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The Role of Production Progress and Human Capital in the Economic Growth of Latvia

The paper sets a goal to assess the impact of production progress and human capital to Latvia's economic development. The authors made an attempt to construct a production function using non-linear modelling. An approach, slightly differing from that used so far for the description of technological process in the models for Latvia's production function, has been applied because the authors of this paper believe it reveals the evolution of the technological process more realistically.

Introduction

When in the middle of the 20th century a number of new states emerged, many predicted that their economic development would be fast. Though in many cases such predictions were underpinned by certain theoretically constructed models (like the Solow–Swan model), they did not materialise. The studies later in the 1980s proved that the real situation since the 1960s was not consistent with the production function under the standard Solow–Swan model. R. J. Barro writes: "Therefore, in the absence of shocks, poor and rich countries would tend to converge in terms of levels per capita income. However, this convergence seems to be inconsistent with cross-country evidence, which indicates that per capita growth rates are uncorrelated with the starting level of per capita product." (Barro (1989).

Observations made in the 1990s renewed the discussion of what the production function should be. The main problem solution, it was discovered, was the production function augmented by human capital.

The paper sets a goal to assess the impact of technological progress and human capital and to estimate long-term growth rates of Latvia's economic development. The authors made an attempt to construct a production function using non-linear modelling. An approach, slightly differing from that used so far for the description of technological process in the models for Latvia's production function, has been applied because the authors of this paper believe it reveals the evolution of the technological process more realistically. In order to improve the production function model for Latvia, the authors augmented the model by human capital approximation.

Chapter 1 deals with theoretical aspects of human capital accumulation and the problems arising when correlations described in literature are tested empirically. Chapter 2 aims to apply the existing models to Latvia's economic growth and to test them empirically; likewise, an attempt has been made to find out whether the GDP dynamics observed so far can be estimated by means of a production function augmented by human capital.

Theoretical background

When the analysis of cross-country historical economic development was conducted in the 1980s, an absolute fact came to the foreground: no convergence in terms of real GDP had occurred since the 1960s. Consequently, the correlation between the per capita GDP growth and initial per capita GDP in a given period, which could be implicitly derived from the Solow model, could not be estimated empirically. Barro and Sala-i-Martin (1995), Barro (1989), Mankiw, Romer and Weil (1992) conclude that the majority of GDP variances can be estimated by a regression derived from the

[1] The views expressed in this publication are those of the authors, employees of the Monetary Policy Department of the Bank of Latvia. The authors assume responsibility for any errors and omissions.

standard Cobb–Douglas (hereinafter, C–D) production function yet it produces an unfoundedly high capital share in GDP. Hence the Solow–Swan model reflects the reality incompletely.

In all the models, the C–D production function is employed:

$$Y_t = K_t^{\alpha}\left(A_t L_t\right)^{1-\alpha} \tag{1}$$

where Y_t is real GDP, K_t is real accumulated capital, L_t is employment in the economy, α is capital share in GDP, and A_t is total factor productivity which is exogenous.

When this model is employed (assuming that the ratio of A_t and saving rate to GDP are constant), all countries converge to one and the same development level (Romer (2001). Thus the model implies that there is no need to interfere in country's growth because the convergence of per capita GDP takes place automatically, provided that A_t is constant and saving sufficiently high (the aim of higher saving and labour productivity are both attainable by way of, e.g. attraction of foreign investment as well as liberalisation of foreign trade and capital movements).

Other studies (Mankiw, Romer and Weil (1992) show that despite regressing equation (1) displays a rather strong relationship, i.e. the dynamics of Y_t is fairly well explained, to a great extent, by the growth in variables on the right-hand side of the equation; however, the implied capital share α = 0.59 of this model cannot be correlated with the empirically estimated variable (approx. 0.30). Therefore, this regression is unlikely to be taken as a Solow model and, consequently, the C–D specification of equation (1) does not hold either. The following equation seems to be a better approximation:

$$Y_t = K_t^{\alpha} H_t^{\beta}\left(A_t L_t\right)^{1-\alpha-\beta} \tag{2}$$

where an additional variable H_t denoting human capital is included.

Mankiw, Romer and Weil (1992), introducing a proxy obtained from education indicators as a factor for human capital and using a simple one-period cross-country regression, produced a capital share of 0.31 and human capital of 0.28 (hence residual of 0.41 is the employment share).

Other studies employing these and similar regressions also arrive at a significant correlation between GDP and human capital factors (Barro (1989), Barro and Lee (1993). The result obtained, however, is unlikely to be treated as holding or being final. The problems related to methodologies and data are discussed in the next chapters.

Methods

The papers on the impact of human capital on the GDP growth use cross-country regressions as a rule, though regressions of a single country are also common. Generally, the production function can be expressed by

$$Y_t = K_t^{\alpha}\left(A_t L_t\right)^{\beta} H_t^{\phi} \tag{3}$$

Taking log of it, we obtain:

$$\log(Y_t) = \beta\log(A_t) + \alpha\log(K_t) + \beta\log(L_t) + \phi\log(H_t)\,. \tag{4}$$

Though a precise functional form is not known, usually the model with the constant returns to scale[1] function is used (i.e. a version of equation (4) where $\alpha+\beta+\phi=1$ and $0<\alpha<1$, $0<\beta<1$, $0<\phi<1$).

Such assumptions are usually tested against the so-called reasonable alternatives:

a) a model of endogenous growth (in equation (4), $\alpha=1$ and $0<\beta<1$, $0<\phi<1$);

b) a Solow model with no human capital included (in equation (4), $\alpha+\beta=1$, $\phi=0$ and $0<\alpha<1$, $0<\beta<1$).

Precautious attitude shall always prevail when correctness of such models is to be proved; likewise, the results obtained continue to be mixed. Barro and Lee (1993) conclude that a human-capital-augmented model reflects the reality very well; Canning, Dunne and Moor (1995) oppose them and prove that neither the augmented Solow model ((b) version) nor the endogenous growth model ((a) version) explains the data. Barro and Sala-I-Martin (1995) conclude that the data can indeed be estimated by a neoclassical production function with human capital and note that technological diffusion models are also useful (as a rule, they have decreasing returns to scale on a factor-level and increasing returns to scale on the whole). Romer (1990) demonstrates that international data can be consistent with endogenous growth models with human capital, which is defined as the number of authors producing research ideas.

The examination of sector-level data shows that increasing returns to scale are observed at the sector- or industry-level (Oulton and O'Mahony (1994): larger production volumes are associated with higher productivity of production factors. Caballerro and Lyons (1990) find that increasing returns to scale are not observable at the industry-level but occur as a result of mutual interaction of the production sectors. For instance, if the development of several sectors or industries is interdependent, an additional 5% of GDP is produced.

Data

The absence of an unbiased and independent human capital variable reduces the significance of production functions augmented by human capital. That is why various approximations are involved. However, the selection of any such approximation can be subject to doubt – on what grounds has this very approximation been selected? If a variable in a regression is endowed with a higher explanatory capacity, is it because of its strong link with the explained variable and not because the variable causes it? Even if there is a relationship, such equations cannot be easily interpreted.

Assuming in equation (3) (changing parameter designation to $Y_t = K_t^{\beta_1}(A_t L_t)^{\beta_2} H_t^{\beta_3}$) that the technical progress (productivity) growth (γ)is constant and, consequently, $A_t = A_0 e^{\lambda t}$, we obtain an equation that can be regression-tested:

$$\log(Y_t) = \beta_2 \log(A_0) + \beta_2 \lambda t + \beta_1 \log(K_t) + \beta_2 \log(L_t) + \beta_3 \log(H_t) + \varepsilon_t . \quad (5)$$

If a function ignoring human capital ($\beta_3 = 0$) is estimated, we obtain:

$$\log(Y_t) = \beta_2 \log(A_0) + \beta_2 \lambda t + \beta_1 \log(K_t) + \beta_2 \log(L_t) + \varepsilon_t . \quad (6)$$

where t is the trend (in this case A_0 is the technological level at the beginning of the given period).

[1] This study uses three types of returns to scale: increasing returns to scale, decreasing returns to scale and constant returns to scale.

Major studies, in which the need to include the human capital variable in the production function is emphasised (Barro (1989), Barro and Lee (1993), Barro and Sala-I-Martin (1995), support the conditional convergence relation, meaning that states do converge to something but this convergence is determined by a human capital variable (i.e. the pace of growth for less developed states is faster, and the income levels gradually converge, provided the countries have the same conditional factor – human capital, in this case).

Barro and Lee (1993) assume male secondary education as a conditional indicator approximating human capital. If the average length of male secondary schooling is increased by 0.68 year, the average annual GDP growth would pick up 1.1 percentage points. But why should the male secondary education be the appropriate human capital indicator? In a World Bank paper The Quality of Growth, Thomas, Dalaimi, Dhareshwar et al. (2000) point to female education as a qualitative indicator of human capital.

Some researchers, however, used aggregated indicators of schooling and have made a significant inference (Nehru and Dhareshwar (1994). The connection between schooling and economic growth indicators has been verified by Levine and Renelt (1992) who rank education level among the two single significant and robust indicators that explain the level of economic growth (investment level being the other indicator). Other scholars (Wolff (1994) maintain that expenditure on education or the number of researchers rank among the basic indicators (Eaton and Kortum (1996).

At the same time, Oulton and Young (1996) who used the same database as Barro and Lee (1993) (freely available on Internet and used in all studies by R. J. Barro[1]), failed to come up with a significant relation between the level of schooling and economic growth. Pritchett (1995) even discovered a negative relation between the two. In both papers, the Barro–Lee database has been used but male secondary education has not been distinguished as a separate factor.

Summing up the findings of available papers, it may be assumed that education indicators do relate to the GDP growth, albeit to some extent only. Any more daring opinions, e.g. on feasible causality, or how human capital enters, if at all, the production function, are unlikely to be reasonably grounded.

As to other areas, production functions with human capital variables are rarely used. Structural models used by central banks, as a rule, are standard C–D functions as in equation (1) (Smets and Woutwers (2002).

All in all, researchers have not yet formulated their opinion regarding the so-called true model.

Modelling Latvia's situation

When attempting to obtain reliable variables for the production function, researchers face one central problem – that of data. Equation (6) shows that data would be necessary on the following time series: real GDP Y_t, total factor productivity A_t, real capital K_t, human capital H_t and employment L_t.

Real capital is reported as accumulated capital, taking into account capital stock at the end of 1994, investment in gross capital formation and the level of depreciation, which is the average depreciation of the period (10% per annum). Labour force surveys constitute the data source for employment. Until 2002, such surveys were conducted on a semi-annual basis; hence for the period prior to 2002, no quarterly data are available. The employment time series for this period has been interpolated on the basis of short-term employment data.

The reporting of human capital presents problems and, as has been stated above, national accounts do not present such data sets. It means that any data series employed is merely an approximation.

[1] http://www.nber.org/pub/barro.lee

Besides, the previous chapter emphasised that the type of approximation is not specified.[1] The lack of quarterly data prior to 2002 makes the problem more complicated.

Census-X12 algorithm has been used to seasonally adjust all time series in econometric modelling.

Constructing of the C–D production function for Latvia has so far been attempted by several authors. Stikuts (2003) derives a relation in which capital share is 0.225. Beņkovskis and Stikuts (2006) do not calculate β but obtain the value of 0.319 through calibration. (in the given study the annual growth in labour productivity γ is 4.6%.)

A similar function with the variable for technological progress obtained with the help of the Kalman filter has been estimated in this study (refer to Hamilton (1994) for a more detailed information on methodology used). The following production function is assumed:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} . \quad (7)$$

The TFP is modelled as a stochastic process with an increase γ_t , which is random walk:

$$A_t = A_{t-1} e^{\gamma_t} \quad (8)$$

and

$$\gamma_t = \gamma_{t-1} + \varepsilon_t^{\gamma} . \quad (9)$$

Taking a log of equations (7) and (8) and combining it with the TFP growth factor, we obtain the state-space system that can be technically estimated:

$$\begin{aligned} \log(Y_t) &= \log(A_t) + \alpha \log(K_t) + (1-\alpha)\log(L_t) + \varepsilon_t^{\log(Y)} \\ \log(A_t) &= \log(A_{t-1}) + \gamma_t \\ \gamma_t &= \gamma_{t-1} + \varepsilon_t^{\gamma} . \end{aligned} \quad (10)$$

In fact, this system is similar to the one in equation (6); it is only assumed here that technological progress is not linear. This construction builds on the assumption that historically the most significant adjustments were not cyclical but have had a lasting impact on the supply side (production function). It could be an adequate approach for the economy with structural changes still in progress. It is assumed that model errors ε_t^{γ} and $\varepsilon_t^{\log(Y)}$ are normally distributed and independent.

The calculations by authors produced the following results.[2]

Table 1. State-space system estimations (for equation system (10)

	Coefficients	Standard error	*z*-statistic	Probability
α	0.303	0.064	4.754	0.000
	Final state	Root MSE*	*z*-statistic	Probability
$\log(A_t)$	−0.133	0.009	−14.954	0.000
γ_t	0.010	0.002	4.357	0.001

[1] This study uses data on the ratio of education sector expenditure to GDP and some schooling indicators.

[2] Here and hereinafter using the Kalman filter, the error is smoothed out restricting its variances by *var* = *exp*(−14). The period used in calculation is from the first quarter 1995 to the fourth quarter 2005. Additional tests are given in Appendix 1.

In this case, TFP is obtained as a state variable (see Figure 1 for projected TFP dynamics). Capital stock (0.303) slightly falls behind the one calibrated by Beņkovskis and Stikuts (2006) (0.319), and differs from the other estimated by Stikuts (2003) (0.225). The figure is consistent with values observed in production functions of other countries (which vary broadly; see Caballero and Lyons (1990), Dimitz (2001), or with calibrated values, which usually exceed 0.3. For instance, the capital share is estimated at 41% for the euro area (Fagan, Henry and Mestre (2001), at 36% for France, with a TFP increase of 1.2% per annum (Bolt and Van Els (2000), at 37% for Estonia (Kattai (2005), and at 36% for Lithuania (Vetlov (2004). The dynamics of observable γ_t (in this case approximating TFP growth) is also interesting and on the whole consistent with expectations (see Figure 1).

Figure 1. TFP dynamics consistently with equation system (10)

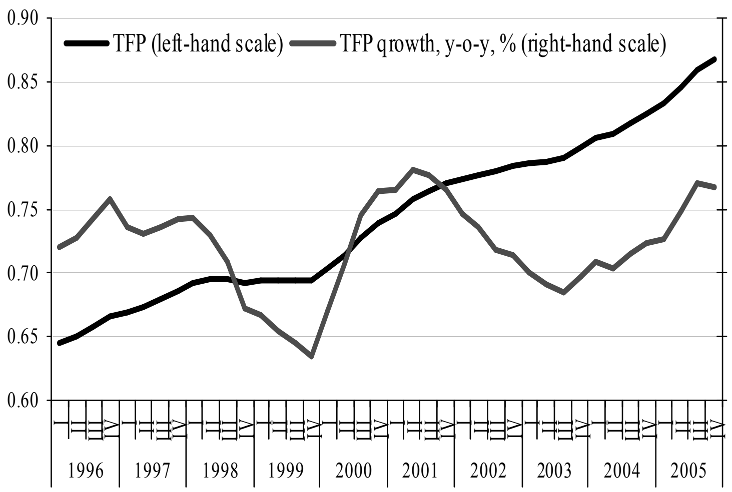


Figure 1 shows that the TFP growth varies in the reference period. During the Russian financial crisis, its growth subsided and was close to zero in the period between the fourth quarter of 1998 and the fourth quarter of 1999. Economic recovery, on the other hand, saw the TFP growth accelerating buoyantly but slowing down afterwards. Latvia's accession to the EU gave a fresh impetus to new acceleration in the TFP growth.

In order to separate short-term deviations from the long-term trend, an error correction model has also been estimated for the system:

$$\begin{aligned}
\log(Y_t) &= \log(A_t) + \alpha \log(K_t) + (1-\alpha)\log(L_t) + \varepsilon_t^{\log(Y)} \\
\Delta \log(Y_t) &= \gamma_t + \phi \log(K_t) + (1-\phi)\log(L_t) + \lambda \varepsilon_{t-1}^{\log(Y)} + \varepsilon_T^{\Delta LOG(Y)} \\
\log(A_t) &= \log(A_{t-1}) + \gamma_t \\
\gamma_t &= \gamma_{t-1} + \varepsilon_t^{\gamma} .
\end{aligned} \tag{11}$$

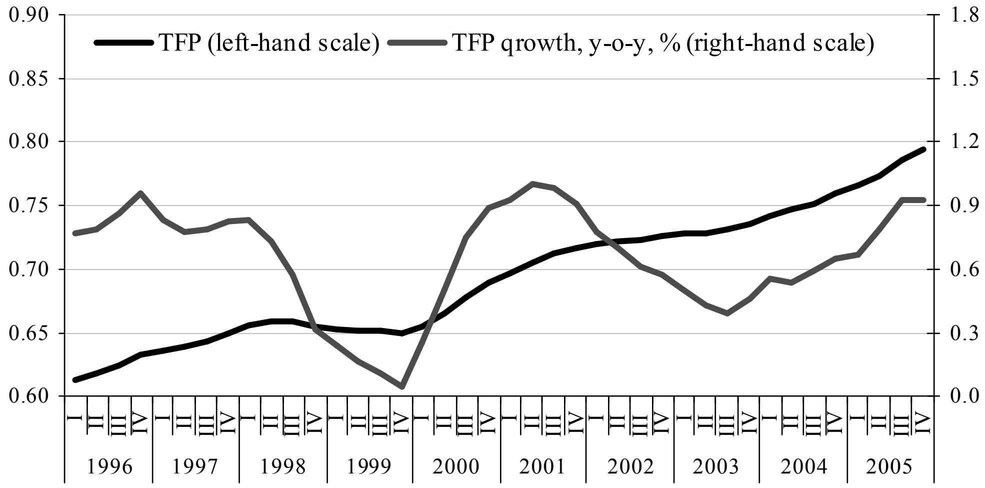
Table 2 shows the estimation of the given system.

Table 2. State-space system with error correction (for equation system (11))

	Coefficients	Standard error	*z*-statistic	Probability
α	0.341	0.054	6.346	0.000
ϕ	0.365	0.063	5.817	0.000
λ	−0.443	0.165	−2.677	0.007
	Probability at end-period	Root MSE*	*z*-statistic	Probability
$\log(A_t)$	−0.221	0.008	−26.105	0.000
γ_t	0.009	0.002	4.125	0.000

Table 2 shows that in this case the capital share is larger in the short-term than in the long-term. The difference, however, is not significant. The TFP dynamics showed in Table 2 is quite similar to the model in equation (10) (see Figure 2).

Figure 2. TFP dynamics consistently with equation system (11)



The inclusion of the human capital variable in equation is an alternative approach. The following data sets likely to figure as human capital approximations are used for the purpose:

c) share of real education expenditure in real GDP (Section M of national accounts; quarterly data available; data available since 1995);

d) share of employed with secondary and university education in the employment group over 15 years of age (Eurostat data; in line with levels 3–6 of ISCED 1997);

e) share of employed with university education in the employment group over 15 years of age (in line with levels 5–6 of ISCED 1997);

f) share of employed with secondary and university education in employment group over 25 years of age (Eurostat data; in line with levels 3–6 of ISCED 1997);

g) share of employed with university education in the employment group over 25 years of age (in line with levels 5–6 of ISCED 1997);

h) share of male with secondary and university education in employment group over 15 years of age (in line with levels 3–6 of ISCED 1997);

i) share of male with university education in employment group over 15 years of age (in line with levels 5–6 of ISCED 1997);

j) share of male with secondary and university education in employment group over 25 years of age (in line with levels 3–6 of ISCED 1997);

k) share of male with university education in employment group over 25 years of age (in line with levels 5–6 of ISCED 1997).

All schooling level data of the employed persons were available only as of 1998, with data for the first four years being semi-annual. The observations missing for the period between 1998 and 2002 were obtained via interpolation.[1]

Approximation-related problems are inherent in these data series. For instance, the share of education in GDP is constantly shrinking (see Appendix 3); however, if other factors (e.g. the share of persons with university education in the employment group over 25 years of age; see Appendix 4) are considered, they do not point to a trend so unequivocally. Although all time series are expected to estimate the same human capital data collection process, they present different dynamics.

Testing the given variables in a similar state-space equation system

$$\begin{gathered}\log(Y_t) = \log(A_t) + \alpha \log(K_t) + \beta \log(H_t) + (1-\alpha-\beta)\log(L_t) + \varepsilon_t^{\log(Y)} \\ \log(A_t) = \log(A_{t-1}) + \gamma_t \\ \gamma_t = \gamma_{t-1} + \varepsilon_t^{\gamma}\,,\end{gathered} \tag{12}$$

we come to the conclusion that the relation where both α and β are significantly different from zero and meet the terms of the production function with constant returns to scale (i.e. $0 < \alpha < 1$, $0 < \beta < 1$ and $\alpha + \beta < 1$) is impossible to obtain. None of the above estimated variables displays a relation that could prompt its inclusion in the production function.

Conclusions

The employment of various human capital approximations in the production function for Latvia convinced the authors that extending the production function with any such independent variable is not reasonable at this point. The authors maintain that the dynamics of the Latvian current economic growth is best estimated by the standard C–D production function with non-linearly modelled productivity. Testing with the Kalman filter and assuming that the TFP process changes in time produced human capital share of around 0.30.

The TFP growth rate estimated in the relevant period proved to be rather unstable. During the Russian financial crisis, TFP growth subsided and was close to zero in the period between the fourth quarter of 1998 and the fourth quarter of 1999. The period of economic recovery saw the TFP growth accelerating rapidly, albeit moderating later. Latvia's accession to the EU, in turn, gave a new impetus to the TFP growth.

In order to separate the short-term variance from the long-term trend, the error correction model was estimated. It resulted in around 0.34 long-term return on capital and a slightly higher 0.37 short-term return (however, the difference is statistically insignificant), with the TFP dynamics remaining broadly unchanged from the previous model estimation. The error correction coefficient is –0.44, indicating that the deviation from the long-term growth trend will result in a 44% adjustment for each period and will disappear in the course of approximately one year.

[1] In this case, two interpolation methods are tested: the linear (a simple mean of two closest values) and the cubic (interpolation method insignificantly smoothing time series). The results did not change depending on the method applied. Results given in Appendix 5 were obtained by the cubic interpolation method.

Appendixes

Appendix 1

Model (10) normal error distribution test

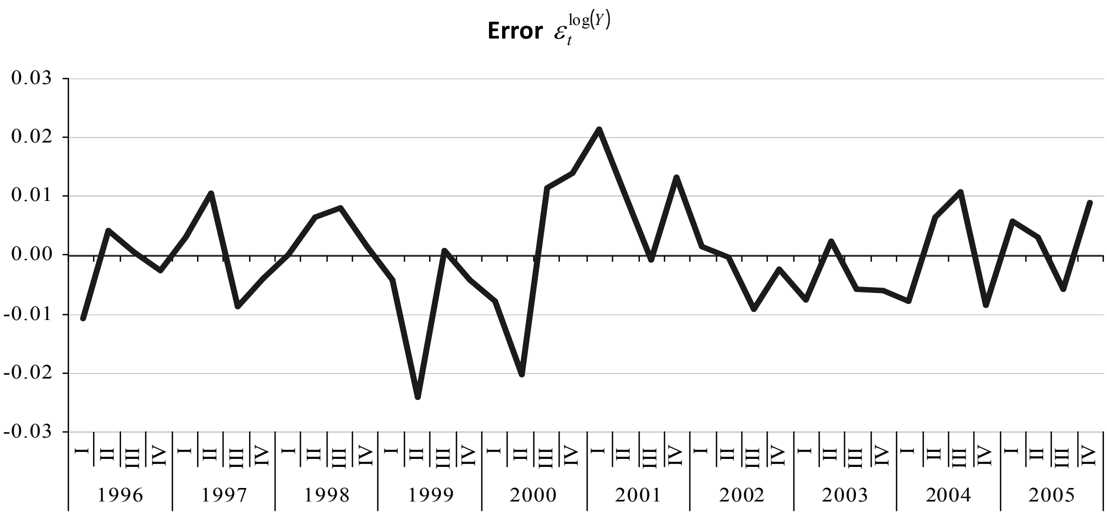
Method	Test value	Adjusted test value	*p*-value
Lilliefors (D)	0.117499	Not available (NA)	>0.1
Cramer–von Mises (W2)	0.062936	0.063651	0.3388
Watson (U2)	0.061975	0.062680	0.3108
Anderson–Darling (A2)	0.358848	0.365382	0.4360

Method: maximum likelihood, degrees of freedom corrected

Parameter	Value	Standard error	*z*-statistic	*p*-value
Mean	0.000429	0.001431	0.299748	0.7644
Variance	0.009495	0.001024	9.273618	0.0000

Appendix 2

Model (11) error tests



Error $\varepsilon_t^{\log(Y)}$ unit root test

Null hypothesis: $\varepsilon_t^{\log(Y)}$ *is the unit root.*

			p-values
Augmented Dickey–Fuller test statistic		−5.605074	0.0000
Test critical values	1%		−2.621185
	5%		−1.948886
	10%		−1.611932

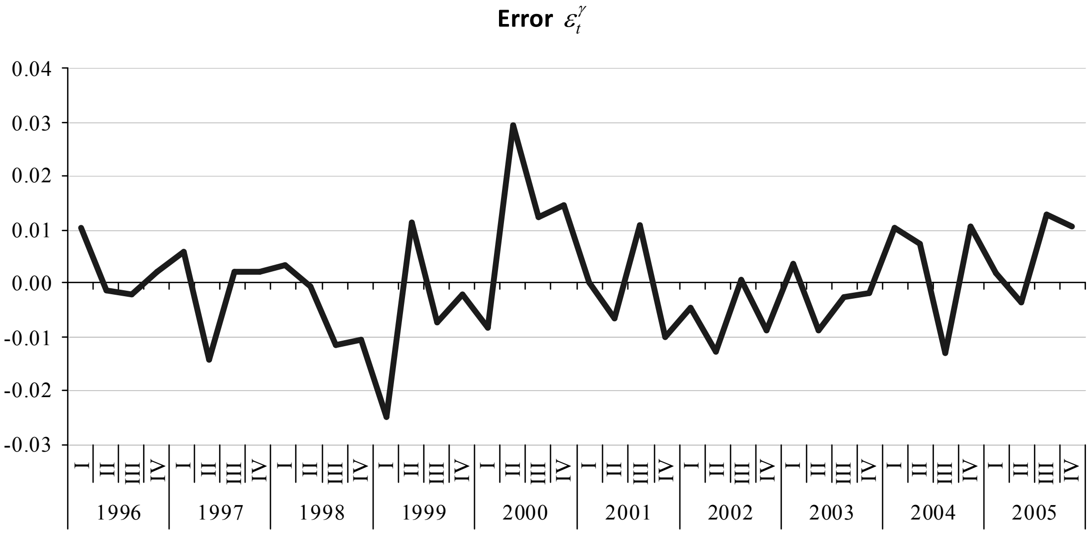
* *MacKinnon (1996) one-sided p-values*

Error $\varepsilon_t^{\log(Y)}$ *normal distribution test*

Method	Test value	Adjusted test value	*p*-value
Lilliefors (D)	0.084033	NA	>0.1
Cramer–von Mises (W2)	0.031466	0.031832	0.8215
Watson (U2)	0.031140	0.031502	0.7941
Anderson–Darling (A2)	0.292612	0.298072	0.5881

Method: maximum likelihood, degrees of freedom corrected

Parameter	Value	Standard error	z-statistic	p-value
Mean	0.000179	0.001385	0.128957	0.8974
Variance	0.009085	0.000991	9.165151	0.0000



Error ε_t^{γ} unit root test

Null hypothesis: ε_t^{γ} is the unit root

		t-statistic
Augmented Dickey–Fuller test statistic	–6.766009	0.0000
Critical test value 1%	–2.621185	
5%	–1.948886	
10%	–1.611932	

* *MacKinnon (1996) one-sided p-values*

Error ε_t^{γ} normal distribution test

Method	Test value	Adjusted test value	p-value
Lilliefors (D)	0.092113	NA	>0.1
Cramer–von Mises (W2)	0.039672	0.040134	0.6795
Watson (U2)	0.039430	0.039888	0.6290
Anderson–Darling (A2)	0.323388	0.329422	0.5154

Method: maximum likelihood, degrees of freedom corrected

Parameter	Value	Standard error	z-statistic	p-value
Mean	0.000114	0.001568	0.072687	0.9421
Variance	0.010284	0.001122	9.165151	0.0000

TPF, capital and employment time series cointegration relation in equation system (11)

Unrestricted Cointegration Rank Test (Trace)

Hypothesised number of cointegration vectors	Eigenvalue	Trace statistic	0.05 critical value	*p*-value*
None	0.603667	45.95704	24.27596	0.0000
At most 1	0.151458	8.011560	12.32090	0.2358
At most 2	0.030688	1.277899	4.129906	0.3017

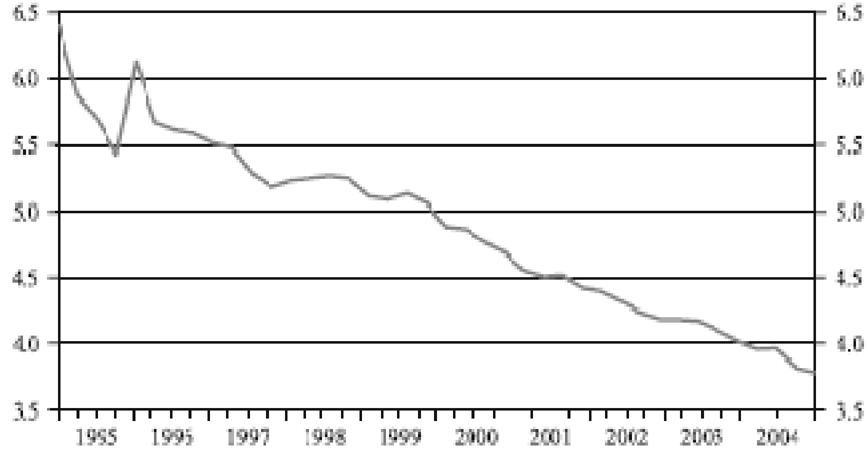
** MacKinnon–Haug–Michelis (1999) p-values*

Hypothesised number of cointegration vectors	Eigenvalue	Maximum eigenvalue statistic	0.05 critical value	*p*-value*
None	0.603667	37.94548	17.79730	0.0000
At most 1	0.151458	6.733661	11.22480	0.2736
At most 2	0.030688	1.277899	4.129906	0.3017

** MacKinnon–Haug–Michelis (1999) p-values*

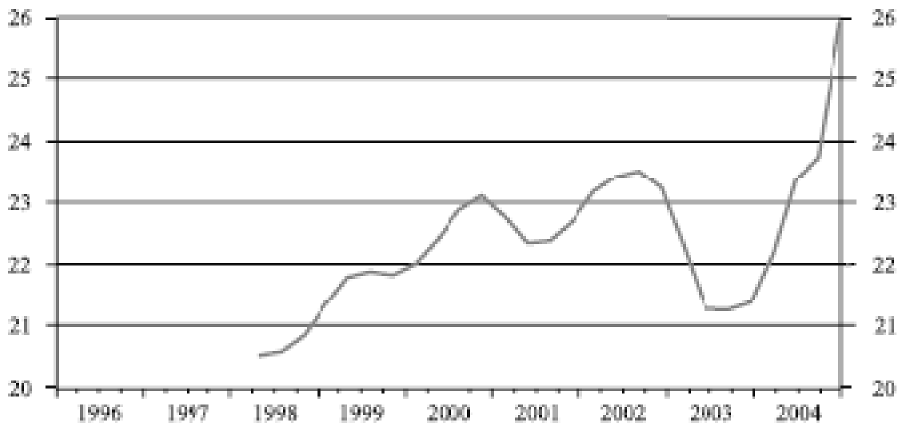
Appendix 3

Ratio of real education expenditure to real GDP in Latvia, %



Appendix 4

Proportion of persons with university education in total employment of Latvia, %, over 25 years of age



Appendix 5

Models with human capital

State-space system model with human capital (equation (13); 1996 Q1–2004 Q4)

Variables (consistently with the list on p. 11-12)	**log(K_t)**	**log(H_t)**
a)	0.91* (0.00)	−0.55* (0.00)
c)	0.44 (0.20)	0.07 (0.55)
d)	0.30 (0.43)	0.30 (0.26)
e)	0.47 (0.17)	0.04 (0.67)
f)	0.32 (0.36)	0.23 (0.23)
g)	0.50 (0.21)	0.01 (0.90)
h)	0.32 (0.36)	0.22 (0.27)
i)	0.60 (0.12)	−0.002 (0.98)

** Statistical significance of coefficient at the 0.01 level*

State-space system model with human capital (equation (12); 1998 Q 3–2004 Q 4)

Variables (consistently with the list on p. 11-12)	log(K_t)	log(H_t)
a)	1.43* (0.00)	−0.67* (0.00)
b)	0.83* (0.00)	−0.04 (0.43)
c)	0.69* (0.00)	0.05 (0.37)
d)	0.81* (0.00)	−0.03 (0.78)
e)	0.73* (0.00)	0.03 (0.53)
f)	0.78* (0.00)	0.01 (0.87)
g)	0.78* (0.00)	0.01 (0.87)
h)	0.77* (0.00)	0.02 (0.78)
i)	0.78* (0.00)	0.01 (0.87)

** Statistical significance of coefficient at the 0.01 level*

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