FISCAL POLICY AND REGIONAL DEVELOPMENT: AN EMPIRICAL ANALYSIS OF THE WAR-AFFECTED REGIONS IN CROATIA

Dario Cziráky
Policy Fellow, IPF

Abstract

The paper analyses the effectiveness of the current Croatian regional fiscal policy in terms of its potential effects on stimulating economic growth in the war-affected regions. It is investigated whether sector (production vs. services), firm size, and the after-tax profit affect the investment behaviour in terms of the profit share re-investment. We estimate single and multigroup structural equation models treating firm size and re-investment behaviour as latent variables. The result suggest significant differences between production and service sector firms, and also some differences between firms of different sizes in respect to their re-investment tendencies. Namely, we find the relationship between the latent size normalised to net profit and re-investment share most pronounced among small and medium production firms, while such effect was not found for service sector and large firms. The results suggest that the enterprise size and sector do affect profit-share re-investment and that a more efficient fiscal policy could be designed by differently treating firms of different sectors and sizes.

Keywords: Regional fiscal policy, tax-deductions, investment, latent variables

1 Introduction

Croatian economy is characterised by unequal regional economic development. The underdeveloped regions are mainly those that were shattered in the war and are thus considered “war-affected”. While development of coastal and north-western regions is taking off, the lagging regions show considerable difficulties in catching up. The areas shattered in the war entered transition period later then other regions and from a lower initial development level.

One of the policy measures taken by the central government with the aim of stimulating economic growth and development of the war-affected regions is a simple form of regional fiscal policy based on general profit-tax reductions for business entities from these regions. The key assumption behind this policy is that general regional profit-tax reductions will result in higher rate of investment in the lower-tax regions and thus stimulate convergence in regional development level. Subsequently, it is expected that such policy will bring up the formerly war-affected and underdeveloped regions to the level of the other regions.

However, there is a lack of analytical studies that can back up either of these two assumptions, so the currently implemented policy is not 'research-based' and thus its expected outcomes are rather uncertain. In the case of slow convergence in regional growth rate regional fiscal policy might be a reasonable choice. Nevertheless, it is questionable whether regional profit-tax reductions will achieve the policy aim which is accelerated growth of the war-affected regions, or whether different or more elaborate policy might be needed.[1]

An alternative, for example, might be to implement a more elaborate fiscal policy that would allow different sector and firm-type treatment (e.g., preferentials for start-ups), refined regional differentiation based on detailed regional development assessment and imposition of tax reductions on reinvested profit share. Such policy would be more complex and more difficult to implement thus requiring detailed analytical background studies of the effects and likely consequences of alternative fiscal measures.

This paper analyses the effectiveness of the current Croatian regional fiscal policy[2] in terms of its potential effects on stimulating economic growth in the war-affected regions.[3]

[1] Namely, general tax reductions aimed at specific region cannot alone assure desired effects. Their effectiveness depends on characteristics and behaviour of the enterprises in the targeted areas, primarily their tendency for profit-share re-investment. It is widely believed, for instance, that Croatian service sector re-invests smaller profit-share then the industrial sector and thus larger after-tax profit is mainly spent on consumption expenditure thus having no effect on economic development and growth. Indirectly, however, reduced government's income from profit taxes will shrink budgetary capabilities to provide underdevelopment subsidies and thus indirectly negatively affect development of these areas.

[2] Special focus is on the existing tax reductions for business entities in the war-affected regions in Croatia focusing and enterprise characteristics and behaviour, especially profit-reinvestment tendency. An additional aspect that needs investigation concerns the effects of enterprise characteristics on investment behaviour specially profit re-investment tendencies.

It is investigated whether sector (production vs. services), firm size, and the after-tax profit affect the investment behaviour in terms of the profit share re-investment. If the enterprise size and sector affect profit-share re-investment, then an efficient fiscal policy should differently treat firms of various sizes and sectors.

2 Regional fiscal policy: Theoretical background

The issue of using fiscal policy to foster regional development and thus bridge regional development gaps has been long present in the economic literature. The importance of regional policy was strongly emphasised already by Higgins (1973) who stated that:

> *"Measures to reduce regional gaps, far from being a "luxury" to be afforded when things are otherwise going well in the country, are the essence of a policy to accelerate growth, reduce unemployment and maintain price stability. For developing countries, where efforts to accelerate growth are inhibited by fear of aggravating inflation, reduction of regional disparities may well be the sine qua non of successful development policy." (Higgins, 1973: 177)*

Later literature on the importance of regional policy questioned Higgins' conclusions on the grounds of the trade-off between aggregate national efficiency and interregional equity (Hewings, 1978). Specifically, because the lower national unemployment rates tend to be linked to higher inflation rates "policies to reduce the regional variability of unemployment should lead, ceteris paribus, to higher rates of inflation" (Hewings, 1978: 258).

An important input for designing regional fiscal policy (as well as evaluating the appropriateness of the already implemented policies) concerns the effects of regional fiscal policy on regional income and employment. How much will the regional income increase per each currency unite of regional investment? This question was addressed already by Archibald (1967) who argued that in the United Kingdom "…the change in a region's income due to one pound of Treasury expenditure of the public works type is in all probability less then one pound" (p. 22).

[3] The policy aspects mainly concern the issue of how to fiscally treat enterprises of different sizes and the question of whether there are any sectoral and regional differences requiring special considerations.

Fiscal policy instruments, such as tax incentives, aimed at decreasing regional disparities are essentially means of expanding aggregate demand because tax incentives for investment merely concentrate additional demand in the capital goods sector (Kesselman, *et al*. 1977). Early examples of fiscal instruments through which the government aims to achieve a leftward shift in the Phillips curve include the *selective employment tax* (SET) and the *regional employment tax* (RET) introduced in the United Kingdom in the sixties. The SET and RET were distributed per man employed and thus taxed the factor labour. Hutton and Hartley (1968) proposed a regional payroll tax that is a function of the target national unemployment rate and the local unemployment rate, as an alternative to the above two tax forms.

Starting from the assumption that the objective of a regional policy includes a reduction in the regional differentials in unemployment rates, an increase in activity rates in the high unemployment areas, a decrease in migration from the underdeveloped areas, and a reduction in the excess demand for labour in the developed regions, Hutton and Hartley (1968: 418) outlined the following criteria a regional fiscal policy should satisfy:

(i) The tax must reduce unemployment rates in the underdeveloped areas;

(ii) The tax must reduce the excess demand for labour in the developed areas;[4]

(iii) The tax needs to be related to both regional and national unemployment rates;

(iv) The tax system should be the least-cost method of achieving policy objectives

The main policy choice in respect to tax reductions is the criteria for awarding tax credits (i.e. reduction). Two general approaches are present in practice and are broadly discussed in the literature—investment tax and employment tax credits. Generally, both tax forms aim to affect the price of labour and thus stabilise the economy.

Analogous to employment tax credits in the policy practice two other terms with the same meaning are in use, "employment subsidies" and "wage subsidies". In practice, wage-subsidies proved to be more efficient then capital or output subsidisation and also superior to tariff protection. Subsidisation of wages is generally used in policies aimed at fostering

[4] Hutton and Hartley (1968) referred to UK's Midlands and South-East as developed areas.

development of underdeveloped areas; particular urban sectors of a developed country; income maintenance; and job training of low-wage workers. Tax variants such as regional employment premiums[5] or selective employment tax provide labour incentives by location and industry, respectively. Regional employment tax credits provide tax reductions to firms that are increasing employment levels.[6]

Employment tax credit policy might provide tax reduction equivalent to a specified amount of per man-hour employed, where subsidy rates on man-hours or wage bill is treated directly, rather then through the tax-credit rule (see Kesselman, *et al.* 1977). It can be expected that such employment tax credit policy would lower the price of labour to the firms and also lower the price of unskilled labour relative to the price of the skilled labour. Alternatively, employment tax credit can be equal to a specified percentage of wage bill of the firm, which could be administered through the reported tax return or social insurance data (e.g. through reductions in the social security contributions which employers are obliged to pay for each employee).

A "marginal" employment tax credit is a related measure that potentially might achieve greater employment increase by reducing taxes of the firms on the grounds of their contribution to increasing employment.[7] The employment tax credit and marginal employment tax credit both subsidise new purchases of the subsidised input, hence investment flow becomes analogous to marginal (i.e. additional) employment by the firm. This can be more efficient then investment-based incentives if the firms adjust their labour inputs faster then their capital inputs.

Theoretically, if the firms are assumed to be cost minimising and facing perfectly elastic input supplies, an exogenous change in effective input prices will stimulate the firm to chose a new cost-minimising mix of inputs for the given output. This implies that the average cost net of the credits must be lower in the presence of an employment tax credits, however in case of marginal employment tax credits firms will find it beneficial only if its

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[5] United Kingdom is the best example of a country where employment premium was used in practice.

[6] Regional employment tax credits were used, e.g., in Italy, Sweden, Finland, and Germany. A version of employment tax credits with a noted training incentive was also introduced in the USA under the Job Opportunities in the Business Sector AFDC Work Incentive Program.

employment without the available credit would have exceeded its current base or if its employment without the credit would have been less then the base. Contrary, if the base is sufficiently large, the firm will not find marginal employment tax credit beneficial.

Additionally, the tax credit policy has potential implications for inflation through changes in the average price of output. It is likely that employment tax credit and marginal employment tax credit policies will have a negative effect on inflation through reducing output price.

Table 1
Alternative fiscal policies

Policy measure	**Assumptions**	**Policy implications**
Profit-tax reductions	• Higher after-tax profit will stimulate investment through larger overall profit re-investment • Investment positively affects growth	• If Firms re-invest after-tax profit then tax cuts will stimulate investment
Employment tax credit: • Tax reduction on the basis of man-hours employed • Tax reduction on the basis of the percentage of wage bill of the firm	• Firms adjust their labour inputs faster then capital inputs • The average cost net of the credits is lower under the employment tax credit policy • Output is responsive to prices	• Employment tax credits will be more efficient then investment tax credits of equal cost only if distributional effects arise • Increase in employment resulting from employment tax policy alone will be small if output is unchanged
Marginal employment tax credit	• Firm's employment without employment tax credit policy is lower then the base employment magnitude	• Marginal employment tax credits will be more efficient then investment tax credits of equal cost only if distributional effects arise
Investment tax credit	• Firms adjust their capital inputs faster then labour inputs • Output is unresponsive to prices	• Investment tax credits are preferred when distribution effects are unlikely to be present

3 The data

We collected firm-level data for a random sample of 400 firms selected using sectoral and firm-size stratification. Fiscal variable (see Table 2) such as operating profit and turnover, and firm-characteristics variable such as firm size, age, number of employees and sector were obtained from the Croatian Financial Agency (FINA). Additionally, data on profit re-

[7] A criteria for tax reduction can be based on the amount of man-hours increased over some specified based such as a last year figure or a related measure of firm's historical performance.

investment tendencies were collected through an auxiliary survey conducted on the same sample obtained from FINA. Since questions on profit-share re-investment preferences and similar information are not particularly sensitive,[8] a higher response rate was expected targeting for a final sample size between 200 and 300 firms. The final sample size included 236 firms, hence the response rate in the auxiliary survey was 59%. Table 3 shows the breakdown of the sample in regards to size and sector. The apparent over-representation of the small firms actually confirms with the distribution of firm size in the Croatian economy where 96% of all business entities are small and medium enterprises. The larger share of the service sector firms is also characteristic for the population of Croatian firms, where production firms are dominated by the service sector firms.

Table 2
Firm-level variables

Description	Symbol
Sectoral belonging	–
Number of employees	x_1
Annual turnover	x_2
Net profit	x_3
Total commitments	x_4
Total expenditures	x_5
Total assets	x_6
Investment in education*	y_1
Investment in physical assets*	y_2
Investment in R&D*	y_3

* As share of the net profit.

The size breakdown used in Table 3 was based on the legal classification of business entities, which was defined by the Croatian Law on Accountancy that classifies firms into 'small', 'medium', and 'large' according to criteria such as profit balance upon deduction of losses; profit during 12 months before balance sheet preparation; and the annual average number of employees.

[8] The sensitive information generally concerns total profit and turnover figures which will be obtained from the FINA agency that has legal authority to collect such information on behalf of commercial banks formally in

Table 3
Distribution of firms in the sample according to size and sector

	All sectors	Production sector	Service sector
All firms	236	97	139
Large firms	23	16	7
Medium firms	45	27	18
Small firms	168	54	114

Table 4 shows the correlation matrix for the full sample, while correlation matrices for sub-samples of production and service sector firms are shown in Table 5. Table 6 gives correlation matrices for sub-samples of small, medium, and large firms, and Table 7 shows the small firms sub-sample split into production and service sector firms.

Table 4
Correlation matrix (full sample, $N = 236$)

	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.94	1.00							
x_3	0.48	0.92	1.00						
x_4	0.39	0.41	–0.14	1.00					
x_5	0.68	0.84	0.57	0.14	1.00				
x_6	0.73	0.75	0.48	0.34	0.86	1.00			
y_1	0.15	0.24	0.21	–0.08	0.05	0.26	1.00		
y_2	0.34	0.21	0.12	–0.02	0.28	0.29	0.84	1.00	
y_3	0.19	0.17	0.11	–0.08	0.31	0.21	0.93	0.78	1.00

charge of the system of payments.

Table 5
Correlation matrix, all firms production and service sectors

	Production sector ($N = 97$)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.87	1.00							
x_3	0.41	0.95	1.00						
x_4	0.31	0.43	–0.12	1.00					
x_5	0.57	0.87	0.52	0.12	1.00				
x_6	0.71	0.72	0.43	0.32	0.81	1.00			
y_1	0.17	0.28	0.23	–0.01	0.07	0.26	1.00		
y_2	0.36	0.24	0.17	–0.05	0.25	0.29	0.86	1.00	
y_3	0.21	0.18	0.13	–0.04	0.37	0.21	0.95	0.83	1.00
	Service sector ($N = 139$)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.77	1.00							
x_3	0.38	0.89	1.00						
x_4	0.33	0.45	–0.13	1.00					
x_5	0.62	0.79	0.57	0.14	1.00				
x_6	0.74	0.75	0.38	0.27	0.83	1.00			
y_1	0.11	0.28	0.26	–0.04	0.03	0.17	1.00		
y_2	0.16	0.1	0.05	–0.03	0.16	0.12	0.63	1.00	
y_3	0.09	0.03	0.09	–0.02	0.21	0.14	0.76	0.57	1.00

4 Econometric methodology

The research problem is be formalised as a structural equation model with latent variables. The model consists of two parts: the measurement model and the structural equation model. Inclusion of the measurement model (an analogue to factor analytic models) jointly with the structural part, though straightforward to implement within the linear structural equation modelling framework (Hoyle, 1995; Mueller, 1996; Schumacker and Lomax, 1996; Kline, 1998; Loehlin, 1998; Maruyama, 1998; Bollen, 1989; Jöreskog *et al.*, 2000) is rather innovative in this type of research. Zhu (2002) gives and example of modelling consumption expenditure as a latent variable through incorporation of a measurement model into the overall structural model. The usual alternative is the simple multiple regression (estimated with OLS) where each type of expenditure, investment, etc. is included as a separate regressor (e.g., Clement *et al.* 2001). There are two problems with this approach. First is purely technical and points to likely multicolinearity among such regressors. Second, from the substantive side, we do not consider modelled variables as perfectly measured and we wish to operate with behavioural concepts and focus on the underlying concepts affecting entrepreneurial investment behaviour.

Table 6

Correlation matrix: large, medium, and small firms

	Large firms (N = 46)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.69	1.00							
x_3	0.34	0.89	1.00						
x_4	0.37	0.55	–0.13	1.00					
x_5	0.62	0.79	0.57	0.24	1.00				
x_6	0.74	0.75	0.38	0.29	0.58	1.00			
y_1	0.1	0.18	0.17	–0.02	0.02	0.19	1.00		
y_2	0.11	0.09	0.12	–0.06	0.1	0.14	0.67	1.00	
y_3	0.03	0.04	0.04	–0.07	0.13	0.11	0.73	0.67	1.00

	Medium firms (N = 90)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.68	1.00							
x_3	0.39	0.91	1.00						
x_4	0.37	0.46	–0.13	1.00					
x_5	0.64	0.79	0.52	0.32	1.00				
x_6	0.73	0.62	0.33	0.32	0.81	1.00			
y_1	0.55	0.29	0.39	–0.16	0.39	0.48	1.00		
y_2	0.43	0.56	0.38	–0.18	0.64	0.67	0.76	1.00	
y_3	0.47	0.48	0.39	–0.09	0.57	0.48	0.75	0.63	1.00

	Small firms (N = 136)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.78	1.00							
x_3	0.43	0.94	1.00						
x_4	0.53	0.51	–0.15	1.00					
x_5	0.67	0.75	0.53	0.36	1.00				
x_6	0.74	0.64	0.37	0.3	0.84	1.00			
y_1	0.35	0.19	0.34	–0.06	0.37	0.28	1.00		
y_2	0.24	0.38	0.29	–0.04	0.45	0.42	0.73	1.00	
y_3	0.27	0.26	0.14	–0.1	0.34	0.36	0.71	0.83	1.00

Table 7
Correlation matrix: production and service sector small firms

	Production sector ($N = 54$)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.83	1.00							
x_3	0.57	0.87	1.00						
x_4	0.45	0.52	–0.17	1.00					
x_5	0.63	0.76	0.64	0.24	1.00				
x_6	0.79	0.77	0.59	0.42	0.87	1.00			
y_1	0.43	0.49	0.64	–0.21	0.17	0.43	1.00		
y_2	0.53	0.36	0.42	–0.19	0.47	0.57	0.89	1.00	
y_3	0.47	0.37	0.29	–0.17	0.52	0.45	0.92	0.78	1.00

	Service sector ($N = 114$)								
	x_1	x_2	x_3	x_4	x_5	x_6	y_1	y_2	y_3
x_1	1.00								
x_2	0.42	1.00							
x_3	0.34	0.68	1.00						
x_4	0.68	0.52	–0.21	1.00					
x_5	0.68	0.74	0.57	0.33	1.00				
x_6	0.71	0.56	0.41	0.26	0.62	1.00			
y_1	0.21	0.27	0.42	–0.08	0.17	0.13	1.00		
y_2	0.18	0.33	0.18	–0.07	0.28	0.17	0.58	1.00	
y_3	0.12	0.17	0.21	–0.06	0.26	0.31	0.67	0.71	1.00

The modelling framework will thus incorporates measurement models for underlying latent concepts and two such models are defined. These are the firm-size model and the investment model.

Investment model. Although total investment of an enterprise can be treated as a "defined" concept that adds all types of investments, we propose to introduce a methodological refinement by treating it as imperfectly measured or indirectly observed. Such an approach assumes "investment" to be a behavioural concept where total investment denotes efforts or concrete steps or actions of an entrepreneur[9]. This approach is novel and its application not only appears to be increasingly popular in general consumption and

[9] Note that the unitary actor hypothesis holds closely for the small and medium enterprises—decisions are in principle made by the owner of the SME, i.e., the "entrepreneur".

investment research[10] but is also particularly attractive in the SME field where there are potentially large differences among business entities in the type and magnitude of particular investment categories.[11] The latent investment variable is measured by three observed indicators, *investment in education* (y_1), *investment in physical assets* (y_2), and investment in R&D (y_3).

Enterprise size model. What is enterprise size? Relying on legal definitions of size and using two or three categories, such as small, medium and large, usually skips this question. However, relying on such non-economic concepts that do not correspond to economic reality and actual "business size" of a firm at best uses imperfect proxies and, at worst, fails to capture the essence of the problem. Furthermore, legal definitions are far from ambiguous because they allow alternative classifications of "either-or" type, i.e., enterprises are ranked small, medium or large if they either have certain number of employees or annual turnover above some specified level, and some definitions even rely on total assets and market value of the firm. From the methodological point of view, such classifications, even if valid, are not useful in our model.

Namely, which indicator of size should we include? As we no longer operate with legal classifications, but true economic relationships, should we include variables such as the number of employees, annual turnover, or firms' assets, thus likely cause multicolinearity and get ambiguous results? As an alternative we propose to measure "size" of an enterprise as latent category that is imperfectly measured with several "size-indicators" such as those mentioned above. This way we could operate with a true latent concept and directly include it into the model subsequently estimating its effect on other variables and investment behaviour. Specifically, we presume the latent enterprise size can be measured by the following observable indicators: *number of employees* (x_1), *annual turnover* (x_2), *annual profit* (x_3), *total commitments* (x_4), *total expenditures* (x_4), and *total assets* (x_5).

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10 Zhu (2002) is a recent example of analysis that treats variables such as total expenditures as not directly observed, i.e., latent.

11 SMEs, for example, invest little in R&D and marketing but across different sectors there are also large differences (relative to total investment magnitudes) in the type of investments actually made by SMEs. From the econometric point of view, we must allow for varying variances of particular investment categories and unequal influence on the (latent) total investment. Finally, it is straightforward to test the two alternatives statistically and accept or reject the latent measurement model of investment in favour of simple additive investment, i.e., perfectly measured and directly observed.

The basic model is of general structural equation (SEM) form with the structural part given by $\boldsymbol{\eta} = \mathbf{B}\boldsymbol{\eta} + \boldsymbol{\Gamma}\boldsymbol{\xi} + \boldsymbol{\zeta}$ and the measurement part given by $\mathbf{y} = \Lambda_y\boldsymbol{\eta} + \boldsymbol{\varepsilon}$ (for latent endogenous variables) and $\mathbf{x} = \Lambda_x\xi + \delta$ (for latent exogenous variables). Table 8 explains the used symbols and notation. We wish to develop measurement models for the two latent variables *size of the enterprise* (measured by x_1, x_2, x_3, x_4, and x_5), and *investment* (measured by y_1, y_2, and y_3).

We use a linear multivariate statistical model specified as a special case of the general structural equation model with latent variables (Jöreskog *et al.,* 2000). In matrix notation, the model can be written in three parts; the measurement model for latent exogenous variables is given by

$$\mathbf{x} = \boldsymbol{\Lambda}_x\boldsymbol{\xi} + \boldsymbol{\delta}\,, \tag{1}$$

the measurement model for latent endogenous variables is

$$\mathbf{y} = \boldsymbol{\Lambda}_y\boldsymbol{\eta} + \boldsymbol{\varepsilon}\,. \tag{2}$$

Finally, the structural part of the model is given by

$$\boldsymbol{\eta} = \mathbf{B}\boldsymbol{\eta} + \boldsymbol{\Gamma}\boldsymbol{\xi} + \boldsymbol{\zeta}\,, \tag{3}$$

where $\boldsymbol{\Lambda}_x$, $\boldsymbol{\Lambda}_y$, $\mathbf{B}$ and $\boldsymbol{\Gamma}$ are the coefficient matrices and $\boldsymbol{\delta}$, $\boldsymbol{\varepsilon}$ and $\boldsymbol{\zeta}$ are latent errors. Under the assumption of multivariate Gaussian distribution of the observed variables the model coefficients, given the model is identified, could be jointly estimated by minimising the multivariate Gaussian (log) likelihood function

$$F_{ML} = ln\left|\boldsymbol{\Sigma}\right| + tr\left\{\mathbf{S}\boldsymbol{\Sigma}^{-1}\right\} - ln\left|\mathbf{S}\right| - (p+q)\,, \tag{4}$$

where $\mathbf{S}$ denotes empirical covariance matrix (computed directly from data), p and q are numbers of observed endogenous and exogenous variables, respectively, and $\boldsymbol{\Sigma}$ is the model-implied covariance matrix given by

$$\boldsymbol{\Sigma} = \begin{pmatrix} \boldsymbol{\Lambda}_y(\mathbf{I}-\mathbf{B})^{-1}(\boldsymbol{\Gamma}\boldsymbol{\Phi}\boldsymbol{\Gamma}^T + \boldsymbol{\Psi})[(\mathbf{I}-\mathbf{B})^{-1}]^T\boldsymbol{\Lambda}_y^T + \boldsymbol{\Theta}_\varepsilon & \boldsymbol{\Lambda}_y(\mathbf{I}-\mathbf{B})^{-1}\boldsymbol{\Gamma}\boldsymbol{\Phi}\boldsymbol{\Lambda}_x^T + \boldsymbol{\Theta}_{\delta\varepsilon}^T \\ \boldsymbol{\Lambda}_x\boldsymbol{\Phi}\boldsymbol{\Gamma}^T[(\mathbf{I}-\mathbf{B})^{-1}]^T\boldsymbol{\Lambda}_y^T + \boldsymbol{\Theta}_{\varepsilon\delta} & \boldsymbol{\Lambda}_x\boldsymbol{\Phi}\boldsymbol{\Lambda}_x^T + \boldsymbol{\Theta}_\delta \end{pmatrix}. \tag{5}$$

Table 8
Definition of variables and notation

Symbol	Variable definition
η	Vector of latent endogenous variables
B	Matrix of coefficients of the latent endogenous variables
Γ	Matrix of coefficients of the latent exogenous variables
ξ	Vector of latent exogenous variables
y	Observed indicators of the latent endogenous variables
x	Observed indicators of the latent exogenous variables
Λ_y	Matrix of coefficients for the endogenous measurement model
Λ_x	Matrix of coefficients for the exogenous measurement model
ζ	Vector of errors of latent variables
ε	Residual vectors of the observed variables in the endogenous measurement model
δ	Residual vectors of the observed variables in the exogenous measurement model

We formulate the following null hypothesis:

H_{01}: *The enterprise size has no effect on investment behaviour.*

H_{02}: *The sectoral belonging has no effect on investment behaviour; firms from production and service sectors have equal propensity to re-invest.*

H_{03}: *The sectoral belonging has no effect on investment behaviour of small firms; small firms from production and service sectors have equal propensity to re-invest.*

5 Empirical analysis

The model is specified as a special case of Eqs. (1-3). The exogenous measurement model is specified with two latent variables, each normalised to the metric of one observed indicator (x_1 and x_4)

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix} = \begin{pmatrix} \lambda_{11}^{(x)} \\ \lambda_{21}^{(x)} \\ 1 \\ \lambda_{41}^{(x)} \\ \lambda_{51}^{(x)} \\ \lambda_{61}^{(x)} \end{pmatrix} \left(\xi_1 \right) + \begin{pmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \end{pmatrix}, \qquad (6)$$

and the endogenous measurement model is specified with a similar normalisation as

$$\begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} \lambda_{11}^{(y)} \\ 1 \\ \lambda_{31}^{(y)} \end{pmatrix} \left(\eta_1\right) + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{pmatrix}. \tag{7}$$

The structural equation model (Eq. 3) is specified as a non-recursive multivariate regression model with weakly exogenous regressors in the form

$$\left(\eta_1\right) = \left(\gamma_{11}\right)\left(\xi_1\right) + \left(\zeta_1\right). \tag{8}$$

The normalisation in (6) to x_3 (operating profit) is important insofar the γ_{11} coefficient from (8) will measure the effect of the firm size normalised to its profit and subsequently measured in the same metric as the operating profit. Therefore, the structural effect of the latent firm size to the latent re-investment variable will have the same sing as the individual effect of firm's profit to its re-investment behaviour.

Corresponding to the specification in Eqs. (6-8), the coefficient matrices are given in Table 9. We estimate the coefficients from Table 9 by minimising the log-likelihood expression given in Eq. (4) where Eq. (5) is using the parametric specification in Eqs. (6-8). The estimation was based on the correlation matrices **S** calculated from the data (Tables 4-7). Full-sample estimation by minimising Eq. (4) using the full information maximum likelihood (FIML) procedure produced results reported in Table 10 (standard errors are in the parentheses).

The estimated coefficients seem well determined and statistically significant. The γ_{11} coefficient is 0.29 and significant, hence the firm's size affects significantly its investment behaviour; on average larger firms indeed re-invest higher share of their profit. The fit of the model is acceptable with the overall fit χ^2 of 46.59 (d.f. = 26). Other fit statistics also indicate approximately good fit (Table 11). Therefore, we reject $\mathbf{H_{01}}$ and conclude that enterprise size does have a (positive) effect on re-investment share.

Table 9
Coefficient matrices

$$\mathbf{\Lambda}_x = \begin{pmatrix} \lambda_{11}^{(x)} \\ \lambda_{21}^{(x)} \\ 1 \\ \lambda_{41}^{(x)} \\ \lambda_{51}^{(x)} \\ \lambda_{61}^{(x)} \end{pmatrix} \qquad \mathbf{\Theta}_\delta = \begin{pmatrix} \delta_1 & & & & & \\ 0 & \delta_2 & & & & \\ 0 & 0 & \delta_3 & & & \\ 0 & 0 & 0 & \delta_4 & & \\ 0 & 0 & 0 & 0 & \delta_5 & \\ 0 & 0 & 0 & 0 & 0 & \delta_6 \end{pmatrix}$$

$$\begin{pmatrix} \lambda_{11}^{(y)} \\ 1 \\ \lambda_{31}^{(y)} \end{pmatrix} \qquad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} \varepsilon_1 & & \\ 0 & \varepsilon_2 & \\ 0 & 0 & \varepsilon_3 \end{pmatrix} \qquad \mathbf{\Gamma} = \left(\gamma_{11}\right)$$

Table 10
Coefficient estimates (full sample)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.21\,(.20) \\ 1.52\,(.24) \\ - \\ .42\,(.16) \\ 1.18\,(.20) \\ 1.14\,(.20) \end{pmatrix} \qquad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.27\,(.14) & & & & & \\ 0 & .85\,(.13) & & & & \\ 0 & 0 & 1.50\,(.15) & & & \\ 0 & 0 & 0 & 1.91\,(.18) & & \\ 0 & 0 & 0 & 0 & 1.31\,(.14) & \\ 0 & 0 & 0 & 0 & 0 & 1.36\,(.15) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 1.16\,(.19) \\ - \\ 1.09\,(.18) \end{pmatrix} \qquad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.02\,(.17) & & \\ 0 & 1.27\,(.16) & \\ 0 & 0 & 1.14\,(.17) \end{pmatrix} \qquad \mathbf{\Gamma} = \left(.29\,(.12)\right)$$

Table 11
Goodness of Fit Statistics

Statistic	Test value	P-value
Minimum Fit Function $\chi^2_{(26)}$	46.59	0.01
Normal Theory Weighted Least Squares χ^2	45.58	0.01
Root Mean Square Error of Approximation (RMSEA)	0.06	0.32
Normed Fit Index (NFI)	0.91	–
Non-Normed Fit Index (NNFI)	0.94	–
Parsimony Normed Fit Index (PNFI)	0.66	–
Comparative Fit Index (CFI)	0.96	–
Incremental Fit Index (IFI)	0.96	–
Relative Fit Index (RFI)	0.88	–
Standardised RMR	0.05	–
Goodness of Fit Index (GFI)	0.93	–
Adjusted Goodness of Fit Index (AGFI)	0.55	–
Parsimony Goodness of Fit Index (PGFI)	0.55	–

Next, we estimate difference between groups of firms of different sizes and sectors, hence test the multigroup hypotheses $\mathbf{H_{02}}$ and $\mathbf{H_{03}}$. We estimate the multigroup models multigroup LISREL framework. Jöreskog (1971) proposed a testing procedure for evaluating group differences in respect to group covariance matrices and group-specific model estimates. Sörbom (1974) appended Jöreskog's procedure with estimates of latent means which, in principle, allows for estimation of general differences across groups or treatments (see also Sörbom, 1981, Bollen, 1989 and Kaplan, 2000). Specifically for our application, we can test three sets of hypotheses, either jointly or separately: $\Lambda_x^{(1)} = \Lambda_x^{(2)} = \cdots = \Lambda_x^{(6)}$, $\mathbf{\Phi}^{(1)} = \mathbf{\Phi}^{(2)} = \cdots = \mathbf{\Phi}^{(6)}$ and $\Theta_\delta^{(1)} = \Theta_\delta^{(2)} = \cdots = \Theta_\delta^{(6)}$, where the numbers in the superscript denote treatment group. Note that the control group is also included as number one treatment (thus there are 6 groups). Formally, the testing proceeds by specifying a multigroup model of Eq. (2) with group (treatment) specific subscript *i*, i.e.,

$$\mathbf{x}_i = \mathbf{\Lambda}_{xi}\boldsymbol{\xi}_i + \boldsymbol{\delta}_i \quad (11)$$

The multigroup multivariate Gaussian log likelihood function is a sum of group-specific terms in the form

$$ln\,F_i = -\frac{N_j}{2} ln\left|\mathbf{\Sigma}_i\right| + tr(\mathbf{S}_i\mathbf{\Sigma}_i^{-1}) \quad (12)$$

The hypothesis of overall equality of covariance matrices $\mathrm{H}_0^{(1)}: \mathbf{\Sigma}_1 = \mathbf{\Sigma}_2 = ... = \mathbf{\Sigma}_k$ can be tested by the Box-*M* test (see Kaplan, 2000) which is given by

$$M = N \cdot ln|\mathbf{S}| - \sum_{i=1}^{k} N_i \cdot ln|\mathbf{S}_i| \sim X^2((k-1)(p+1)p/2) \tag{13}$$

where k is the number of groups and p is the number of variables (i.e., the analysed covariance matrices are of dimension $p \times p$. In respect to specific multivariate structure of the analysed matrices, if they are found not to be overall identical we can test for the equality of the number of factors and equality of the model parameters. Particularly, as already mentioned, we can test for $\mathrm{H}_0^{(2)}: \mathbf{\Lambda}_1 = \mathbf{\Lambda}_2 = ... = \mathbf{\Lambda}_k$ and for $\mathrm{H}_0^{(2)}: \mathbf{\Theta}_1 = \mathbf{\Theta}_2 = ... = \mathbf{\Theta}_k$ by minimising the likelihood function given in Eq. (12) with and without the equality constraints which allows computing a likelihood ratio statistic and formal hypothesis testing.

The addition of latent means in the Eq. (11) results with inclusion of additional parameters (see Sörbom, 1974) and the model becomes $\mathbf{x}_i = \boldsymbol{\tau}_i + \mathbf{\Lambda}_{xi}\boldsymbol{\xi}_i + \boldsymbol{\delta}_i$ with an additional assumption that $E(\mathbf{x}_i) = \boldsymbol{\tau}_i + \mathbf{\Lambda}_{xi}E(\boldsymbol{\xi}_i)$. The model with means requires zero means restrictions on the latent means parameters in the reference group (e.g., control treatment) in order to be identified and thus group or treatment means measure deviations from the reference group means. Sörbom's means-structure model assumes factorial invariance (i.e., invariance of the measurement model) across different groups. In the typical experimental design applications this assumptions precludes the effect of particular treatments on the inter-relationships among variables allowing merely different effects on means. This type of *ceteris paribus* assumption is thus problematic in a relatively large class of experimental treatment applications.

The multigroup LISREL estimation allows for more detailed analysis then generally required in experimental forestry research. Namely, it allows analysing in more detail covariance structures within each treatment group as well as testing for structural differences across groups. A relevant use of multigroup estimation for our purpose is to check whether the model from which we computed the latent scores holds approximately in each treatment group, but it additionally allows us to investigate treatment effects on the covariance structure of the measurements and their inter-relationships which might differ both across treatments and across time.

Estimation of the model (6)-(8) produced the results shown in Tables 12 and 13. It appears that the effect of the latent firm size (normalised to operating profit) is of higher magnitude in the production firms sub-sample while in the service sector sub-sample this effect appears insignificant according to its estimated standard error.

Table 12

Coefficient estimates (all firms: production sector, $N = 97$)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.07\,(.29) \\ 1.56\,(.37) \\ - \\ 0.41\,(.24) \\ 1.11\,(.30) \\ 1.04\,(.29) \end{pmatrix} \qquad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.41\,(.23) & & & & & \\ 0 & 0.74\,(.22) & & & & \\ 0 & 0 & 1.48\,(.24) & & & \\ 0 & 0 & 0 & 1.91\,(.28) & & \\ 0 & 0 & 0 & 0 & 1.36\,(.23) & \\ 0 & 0 & 0 & 0 & 0 & 1.44\,(.24) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 1.13\,(.27) \\ 1 \\ 1.09\,(.26) \end{pmatrix} \qquad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.03\,(.26) & & \\ 0 & 1.23\,(.25) & \\ 0 & 0 & 1.09\,(.25) \end{pmatrix} \qquad \mathbf{\Gamma} = \left(0.32\,(.18)\right)$$

The general differences in terms of the estimated model between the two sub-samples were tested by estimating a multigroup model which resulted with a χ^2 of 353.89 (d.f. = 71), hence the production and service sector firms differ significantly in terms of their model-implied covariance structures. It thus follows that the model differs between production and service groups and hence the sectoral belonging does play a significant role in the re-investment behaviour. We thus reject $\mathbf{H_{02}}$ noting that positive effect between firm size normalised to its profit and its re-investment latent variable is only significantly positive for the production sector firms.

Table 13
Coefficient estimates (all firms: service sector, N = 139)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.13\,(.28) \\ 1.53\,(.34) \\ - \\ 0.44\,(.22) \\ 1.23\,(.29) \\ 1.20\,(.29) \end{pmatrix} \quad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.42\,(.20) & & & & & \\ 0 & 0.93\,(.19) & & & & \\ 0 & 0 & 1.54\,(.21) & & & \\ 0 & 0 & 0 & 1.91\,(.23) & & \\ 0 & 0 & 0 & 0 & 1.31\,(.19) & \\ 0 & 0 & 0 & 0 & 0 & 1.34\,(.20) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 1.36\,(.42) \\ 1 \\ 1.19\,(.35) \end{pmatrix} \quad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.13\,(.29) & & \\ 0 & 1.53\,(.23) & \\ 0 & 0 & 1.34\,(.26) \end{pmatrix} \quad \mathbf{\Gamma} = \left(0.19\,(.14)\right)$$

Further to the single-group analysis performed above, we estimate a multigroup model with groups of small, medium, and large firms. Separate estimates for each group are shown in Tables 14, 15, and 16. The estimates of the structural parameter (γ_{11}), while positive, is insignificant for large firms, while significant for medium and small firms. While the magnitude of γ_{11} is largest for the medium firms (0.93) the estimated standard error is 0.46, while for the small firms the estimate is 0.59 with standard error of only 0.19.

Table 14
Coefficient estimates (large firms, N = 46)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.02\,(.46) \\ 1.56\,(.60) \\ - \\ 0.56\,(.39) \\ 1.11\,(.47) \\ 1.06\,(.46) \end{pmatrix} \quad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.50\,(.36) & & & & & \\ 0 & 0.80\,(.35) & & & & \\ 0 & 0 & 1.53\,(.36) & & & \\ 0 & 0 & 0 & 1.85\,(.40) & & \\ 0 & 0 & 0 & 0 & 1.42\,(.35) & \\ 0 & 0 & 0 & 0 & 0 & 1.46\,(.35) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 1.10\,(.54) \\ 1 \\ 1.07\,(.52) \end{pmatrix} \quad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.25\,(.45) & & \\ 0 & 1.38\,(.42) & \\ 0 & 0 & 1.29\,(.44) \end{pmatrix} \quad \mathbf{\Gamma} = \left(0.15\,(.26)\right)$$

Table 15
Coefficient estimates (medium firms, $N = 90$)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.21\,(.54) \\ 1.42\,(.59) \\ - \\ 0.44\,(.41) \\ 1.40\,(.59) \\ 1.28\,(.56) \end{pmatrix} \quad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.40\,(.35) & & & & & \\ 0 & 1.17\,(.33) & & & & \\ 0 & 0 & 1.59\,(.37) & & & \\ 0 & 0 & 0 & 1.92\,(.41) & & \\ 0 & 0 & 0 & 0 & 1.20\,(.33) & \\ 0 & 0 & 0 & 0 & 0 & 1.33\,(.34) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 0.95\,(.38) \\ 1 \\ 0.92\,(.37) \end{pmatrix} \quad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.30\,(.38) & & \\ 0 & 1.22\,(.38) & \\ 0 & 0 & 1.34\,(.38) \end{pmatrix} \quad \mathbf{\Gamma} = \left(0.93\,(.46)\right)$$

Table 16
Coefficient estimates (all small firms, $N = 136$)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.25\,(.27) \\ 1.46\,(.30) \\ - \\ 0.60\,(.21) \\ 1.31\,(.28) \\ 1.21\,(.27) \end{pmatrix} \quad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.32\,(.18) & & & & & \\ 0 & 1.08\,(.17) & & & & \\ 0 & 0 & 1.56\,(.19) & & & \\ 0 & 0 & 0 & 1.84\,(.21) & & \\ 0 & 0 & 0 & 0 & 1.25\,(.17) & \\ 0 & 0 & 0 & 0 & 0 & 1.36\,(.18) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 0.84\,(.18) \\ 1 \\ 0.92\,(.20) \end{pmatrix} \quad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.37\,(.20) & & \\ 0 & 1.10\,(.21) & \\ 0 & 0 & 1.24\,(.20) \end{pmatrix} \quad \mathbf{\Gamma} = \left(0.59\,(.19)\right)$$

Finally, we analyse differences between production and service sector firms in the sub-sample of small firms which, with $N = 168$, is large enough to allow multigroup estimation. The maximum likelihood coefficient estimates in each group sub-sample are shown in Tables 17 and 18. Similar to the results obtained above for all firms, the results for the small firms indicate significant difference between production and service sector firms with the multigroup χ^2 of 282.72 (d.f. = 71), which rejects equality of all parameters. The estimates of the γ_{11} coefficient are 0.62 for the production sector firms and 0.44 for the service sector firms, with standard errors 0.29 and 0.24, respectively. Therefore, the magnitude of the effect is again much higher for the production sector firms, which is indicative of the positive link between the firm's profit and re-investment share for the production sector firms, or lack of such link for the service sector firms.

Table 17

Coefficient estimates (small firms: production sector, $N = 54$)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.13\,(.38) \\ 1.27\,(.41) \\ - \\ 0.43\,(.31) \\ 1.10\,(.38) \\ 1.20\,(.39) \end{pmatrix} \qquad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.27\,(.30) & & & & & \\ 0 & 1.08\,(.28) & & & & \\ 0 & 0 & 1.43\,(.32) & & & \\ 0 & 0 & 0 & 1.90\,(.37) & & \\ 0 & 0 & 0 & 0 & 1.31\,(.30) & \\ 0 & 0 & 0 & 0 & 0 & 1.19\,(.29) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 1.10\,(.34) \\ 1 \\ 1.00\,(.32) \end{pmatrix} \qquad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.02\,(.33) & & \\ 0 & 1.19\,(.32) & \\ 0 & 0 & 1.18\,(.32) \end{pmatrix} \qquad \mathbf{\Gamma} = \left(0.62\,(.29)\right)$$

Table 18

Coefficient estimates (small firms: service sector, $N = 114$)

$$\mathbf{\Lambda}_x = \begin{pmatrix} 1.28\,(.41) \\ 1.39\,(.43) \\ - \\ 0.74\,(.32) \\ 1.50\,(.45) \\ 1.26\,(.40) \end{pmatrix} \qquad \mathbf{\Theta}_\delta = \begin{pmatrix} 1.43\,(.23) & & & & & \\ 0 & 1.33\,(.23) & & & & \\ 0 & 0 & 1.65\,(.24) & & & \\ 0 & 0 & 0 & 1.81\,(.25) & & \\ 0 & 0 & 0 & 0 & 1.22\,(.23) & \\ 0 & 0 & 0 & 0 & 0 & 1.45\,(.23) \end{pmatrix}$$

$$\mathbf{\Lambda}_y = \begin{pmatrix} 0.94\,(.30) \\ 1 \\ 1.11\,(.35) \end{pmatrix} \qquad \mathbf{\Theta}_\varepsilon = \begin{pmatrix} 1.44\,(.26) & & \\ 0 & 1.36\,(.27) & \\ 0 & 0 & 1.22\,(.29) \end{pmatrix} \qquad \mathbf{\Gamma} = \left(0.44\,(.24)\right)$$

6 Conclusion

Regional fiscal policy measures such as profit-tax reductions aimed at stimulating investment in underdeveloped regions rest on the assumption that higher after-tax profit will result in higher re-investment share which, in turn, will stimulate growth and regional convergence in economic development. However, it questionable whether the extra profit due to smaller profit tax will be re-invested, saved or consumed. Furthermore, it is not clear whether the relationship between profit and investment is the same for firms in production and service sectors and for the firms of different sizes. We analyse this issues on the example of the Croatian war-affected (underdeveloped) regions and find that, on average, policy of profit tax reductions might be effective as the higher is the after-tax profit, the higher will be the re-investment share. However, we find differences between the production and service sectors where significant positive relationship between after-tax profit and investment exists for production firms, but lacks for the service sector firms. The general policy conclusion, therefore, would be to consider a differential treatment of production and service sectors, thereby allowing for higher profit tax reductions for production firms then for the service firms. In fact, we find no support for profit-tax reduction policy targeting service sector firms, hence higher tax revenues while still stimulating regional development and growth could be achieved by introducing lower profit taxes for only production sector firms.

Our findings are generally limited by the small sample sizes and possible measurement error in the data. The obtained results, nevertheless, indicate that similar analysis should be done on a larger sample, which would ultimately allow stronger policy conclusions and recommendations.

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