0.92 | 2.24 |

0.2 Descriptive Statistics

0.3 右歪曲の所得分布と寄付価格の変動

0.4 2014 年税制改革直後、寄付者比率が減少

0.5 税インセンティブは寄付額を増やした

0.6 寄付者に限定すると、寄付額に対する価格効果ははっきりとしない

0.7 税インセンティブは寄付者を増やした

0.8 制度改革に関わらず、給与所得者は寄付申告をしやすい

0.9 2 種類の寄付の価格弾力性

(Scharf2020?) に従い、2 種類の価格弾力性を推定する

1. Intensive-margin tax-price elasticity: 1% の価格上昇で寄付者の寄付額が何% 増えるか？
2. Extensive-margin tax-price elasticity: 1% の価格上昇で寄付確率が何% 増えるか？

0.10 Intensive-Margin Tax-Price Elasticity の推定方法

$$\ln g_{it} = \theta_i + \gamma(R_{it} \times \ln(1 - s_{it})) + \beta X_{it} + \lambda_t + u_{it}, \quad (1)$$

- X_{it} は課税前所得 (y_{it}) を含んだ共変量ベクトル

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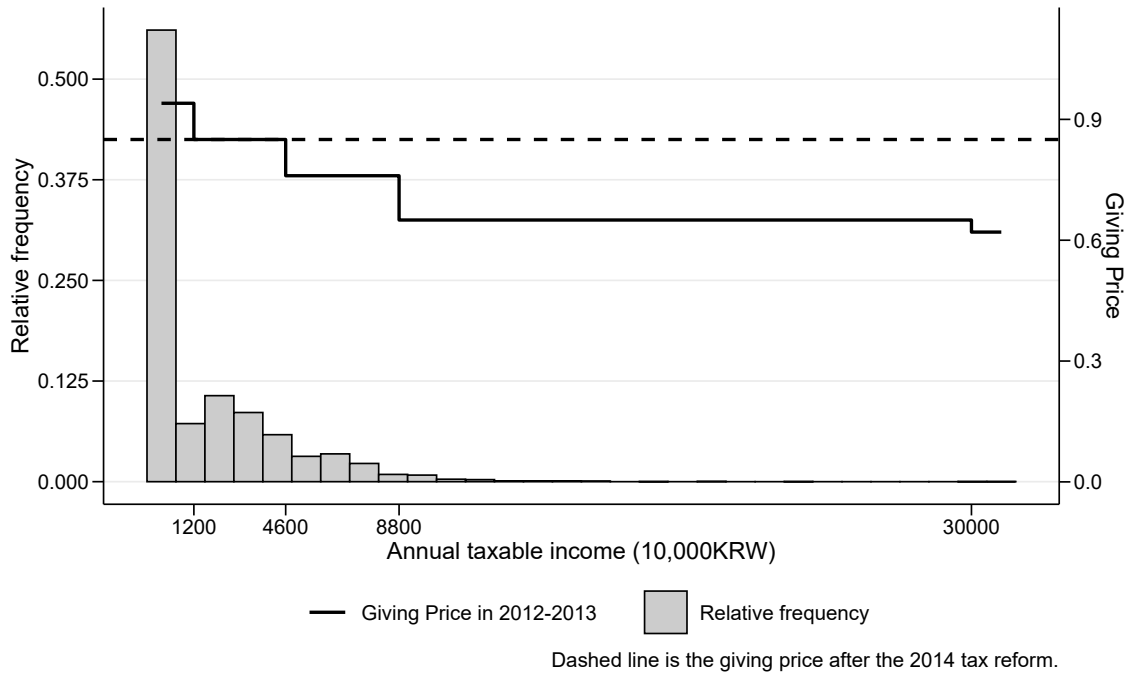


Figure 1: Income Distribution in 2013 and Relative Giving Price. Notes: The left and right axis measure the relative frequency of respondents (grey bars) and the relative giving price (solid step line and dashed line), respectively. A solid step line and a dashed horizontal line represents the giving price in 2013 and 2014, respectively.

- θ_i は個人固定効果、 λ_t は時間固定効果
- u_{it} は idiosyncratic error
- 関心のあるパラメータは γ で、intensive-margin tax-price elasticity を示す

0.11 Extensive-Margin Tax-Price Elasticity の推定方法

$$D_{it} = \theta_i + \delta(R_{it} \times \ln(1 - s_{it})) + \beta X_{it} + \lambda_t + u_{it}, \quad (2)$$

- D_{it} は正の寄付額 ($g_{it} > 0$) が観測されたら 1 を取るダミー変数
- 関心のあるパラメータは δ
 - 二値のアウトカム変数なので、 δ は直接、価格弾力性として解釈できない
 - Extensive-Margin Tax-Price Elasticity は $\hat{\delta}/\bar{D}$ で得られる (\bar{D} は D_{it} の標本平均)

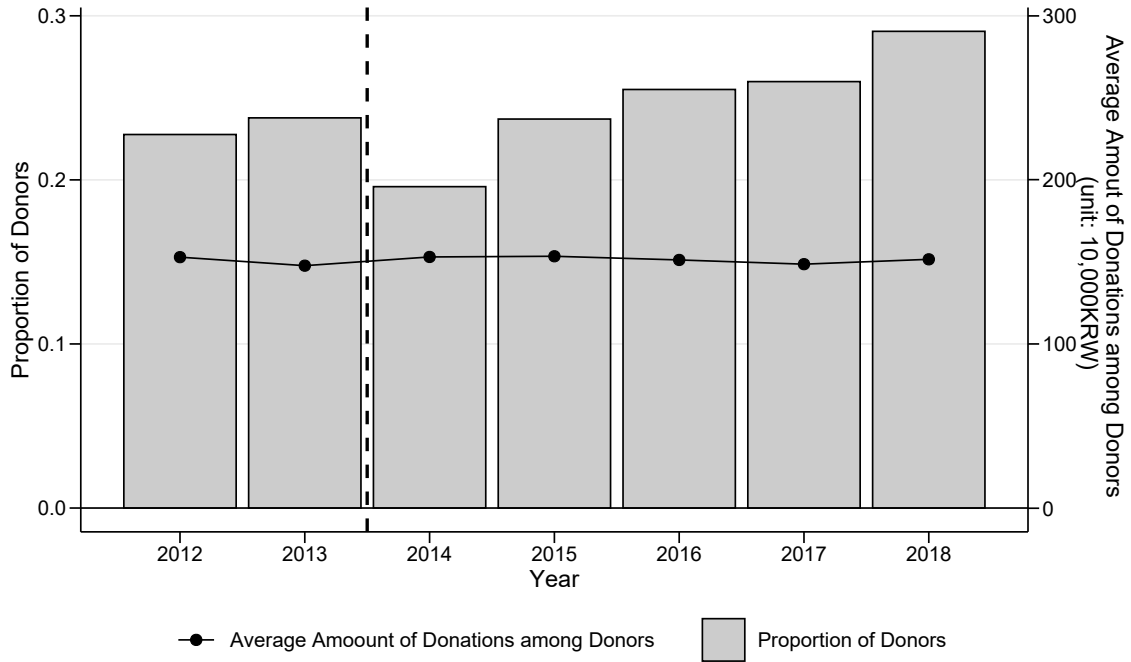


Figure 2: Proportion of Donors and Average Donations among Donors. Notes: The left and right axes measure proportion of donors (grey bars) and the average amount of donations among donors (solid line), respectively.

0.12 寄付の相対価格の内生性

$$1 - s_{it} = \begin{cases} 1 - T'_t(y_{it} - g_{it}) & \text{if } t < 2014 \\ 1 - m & \text{if } t \geq 2014 \end{cases}, \quad (3)$$

- $T'_t(\cdot)$ は t 年の限界所得税率、 m は税額控除率 ($m = 0.15$)
- 所得控除のとき、寄付価格は寄付額 (g_{it}) に依存する
- この価格は *Last-unit price* と呼ばれる

過去の研究にならい、本研究は以下の *first-unit price* を *last-unit price* の代わり（もしくはその操作変数）として用いる

$$1 - s_{it}^f = \begin{cases} 1 - T'_t(y_{it} - 0) & \text{if } t < 2014 \\ 1 - m & \text{if } t \geq 2014 \end{cases}, \quad (4)$$

0.13 寄付申告の内生性

給与所得者ダミーを IV として用いる

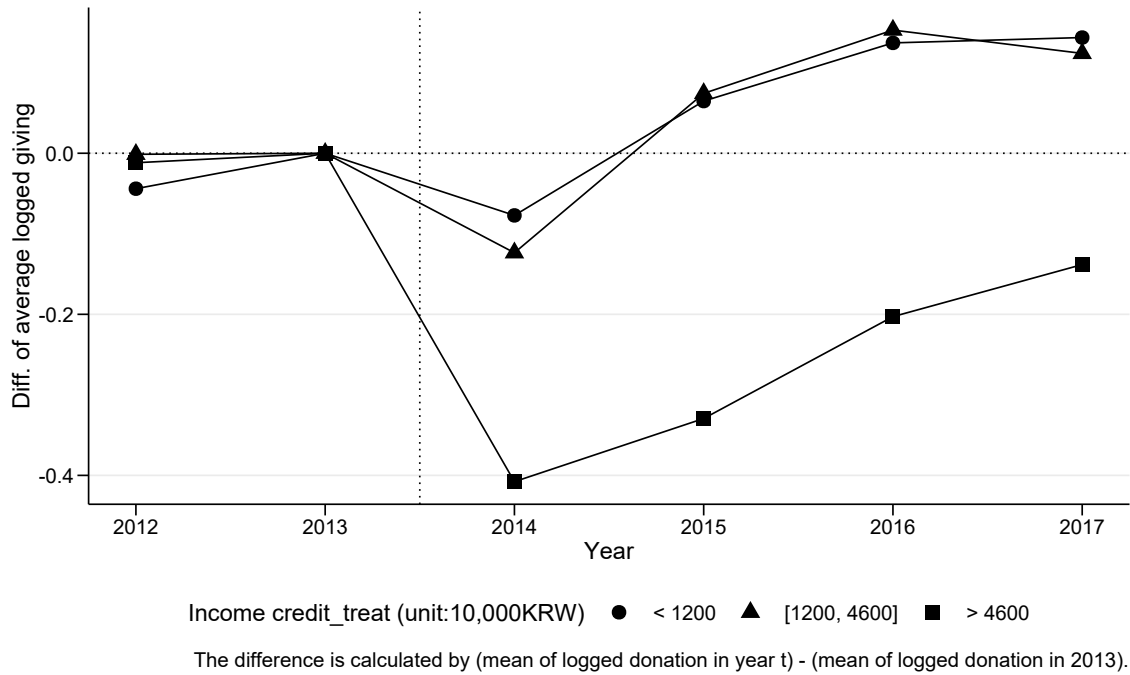


Figure 3: Average Logged Giving by Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014. The group averages are normalized to be zero in 2013.

- 所得や業種をコントロールすれば、給与所得者であるかどうかは直接寄付額に影響しない
- 給与所得者のほうが非給与所得者より寄付申告コストが安いと考えられる

(Wooldridge2010a?) より、以下の二つの方法で推定する

1. 給与所得者ダミー (Z_{it}) と first-unit price の交差項を $R_{it} \times \ln(1 - s_{it}^f)$ の操作変数として用いる
2. 寄付申告の傾向スコア P_{it} と first-unit price の交差項を操作変数として用いる
 - 傾向スコア P_{it} は $R_{it} = 1[\alpha_0 + \alpha_1 Z_{it} + \alpha_2 \ln(1 - s_{it}^f) + \alpha_3 X_{it} + u_{it0} > 0]$ をプロビット推定し、その予測確率で得る
 - プロビット推定は係数が時間に対して一定と仮定した Pooled モデルと係数が時間に対して異なると仮定した Separated モデルで推定

Table 2: Intensive-Margin Tax-Price Elasticity

| | FE | | | FE-2SLS | | |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Applying tax relief x log(first price) | -0.748*** (0.225) | | | -1.400*** (0.411) | -1.437*** (0.363) | -1.540*** (0.375) |
| PS of applying tax relief x log(first price) | | -1.544*** (0.388) | -1.515*** (0.367) | | | |
| First-stage: Instrument | | | | 0.638 [468.1] | 1.075 [534.6] | 0.984 [662.2] |
| Num.Obs. | 7004 | 6975 | 6975 | 6975 | 6975 | 6975 |
| Instrument | | | | WE x Price | PS x Price | PS x Price |
| Method of PS | | Pool | Separate | | Pool | Separate |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. A square bracket is wald statistics of instrument.

Table 3: Extensive-Margin Tax-Price Elasticity

| | FE | | | FE-2SLS | | |
|--|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Applying tax relief x log(first price) | -2.800*** (0.074) | | | -0.464*** (0.176) | -0.563*** (0.120) | -0.738*** (0.116) |
| PS of applying tax relief x log(first price) | | -0.452*** (0.107) | -0.566*** (0.101) | | | |
| Implied price elasticity | -10.799*** (0.287) | -1.741*** (0.411) | -2.181*** (0.388) | -1.788*** (0.678) | -2.169*** (0.463) | -2.841*** (0.448) |
| First-stage: Instrument | | | | 0.289 [276.6] | 0.803 [311.7] | 0.768 [361.9] |
| Num.Obs. | 27 017 | 26 863 | 26 863 | 26 863 | 26 863 | 26 863 |
| Instrument | | | | WE x Price | PS x Price | PS x Price |
| Method of PS | | Pool | Separate | | Pool | Separate |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. A square bracket is wald statistics of instrument.

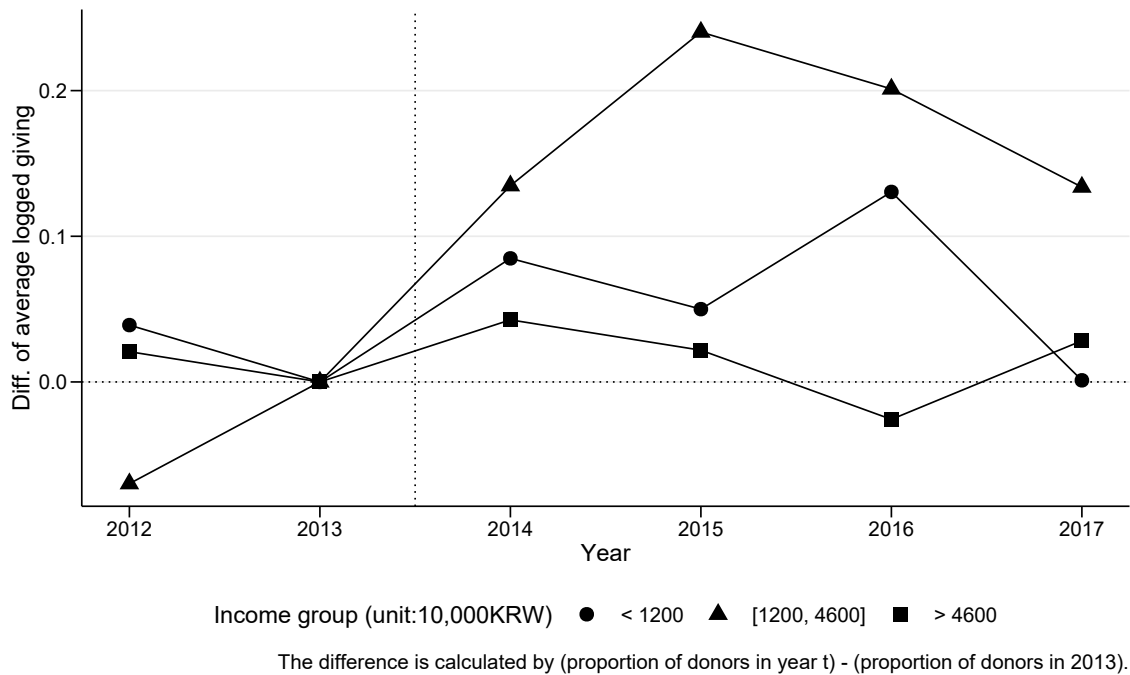


Figure 4: Average Logged Giving by Three Income Groups Conditional on Donors. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014. The group averages are normalized to be zero in 2013.

0.14 結果: Intensive-Margin Tax-Price Elasticity

0.15 結果: Extensive-Margin Tax-Price Elasticity

0.16 ロバストネスチェック

1. 2013-2014 年データを除外 (Table ?? and ??)

- 税制改革のアナウンスメント効果を排除

2. First-unit price ではなく、Last-unit price で弾力性を推定 (Table ?? and ??)

3. 給与所得者ダミーと寄付価格の交差項ではなく、first-unit price を操作変数にする (Table 4-5)

4. 寄付申告者に限定し、所得控除制度による内生性 (e.g. 所得の変動) を考慮した分析を実施 (Table 6 and 7)

- 階差モデルやリードラグ変数の使用 (Gruber and Saez, 2002; Randolph, 1995; Scharf2020?)

ほとんどの分析で、intensive-margin tax-price elasticity は-1.5 から-2 の間に入り、extensive-margin tax-price elasticity は-1.7 から-5 の間に入る

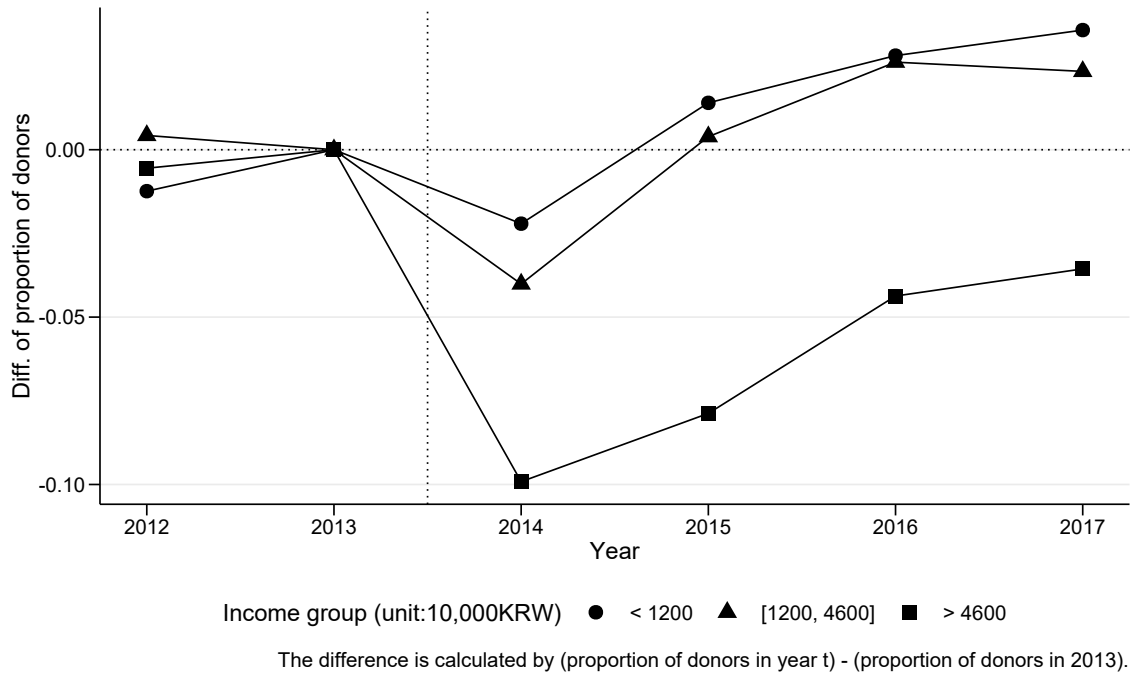


Figure 5: Proportion of Donors by Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014. The group averages are normalized to be zero in 2013.

0.17 韓国での寄付の価格弾力性は先行研究より弾力的

- 申告の自己選択を無視すると、Intensive-margin tax-price elasticity は過小推定
 - 寄付者の寄付額を決める観察できない要素と申告が正の相関をしている
 - そのような要素を寄付額を高めるならば、節税による便益が高くなるので、申告しやすくなる
- 申告の自己選択を無視すると、Extensive-margin tax-price elasticity は過大推定
 - 寄付価格が申告と寄付するかどうかの意思決定の両方に同じ方向の影響を与え、負の相関をより強くした可能性がある

0.18 Conventional Method to Estimate Tax-Price Elasticity

0.19 Conventional Method to Estimate Tax-Price Elasticity (2)

0.20 Estimating Price Elasticity Using Compliers

0.21 k -th Difference Model

Table 4: Estimation of Last-Unit Price Elasticities

| | Intensive margin | | Extensive margin | |
|-------------------------------|----------------------|----------------------|-----------------------|----------------------|
| | FE | FE-2SLS | FE | FE-2SLS |
| | (1) | (2) | (3) | (4) |
| log(last price) | -0.634*** (0.231) | -1.907*** (0.451) | -2.945*** (0.071) | -1.570*** (0.127) |
| Implied price elasticity | | | -11.684*** (0.281) | -6.227*** (0.502) |
| First-stage: log(first price) | | 0.726 [442.4] | | 0.353 [407.8] |
| Num.Obs. | 7234 | 7234 | 28 696 | 28 696 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. A square bracket is wald statistics of instrument.

Table 5: Estimation of Last-Unit Price Elasticities Excluding 2013 and 2014 data

| | Intensive margin | | Extensive margin | |
|-------------------------------|---------------------|----------------------|-----------------------|----------------------|
| | FE | FE-2SLS | FE | FE-2SLS |
| | (1) | (2) | (3) | (4) |
| log(last price) | -0.679** (0.333) | -2.088*** (0.600) | -3.097*** (0.086) | -1.560*** (0.170) |
| Implied price elasticity | | | -11.574*** (0.320) | -5.830*** (0.634) |
| First-stage: log(first price) | | 0.796 [270.6] | | 0.363 [244.3] |
| Num.Obs. | 5405 | 5405 | 20 198 | 20 198 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. A square bracket is wald statistics of instrument.

Table 6: Estimating Intensive-Margin Price Elasticities for Those Who Applied for Tax Relief

| | (1) | (2) | (3) | (4) |
|------------------------------|----------------------|-------------------|----------------------|-------------------|
| log(first price) | -1.203*** (0.390) | -0.506 (0.847) | | |
| log(last price) | | | -1.330*** (0.452) | -0.254 (0.903) |
| log(income) | 0.525 (0.776) | 6.126 (5.365) | 0.532 (0.785) | 6.093 (5.503) |
| 1-year lag of price | | 0.369 (0.884) | | 0.487 (0.911) |
| 1-year lag of income | | 1.040 (4.777) | | 1.129 (5.030) |
| 1-year lead of income | | -0.821 (0.907) | | -0.826 (0.904) |
| Instrument: log(first price) | | | 0.942 [3083.6] | -0.000 [0.0] |
| Num.Obs. | 4079 | 1029 | 3972 | 1024 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. 1-year lead of price cannot be estimated because of collinearity.

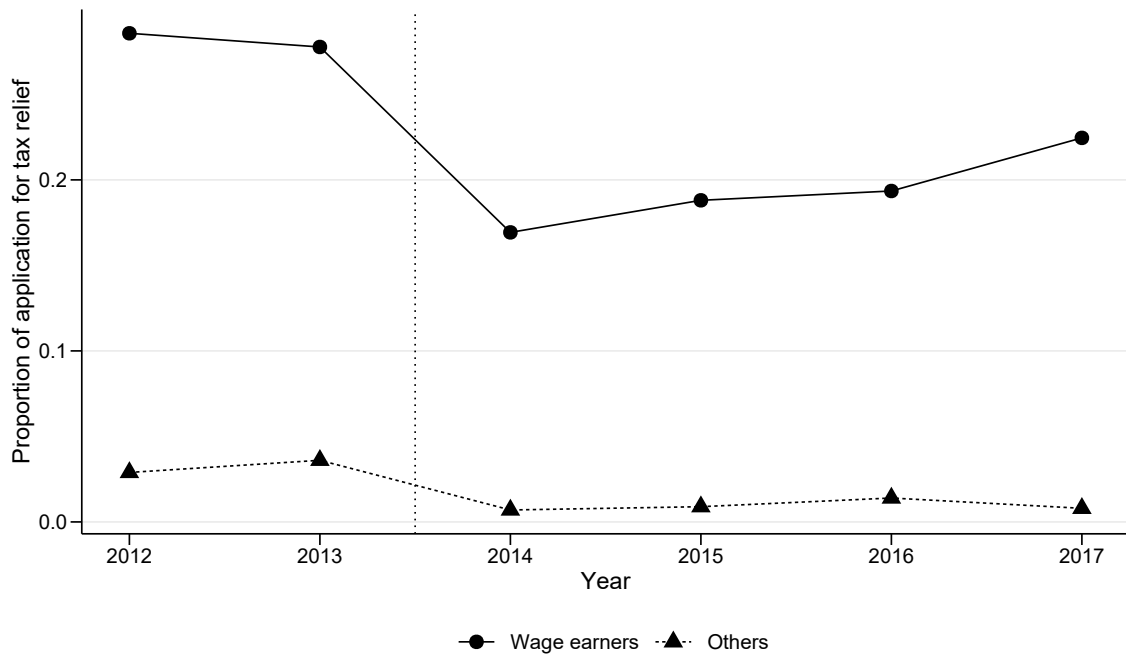


Figure 6: Share of Tax Relief by Wage Earners. Notes: A solid line is the share of applying for tax relief among wage earners. A dashed line is the share of applying for tax relief other than wage earners.

Table 7: k -th Difference Model Using Those Who Applied for Tax Relief

| | 1-year lag | 2-year lag | 3-year lag |
|----------------------------------|--------------------|----------------------|----------------------|
| | (1) | (2) | (3) |
| Difference of logged first price | -1.890* (1.107) | -2.530*** (0.895) | -4.057*** (0.720) |
| First-stage: Instrument | 0.995 [34401.5] | 0.991 [31041.1] | 0.984 [17987.3] |
| Num.Obs. | 4014 | 3903 | 3765 |
| Std.Errors | Clustered (pid) | Clustered (pid) | Clustered (pid) |
| FE: area | X | X | X |
| FE: indust | X | X | X |
| FE: year | X | X | X |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. Instrument is difference between lagged first price in year t and in year $t - k$ fixing income in year $t - k$.