

Uncovering the Tax Elasticity Using Administrative Data: Evidence from a Comprehensive Tax Reform*

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Abstract

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1 Overview

The level and distribution of tax elasticity are central questions for public policy analyses and continue to be extensively discussed and studied. Bulgaria implemented a comprehensive labor income tax reform in 2008 which replaced the existing progressive tax system with a flat personal income tax of 10%. We utilize a unique and large Bulgarian administrative dataset in order to analyze the individual labor earnings responses to these tax changes and the resulting tax elasticity. The dataset is based on the Declaration Form 1 files collected by the Bulgarian National Revenue Agency (BNRA) between 2005 and 2012.¹ Declaration Form 1 is filed on a monthly basis, on the 25th of each month, by all employers for each of their employees separately. Therefore, the dataset covers all employees of all employers in the country and contains approximately 2.5 million tax filings each month. Our unit of analysis is monthly earnings in the month of April and October

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¹The data is available from 2005 until 2018, but for now we restrict our analysis to the 2005-2012 time period.

each year. The dataset is also quite rich – it contains information at the individual worker’s level, such as a unique individual identifier, age, gender, 1-digit occupation, postal code, city, and region. It also contains a unique firm identifier allowing all workers employed at a firm in a particular month to be linked.

We begin our analysis by computing the marginal tax rates that each worker faces in each year between 2005 and 2012. We take into account not only the personal income tax, but also (i) any social security and health insurance taxes paid by the employee and (ii) all relevant social security and health insurance minimum and maximum thresholds. Overall, the tax reform has decreased the marginal tax rate by approximately 10 percentage points, on average, for about two-third of all workers and has increased the marginal tax rate by about 10 percentage points, on average, for the rest.

We find a large tax elasticity – a decline in the marginal tax rate leads to a substantial increase in pre-tax earnings. In our preferred specification, the tax elasticity is 0.57. We are able to provide also a detailed description of the distribution of the tax elasticity across various age, gender, and marital status groups. Finally, we plan to extend the standard analysis of tax elasticity in a novel way – using registry data we are able to match spouses, account for within-household decisions, and characterize the level and distribution of tax elasticity, explicitly controlling for spousal characteristics.

Figure 1: Declaration 1 Form

Приложение №1

НАЦИОНАЛНА АГЕНЦИЯ ЗА ПРИХОДИТЕ 2014									
ДЕКЛАРАЦИЯ образец №1 "Данни за осигуряването"									
1. Код корекция		2. Месец		3. Година		4. Код на задълженото лице		5.2. За ЛРЧ/СЛ, номер лод: 0 - мъж, 1 - жена	
5. ЕГН (ЛНЧ)		6. Фамилия		7. Инициали		8. Пощенски код		9. Област	
5.1. За ЛРЧ/СЛ, номер-дата на раждане		ден		месец		година		10. Населено място	
11. Адрес по местоживее на лицето									
12. Вид осигурен		12.1. Поряден номер на квалификационна група професионална на осигуряване		12.2. Код иконом. дейност на осигуряване		12.3. Поряден номер на основна иконом. дейност на осигуряване		12.4. Работодателни дължими вноски за месец по Закона за гарантиране вземания на работниците и служителите при неспособност на работодателя	
13. Код продължаване на осигуряването		14. Дан. от който осигуряването е възобновено		15. Последен ден в осигуряване		Процент осигурителни вноски за социално осигуряване		Процент осигурителни вноски за здравно осигуряване	
16. Дни в осигуряване - общо		17. Доход, върху който се дължат здравноосигурителни вноски за лицата по чл. 40, ал. 1, т. 5 от ЗОО, с изключение на лицата в отпуск по чл. 164 от КТ		18. Върху сумите в т. 17 и 17.1		за сметка на работодателя		за сметка на осигуреното лице	
16.1. Отработени и други дни с осигурителни вноски		17.1. Доход, върху който се дължат здравноосигурителни вноски за периода на отпускане на вете по чл. 164 от КТ		19. Сума за социални разходи, върху които се дължат осигурителни вноски		за сметка на работодателя		за сметка на осигуреното лице	
16.2. Дни във временна неработоспособност и/или дни с право на обезщетение по чл. 53а от КОО		17.2. Доход, от който е определено наречното обезщетение за периода на временна неработоспособност или болестност и разходите		20. За фонда Пенсионен върху сумите в т. 19		за сметка на работодателя		за сметка на осигуреното лице	
16.3. Дни за отпускане на малко дете		17.3. Сума за социални разходи, върху които се дължат осигурителни вноски		21. Осигурителен доход, върху който се дължат осигурителни вноски, вкл. сумата по чл. 40, ал. 5 от КОО, с изключение на сумата по т. 19		22. За фондове на ДОО, без ТЗТБ в/у сумите в т. 21		22.1. Върху сумите в т. 19, и т. 21.	
16.4. Дни без осигурителни вноски, зачетени за осигурителен стаж		21. Осигурителен доход, върху който се дължат осигурителни вноски, вкл. сумата по чл. 40, ал. 5 от КОО, с изключение на сумата по т. 19		22.2. За фонда ТЗТБ върху сумите в т. 21		23. За Училищния пенсионен фонд в/у сумите в т. 21		23.1. Училищния пенсионен фонд в/у сумите в т. 19 и 21.	
16.5. Дни в трудовата злополука		22. За фондове на ДОО, без ТЗТБ в/у сумите в т. 21		23. За Училищния пенсионен фонд в/у сумите в т. 19 и 21.		24. За универсален пенс. фонд в/у сумите в т. 19 и 21.		24.1. Върху сумите в т. 19 и 21.	
16.6. Дни в професионална болест		23. За Училищния пенсионен фонд в/у сумите в т. 21		24. За универсален пенс. фонд в/у сумите в т. 19 и 21.		25. За профес. пенс. фонд в/у сумите в т. 19 и 21.		25.1. Върху сумите в т. 19 и 21.	
16.7. Отработени часове - общо		24. За универсален пенс. фонд в/у сумите в т. 19 и 21.		25. За профес. пенс. фонд в/у сумите в т. 19 и 21.		26. За универсален пенс. фонд в/у сумите в т. 19 и 21.		26.1. Върху сумите в т. 19 и 21.	
16.8. В т.ч. часов положен извънреден труд		25. За профес. пенс. фонд в/у сумите в т. 19 и 21.		26. За универсален пенс. фонд в/у сумите в т. 19 и 21.		27. Доход, върху който се дължат вноски само за здравно осигуряване		27.1. Върху сумите в т. 27.	
29. Брутно трудово възнаграждение		30. % вноса за фонда гравит. взем. на работ. и служ.		31. А. Начислен месечен данък		31. А. Начислен месечен данък		31. А. Начислен месечен данък	
31. Начислен месечен облагаем доход по чл. 24 от ЗДДФЛ		32. Лични вноски за доброволно пенсионно осигуряване и доброволно осигуряване за безработица		33. Лични вноски за доброволно здравно осиг. и премия/взноски по договори за застраховки "Живот и риза" и застраховки "Живот", свързани с инвестиционен фонд		34. Нето възнаграждение		34. Нето възнаграждение	
32. Лични вноски за доброволно пенсионно осигуряване и доброволно осигуряване за безработица		33. Лични вноски за доброволно здравно осиг. и премия/взноски по договори за застраховки "Живот и риза" и застраховки "Живот", свързани с инвестиционен фонд		34. Нето възнаграждение		34. Нето възнаграждение		34. Нето възнаграждение	
33. Лични вноски за доброволно здравно осиг. и премия/взноски по договори за застраховки "Живот и риза" и застраховки "Живот", свързани с инвестиционен фонд		34. Нето възнаграждение		34. Нето възнаграждение		34. Нето възнаграждение		34. Нето възнаграждение	
34. Нето възнаграждение		34. Нето възнаграждение		34. Нето възнаграждение		34. Нето възнаграждение		34. Нето възнаграждение	
Подпис на работодателя (самоосигуряваща се):									
Печат, дата									

2 A Large Personal Income Tax Reform

The Bulgarian government implemented a large personal income tax (PIT) reform in January 1, 2008. The PIT reform introduced a flat tax rate of 10%. In the year preceding the reform the PIT schedule was progressive with marginal tax rates of 0% for 0-200 Bulgarian lev (BGN), 20% for 201-250 BGN, 22% for 251-600 BGN and 24% for 601 BGN and above. The average monthly salary in 2007 was around 400 BGN. Taxation in Bulgaria is at the individual level.

3 Personal Income Tax Details

We incorporate fully the details of the tax and social insurance system in Bulgaria. In particular, we consider the occupation- and industry-specific minimum social insurance thresholds. The maximum thresholds for social insurance are common for all earners and are taken into account as well.

4 Sample Restrictions

The data sample is restricted to workers of age between 25 and 59 years old. These age limits are chosen so that college students working part-time are not included. Given that the obligatory retirement age in Bulgaria is 60, working retirees are not included either. In addition, we drop observations with missing information on occupation, industry, or hours worked. Finally, we exclude workers with more than one employer in a month and restrict the analysis to social insurance type 1 workers (most common). Therefore, employees in the public sector or the self-employed are not considered. The sample size after restrictions in our baseline specification is 8,861,182 observations.

5 Methodology

Gruber and Saez (2002) derive the empirical log-linear model

$$\log(y_{i,s}) = \alpha_i + \beta \log(1 - \tau_{i,s}) + \varepsilon_{i,s},$$

where $y_{i,s}$ is taxable income of individual i in year s , α_i is an individual i fixed effect, and $1 - \tau_{i,s}$ is the marginal net-of-tax rate of individual i in year s . The model is estimatable under its first-difference version

$$\Delta \log(y_{i,s+1}) = \beta \Delta \log(1 - \tau_{i,s+1}) + \Delta \varepsilon_{i,s+1},$$

where $\Delta \log(y_{i,s+1})$ is the log difference of income between base year s and year $s+1$. $\Delta \log(1 - \tau_{i,s+1})$ is the log difference of marginal net-of-tax rate between base year s and year $s+1$.

To address the endogeneity of the marginal tax rate (τ), we use the simulated mechanical marginal tax rate τ as an instrumental variable. The mechanical tax rate is the hypothetical marginal tax rate an individual faces under a new tax scheme if she keeps the income and hours

worked levels and the occupation/industry status from the pre-reform period. To account for aggregate trends in earnings as well as different underlying trends in earnings growth for various groups (including mean reversion), we utilize a rich set of linear spline controls for past income and past income growth.

6 Preliminary Results

Table 1 presents several estimates for the elasticity of taxable income based on the Bulgarian administrative data. Given that we observe earnings in each April and October from 2005 to 2012, we can derive the growth rate of earnings (proxied by the differenced log earnings) at different time periods. In column (1) we present results for intervals of 6 months. Columns 2-4 present the results for intervals of 12, 18 and 24 months. The two panels of the table present the estimates for years 2005-2012 and 2005-2009 respectively. Finally, each row of each of the two panels presents estimates based on restrictions on hours worked. For instance, the row "Any" shows the results for workers who declare any amount of hours worked, while the results in the following rows are based only on workers who report sufficiently high hours worked.

We include basic socioeconomic controls in the estimation as well as linear splines of earnings two periods ago $s - 2$, and earnings growth from period $s - 2$ to period $s - 1$. First, the results point out that the elasticities of taxable income for the restricted period 2005-2009 are similar to the ones estimated on the full sample 2005-2012. Second, the estimated elasticity increases with the length of the considered time period. We interpret this as evidence that the long-run effect of changes in taxes on earnings is higher than the immediate effect. Finally, the tax elasticity is higher for workers who work full-time compared to their part-time counterparts. Our preferred estimate of 0.572 is for the time period of 12 months and for workers who work at least 75% of the time.

Table 2 reports the estimates for the split samples of married/single men and women at our preferred time period duration and for full-time workers. The tax elasticity for men is higher than for women. This difference is particularly pronounced among the married.

Table 3 reports the estimated tax elasticities for different age and income groups. Age differences are present but are small – younger workers' response to changes in taxes is slightly higher. However, we document large differences in the tax elasticity based on the position in the income distribution. The tax elasticity for workers in the top decile of the distribution is substantially higher than the baseline estimate for the whole sample.

Table 1: Elasticity of Taxable Income

	<i>Dependent variable: $\Delta \log(y)$</i>			
	<i>Time period (in months):</i>			
	6	12	18	24
	(1)	(2)	(3)	(4)
<i>Independent variable: $\Delta \log(1 - \tau)$</i>				
<u>Hours worked:</u>				
		<u>Time span: 2005-2012</u>		
Any	0.043*** (0.007)	0.340*** (0.006)	0.473*** (0.006)	0.703*** (0.008)
>50% of full-time hours	0.153*** (0.007)	0.540*** (0.007)	0.672*** (0.007)	1.022*** (0.009)
>75% of full-time hours	0.182*** (0.008)	0.572*** (0.007)	0.710*** (0.007)	1.100*** (0.009)
		<u>Time span: 2005-2009</u>		
Any	0.059*** (0.007)	0.336*** (0.007)	0.463*** (0.007)	0.597*** (0.010)
>50% of full-time hours	0.205*** (0.008)	0.524*** (0.007)	0.632*** (0.008)	0.866*** (0.011)
>75% of full-time hours	0.215*** (0.008)	0.551*** (0.008)	0.665*** (0.008)	0.937*** (0.012)
Splines, $\log(y_{s-2})$	✓	✓	✓	✓
Splines, $\Delta \log(y_{s-1})$	✓	✓	✓	✓
Controls	✓	✓	✓	✓

Notes: Elasticity estimates are based on 2SLS regressions with standard errors in parentheses. The dependent variable is the change in log monthly labor earnings of an individual over time periods of 6, 12, 18 or 24 months. The independent variable of interest is the change in log marginal net-of-tax, which is instrumented with the change in log of the simulated marginal net-of-tax rate under the base-month behavior. Socioeconomic controls include 5-year age interval, gender and marital status dummies. All specifications include base-month fixed effects and weights by labor earnings. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Elasticity of Taxable Income - Marital Status Heterogeneity

<i>Dependent variable: $\Delta \log(y)$</i>					
	Married:			Single:	
	Baseline	Men	Women	Men	Women
$\Delta \log(1 - \tau)$	0.572*** (0.007)	0.699*** (0.013)	0.412*** (0.011)	0.548*** (0.018)	0.511*** (0.020)
Splines, $\log(y_{s-2})$	✓	✓	✓	✓	✓
Splines, $\Delta \log(y_{s-1})$	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
R ²	0.092	0.091	0.089	0.101	0.105
Observations	8,861,182	3,064,789	3,172,004	1,515,258	1,109,131

Notes: Elasticity estimates are based on 2SLS regressions with standard errors in parentheses. The dependent variable is the change in log monthly labor earnings of an individual over time periods of 12 months for the period 2005-2012. Hours worked are restricted to be at least 75% of the full-time hours worked. The independent variable of interest is the change in log marginal net-of-tax, which is instrumented with the change in log of the simulated marginal net-of-tax rate under the base-month behavior. Socioeconomic controls include 5-year age interval, gender and marital status dummies. All specifications include base-month fixed effects and weights by labor earnings. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Elasticity of Taxable Income - Age and Income Heterogeneity

<i>Dependent variable: $\Delta \log(y)$</i>					
	Age:			Income:	
	Baseline	25-39	40-59	Top 10	Top 20
$\Delta \log(1 - \tau)$	0.572*** (0.007)	0.576*** (0.011)	0.535*** (0.010)	0.994*** (0.034)	1.418*** (0.024)
Splines, $\log(y_{s-2})$	✓	✓	✓	✓	✓
Splines, $\Delta \log(y_{s-1})$	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
R ²	0.092	0.101	0.083	0.275	0.212
Observations	8,861,182	3,493,856	5,367,326	1,117,086	2,203,503

Notes: Elasticity estimates are based on 2SLS regressions with standard errors in parentheses. The dependent variable is the change in log monthly labor earnings of an individual over time periods of 12 months for the period 2005-2012. Hours worked are restricted to be at least 75% of the full-time hours worked. The independent variable of interest is the change in log marginal net-of-tax, which is instrumented with the change in log of the simulated marginal net-of-tax rate under the base-month behavior. Socioeconomic controls include 5-year age interval, gender and marital status dummies. All specifications include base-month fixed effects and weights by labor earnings. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.