Industrial Policy at Work: Evidence from Romania's Income Tax Break for Workers in IT[1]

Isabela Manelici* and Smaranda Pantea**

*UC Berkeley and **The Ministry of Public Finance of Romania

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[1] The present work represents the views of the authors and does not necessarily reflect those of the Ministry of Public Finance of Romania

The Romanian Income Tax Break for Workers in IT

Context

- ▶ IT sector perceived as key sector.

- ▶ IT services sector largely underdeveloped compared to its potential.

- ▶ Large potential for development due to high quality STEM education.

- ▶ Main problem: large tax wedge.

- ▶ Personal income tax: progressive, with rates between 18% and 40%.

The Romanian Income Tax Break for Workers in IT

Initial law, introduced in 2001.

Income tax break for workers fulfilling the following conditions:

- ▶ Working for a firm in NACE code rev.1 722 (Software creation)
- ▶ Working in a department in charge of software creation
- ▶ Having an eligible, IT-related, university degree
- ▶ Working in an eligible, programming related, occupation
- ▶ Working for a firm which has provided evidence of income from software creation of more than $10,000 per employee (to be exempted)

The Romanian Income Tax Break for Workers in IT

2013 amendment.

Income tax break for workers was expanded due to:

- Redefinition of eligible sectors based on NACE rev.2 as: 5821, 5829, 6201, 6202, 6209.

- Inclusion of several new IT-related, university degrees on the list of eligible specializations: eligible specializations increased from 6 to 14.

Research Questions

1. What are the effects of this income tax break on the size of the sector? Relative to "comparable" sectors and to "comparable" countries

2. What are the effects of this income tax break on the exempted firms?

3. What are the mechanisms through which the expansion occurred?

4. Are there any effects on the wider economy? Inter-industry spillovers on sectors using IT-services intensively?

Related Literature

1. Descriptive studies on the effects of this tax break (Grigoras et al., 2017).

2. Impact of industrial policy on development (Harrison and Rodrguez-Clare, 2010; Lane, 2016; Liu, 2017; Juhasz, 2018).

3. Effects of reduction in non-wage labor costs. Mainly positive effects on: employment (Crepon and Desplatz, 2002; Kangasharju, 2007; Cahuc et al. 2014), average wages (Bennmarker, et al., 2009, Saez, et al., 2017), profits, turnover, and long-term investment (Saez et al., 2017).

Related Literature

1. Drivers of growth in IT sector: size, age, and productivity (Johansson, 2004; Falk and Hagsten, 2018), human capital (Colombo and Grilli, 2005, Ganotakis, 2012), internationalization (Ganesan and Samii, 2014; Falk and Hagsten, 2018).

2. Importance of IT sector for productivity and growth (Striroh, 2002; van Ark, et al. 2008; Syverson, 2011; Bloom et al., 2012).

Sector expansion after the introduction of income tax break in 2001:
Synthetic control analysis

Outcomes: turnover, production, VA, investment, number of firms, employment.

Treated sector: 72 (Computer and related activities).

Control sectors: 73 (Research and development) and 74 (Other business activities).

Pool of donor countries: BG, CZ, CY, EE, HU, IE, LV, LT, MT, PL, PT, SK and SI.

Predictors: GDP pc, % of medium and high-tech industry, and % of services.

Data: SBS from Eurostat and World Development Indicators from World Bank.

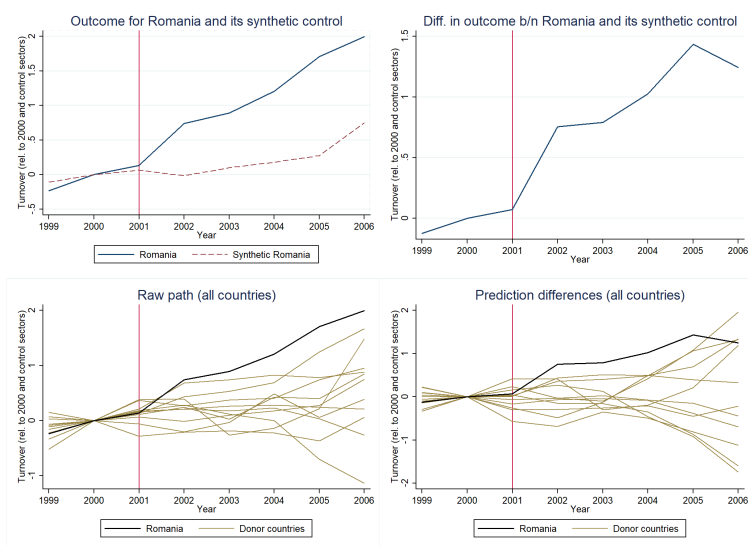# Sector expansion after the introduction of income tax break in 2001

Figure: Synthetic control analysis: Turnover or gross premiums written (normalized)

Sector expansion after the Introduction of Income Tax Break in 2001

Figure: Synthetic control analysis: Employment (normalized)

Firm-level Expansion after the 2001 Income Tax Break Law: DiD

Specification:

$$log(Y_{ist}) = \alpha_i + \lambda_s + \sum_{t=1999, t \neq 2000}^{2005} \delta_t \times \tau_t +$$

$$+ \sum_{t=1999, t \neq 2000}^{2005} \beta_{DiD,t} \times \tau_t \times \textit{Target\_sector}_{is} + \varepsilon_{ist},$$

Y_{ist} employment, turnover, total assets and solvency rate of firm i in sector s in year t.

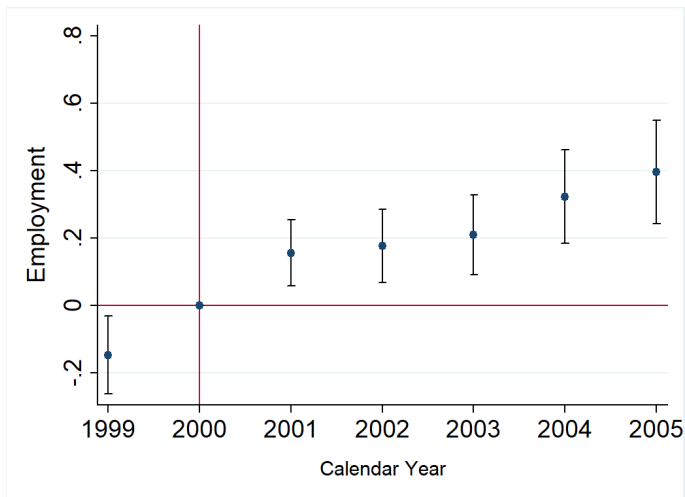**Treated sector:** 722 (Software consultancy and supply).

Control sectors: 642, 721, 723, 724, 725, 726, 731, 732, 741, 742, 743, 744, 748, and 921 (main specification, results robust to five alternative sets of control sectors).

Data: Amadeus from Bureau Van Dijk.

Firm-level Expansion after the 2001 Income Tax Break Law: DiD

	log Turnover	log Workers	log Assets	Solvency Ratio
$\beta_{DiD,1999}$	-0.094	-0.147**	-0.082	-2.547
	(0.105)	(0.059)	(0.108)	(2.448)
$\beta_{DiD,2001}$	0.309***	0.156***	0.312***	4.226
	(0.095)	(0.050)	(0.090)	(2.571)
$\beta_{DiD,2002}$	0.398***	0.177***	0.420***	6.546**
	(0.102)	(0.055)	(0.100)	(3.083)
$\beta_{DiD,2003}$	0.500***	0.210***	0.512***	15.447***
	(0.108)	(0.060)	(0.103)	(3.585)
$\beta_{DiD,2004}$	0.607***	0.323***	0.591***	19.421***
	(0.119)	(0.071)	(0.111)	(3.991)
$\beta_{DiD,2005}$	0.543***	0.396***	0.529***	17.724***
	(0.129)	(0.078)	(0.117)	(3.897)
Adjusted R^2	0.326	0.037	0.346	0.088
# Observations	7,264	6,893	7,290	7,101
# Firms	1,086	1,086	1,086	1,086
Firm FE	YES	YES	YES	YES

Firm-level Expansion after the 2001 Income Tax Break Law: DiD

Firm Expansion After the 2013 Amendment: Difference-in-Difference

Specification

$$log(Y_{ist}) = \alpha_i + \lambda_s + \lambda_{s \times t} + \sum_{t=2011, t \neq 2012}^{2015} \delta_t \times \tau_t +$$

$$+ \sum_{t=2011, t \neq 2012}^{2015} \beta_{DiD,t} \times \tau_t \times Exempted_{ist} + \beta_{Contr} \times X_{ist} + \varepsilon_{ist},$$
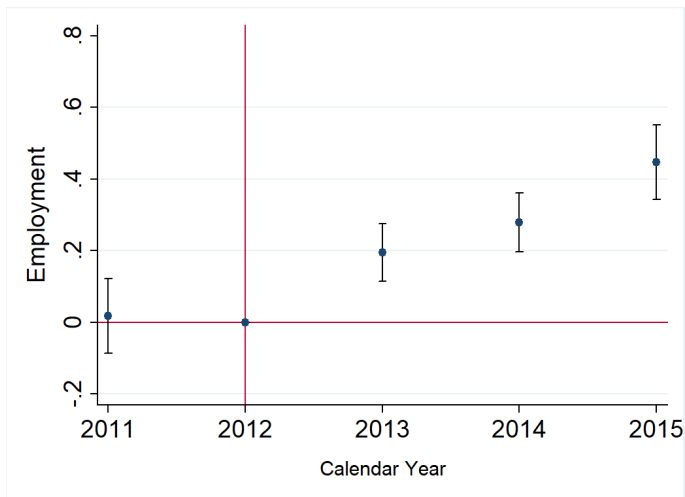
Y_{ist} employment, turnover, sales and total assets of firm i in sector s in year t.

Treated group (Exempted): firms in target sectors with a % of exempted employees of at least 20% after 2013.

Control group: firms in ICT service sectors with at most 5% exempted employees during the whole period.

Data: Administrative data

Firm Expansion After the 2013 Amendment: DiD

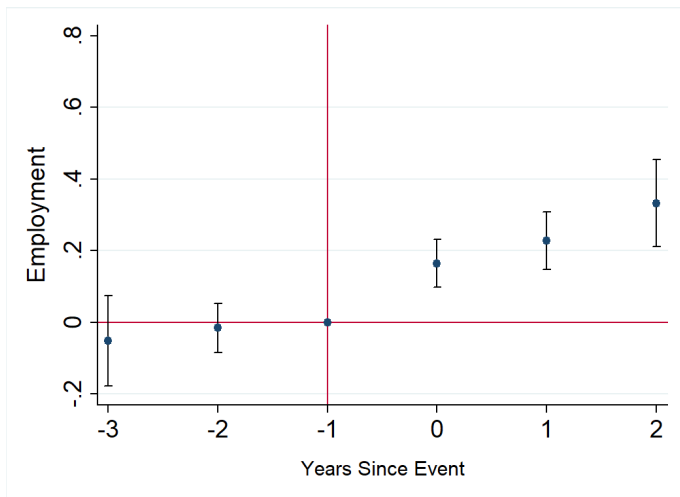# Firm Expansion After the 2013 Amendment: Event Study

Specification

$$log(Y_{ist}) = \alpha_i + \lambda_t + \lambda_s + \lambda_{s \times t} + \sum_{k=-4}^{+2} \theta_k \times D_{ist}^k + \beta_{Controls} \times X_{ist} + \varepsilon_{ist},$$

Y_{ist} employment, turnover, sales and total assets of firm i in sector s in year t.

Event year: the year when the % of exempted employees increased from less than 5 to at least 20% after 2013.

Data: Administrative data

Firm Expansion After the 2013 Amendment: Event Study

Robustness Checks

Our findings on the impact of the 2013 amendment are robust to:

- ▶ Control group choice: high-tech, knowledge-intensive sectors, or only in targeted sectors

- ▶ Threshold choice to define treatment: 15 vs. 20%

- ▶ Inclusion or not of controls on initial firm conditions

- ▶ Focus in the event-study only on firms eventually experiencing the event

Heterogeneity Analysis

	Employment	Turnover	Sales	Assets	Employment	Turnover	Sales	Assets
Panel A: Size		*Micro: < 10 employees*				*Small, medium large: ≥10 employees*		
β_{DiD}	0.347***	0.440***	0.397***	0.283***	0.211***	0.352***	0.325***	0.191**
	(0.047)	(0.072)	(0.075)	(0.066)	(0.053)	(0.085)	(0.083)	(0.08)
Adjusted R^2	0.82	0.81	0.797	0.867	0.921	0.903	0.909	0.944
# Observations	11,579	11,579	11,455	11,579	2,873	2,873	2,868	2,873
# Firms	2,927	2,927	2,903	2,927	656	656	655	656
Panel B: Age		*Young: < 5 years old*				*Old: ≥ 5 years old*		
β_{DiD}	0.611***	0.866***	0.844***	0.326*	0.177***	0.241***	0.211***	0.180***
	(0.099)	(0.172)	(0.167)	(0.175)	(0.034)	(0.045)	(0.048)	(0.045)
Adjusted R^2	0.851	0.779	0.782	0.782	0.938	0.913	0.904	0.938
# Observations	1,869	1,869	1,859	1,869	12,570	12,570	12,451	12,570
# Firms	532	532	532	532	3,048	3,048	3,023	3,048
Panel C: Productivity		*Below average*				*Above average*		
β_{DiD}	0.295***	0.482***	0.481***	0.285***	0.273***	0.305***	0.231***	0.202***
	(0.047)	(0.078)	(0.077)	(0.073)	(0.056)	(0.065)	(0.071)	(0.064)
Adjusted R^2	0.918	0.847	0.85	0.889	0.945	0.923	0.911	0.944
# Observations	9,329	9,329	9,237	9,329	5,123	5,123	5,086	5,123
# Firms	2,368	2,368	2,351	2,368	1,215	1,215	1,207	1,215
Panel D: % exempted employees		*Below average*				*Above average*		
β_{DiD}	0.217***	0.219***	0.203***	0.114*	0.309***	0.575***	0.533***	0.399***
	(0.048)	(0.071)	(0.071)	(0.063)	(0.052)	(0.086)	(0.086)	(0.088)
Adjusted R^2	0.934	0.905	0.895	0.931	0.926	0.881	0.877	0.896
# Observations	9,634	9,634	9,534	9,634	3,669	3,669	3,649	3,669
# Firms	2,625	2,625	2,604	2,625	932	932	926	932

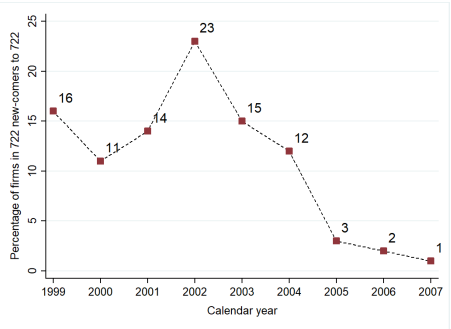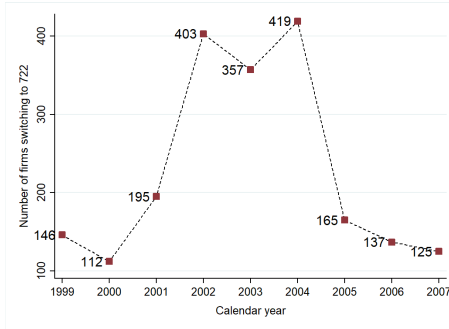# Mechanisms behind the Growth of the Romanian IT Sector

Extensive margin

- Incumbent firms switching sectors
- New firm entries and exits
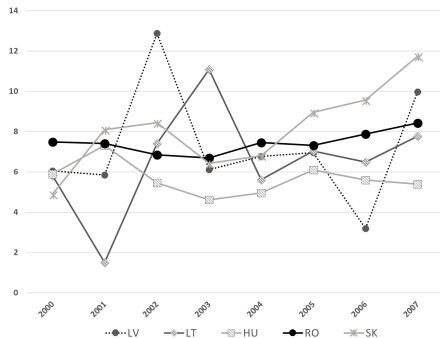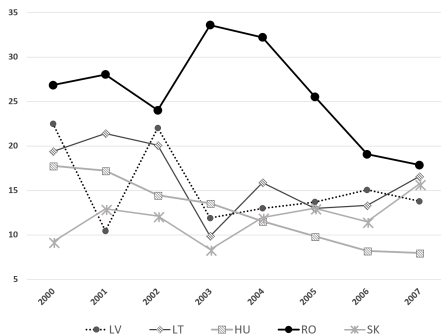
Intensive margin for incumbent firms, not switching sectors

- Relatively lower growth of gross wages
- Increases in labor productivity

Extensive Margin Expansion through Sectoral Switches

Extensive Margin Firm Births and Deaths in the Targeted Sector

Intensive Margin: Average Gross Wages and Sales per Worker

	Average Gross Wages		Sales per Worker	
θ_{-4}	-0.172***		0.083	
	(0.060)		(0.104)	
θ_{-3}	-0.159***	-0.163***	-0.091	-0.018
	(0.040)	(0.061)	(0.068)	(0.080)
θ_{-2}	-0.087***	-0.113***	-0.046	-0.001
	(0.032)	(0.042)	(0.055)	(0.057)
θ_{0}	0.016	0.016	0.053	-0.006
	(0.038)	(0.043)	(0.051)	(0.048)
θ_{+1}	0.048	0.051	0.139**	0.081
	(0.048)	(0.052)	(0.057)	(0.058)
θ_{+2}	0.144**	0.163**	0.211**	0.156*
	(0.071)	(0.074)	(0.090)	(0.093)
Controls				
Rel. prod.		0.099*		0.557***
		(0.051)		(0.129)
Small		0.043*		0.035
		(0.023)		(0.037)
Medium		0.034		0.069
		(0.060)		(0.073)
Large		0.157*		-0.002
		(0.087)		(0.149)
Young		0.127*		-0.120
		(0.067)		(0.134)
Adjusted R^2	0.823	0.823	0.783	0.818
# Observations	14,452	11,227	14,205	11,032
# Firms	3,583	3,397	3,535	3,343

Effects on the Wider Economy: Inter-industry Spillovers

Tax break for IT workers could indirectly affect other sectors:

- ▶ The IT sector plays an important role in increasing aggregate productivity (van Ark et al., 2008).

- ▶ IT services are key inputs for other sectors.

We check this possibility by comparing the growth of sectors using IT-services intensively to those using IT-services less intensively.

Sectors are classified as high- or low-intensity users of IT services based on the 2000 Input-Output Table for Romania.

Effects on the Wider Economy: Synthetic Control Analysis

Outcomes: turnover, VA, production value, employment.

Treated sectors: High-intensity in terms of IT services usage.

Control sectors: Low-intensity in terms of IT services usage.

Pool of donor countries: BG, CZ, EE, HU, IE, LV, LT, PL, PT, SK and SI.

Predictors: GDP pc, % of medium and high-tech industry, and % of services.

Data: SBS from Eurostat and World Development Indicators from World Bank.

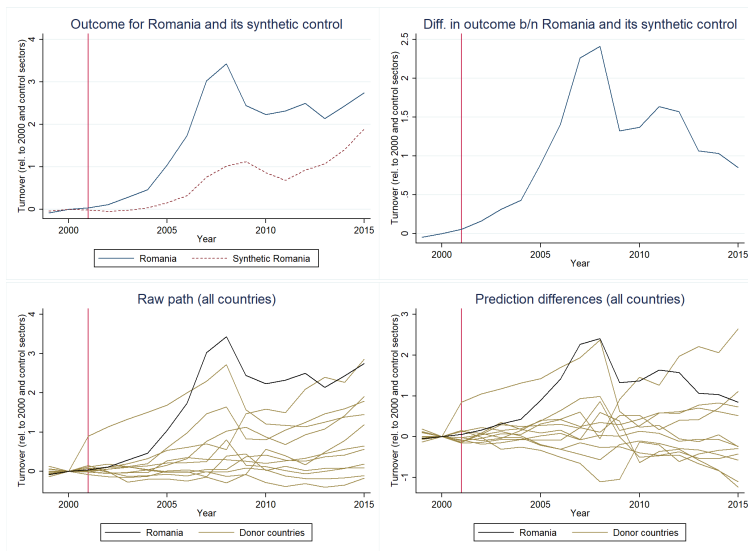# Effects on the Wider Economy: Inter-industry Spillovers

Figure: Synthetic control analysis: Turnover or gross premiums written (normalized)

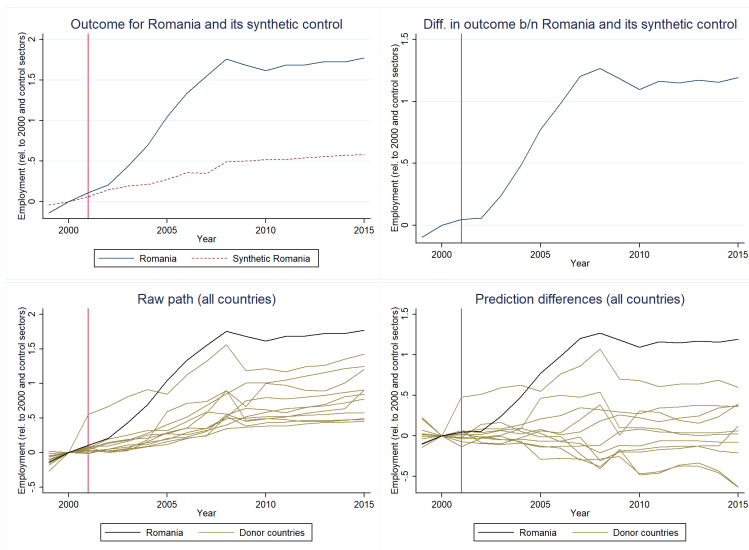# Effects on the Wider Economy: Inter-industry Spillovers

Figure: Synthetic control analysis: Employment (normalized)

Back-of-the-Envelope Estimates of the Costs of the Tax Break

The cost of the tax break = foregone tax revenues from the personal income tax on wages of exempted workers.

In 2015, the foregone tax revenues represented:

- 263 - 356 mil. RON (62 and 80 mil. Euro)

- 4.7 - 6.4 percent of the gross wage bill

- 2.8 - 3.8 percent of the VA

Conclusions

- ▶ The income tax break for workers in IT has had strong and positive effects on turnover, employment, and assets of firms in the IT sector.

- ▶ The main channels were relatively lower wage growth and higher labor productivity growth.

- ▶ The tax break has led to a temporary increase in the entry rate in the sector.

- ▶ It has also generated inter-industry spillovers for sectors that use IT intensively.

Policy Implications

- ▶ The income tax break has been an effective policy instrument to support the development of the software sector.

- ▶ It contributed to the development of manufacturing and service sectors that use intensively IT services.

- ▶ It increased the share of high-tech knowledge intensive sectors in the economy, facilitating the transition towards a knowledge-based economy.

Sectors: Highest and Lowest-intensity Users of IT Services

Lowest 25%	Highest 25%
Wood and products of wood and cork (20)	Transport and storage (60-63)
Coke, refined petroleum products and nuclear fuel (23)	Real estate activities (70)
Fabricated metal products (28)	Health and social work (85)
Private households with employed persons (95)	Education (80)
Agriculture, hunting, forestry and fishing (01-05)	Public administration and defence (75)
Electricity, gas and water supply (40-41)	Renting of machinery and equipment (71)
Basic metals (27)	Wholesale and retail trade (50-52)
Food products, beverages and tobacco (15-16)	R&D and other business activities (73-74)
Financial intermediation (65-67)	

Note: The first column presents the bottom 25% sectors with the lowest share of inputs purchased from the IT services sector (lowest sector first). The second column presents the top 25% sectors with the highest share of inputs purchased from the IT services sector (highest sector last).