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DO HIGHER TAX RATIOS RESULT IN LOWER ECONOMIC GROWTH?

September 2010
Media owner: Chamber of Labour for Vienna
1040 Wien Prinz-Eugen-Straße 20-22
Print: Own copy system
Publishing and production place: Vienna

CONTENTS

„It is well known that taxes and transfers reduce productivity. Well known – but unsupported by statistics and history. “

Peter Lindert 2004

1. INTRODUCTION

The idea to conduct this study was born at last year's European Forum Alpbach around the issue of tax ratios and economic growth. Several economic researchers started their speech by stating that a rise of tax ratios by so-and-so many percentage points would result in a decrease of the growth rate by so-and-so many percentage points. They did as if this postulate was a law of nature, and obviously, it also seemed perfectly evident to the journalists and politicians present: They saw no need to question it at all. However, even a layperson in economics should have wondered how it then came that Scandinavian countries generally had high tax ratios and nonetheless showed relatively strong growth rates in the normal case. The idea that the state, like an enormous kraken, paralyses the free entrepreneur in its energy is persistent and it seems to be unthinkable to challenge the claim according to which tax increases result in economic slowdown. Those who maintain the opposite are considered unscientific and as ideologues.

But where does this conviction come from? In a study that received much attention, the Organisation for Economic Cooperation and Development (OECD 2003[0]) has examined the influence of the tax ratio on economic growth. The study was based on a growth model that included per capita GDP, physical capital, human capital, improvement of the quality of workforce, research expenditure and tax structure as explanatory variables. The major variant revealed a highly significant negative correlation. Its most important outcome: Increasing the tax ratio by one percentage point results in a decrease of the growth rate by 0.6 percentage points. If we take into account the impact of tax-financed additional public expenditure, this value falls to approximately 0.3 percentage points. However, if we also consider the indirect influence of direct taxes on investment, we again get a value around 0.6. This is a credo which we inevitably encounter at any political-economic event. But is it really plausible? Looking at the Scandinavian countries, we wonder if there is an economic growth elk which can only be hindered by fiscal ties to cause the two digit economic growth rates there?

In **chapter 1** we will first provide an overview of empirical and theoretical literature on this issue.

Chapter 2 is about the informative value and international comparability of tax ratios. For the purpose of further analysis, we will develop an adjusted tax ratio which ensures a better comparability.

In **chapter 3**, we will make a simple regression analysis on the basis of data from the period 1970-2008. In this context, we will also test the adjusted tax ratios. The result for 16 developed industrialized nations, which approximately correspond to the OECD sample, showed a positive (but not significant) correlation between economic growth and adjusted tax ratios. This was true both for the long time series (1970-2008) and for a shorter time series from 1990. When we used the official tax ratios, there was a not significant negative relationship for the long as well as for the short time series. Critics may object that our method was inadequate in econometric terms and that, given that economic growth depends on many explanatory variables, among which the tax ratio is in fact not the most important one, only multivariate regression models are adequate means to examine the dynamics of economic growth.

In **chapter 4** we apply the multivariate method of the OECD, however for different time series. We will show that whether or not we get a clear-cut negative relationship between the tax ratio and economic growth depends on the estimation methods, the data series used and the choice of explanatory variables. Empiric results on the correlation between these two values are highly explosive in political terms; in general, one picks up the results that best fit his aims and presents them as statistically firm data to his adversary. This does however not really serve the purpose of gaining knowledge.

2. LITERATURE SURVEY

Looking at the rich literature on this highly explosive issue, we find studies with completely different results. The mainstream of research is based on a neoclassical micro-economic model where the individual is in a position to decide between more work and more leisure time: If the profit from work falls due to income taxation, labour supply tends to decrease, too and people consume more leisure time. What is decisive in this context is less the average tax rates than the marginal tax rates. At the first glance, this seems to be obvious. Nonetheless, another aspect may produce very different effects: As long as people are under social pressure to keep a certain standard of living or to improve this standard, higher taxes will induce them to work even more, and not to reduce their working time. There are a number of simulation methods to explore this question. These simulation models produced very different results. In general, these depended on the assumptions underlying the model used.

When labour supply strongly rose or fell in the event of changes in net wages, and when the elasticity of substitution between labour and capital was high, the impact of changes in the tax system on growth was important, too (Jones et. al. 1993). However, when lower elasticity was underlain, the influence on growth was also less considerable (Lucas 1990)[2,3]. However, what is essential with regard to our questions is not theoretical models but empirical tests. These tests, however, cannot be conducted without any theoretical background.

With regard to the United States, we have many empirical long-term studies on how quantitative labour supply correlates with changes in wages (Hausman 1985)[4].

Source:	**Wage elasticity of labour supply**
Wales/Woodland (1979)	0.09
Ashworth (1981)	-0.13
Hausman (1981)	0.00
Hausman (1983)	0.08
Hausman/Rudd (1984)	-0.03

According to the studies, the empirical elasticities of labour supply to changes in wage in the US were very low or even slightly negative. We may therefore assume that the situation is the same when changes in net wages occur due to shifts in taxation. Many empirical studies point into this direction (Hausman 1985):

2.1 Elasticity of labour supply with regard to marginal income tax rates

Source:	Low income	Medium income	High income
Men			
Hausman		- 0.07	- 0.15
Ashworth	+ 0.02	- 0.01	- 0.13
Robins	+ 0.02		
Triest	+ 0.00	+ 0.00	+ 0.00
Bourguignon	+ 0.00	+ 0.00	+ 0.00
Married women			
Hausman		- 0.40	
Robins	- 0.10		
Eissa			- 0.80
Single women			
Robins	+ 0.03		
Triest		- 0.20	

In fact, the results are very plausible if we underlie the behaviour of a real human being and not that of a homo economicus. Men with low income have no choice but to keep their standard of living: They work more when taxes rise. Whereas married women seem to have more options to adjust their working time in the event of wage changes, the reaction of single women is between that of men and married women.

Recent surveys do in principle confirm these basic findings of the 1980ies on how changes in wages influence labour supply (Blundell, MaCurdy 1998)[5], (Meghir, Phillips 2008)[6]. The spectrum of numerical results is wide; Meghir and Phillips provide a very clear overlook.

As a matter of fact, not only the employment of labour, but also that of capital is an important factor for economic growth. In the framework of a comprehensive survey covering 85 countries, authors of the world bank and Harvard University found out that there was a highly significant and very strong relationship between investment and foreign direct investment on the one side and effective corporate tax rates on the other side (Djankov, Ganser, McLiesh, Ramaho, Shleifer 2009)[7]. This assumption was tested against many other variables wich potentially autocorrelate. The authors examined for instance whether there was an autocorrelation on per capita GDP to avoid that the statistical overall result was distorted by the fact that developing countries and emerging economies had systematically higher investment ratios and lower effective tax rates in general. According to these tests, the result seems to be robust.

However, there are other studies with less unequivocal findings, in particular on foreign direct investments (Panagiota 2009)[8]. In some surveys, no relationship at all could be found, while others reveal quite unexpected relationships. A study by the OECD (OECD 2007)[9] refers to the evaluation of existing empirical studies by a Dutch group of researchers (De Mooij, Ederveen 2001)[10, 11]. Ac-

cording to this study, the median value measured with regard to semi-elasticity of foreign direct investment to corporate tax rate is –3.72. This means that an increase of the corporate tax rate by one percentage point would lead to a drop in direct foreign investment by 3.72 percent. The individual values in the studies evaluated vary between –5 and 0. This means that the results are not as unequivocal as they seem to be at first view. Obviously, the empirical findings strongly depend on the choice of data series, the periods examined, the statistical methods and the underlying economic models. As a matter of fact, real investment decisions do not always follow the ideas suggested by micro-economic models. It is obvious that an entrepreneur makes an investment in order to make profits; however, in a world governed by insecurity he actually ignores what flow of yields he can exactly expect. The investment motivations prevailing in the real world are therefore:

- Permanent reaching of capacity limits by the company (→ expansion investments);
- Technical depreciation of investment goods (→ replacement investments); and
- New technology promising either product improvements or significant economies due to productivity improvements (→ innovation investments).

In this context, the amount of corporate tax is insofar relevant as it reduces the net profits, i.e. the amount of money available for investments. This negative effect can however be compensated for by a positive effect: If the corporate tax rate is high, investments in real assets are, via amortization, depreciation and write-offs, more attractive than investments in financial assets. Empirical findings that see no relationship between corporate tax and investment level are not necessarily erroneous. On the basis of the above-described alternative approach, they may in fact also be correct.

At last, the following complex of problems is to be considered: In practice, we can only rarely observe considerable tax rate changes within shorter periods of time. If adjustments are such that individuals hardly notice them, what is then the significance of reaction behaviour measurements? Sometimes tax reforms also bring about considerable tax rate cuts, but lead to an expansion of the tax base; in the end, the actual result of taxation is only slightly different from that before. A classical example is the US Tax Reform Act 1986. Feldstein concluded in an empirical study that within the period 1985-1988, the tax assessment bases strongly reacted to the decrease in marginal tax rates (Feldstein 1995)[12]. We are not in a position to judge the 1986 tax reform in the US, but we point out to the fact that the tax reform implemented in Austria in 1988 showed a similar pattern. By means of eliminating exceptions, the reformers intended to enlarge the tax assessment bases. If we analysed the reform in econometric terms, we would find out that there was a strong, highly significant relationship between the decrease of marginal tax rates and the extension of tax assessment bases. However, would such a relationship alone allow us to claim that tax rate cuts are adequate means to extend tax bases?

The publications we mentioned so far were based on particular micro-economic models. They examine how income and corporate tax rates affect the employment of labour and capital. The majority of the surveys revealed a negative but nonetheless often weak relationship between these values. But does this prove that high tax ratios curb economic growth? If we want to find an answer to this question, we have to extend our analysis from income taxes to other types of taxes and contributions that may have an effect on growth. And – this is even more important – we have to keep in mind that taxes do not simply disappear in a black hole, but they are actually used on various purposes. If taxes result in increased public investment, promote education and research or strengthen demand by households, this may at the end also lead to higher growth of the economy as a whole. Yet, the studies we quoted so far completely neglected this perspective.

Prescott assumed in a survey (Prescott 2004)[13] that not only the marginal income tax rate, but also the level of tax on consumption is decisive for the employment of labour. According to his empirical

findings, a decrease in marginal income tax rates accompanied by an increase in the level of tax on consumption may lead to a significantly higher employment of labour. De Bruin came to a similar conclusion with regard to a selection of European countries (de Bruin 2007)[14]. His findings are generally presented as the most convincing explanatory variable for the employment of labour. He so provided the intellectual basis for flat tax models (Hall, Rabushka 1995)[15]. In our opinion, however, these strongly ideological studies are unsatisfactory in econometric terms. We maintain that the most decisive factors for labour employment (as measured in hours) are the economic situation and working time regulations. Whether the assumption of the Prescott survey is substantive or not can only be evidenced if it is tested against these variables.

The OECD has analysed how different types of taxes impact economic growth (OECD 2008-1)[16, 17]. In a growth effect ranking, corporate tax was on top, followed by income tax. Taxes on consumption and property taxes came after income tax. According to the OECD analysis, a shift in the tax structure from income taxation towards property-related taxation could even have a positive growth effect.

The US with its 50 states is a good field to examine the growth effect of different tax ratios: Poulson and Kaplan have for instance explored the different marginal income tax rates (Poulson, Kaplan 2008)[18] and found that high marginal tax rates had a noticeably negative impact on growth. They tested this assumption against other possible factors such as different base levels of income or regional factors. The result seems to be plausible for die US, because mobile Americans are in fact capable of moving to another federal state for tax reasons. We must however not jump to the conclusion that this would also be true at international level. It can for instance not be expected that US citizens would move to Mexico for fiscal reasons.

In classical economic magazines, we rarely find articles suggesting that high tax ratios are *not* harmful in terms of economic growth. But such articles do nonetheless exist: (Lee 2004)[19], (Lindert 2004)[20] (Sala-i-Martin 1997)[21]. In the following, we want to show that statements according to which high tax ratios are *not* harmful for economic growth do nonetheless have a scientific footing; and what seems to be evident from an empirical point of view is in fact not evident at all.

3. WHAT THE TAX RATIO ACTUALLY TELLS US

The tax ratio is defined as the sum of all taxes, duties and charges levied by a country divided by its gross domestic product. At the first view, the definition seems to be clear. However, there are cases where it is disputable whether a payment to the state is to be considered as a tax payment or as a payment in exchange for a service which is not regarded as a tax payment. Every year, the OECD publishes the tax ratios of its member states (OECD 2008-2)[22]; the annex includes detailed definitions. In the following cases it is difficult to draw the line between tax payments and payments in exchange for services:

- **Social security contributions**
  Under the OECD definition, social security contributions are mandatory payments to the public sector (in Austria, the public sector also includes corporations under public law); voluntary payments or payments to entities under private law (pension funds) are however not considered as social security contributions, not even when these payments are obligatory pursuant to a collective bargaining agreement. The yawning gap between the tax ratios of different states with a comparable level of welfare is explained by the fact that the social security systems of some states are based on a pay-as-you-go scheme while others have a fully funded scheme.

- **Fees and charges**
  A distinction has to be made between fees and charges that are levied for the delivery of services and others that have tax character. According to the OECD, fees and charges have tax character when they also need to be paid in cases where no service is delivered or where they are disproportionally high in comparison to the market value of the services delivered. Most municipal charges in Austria have therefore tax character. In other countries, waste or sewage disposal services are privately operated. Here, the related charges do not have tax character. Yet, for a household, it does not matter that much whether the charges are paid under public or private law. In both cases, the money is gone; and waste or sewage disposal are quite indispensable services.

- **Transfers**
  In the event of tax reductions, we have to distinguish between real tax relief that decreases public revenues and tax-financed transfers that do not decrease the revenues of the state. In Austria, the tax allowance for a child is for instance considered a real tax relief. However, insofar as it has the effect of a negative tax, it is regarded as a transfer payment. If family benefits (“Familienbeihilfe”; in Austria, these benefits are paid to every family with children regardless of the family income) were constructed as a tax allowance with the effect of a negative tax, nothing would change for the beneficiaries, but the tax ratio would immediately decrease by approximately one percentage point.

3.1 Tax Ratios for the Year 2006

Country	Tax ratio according to OECD	Adjusted tax ratio
Australia	30,6	39,5
Austria	41.8	42.7
Belgium	44.4	45.0
Canada	33.6	37.4
Czech Republic	37.1	37.1
Denmark	49.6	50.2
Finland	43.5	54.5
France	44.1	45.5
Germany	35.6	36.9
Greece	31.2	
Hungary	37.1	38.8
Iceland	41.5	49.7
Ireland	31.7	32.3
Italy	42.3	42.8
Japan	28.0	28.2
Korea	25.0	26.9
Luxembourg	35.8	36.0
Mexico	18.3	19.4
Netherlands	38.9	43.8
New Zealand	36.6	38.3
Norway	44.0	44.5
Poland	34.0	35.5
Portugal	35.5	36.9
Slovakia	29.4	
Spain	36.7	38.0
Sweden	49.1	49.1
Switzerland	29.3	38.2
Turkey	24.5	24.5
United Kingdom	36.6	39.8
United States	28.2	33.8

Austria has approximately the same welfare level as Switzerland; however, the Austrian tax ratio stands at 41.8%, while that of Switzerland is only 29.3%. How do the smart Swiss manage? The difference in the ratios is to be nearly exclusively explained by the different financing of the pension systems. It would be wrong to conclude that the burden for the Swiss people is smaller; after all, they also have to finance their pensions. To the citizens, it does not really matter whether they are obliged to contribute to a system under public law or to a pension scheme under private law. From an economic point of view, the impact of a fully funded retirement provision scheme is of course different from that of a pay-as-you-go scheme. But this is not relevant in the context of the present paper. The tax ratio is to reflect the burden of obligatory payments on the citizens. However, in the present definition, it fails to do so. This is why we have adjusted the official tax ratios by means of adding the overall expenses for private retirement provisions in the various states. The table above compares the tax ratio published by the OECD and the adjusted tax ratio. In the adjusted tax ratio,

the sum of the taxes and social security contributions is adjusted by means of adding health expenditure of private health insurances (OECD Health Data 2010)[23] as well as contributions to pension schemes (OECD Pension Statistics 2010)[24], in each case in relation to GDP. The amount of contributions to private health insurances may be underestimated as health-related expenses by private health insurance schemes only approximately correspond to private health insurance contributions, but are in general lower. In this context, we are unable to distinguish between mandatory and voluntary contributions, which are purely private expenses. However, since the share of individual voluntary contributions in relation to GDP is likely to be about the same in each country, the distortions with regard to the adjustments should be limited.

When interpreting the figures, we have to know that some countries such as the US, Ireland, France and Sweden did not deliver any data for the Pension Statistics. If we added the missing data, the tax ratio of the US would suddenly get very close to that of Austria.

After these adjustments, Austria is average compared to other developed OECD industrialized nations as regards its tax ratio. If we now made further adjustments by means of taking into account municipal charges and family benefits, Austria would rank even lower. These findings may not prevent some politicians from designating Austria as a high tax country, but those who know the real interrelationships cannot agree with such statements.

In the following, we will make regression analyses of tax ratios and growth rates; for this purpose, we will test both the official tax ratios and the adjusted tax ratios.

4. SIMPLE REGRESSION ANALYSIS OF TAX RATIOS AND ECONOMIC GROWTH RATES

We based our analysis on data from the period 1970-2008; we were however unable to get the full data for all OECD countries (for basic data, see annex I and II). Due to the lack of some data series, in particular for Eastern European countries, the results may be distorted to some extent. This is why we also analysed a shorter period of time from 1990. On the basis of the data, we generated average values for three years' periods in order to minimize the possible impact of cyclical fluctuations. In this context, we made a traditional regression analysis (OLS regression) and a GMM regression (General Method of Moments) based on the system GMM estimator by Blundell/Bond (1998)[25].

4.1 Econometric Excursus

Concerning the use of particular estimation methods, various econometric aspects have to be borne in mind: The set of data used consisted of panel data. The analysis of such data is conducted on the basis of an econometric model; the variables of this model include a temporal and a spatial dimension. The model can be described as follows:

$$y_{it} = \alpha + x'_{it}\ ß + u_{it}\ \ for\ t = 1,...,T\ and\ i = 1,...,N$$

Whereas α is the model constant and $\mathbf{X}_{it}$ is the regression vector with ß being the vector of the regression coefficient, in each case of the dimension K (number of regressors). In connection with panel data analysis, analysts moreover often assume that the model constant varies to individuals and beyond. These panel specific and time-invariant deviations of the constant are called "fixed effects"; they are in particular relevant in connection with macroeconomic panel data sets. These fixed effects include country-specific qualities which are not observable but have an impact on the endogenous variable and therefore need to be included in the estimation model. At the same time, panel-invariant temporal effects can be taken into account. Both these temporal effects and panel-specific factors are reflected by the combined error term u_{it}; for this reason, it seems to be useful to break down this error term for the purpose of the econometric analysis.

$$u_{it} = u_i + \lambda_t + v_{it}$$

Whereas u_i is the panel specific effect, λ_t is the temporal effect and v_{it} is the remaining error. By means of including dummy variables in the econometric model, these fixed effects can be filtered from the error term. In the following, an estimation according to the OLS model can be made.

The analysis using OLS (Ordinary Least Squares) is based on the principle according to which the squared vertical difference between the observed values of the independent variable and the regression line is to be minimized. This method is however less suitable for dynamic models with lagged endogenous variables where we get biased and inconsistent values for the coefficient β if the temporal dimension of the panel is small. To get this problem under control, new estimation methods have been developed, such as the General Method of Moments (GMM). Here, past values of the independent variable and the relationship of the variable to the error terms are included as constraints for the estimation. Thus, the impact of endogeneity of single variables (i.e. a correlation between explanatory variable and error term) or heteroscedasticity of error terms (a non-constant vari-

ance of the error terms to the explanatory variable) to the estimator is reduced and the consistence and unbiasedness of the estimator is improved.

4.2 Results of the Simple Regression Analysis:

Explanatory variable: Log(Growth of Real GDP Per Capita to Purchasing Power Standard (PPS)): All states, official tax ratios

	1970		**1990**	
	OLS	**GMM**	**OLS**	**GMM**
Log(tax ratio)	-0.6351536	-0.0360162	1.104007	1.179182
	t = (-1.31) p = (0.191)	t = (-0.08) p = (0.940)	t = (1.04) p = (0.300)	t = (1.03) p = (0.311)
Observations/states	289/30	289/30	160/30	160/30
F-test	3.1	13.1	1.57	1.32
	(p=0.0004)	(p=0.000)	(p=0.1610)	(p=0.281)

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

We see that as expected, there is a significant negative relation in the longer time series. The coefficients can be interpreted as elasticities. The coefficients are to be read as follows: In the OLS regression, an increase of the tax ratio by 1 percent means a decrease of the growth rate of real per capita GDP by 0.64 percent, quite a strong effect – which is however not supported by statistics. In the shorter time series we see a positive relationship. Suddenly, increasing the tax ratio seems to boost growth. This is probably to be explained by the exceptional factors in Eastern European countries. In most countries, increases in tax ratios were accompanied by strong growth results. We would nonetheless not advocate that increasing tax ratios be the best economic strategy. We only want to show that findings very much depend on the choice of data series and estimation methods.

This assumption is also confirmed if we exclusively look at the traditional industrialized nations for which we have in any case long data series:

Explanatory variable: Log(Growth of Real GDP Per Capita to PPS): Industrialized nations, official tax ratios

	1970		1990	
	OLS	**GMM**	**OLS**	**GMM**
Log(tax ratio)	-1.252543	-0.5721501	-0.2350954	3.598039
	t = (-1.01) p = (0.313)	t = (-0.34) p = (0.738)	t = (-0.09) p = (0.931)	t = (0.84) p = (0.416)
Observations/states	171/16	171/16	89/16	89/16
F-test	4.03	91.92	4.46	11.75
	(p=0.0000)	(p=0.000)	(p=0.0007)	(p=0.000)

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

At least for the OLS regression, we now get an insignificant negative relation also for the short time series.

In this context, we have to take into account that the tax ratio under the OECD definition does not truly reflect the burden on the citizen but represents the ratio of charges under public law, as we explained in chapter 2. If we make the tax ratio adjustments as described in chapter 2, we get the following results for the sample of industrialized nations:

Explanatory variable: Log(Growth of Real GDP Per Capita to PPS): Industrialized nations, adjusted tax ratios

	1970		1990	
	OLS	**GMM**	**OLS**	**GMM**
Log(tax ratio)	0.1652688	0.0343849	0.4245765	1.330996
	t = (0.21) p = (0.835)	t = (0.05) p = (0.965)	t = (0.26) p = (0.793)	t = (0.53) p = (0.604)
Observations/states	124/16	124/16	79/16	79/16
F-test	3.6	119.46	4.6	10.97
	(p=0.0002)	(p=0.000)	(p=0.0007)	(p=0.000)

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Here, the relationship is positive, contrary to theoretical expectations and under all estimation procedures used. We do not want to draw any economic conclusions from these insignificant results, but urge that we be careful in interpreting the results of regression analyses. The fact that we got insignificant results in all cases indicates that the relation between tax ratio and economic growth is by no means unequivocal. Economic growth is determined by a number of factors. We can only achieve results that are correct in econometric terms if we apply a multivariate estimation model that takes into account the most important parameters for economic growth.

5. MULTIVARIATE REGRESSION ANALYSIS OF TAX RATIOS AND ECONOMIC GROWTH RATES

We performed a multivariate analysis on the basis of an OECD method (OECD 2003)[0].

For the purpose of the regression analysis, we first underlay as independent variable growth of real gross domestic product (GDP) per person capable of work (*rgdp_growth*). As explanatory variables we took real GDP per person capable of work in the previous period (*rgdp_head-1*) as well as growth of labour force (*labforce_growth*), research expenses as percentage of GDP (*research_gdp*), gross fixed assets investments as percentage of GDP (*fixedcapital_gdp*) and the tax ratio. Moreover, we included an indicator to roughly reflect the tax structure in a country in the equation (*tax_structure*). This indicator reflected the relationship between taxes on labour and taxes on capital.

The data specification was made on the basis of the criteria below and is to some extent different from that by the OECD.

5.1 Data Description

Designation	**Description**	**Source**
rgdp_growth	Growth rate of real GDP to purchasing power standards per person capable of work	Own calculation, OECD Economic Outlook
rgdp_head	Real GDP to purchasing power standards per person capable of work. Base year=2000	Own calculation, OECD Economic Outlook
labforce_growth	Labour force; number of persons between 15 and 64 years	OECD Economic Outlook
research_gdp	Research expenses as percentage of GDP	Own calculation, OECD Statistics
fixedcapital_gdp	Gross fixed assets investments as percentage of GDP	Own calculation, OECD Economic Outlook
tax_ratio	Tax ratio according to OECD	OECD Revenue Statistics
effective_tax_ratio	Effective tax ratio, i.e. official tax ratio including contributions to pension schemes and payments by private health insurances	OECD Revenue Statistics, Pensions Statistics, Health Data, own calculation
tax_structure	Taxes on labour to taxes on capital	OECD Revenue Statistics, own calculation
emerging	Indicator for economically highly developed countries; it is 0 for industrialized nations and 1 for countries that are economically lagging behind	Determined by us

With regard to the indicator for economically highly developed countries, we made the following distinction:

Industrialized Nations	Newly Industrialized Countries
Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Finland, France, United Kingdom, Luxembourg, Netherlands, Norway, New Zealand, Sweden, USA.	Czech Republic, Spain, Greece, Hungary, Ireland, Iceland, Italy, Japan, South Korea, Mexico, Poland, Portugal, Slovakia, Turkey

In all cases, we considered the variables at their logarithmic value. This reduced on the one hand the influence of outliers on the results and permitted us on the other hand to interpret the regression coefficients as elasticities. Thus, the coefficient tax ratio indicates for instance to what extent (as measured in percent) growth of real per capita GDP would change if the tax ratio was raised by one percent.

The base specification of the estimation equation was therefore as follows:

$$\ln(rgdp\_growth)_{it} = \alpha + \beta_0 \ln(rgdp\_head_{-1})_{it} + \beta_1 \ln(labforce\_growth)_{it} + \beta_2 \ln(research\_gdp)_{it} + \beta_3 \ln(fixedcapital\_gdp)_{it} + \beta_4 \ln(tax\_ratio)_{it} + \beta_5 \ln(tax\_structure)_{it} + u_{it}$$

The definition of estimation equation and of the variables used followed to a large extent the studies by Falk/Unterlass (2006)[25] and Bassanini et. al. (2001)[27]. In this context, we have to note that in both of the studies mentioned the average number of school years attended by the population in the examined countries was taken into account as an indicator for the value of human capital. In the present survey we refrained however from including this variable as we maintain that the number of school years attended is not an adequate parameter to measure human capital. In this variable, the development of human capital by means of apprenticeships, continuing education and training at the workplace is completely neglected.

Now, with regard to the estimation model in its base specification, we can make the following assumptions concerning tax policy:

A1: According to neoclassical economics, high taxes and contributions slow down GDP growth as incentives to work and invest money are reduced. Under this theory, both the tax ratio and the effective tax ratio have a significantly negative impact on economic growth.
Thus:

$$\beta_4 \ln(tax\ ratio) \triangleleft 0$$

A2 Moreover, we often hear the argument according to which high taxation of capital results in an exodus of the production factor capital accompanied by a slowdown of economic growth. Advocates of this viewpoint recommend that the tax burden be minimised. The taxation of the production factor labour is considered less problematic in this context, as labour is factually (albeit not theoretically) less mobile. In the sense of this conservative liberal argumentation, the indicator tax structure would have a significantly positive influence on economic growth.
Thus: $\beta_s \ln(tax\ structure) \triangleright 0$

In the analysis that we carried out, the remaining variables only served as control variables.

5.2 Results

The outcome was as follows:

Explanatory variable: Log(Growth of Real Per Capita GDP to PPS): All states, official tax ratios

	1970		**1990**	
	OLS	**GMM**	**OLS**	**GMM**
Log(per capita GDP in previous period)	-1.54249**	-1.915274**	-1.702091	-2.616145***
	t = (-1.78)	t = (-2.15)	t = (-1.17)	t = (-2.95)
	p = (0.078)	p = (0.40)	p = (0.245)	p = (0.006)
Log(development of labour potential)	-0.1977294***	-0.1565332	-0.2558916*	-0.0990868
	t = (-2.91)	t = (-1.59)	t = (-1.75)	t = (-0.69)
	p = (0.04)	p = (0.124)	p = (0.083)	p = (0.497)
Log(research expenses)	0.3526819	0.3394509	-0.3291413	-0.077934
	t = (1.11)	t = (-0.71)	t = (-0.41)	t = (-0.10)
	p = (0.267)	p = (0.482)	p = (0.681)	p = (0.917)
Log(gross fixed assets investments)	1.645303***	1.508307**	1.244475	1.031025
	t= (3.29)	t = (2.63)	t = (1.41)	t = (1.17)
	p = (0.001)	p = (0.014)	p = (0.162)	p = (0.251)
Log(tax ratio)	-0.496322	0.0043028	1.641867	1.486192
	t = (-0.61)	t = (0.01)	t = (0.88)	t = (1.29)
	p = (0.52)	p = (0.995)	p = (0.380)	p = (0.208)
Log(tax structure)	-0.5573361*	-0.4728763*	0.2527956	0.367403
	t = (-1.80)	t = (-1.71)	t = (0.61)	t = (0.96)
	p = (0.074)	p = (0.099)	p = (0.543)	p = (0.344)
Observations/states	203.29	203/29	119/29	119/29
F-test	2.73	4.26	1.94	5.65
	(p=0.0009)	(p=0.000)	(p=0.0516)	(p=0.000)

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

In the OLS estimation, we got a strong, not significant negative relationship between tax ratio and economic growth in the longer time series. As regards the shorter time series, we got an unrealisti-

cally high and positive relation, which was probably due to the special situation in the Eastern European countries as described earlier in this paper.

Explanatory variable: Log(Growth of Real Per Capita GDP to PPS): Industrialized nations, official tax ratios

	1970		1990	
	OLS	**GMM**	**OLS**	**GMM**
Log(per capita GDP in previous period)	-1.545453	-2.762359	-6.361079*	-5.720345
	t = (-0.95)	t = (-1.63)	t = (-1.91)	t = (-1.73)
	p = (0.344)	p = (0.124)	p = (0.063)	p = (0.104)
Log(development of labour potential)	-0.1407707**	-0.1428696*	-0.0249361	-0.0052621
	t = (-2.38)	t = (-2.01)	t = (-0.15)	t =(-0.03)
	p = (0.019)	p = (0.063)	p = (0.878)	p = (0.977)
Log(research expenses)	-0.0039581	-0.2944944	-1.255667	-1.305363
	t = (-0.01)	t = (-0.57)	t = (-1.04)	t = (-0.97)
	p = (0.993)	p = (0.578)	p = (0.306)	p = (0.346)
Log(gross fixed assets investments)	1.047872*	0.9681072	-0.6374581	-0.5084971
	t = (1.78)	t = (1.44)	t = (-0.45)	t = (-0.40)
	p = (0.079)	p = (0.170)	p = (0.654)	p = (0.693)
Log(tax ratio)	-1.225614	0.2728913	-2.880024	-2.883299
	t = (-0.59)	t = (0.15)	t = (-0.53)	t = (-0.83)
	p = (0.556)	p = (0.883)	p = (0.601)	p = (0.417)
Log(tax structure)	-0.2238204	-0.1260513	-0.1094495	0.0518394
	t = (-0.65)	t = (-0.35)	t = (-0.18)	t = (0.12)
	p = (0.519)	p = (0.733)	p = (0.854)	p = (0.908)
Observations/states	121/16	121/16	68/16	68/16
F-test	2.81	180.32	3.34	21.66
	(p=0.0013)	(p=0.000)	(p=0.0028)	(p=0.000)

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

The longer time series corresponded to a large extent to that in the OECD survey (OECD 2003)[0] quoted earlier in this paper, but we underlay a slightly modified country selection, different data specification for the explanatory variables and another estimation method, which immediately lead to a different result. While the OECD study revealed a highly significant negative relationship between tax ratio and economic growth, we found a strong, not significant negative relationship by means of performing the OLS analysis.

In the shorter time series, we found interestingly a strongly negative relation for both estimation methods, which clearly contrasts with the results in the simple regression analysis (as described in

chapter 3). This shows how much the results depend already on the choice of the other explanatory variables.

Explanatory variable: Log(Growth of Real Per Capita GDP to PPS): Industrialized nations, adjusted tax ratios

	1970		1990	
	OLS	**GMM**	**OLS**	**GMM**
Log(per capita GDP in previous period)	-0.7211221	-2.257889	-5.010072	-4.933193
	t = (-0.40)	t = (-1.03)	t = (-1.18)	t = (-1.21)
	p = (0.692)	p = (0.321)	p = (0.246)	p = (0.243)
Log(development of labour potential)	-0.1271326*	-0.1442516	-0.062679	-0.029881
	t = (-1.77)	t = (-1.42)	t = (-0.41)	t = (-0.19)
	p = (0.081)	p = (0.176)	p = (0.684)	p = (0.852)
Log(research expenses)	-0.2613055	-0.7452378	-1.661961	-1.613827
	t = (-0.57)	t = (-1.61)	t = (-1.11)	t = (-1.06)
	p = (0.574)	p = (0.128)	p = (0.272)	p = (0.306)
Log(gross fixed assets investments)	0.8783911	0.5733044	-0.935533	-0.6920793
	t = (1.12)	t = (0.65)	t = (-0.60)	t = (-0.52)
	p = (0.268)	p = (0.525)	p = (0.552)	p = (0.611)
Log(tax ratio)	-0.0131789	0.5042018	-0.3024474	-0.2004565
	t = (-0.01)	t = (0.40)	t = (-0.18)	t = (-0.16)
	p = (0.992)	p = (0.697)	p = (0.861)	p = (0.872)
Log(tax structure)	-0.2678796	-0.3218593	-0.3354733	0.0416294
	t = (-0.51)	t = (-0.63)	t = (-0.47)	t = (0.07)
	p = (0.609)	p = (0.538)	p = (0.651)	p = (0.949)
Observations/states	98/16	98/16	64/16	64/16
F-test	2.21	851.81	2.62	10.92
	(p=0.0143)	(p=0.000)	(p=0.0157)	(p=0.000)

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

With regard to the adjusted tax ratio, we found mainly a negative relationship which however turned out to be highly insignificant.

6. CONCLUSIONS

There is no statistical evidence to the negative relationship between tax ratio and economic growth. In cases where such a relationship is found, either by means of selecting a specific data preparation, time series or countries or by means of applying a particular estimation method, this is a matter of pure coincidence. On the basis of the considerations in this paper, it would also be more than surprising if there really was such a relationship. As the tax ratios reflect different economic information, their international comparability is very limited. For those taking part in economic life it does not matter that much whether they have to pay contributions to a privately organised pension fund or to a state pension scheme. The performance and the risk profile of the various pension schemes are of course not the same, but in both cases the income available to the individual is reduced by mandatory contributions. The tax ratio is not what it is taken for: it does *not* reveal the real burden on taxpayers. The great gap between for instance Switzerland and Austria as suggested by the tax ratio does by no means reflect the reality. The welfare level is roughly the same in both countries and the decrease of available income by compulsory payments is comparable, too. The differences in the tax ratios result from different definitions. It is unlikely that such differences in definitions also lead to different effects with regard to economic growth.

What is more important than the level of the tax ratio is what actually happens to the taxes and contributions. It will make a difference whether the money is invested in education, training and research or whether it goes to military intervention abroad. And it will of course make a difference in terms of economic growth whether a state is organised in an efficient manner or whether public resources are just wasted. It is a matter of nature that a country in which schools are privately organised will have a lower tax ratio than a country with a public school system. A private school system would only have a positive growth effect if it was considerably better than the public system, but this cannot be empirically proved. A country that leaves its infrastructure to go rack and ruin will sooner or later suffer from economic slowdown, and a lower tax ratio will not be of any help in this case.

This study is intended to contribute to a more objective discussion on the issue of the tax ratios. There is no empirical evidence that increasing the tax ratio would hinder economic growth, and claiming such a thing over and over again is not helpful at all. It would be more sensible to ask the following questions: How are the taxes and contributions used? Are they administrated in an efficient manner? Are they used on purposes that generate growth? These factors are much more relevant for growth than the tax ratio as such.

7. ANNEX

7.1 Official Tax Ratios

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Australia	21.51	22.28	21.81	22.94	25.14	25.87	26.08	25.95	25.02	25.61	26.68	26.89	27.4	26.61	28.17	28.33	29.18	29.09	28.73	28.49
Austria	33.83	34.51	34.93	35.1	36.09	36.6	36.47	36.84	39	38.37	38.85	39.95	38.75	38.45	40.12	40.79	40.68	40.31	40.32	39.3
Belgium	33.88	35.03	34.87	36	36.9	39.48	39.69	41.64	42.23	43	41.31	41.59	42.82	43.54	44.27	44.35	44.09	44.73	43.41	41.57
Canada	30.85	30.38	30.85	30.38	32.75	31.99	31.51	30.68	30.4	30.14	30.99	33.25	33.05	32.51	32.61	32.53	33.22	34.24	33.67	34.83
Czech Republic	19.28	19	19.37	21.35	22.16	23.87	25.23	25.43	25.36	24.92	24.7	24.75	25.25	25.78	29.32	25.49	26.57	26.36	26.69	26.01
Denmark																				
Finland	31.53	32.03	33.52	35.01	34.87	34.31	35.29	36.66	36.66	36.38	36.43	35.86	35.54	35.56	35.71	36.08	35.83	36.29	35.95	36.23
France	38.35	41.44	40.95	40.28	42.14	38.39	39.4	39.82	41	42.14	43.04	42.78	41.63	43.58	44.73	46.13	48.25	48.92	49.44	48.27
Germany	15.92	16.19	17.09	17.66	17.08	18.44	18.43	20.24	21.49	22.01	22.59	23.83	24.12	26.04	26.39	27.57	28.96	30.77	30.92	32.69
Greece	31.51	33.12	33.6	34.42	33.68	36.52	40.06	40.14	36.84	35.45	35.7	37.69	36.82	36.5	38.03	39.68	40.83	39.29	42.53	42.1
Hungary	34.09	33.51	33.88	33.82	34	35.38	37.19	37.15	37.16	38.66	40.11	40.36	41.21	41.79	42.76	42.82	42.35	42.79	42.07	41.85
Iceland	36.69	34.77	33.06	31.22	34.17	34.94	34.77	34.26	32.66	31.89	34.8	36.24	38.51	36.9	37.01	36.96	37.45	36.14	36.17	35.6
Ireland	19.97	19.78	19.66	18.09	18.97	19.44	21.12	21.43	21.38	22.17	21.56	21.73	24.52	24.94	25.51	25.52	26.79	27.26	24.6	23.84
Italy																				
Japan	28.47	29.5	28.27	28.44	28.87	28.77	31.89	30.38	28.77	28.42	31.06	32.14	33.54	34.97	35.75	34.68	35.43	35.61	36.81	33.53
Korea	27.37					29.96					29.6	30.74	31.02	28.35	29.59	28.17	28.38	28.71	31.29	31.4
Luxembourg	25.7	26.35	26.26	23.93	25.07	25.37	26.31	26.81	26.97	26.14	29.71	30.87	33.03	34.99	34.14	33.64	35.19	35.28	35.84	36.81
Mexico	19.61	19.9	20.56	22.29	22.85	20.84	21.68	22.24	23.91	24.31	25.36	26.06	26.43	26.95	27	27.36	28.13	29.24	29.51	29.83
Netherlands			12.02	11.62	12.73	14.45	15.67	15.64	16.07	16.44	16.54	16.31	16.61	16.98	16.07	15.71	15.34	15.69	15.69	16.55
New Zealand	23.47	25.68	26.2	26.57	27.46	32.76	32.94	36.49	37.16	34.8	35.56	36.52	37.75	39.81	38.29	39.36	37.32	37.52	36.14	35.31
Norway											14.76	14.35	14.62	16.31	15.85	15.46	14.75	15.69	15.13	15.69
Poland	35.6	37.07	38.23	39.28	39.72	40.73	40.61	41.5	42.17	42.61	42.93	42.3	42.74	43.75	42.27	42.43	43.1	45.5	45.45	42.87
Portugal	34.49	37.01	38.91	39.32	39	39.2	40.64	41.39	40.88	40.75	42.42	43.86	43.1	41.86	41.16	42.62	44.48	42.7	42.2	40.48
Slovakia	26.13	25.03	26.67	27.35	30.6	28.65	29.38	32.51	30.31	30.99	30.82	32.29	33.34	30.58	30.19	31.27	31.96	35.54	34.71	38
Spain																				
Sweden	18.39	18.13	17.9	17.49	17.92	19.72	21.41	21.84	21.09	20.78	22.89	24.21	24.83	26.25	25.72	25.23	26.62	25.09	26.8	27.49
Switzerland																				
Turkey	37.81	38.59	39.91	39.12	40.25	41.24	45.29	47.43	47.81	46.56	46.38	47.72	46.71	47.35	46.96	47.36	49.56	52.08	51.4	51.86
United Kingdom	9.28	10.65	10.84	11.28	10.52	11.88	12.14	12.69	12.38	11.71	13.35	14.14	13.7	12.78	10.67	11.49	13.04	14	13.24	13.89
United States	27	25.03	25.55	25.46	26.21	25.58	24.87	26.11	25.84	26.04	26.39	26.82	26.98	24.87	24.94	25.55	25.48	26.53	26.35	26.61

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Australia	28.52	27.04	26.47	26.95	27.96	28.8	29.43	29.2	30.03	30.55	31.14	29.62	30.51	30.62	31.11	30.82	30.63	30.83	
Austria	39.67	40.12	41.71	42.15	42.19	41.41	42.88	44.35	44.36	44.04	43.24	45.26	43.97	43.8	43.4	42.25	41.81	42.27	42.87
Belgium	42.02	42.25	41.81	43.27	43.55	43.57	44	44.53	45.18	45.17	44.9	44.9	45	44.58	44.77	44.75	44.36	43.87	44.3
Canada	35.89	36.37	35.97	35.38	35.25	35.57	35.88	36.73	36.7	36.41	35.64	34.85	33.74	33.73	33.63	33.38	33.55	33.28	32.17
Czech Repub-lic	25.76	25.56	26.01	26.52	27.03	27.72	28.15	27.63	28.53	28.69	30.02	29.51	29.85	29.21	28.82	29.17	29.34	28.89	29.45
Denmark				40.39	38.91	37.52	35.96	36.34	34.89	35.84	35.33	35.65	36.3	37.32	37.8	37.59	37.1	37.37	36.58
Finland	34.8	36.04	36.96	36.97	37.18	37.22	36.52	36.19	36.43	37.11	37.19	36.11	35.45	35.51	34.78	34.79	35.59	36.17	36.43
France	46.54	45.88	46.28	47.67	48.71	48.8	49.16	48.95	49.3	50.1	49.36	48.45	47.84	48	49.01	50.82	49.63	48.67	48.29
Germany	32.48	32.76	33.79	32.82	32.85	32.14	31.9	32.89	33.24	34.14	34.19	33.77	34.16	34.17	34.65	35.74	36.67	37.24	33
Greece	43.51	45.1	44.92	44.42	46.88	45.72	46.99	46.28	46.09	45.78	47.22	44.59	44.63	44.03	43.5	44.01	43.48	43.01	42.78
Hungary	41.99	42.39	42.01	42.35	42.82	42.92	44.13	44.36	44.21	45.13	44.35	44.03	43.37	43.16	43.46	43.91	44.05	43.47	43.07
Iceland	35.52	34.33	33.42	32.37	32.96	34.04	33.84	34.28	35.47	35.75	36.39	36.14	34.6	34.34	34.91	35.76	36.62	36.08	35.71
Ireland	26.18	26.28	27.15	27.61	27.89	28.88	35.86	30.34	32.03	32.89	34.03	32.92	33.55	32.2	31.11	31.4	31.24	32.03	31.32
Italy		45.22	44.95	45.81	43.31	41.32	39.7	38.06	37.84	38.11	38.04	38.05	37.92	37.56	37.6	37.35	37.12	39.55	40.14
Japan	33.12	33.71	34.04	34.04	35.15	32.5	32.47	31.77	31.3	31.5	31.28	29.1	27.99	28.52	29.9	30.36	31.69	30.81	28.26
Korea	30.94	31.3	32.14	31.06	30.6	31.19	32.3	32.21	34.49	36.9	37.23	35.4	35.33	36.75	37.95	40.64	41.5	40.86	36.04
Luxembourg	37.8	38.23	40.59	42.25	40.24	40.12	41.83	43.21	41.75	42.54	42.29	41.97	41.36	41.8	41.05	40.85	42.34	43.46	43.17
Mexico	29.07	28.69	27.01	27.14	26.25	26.85	26.83	27.18	26.81	26.31	27	27.26	26.16	25.7	26.29	27.4	27.97	28.33	
Netherlands	18.14	17.76	17.75	18.22	18.56	18.65	19.23	20.12	20.2	20.62	22.6	22.99	23.17	23.94	23.19	23.91	24.98	26.53	26.59
New Zealand	35.66	33.39	34.07	36.53	36.77	37.09	37.57	39.33	39.38	38.28	39.13	39.75	39.3	38.11	37.24	37.62	35.82	36.55	38.29
Norway	15.8	15.74	16.1	16.13	15.73	15.2	15.26	15.93	15.12	15.81	16.85	17.11	16.48	17.37	17.09	18.13	18.26	17.98	20.41
Poland	42.89	45.14	44.79	44.98	42.98	41.53	40.94	40.87	39.11	40.12	39.66	38.17	37.51	36.92	37.3	38.5	38.91	37.54	
Portugal	40.99	41.12	40.31	39.45	40.79	40.87	40.85	41.5	42.41	42.71	42.64	42.85	43.09	42.28	43.29	43.52	43.97	43.63	42.09
Slovakia	37.36	35.58	35.89	35.95	36.52	36.64	34.81	35.01	33.38	33.38	33.6	33	34.35	34.18	35.28	37.42	36.56	35.73	34.47
Spain		34	34.93	38.78	36.93	36.19	37.38	36.63	35.58	35.07	32.75	32.56	33.07	32.56	31.65	33	33.98	34.86	
Sweden	27.7	28.79	30.8	29.31	30.12	32.1	32.67	32.78	33.02	33.87	34.09	33.77	34.51	34.68	33.88	34.74	35.48	36.41	36.47
Switzerland									36.75	35.37	34.1	33.15	33.22	33.07	31.62	31.45	29.36	29.39	29.31
Turkey	52.23	49.82	47.26	46.07	46.33	47.48	49.42	50.63	51.05	51.42	51.79	49.85	47.91	48.34	48.72	49.48	49.05	48.31	47.11
United King-dom	14.9	15.61	16.69	16.86	16.55	16.78	18.91	20.73	21.11	23.14	24.16	26.1	24.62	25.93	24.07	24.26	24.52	23.71	23.54
United States	27.32	27.06	26.91	27.14	27.53	27.85	28.29	28.72	29.25	29.39	29.89	28.84	26.45	25.88	26.08	27.54	28.2	28.29	26.86

7.2 Growth of Real Per Capita GDP to Purchasing Power Standard

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Australia	1.22	0.53	1.56	-1.22	0.78	2.20	-0.91	3.02	2.02	0.57	1.52	-3.94	3.31	3.45	1.71	-1.03	2.86	1.02	0.29
Austria	4.41	5.77	3.63	3.02	-0.41	4.05	3.56	-1.03	4.93	0.88	-0.23	2.18	2.85	0.02	1.85	1.46	0.84	2.14	2.45
Belgium	3.13	4.92	5.09	2.32	-1.71	4.65	0.26	1.98	1.09	4.17	-0.45	0.25	0.85	2.44	1.92	1.21	1.80	3.80	3.46
Canada	1.25	2.33	2.61	-0.25	-1.59	-0.03	0.65	0.53	0.40	-0.82	0.47	-3.57	1.04	3.86	2.62	0.41	2.29	2.99	0.61
Czech Repub-lic																			
Denmark	2.81	2.05	2.82	-1.03	-2.14	4.12	1.29	0.77	3.72	-0.32	-1.28	2.76	1.91	2.92	2.93	4.05	-0.23	-0.18	-0.19
Finland	2.04	7.34	4.82	0.80	1.64	-3.98	0.31	2.54	5.63	2.91	-0.34	1.75	2.28	2.26	2.43	2.49	4.08	5.27	3.79
France	4.35	3.81	5.00	3.39	-1.18	2.76	2.31	3.83	1.81	0.39	0.23	2.11	1.50	0.72	1.07	1.35	2.09	4.62	3.39
Germany																			
Greece	8.76	9.30	7.41	-7.03	5.80	6.26	2.53	6.43	2.10	-1.55	-7.99	-2.14	-4.39	1.32	1.86	0.62	-2.18	2.24	3.58
Hungary																			
Iceland	8.13	3.58	3.90	2.19	-1.15	2.29	8.35	2.85	3.77	2.43	-0.60	-0.79	-3.39	2.34	0.07	3.33	2.76	2.59	0.88
Ireland	1.13	8.29	3.74	3.12	1.98	2.57	5.05	6.44	-0.40	3.38	0.10	1.47	-2.27	4.27	2.27	-0.44	4.15	5.76	7.19
Italy	1.95	4.45	5.91	3.99	-3.08	5.52	1.15	2.65	4.35	2.01	0.74	0.14	0.20	2.04	2.37	1.01	3.03	3.35	3.69
Japan	3.97	7.47	5.68	-0.94	2.80	2.86	2.94	3.69	4.18	1.83	1.87	1.57	-0.36	2.43	4.34	1.97	2.68	5.20	3.49
Korea	4.55	0.06	6.65	2.55	3.35	4.33	6.44	4.96	4.47	-3.52	4.25	4.72	9.66	8.59	2.69	6.79	5.94	7.58	2.46
Luxembourg	0.24	4.02	6.37	1.72	-8.15	2.24	1.59	4.09	1.59	0.28	-1.19	1.01	2.99	5.40	2.40	8.50	2.38	7.03	8.02
Mexico																			
Netherlands	2.97	2.19	5.05	3.09	-1.08	3.75	1.41	1.23	0.21	1.67	-2.26	-2.68	0.22	2.66	2.29	1.26	0.24	1.78	2.65
New Zealand	2.40	3.68	4.46	1.61	-3.73	-0.87	-5.69	-1.23	-1.56	0.18	1.64	3.10	1.88	2.98	-1.65	1.97	0.02	1.45	2.02
Norway			4.25	3.41	1.28	1.61	2.35	1.89	3.01	4.20	-0.25	-0.92	2.86	4.78	3.57	1.09	-0.24	-0.72	2.31
Poland																			
Portugal	6.39	8.21	11.36	-5.44	-10.68	2.97	3.41	2.18	3.98	2.54	1.46	2.33	-4.84	-2.38	3.11	3.96	5.20	6.05	4.77
Slovakia																			
Spain								1.53	-0.05	2.45	0.04	0.42	0.82	1.67	1.90	1.86	1.79	3.44	3.47
Sweden	-0.63	1.99	3.79	1.69	0.51	0.46	-2.39	0.82	2.44	0.61	-0.78	0.50	1.19	3.81	1.58	2.48	2.95	1.77	1.55
Switzerland	2.57	1.94	2.16	1.68	-3.20	0.96	2.21	-0.47	1.54	2.46	-0.27	-1.97	0.00	1.88	1.74	-0.25	-0.93	1.06	2.30
Turkey	3.35	4.91	0.88	2.35	5.41	7.17	-0.92	0.12	-0.77	-3.09	4.93	2.60	3.12	5.11	3.01	4.16	6.40	0.52	-2.43
United King-dom	2.39	3.05	6.16	-1.86	-1.05	2.38	1.96	2.86	1.69	-3.22	-1.77	2.86	3.45	0.17	2.75	3.35	3.49	3.72	1.15
United States	1.51	2.30	3.02	-3.35	-2.13	2.77	1.63	2.28	0.39	-2.17	0.93	-3.37	3.24	5.17	2.28	1.40	1.35	2.53	1.71

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Australia	-3.02	-0.53	2.95	3.43	2.55	1.21	2.55	3.48	3.91	3.13	-0.05	2.02	1.60	2.09	1.61	-0.12	1.01	1.20	0.37
Austria	1.73	1.36	1.08	0.27	2.15	2.32	1.14	1.48	2.50	2.12	2.98	-0.17	0.89	0.41	2.38	1.27	2.53	2.40	0.22
Belgium	2.89	1.63	0.97	-1.99	2.32	1.72	1.31	3.35	0.05	3.07	3.38	-0.30	0.48	-0.07	2.04	0.24	1.77	2.12	-0.31
Canada	-1.17	-2.72	0.83	1.63	3.78	1.97	0.47	2.66	2.43	3.63	3.45	0.13	0.04	-0.42	1.76	2.05	1.38	0.52	-1.24
Czech Repub-lic					0.98	5.14	3.95	-1.06	-1.18	1.15	4.24	2.95	1.85	3.68	4.13	5.16	6.14	5.92	1.82
Denmark	1.52	1.11	2.22	0.44	5.88	3.21	2.33	2.90	1.14	1.50	3.72	-0.40	0.34	0.62	2.72	2.14	2.29	-0.69	-1.36
Finland	0.08	-4.85	-1.98	-0.01	4.00	3.08	3.26	6.14	4.27	1.90	3.71	1.99	1.41	2.19	3.88	1.68	3.78	3.08	-0.04
France	2.61	1.23	0.65	-1.56	1.87	1.55	0.03	2.40	2.87	2.49	2.77	1.17	-0.12	0.98	1.65	1.16	1.60	1.52	-0.30
Germany				-0.83	2.11	1.87	0.55	1.11	1.18	1.49	2.08	0.69	-0.23	-0.32	0.29	-0.08	3.36	2.37	1.04
Greece	-0.83	4.72	-1.81	-3.54	0.14	0.76	0.71	4.07	-1.69	2.04	3.82	4.80	1.74	4.10	2.75	1.64	3.59	3.76	1.58
Hungary				3.62	7.60	3.95	1.91	5.26	4.19	2.01	3.80	4.41	4.13	2.87	5.06	2.24	2.85	1.00	1.30
Iceland	0.93	-0.22	-5.20	0.47	2.72	-2.33	5.67	4.63	3.24	1.16	1.97	2.20	0.59	2.15	8.23	4.44	-1.04	1.56	-0.11
Ireland	6.35	0.20	2.00	0.39	3.56	7.42	4.50	8.25	4.68	6.32	5.61	2.91	3.93	2.12	1.75	1.64	0.85	2.09	-4.07
Italy	2.00	1.40	1.54	1.09	2.70	2.84	0.58	1.38	0.25	0.65	2.76	0.91	-0.49	-0.77	0.53	0.31	1.10	1.20	-2.52
Japan	3.27	1.41	-0.16	-0.31	0.64	1.61	2.05	0.43	-2.15	0.06	3.01	0.39	1.19	1.74	3.07	1.80	1.92	2.19	-0.42
Korea	5.94	5.95	3.69	4.40	5.47	6.39	4.66	2.25	-5.46	7.77	6.20	2.39	4.93	2.61	2.53	2.50	4.06	3.99	1.66
Luxembourg	3.92	6.76	1.37	3.90	2.32	0.25	0.29	4.09	4.82	5.81	4.29	0.02	1.89	-0.25	2.54	3.09	3.74	4.07	-3.07
Mexico			0.02	-1.68	0.61	-9.10	2.72	2.20	2.80	3.67	4.11	-0.25	-1.87	0.46	-0.17	2.78	1.88	1.47	-1.05
Netherlands	2.07	1.01	0.34	-0.45	1.15	1.27	1.71	2.20	2.58	2.86	2.63	0.20	-0.76	-0.32	2.20	1.49	2.55	1.76	1.01
New Zealand	-1.36	-2.56	0.75	5.17	2.57	1.58	0.44	0.56	0.24	4.37	1.39	1.76	1.74	2.22	1.04	0.18	-0.61	1.39	-2.25
Norway	2.49	3.79	3.27	2.69	3.99	2.46	2.56	3.17	1.11	1.54	2.50	1.48	0.78	1.15	3.51	1.97	0.31	0.66	-1.21
Poland					6.26	7.09	6.00	6.71	4.45	4.56	3.22	0.82	2.38	5.36	4.74	2.76	7.35	7.03	3.99
Portugal	2.06	1.92	0.39	-1.49	-0.35	4.43	2.90	2.81	4.14	2.95	2.03	0.16	-0.90	-1.70	1.02	-0.27	0.61	1.39	-0.23
Slovakia						4.61	5.18	4.51	3.79	-1.30	-0.09	1.63	5.32	4.25	3.99	6.62	7.73	10.12	4.62
Spain	1.79	1.59	1.23	-1.13	0.71	0.74	1.07	1.66	2.24	1.95	1.14	0.25	-1.28	-0.88	-0.06	0.38	0.65	0.74	-2.07
Sweden	-0.11	-0.76	0.14	-0.47	4.10	3.28	0.99	3.07	4.33	3.97	3.71	0.09	2.01	1.56	3.60	2.40	2.94	1.02	-1.38
Switzerland	0.81	-4.30	-0.85	-0.52	1.89	0.61	0.13	1.57	1.86	1.01	3.03	-0.20	-0.66	-0.74	2.14	1.86	1.76	1.68	0.19
Turkey	7.79	-3.16	4.64	12.19	-12.85	5.13	4.98	7.00	0.38	-5.47	9.89	-7.77	4.14	5.74	7.32	6.14	5.39	3.01	-1.99
United King-dom	0.45	-0.60	1.31	2.65	4.38	2.74	2.48	2.70	3.30	2.33	3.23	1.99	1.22	2.02	1.94	0.94	1.29	2.40	-0.41
United States	0.24	-0.66	2.01	1.98	2.65	1.53	2.44	2.71	3.28	3.53	1.82	0.18	1.22	0.84	3.16	2.36	0.37	1.48	-0.78

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