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Tax Rates and Corruption: Labour-market and Fiscal Effects

Empirical Cross-country Comparisons on OECD and Transition Countries

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Abstract

The paper attempts to explain how tax rates, the extent of corruption and various institutional aspects of the labour market influence the relative size of different segments (unemployment, employment, self-employment and activity in the hidden economy) of the labour market as well as the tax revenues in both developed market economies and transition countries. Based on theoretical assumptions and methodological considerations, alternative regression calculations are carried out on data for 28 OECD countries and partly on 18 transition countries for the period 1995 to 2000. A methodological novelty of the investigation is the establishment and testing of a new variable, the subjective tax rate.

Keywords: taxation, corruption, labour market, hidden economy

JEL classification: H2, H26, D73, J2, E26

Executive summary

This paper analyses how tax rates, the level of corruption and various institutional aspects of the labour market influence the relative size of the different segments of the labour market (unemployment, employment, self-employment and activity in the hidden economy). Another aim of the research is to explain the tax revenues in both developed market economies and transition countries, with the help of the mentioned explanatory factors. Based on theoretical assumptions and methodological considerations, alternative econometric investigations are carried out on data for 28 OECD countries, and partly on 18 transition countries, for the period 1995-2000. A methodological novelty of the investigation is the establishment and testing of a new variable, the subjective tax rate.

According to the experience presented in the literature about the hidden economy, simple comparisons of the statutory tax rates on economic activity across countries may be misleading if we do not take account of the environment in which these tax rates let their impact be felt. Here the environment means the way taxes are set and collected (coherence, transparency, orderly tax system and collection) and the way taxes are used in the provision of government services (again transparent, orderly and economical utilization). For a proper cross-country comparison of tax rates we define a new indicator, the so-called subjective tax rate, which combines the traditional tax rate with the level of inefficiency of the institutional environment. The latter is proxied by the level of corruption in the given country.

Our empirical investigation shows that, apart from other institutional differences in the labour market, subjective tax rates are relevant factors in explaining the cross-country differences in unemployment, employment and self-employment rates, as well as the size of the hidden economy.

We find that these relationships are quite comprehensive, but also sophisticated. If high traditional tax rates along with a high level of corruption (and implied worse conditions of employment) make the employee status less available and/or less attractive, female and male employees respond differently. Female workers go into unemployment, or join the group of unpaid family workers within the self-employed sector, or even leave the labour market. Male participants, however, as a rule, get self-employed, because male employment is critical to earn a living for the rest of the family, possibly (at least partly) in the declared economy.

The same factors that affect the changing size of the hidden economy influence, in a complex way, the move of the potential labour force across the different visible segments of the labour market. For instance, high tax rates on labour combined with a high level of corruption may give rise to a large hidden economy segment, but these very factors may also contribute to a rise in the unemployment rate and the inactivity rate. At the same time, these factors may affect another segment of the employed people, namely the self-employed persons, whose ratio in total employment may increase. This increase in self-employment may further increase the size of the hidden economy, since self-employed persons are able to evade and avoid taxes much more easily than employed persons. In this mechanism unemployment and self-employment develop in parallel. Another factor, the generosity of unemployment benefits, gives rise to contrasting developments in the various segments of the labour market. Generous

unemployment benefits may contribute to an increase in the number of unemployed, but at the same time they induce, *ceteris paribus*, a drop in the self-employment rate. A high corporate tax rate combined with a high level of corruption may crowd people out of the employee status and increase the ratio of self-employed. These are the so-called false self-employed: in practical terms they are still employees, but are undeclared, as far as payroll taxes are concerned. This transformation of the employee status enables both employees and employers to evade taxes, but the same combination of factors can also increase the share of non-employed people who (just as the self-employed) are prone to be engaged in the hidden economy.

The above-outlined complex system of relationships in the labour market is reflected in the development of tax revenues. The specific tax revenues investigated (labour tax revenues, social security contribution revenues, and value added tax revenues) and the relevant subjective tax rates (subjective tax wedge, subjective social security contribution rates and subjective value added tax rates) form a Laffer-type relationship in cross-country comparison. The presentation of the relationship by figures and by more articulate econometric investigations shows that higher subjective tax rates initially increase tax revenues, but beyond a certain point further increases in the subjective tax rates cause the revenue to fall. It also became clear that most of the transition countries (especially the post-Soviet and Southeast European countries) are currently found on the downward part of the Laffer curve, but some OECD countries are also located on that part of the curve.

By utilizing the results obtained with the use of the concept of the subjective tax rate, and applying a special estimation method of the hidden economy based on tax revenues (TRAM) we develop an estimation method for the relative size of the repressed economy implied by the subjective tax rates. ('Repressed economy' is a wider concept than the hidden economy, because it also contains the 'held-back economy' and loss of performance due to inferior productivity in the hidden economy.) Our estimations show that, among the OECD countries investigated, Italy, Spain, Greece, Belgium, Poland and Hungary have relatively high levels of repressed economies. Among the transition countries, particularly the post-Soviet and the Southeast European countries have large repressed economies, certainly larger than those transition countries which are already among the OECD countries (Poland, the Czech Republic, Slovakia and Hungary).

The main policy conclusion of this study is the following: Any characterization of tax rates according to their nominal size or even in international or timewise comparison is misleading. Taxes let their impact be felt on the decisions of economic agents (in our case on the various participants of the labour market and the entrepreneurs) in the context of the social environment in which these rates are set and revenues are collected and redistributed. In an environment in which the participants do not believe in the efficient collection and utilization of the tax revenues, even small tax rates may be considered too high, while in an environment with a perception of excellent public services, even record-high tax rates would not induce participants of the economy to keep their efforts back or hide their activities.

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Tax rates and corruption: labour-market and fiscal effects
Empirical cross-country comparisons on OECD and transition countries

1 Introduction

This study attempts to explain how tax rates, the extent of corruption and various institutional aspects of the labour market influence the relative size of different segments of the labour market (unemployment, employment, self-employment and activity in the hidden economy) as well as the tax revenues in both developed market economies and transition countries. After developing a theoretical framework, establishing theoretical assumptions and taking into account certain methodological considerations, we test our hypothesis by undertaking alternative econometric investigations on data for 28 OECD countries and partly on 18 transition countries for the period 1995-2000.

The data available are mostly highly aggregated and refer to a few years only; however, we could collect them for many countries in a comparable form. These conditions call for the use of cross-section analyses which will be pursued here. We make the investigation on a broad sample of countries containing the developed market economies (OECD) and a large number of transition countries (depending on data availability). Cross-section analysis is known to provide a rather static picture. However, in the case of a more or less homogenous population, we can draw implications from the cross-sectional behaviour for longitudinal ones. Thus we will be in a position to analyse the motives and the relative strength of these motives in the decisions that labour market participants make about moving between the various segments of the labour market.

Figure 1 presents the segments of the labour market that we are investigating. We see the categories of unemployed, employees and self-employed: these three make up participation in the labour market, while the population of inactive persons remains outside the market. As indicated in the figure, participation in the hidden economy may belong to any other segment of the labour market. However, we may assume that people from the category of employees have a relatively lower tendency to work simultaneously in the hidden economy than do people from other segments: this is symbolized in the figure by the narrower part of the ellipsis of the hidden activity overlapping with the employee category.

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Figure 1

Developed market economies: segments of the labour market

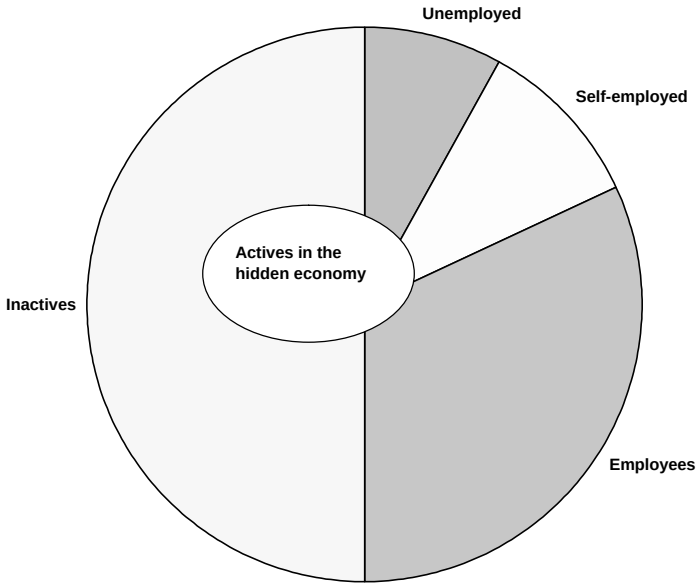
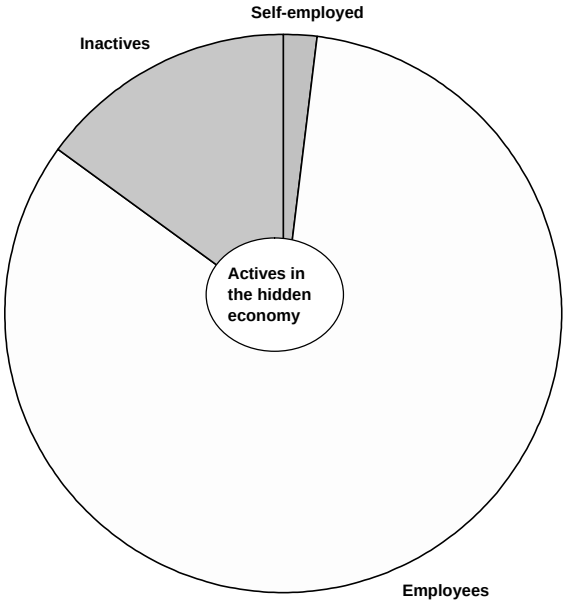


Figure 2

Transition countries: segments of the labour market before transition



In developed market economies the relative shares of the various segments of the labour market are rather stable. In the transition economies, however, various developments in the past 15 years have accelerated the migrations among these segments. A stylized distribution of the segments of the labour market before transition is presented in Figure 2; ten or more years later, however, the stylized distribution is very similar to that shown in Figure 1. The difference reflects the general empirical evidence that, due to institutional changes and various demand and supply shocks, the shares of the inactive, unemployed and self-employed have increased, as did the share of those who are engaged in the hidden economy.

The literature on the cross-country differences in the rates of unemployment, employment and self-employment focuses on the effects of taxes and labour market institutions. In the studies searching for explanations for the cross-country differences concerning the hidden economy the role of taxes has been generally emphasized. Recently the differences in the level of corruption have received more and more attention in the theoretical and empirical models.

This paper attempts to explain how tax rates, the extent of corruption and various institutional aspects of the labour market influence the relative size of the segments of the labour market and tax revenues in developed market economies and in the transition countries. The novelty of our analysis is, on the one hand, that the role of corruption is closely connected with tax rates and the two effects can be combined in a new indicator: the subjective tax rate. On the other hand, this joint indicator is taken into account not only in explaining the size of the hidden economy, but along with labour market rigidities, the joint indicator becomes a major factor in the explanation of cross-country differences in the rates of unemployment, employment and self-employment and in government tax revenues.

Section 2 of the study provides a brief review of the literature on the role of corruption in the economy. In section 3 we continue with summarizing the results of the literature, here on the role plaid by taxes and corruption in the emergence and development of the hidden economy. In section 4 we introduce the new indicator – the subjective tax rate – and analyse its structure and order of magnitude. Section 5 is the core part of the study: it investigates the impact of the subjective tax rate (and other factors) on the development of the various segments of the labour market. Section 6 deals with the fiscal effects of the subjective tax rates (i.e. tax revenues), while section 7 returns to the determination of the hidden economy. The concept of the hidden economy is broadened to a new concept, the ‘repressed economy’, and empirical estimations are made about its size. The study concludes with a Summary.

2 The causes and effects of corruption in the economy – a brief review of the literature

Corruption has different definitions. The simplest definition is that it is the abuse of public power for private gains. From this definition it should not be concluded, however, that corruption cannot exist in private sector activities. In large private enterprises, and especially when the managers are not the same as the owners, this phenomenon can also exist, but here the conflict between public and private interests has to be reassessed to company vs. personal private interests.

In some countries corruption is widespread, while in others it is persistently low. Why do officials in some countries misuse public office for private gain more frequently and for larger payoffs than officials in other states? Different theories associate the cross-national variation in the extent of corruption with particular historical and cultural traditions, with the level of economic development, with political institutions and with government policies.

Djankov et al. (2001), La Porta (1997a,1997b,1998a,1998b) and Treisman (2000) found support for several arguments that may affect the expected costs, benefits, or both of a corrupt act. The most obvious cost is the risk of getting caught and punished. The probability of getting caught depends in part on the effectiveness of the country's *legal system*. Legal systems differ in the degree of protection and the opportunities for recourse they offer to private property owners harmed by corrupt acts of officials. Djankov et al. (2001) argue that common law systems (found mostly in Britain and its former colonies) differ in this dimension from civil law systems (found mostly in continental Europe and its former colonies). The common law tradition developed first in England, to some extent as a defence of the parliament and property owners against the attempts by the sovereign to regulate and expropriate them. This type of law developed from precedents established by judges, usually allied with the property-owning aristocracy against the Crown. Civil law systems in their Napoleonic, Bismarckian or other forms developed more as an instrument used by the sovereign for state-building and controlling economic life. This type of law developed from codes drawn up by jurists at the sovereign's bidding. Djankov et al. (2001) and Treisman (2000) hypothesize and show that the greater protection of property against the state embodied in common law systems improve various aspects of government performance, including the prevention or reduction of corruption.

Legal systems differ not just in the formulations and original intent of laws, but also in the prevailing expectations and practices that govern how the laws are enforced. This refers to the role of *legal culture*. The conceptions of the social role of law and the relative importance of law in preserving social order differ across countries. In Britain, and in some of its former colonies, scholars have noted an almost obsessive focus on the procedural aspects of law. In many other cultures, social order is associated with the respect of hierarchy and the authority of offices. The willingness of judges to follow procedures, even

when the results threaten the hierarchy, clearly increases the chance that the officials' corruption will be exposed.

Religious traditions have often been thought to condition cultural attitudes towards social hierarchy. Where more hierarchical religions – Catholicism, Eastern Orthodoxy, and Islam – dominate, challenges to officeholders might be rarer than in cultures shaped by more egalitarian or individualistic religions, such as Protestantism. A second pathway by which religion could affect corruption levels is via the historical pattern of influence that developed in different settings between the Church and the State. In religious traditions such as Protestantism, which arose in some versions as dissenting sects opposed to the Church, religious belief may play a role in monitoring and denouncing abuses of position by state officials. In other traditions – such as the Islam – where Church and State hierarchies are closely intertwined, such a role may be absent.

In *ethnically heterogeneous societies* it has been common for the groups that come to power to fashion government policies such that they expropriate (or kill) the ethnic losers, restrict their freedom of opposition, and limit the production of public goods. This way they prevent those outside the ruling group from also benefiting and getting stronger. Political theories predict that as ethnic heterogeneity increases, governments become more interventionist and less efficient, and the quality of public goods falls, as do the size of government and political freedom. As Djankov et al. (2001) shows, higher fractionalization is associated with more interventionism, lower government efficiency, i.e. more corruption, and inferior provision of public goods. The adverse effects of ethnological fractionalization on government performance are broadly consistent with the argument that it captures the predisposition of ethnic groups in power to redistribute.

For a number of reasons, the risk of exposure of corrupt acts may also be higher in more democratic, open political systems. Freedom of association and freedom of the press engenders public interest groups and reporters with a mission and the right to expose abuses. Greater civic engagement may lead to closer monitoring. Exposure may also be more likely in more economically developed countries. *Economic development* increases the spread of education, literacy, and depersonalized relationship – each of which should raise the odds that an abuse will be noticed and challenged. The other argument is that development improves government performance. Richer countries are less interventionist in that they protect property rights and regulate better, although they also have higher tax rates.

One of the specific features of corruption is that, except for a few interested persons, it is invisible. Therefore the direct measurement of the intensity or spread of corruption is very difficult. There are several indirect ways, however, of getting information about its prevalence in a country or in an institution. Information can be obtained from

– reports on corruption available from published sources (newspapers, journals);
– case studies about corrupt agencies such as tax administrations, customs, and police;
– questionnaire-based surveys: these can be related to a specific institution or to a whole country; these surveys measure the perception of corruption rather than corruption *per se*.

Currently, country-wide surveys are available from the following organizations:

(1) Global Competitiveness Report by the World Economic Forum (Geneva);

(2) Political and Economic Risk Consultancy (Hong Kong);

(3) Transparency International;

(4) Political Risk Services;

(5) The Gallup;

(6) The World Bank.

The results obtained from these surveys are now widely used by researchers and business people. The best-known of these surveys, the corruption index, has been constructed and compiled by Transparency International. In this paper the published values of this index will be used. Transparency International's annual index of 'perceived corruption' represents a poll of polls, constructed by a team of researchers at Göttingen University from a number of individual surveys of businessmen or local population of the relevant countries as well as several ratings by economic risk analysts and country experts.

Over the past ten years, when the nature and impact of corruption gained growing attention among scholars, politicians and public officials, numerous investigations have been made about the effects of corruption on the economy. Several cross-sectional econometric analyses using the available quantified indices of corruption were carried out, reporting important quantitative results regarding the effects of corruption on various macroeconomic variables. These results by and large suggest that corruption has a negative impact on *economic growth*. The detailed results that support this outcome are the following: Corruption reduces *investment* and, as a consequence, the growth rate of output (Mauro, 1995); it reduces *expenditure on education and health* (Mauro, 1998); decreases *public investments* (Tanzi and Davoodi, 1997) and also reduces the outcomes of public spending. For example, public health spending lowers child and infant mortality rates in countries with low level of corruption (Rajkumar and Swaroop, 2002). Corruption distorts the effects of industrial policy on investments (Ades and Di Tella, 1997); diminishes the *productivity* of public investments and the productivity of the country's infrastructure (Tanzi and Davoodi,1997); reduces *tax revenues*, mainly through its adverse impact on the work of tax and customs administrations, thereby limiting the government's ability to realize

the needed level of *public expenditures* (Tanzi and Davoodi, 1997); corruption also reduces *foreign direct investment*, because it operates as an additional tax (Wei, 1997).

In the investigations of the different segments of the *labour market*, i.e. unemployment, employment and self-employment, the direct effect of the corruption is rather neglected (an exception being Boeri and Garibaldi, 2000).

The impact of corruption has been seriously taken into account only in the investigation of the *hidden (unofficial) economy*. One expert contemplates about a substitutive relationship between corruption and the hidden economy (Rose-Ackerman, 1997), but others, based on empirical studies, stress complementarity: countries with more corruption and bribery have, as a rule, larger hidden economies (Loyaza, 1997; Johnson et al., 1997, 1998, 1999; Friedman et al., 2000).

3 The role of tax rates and corruption in the hidden economy – survey of the literature

Loyaza (1997) presents the view that informal economies arise when governments impose excessive taxes and regulations that they are unable to enforce. Loyaza studies the determinants and effects of the informal sector using an endogenous growth model in which production technology depends essentially on congestable public services.

Using data from Latin American countries in the early 1990s, he tests some of the implications of the model and estimates the size of the informal sector in these countries. He uses a MIMIC model of latent variable, where exogenous causes determine the latent variable, and the latent variable determines a set of endogenous indicator variables,[1] The casual variables are the corporate income tax rate, a proxy for labour market restrictions and a proxy for the strength of the enforcement system (an average of three subjective indicators, namely the quality of bureaucracy, corruption in the government, and the rule of law, reported in the International Risk Guide for the period 1990-1992). The calculations show that the informal sector depends positively on proxies for tax burden and labour market restrictions, and negatively on a proxy for the quality of government institutions.

Johnson, Kaufmann and Shleifer (1997), using the sample of the transition countries, examine how the interplay of politics and economic and institutional incentives influences the growth of the unofficial economy and, in turn, how the unofficial economy affects economic performance. A simple model of tax and regulatory incentives that lead firms to choose between operating in the official and the unofficial sector is provided. A higher unofficial economy leads to a loss of public revenues, less public goods, such as law and

[1] About the MIMIC model see section 7.1 below.

order, a decrease in the productivity of firms and a further boost to the unofficial economy. Firms in the unofficial sector neither pay official taxes nor share in public goods (such as law and order), but instead pay private agencies – the 'mafia' – for contract enforcement and protection from thieves. A multiple equilibrium model ensues.

The empirical analysis, based on data from a wide variety of sources, offers support to the model. As output in the unofficial sector is not captured in officially measured GDP, total GDP is estimated from electricity consumption. The results suggest substantial variation in the size of the unofficial sector in the individual transition economies, as well as important differences in both levels and growth rates of total GDP compared with official GDP. According to the results, between 1989 and 1995 the relative size of the unofficial economy changed slightly on average in Eastern Europe; by contrast, in the countries of the former Soviet Union the average ratio of the hidden economy rose from 12% to 34%. This means that e.g. for Russia, in 1995, total GDP is 74% of its 1989 level, while official GDP is only 49% of its 1989 level.

To quantify the relative costs and benefits of operating in the official economy, the authors use an array of indicators including measures of liberalization, privatization, deregulation, corruption, and tax fairness, as well as characteristics of the legal environment – legal safeguards for investment, the rule of law, and the extensiveness and effectiveness of legal systems in protecting investment –, the public goods most relevant to their model. Better performance in terms of these institutional and legal reform measures is associated with a smaller unofficial economy and higher official GDP. Also, a large unofficial sector and less official output are associated with larger budgetary deficits and higher inflation.

Friedman et al. (2000) raise the question: what drives entrepreneurs and large businesses underground? They bring up two competing hypotheses: (1) high taxes, (2) special political and social institutions that govern the economy, such as excessive bureaucracy and corruption, and a weak legal environment. When testing the two hypotheses they use data from 69 countries for the 1990s for variables such as tax rates, bureaucracy, corruption, the legal environment, and the size of the unofficial economy. The analysis reveals no evidence that higher direct or indirect tax rates are associated with a larger unofficial economy. In fact, the authors find some support to the relationship that higher direct tax rates are associated with a smaller underground sector. However, when per capita income levels are controlled for (in order to allow for the possibility that richer countries have a better-run administration, and operate with higher tax rates), this paradoxical relationship ceases to be significant. By contrast, more bureaucracy, greater corruption and weaker legal environment are all associated with a larger unofficial economy, even (in most cases) when per capita income is controlled for.

These findings are confirmed not only for the whole sample, but also for different groups of countries, such as the OECD countries, the transition economies and Latin American states. While Friedman et al. work with eight different measures of tax rates, eventually they focus on the synthetic index of tax burden of the Heritage Foundation[2], in which a higher score (on a scale of 1 to 5) means more onerous taxation, i.e. higher average and marginal tax rates. The negative or insignificant relationship between tax rates and the unofficial economy in the OECD countries is a real surprise, particularly because this analysis needed data to start with on the size of the hidden economy. And in order to estimate data on the size of the hidden economy (through the use of the so-called currency demand estimation method) the positive influence of tax rates had to be already assumed and verified (see Schneider and Enste, 2000).

Johnson et al. (1999) also investigate the relationship between taxes and the unofficial economy. After building a theoretical model, they empirically show that the tax burden on the agents depends much more on the extent of bribery and corruption than on the size of the tax rates *per se*. This study uses indicators for the tax burden from the Global Competitiveness Survey 1997 of the World Economic Forum.[3] Johnson et al. find an insignificant relationship, with ambiguous sign, between the size of corporate and income tax rates on the one hand and the tax burden as reported by the firms on the other. They also find that the extent of bribery and corruption significantly affects the tax burden felt by the enterprises.

While the previously mentioned empirical analyses investigated the impact of tax rates and corruption on the hidden economy separately, in this paper we concentrate on the impact of the interaction between tax rates and corruption, namely the subjective tax rate, on the hidden economy.

4 A new indicator: the subjective tax rate

Theory usually differentiates between two types of corruption: small and grand corruption. Small corruption – which means the corruption of bureaucrats, tax inspectors and administrators – is practically an extra tax levied on business. Grand corruption – which is connected with the attitude of politicians, representatives of the parliament and others – influence the taxpayers' moral behaviour. A higher level of small corruption therefore means that the nominal tax rate of *t* will be complemented with an additional tax related to corruption. Higher grand corruption in turn signals that in the given country public revenues

[2] This index is an average of income taxes and corporate taxes adjusted for other taxes, such as value-added tax, sales tax, and state and local taxes.

[3] This source collected answers for the following question: 'Does the tax system in your country hinder or enhance business competitiveness?' The evaluation ranged between 1 and 7, where a higher value meant a better opportunity for private business.

are less likely to be used for the necessary public services, and also that the risk of conducting orderly business is higher. Under extensive grand corruption the main functions of the public sector are distorted: the allocative function (allocation between social and private goods), the redistributive function (redistribution between the rich and poor) and the stabilization function (the use of the budget policy to maintain a sufficient level of employment, price level stability, budget deficit, and so on).

Thinking in a cost-benefit framework, the decision-maker (employee, employer, tax payer, etc.) observes the *combined cost* of the actual tax obligations and corruption. The *future benefits* to be materialized from the recent or current tax revenues are only partly observed, because some benefits are realized only in the long term. However, the decision-maker observes that in a corrupt institutional system the benefits are reduced, they are eroded, and this means an inefficient use of tax revenue (for example, extra costs in healthcare, legal protection, protection against crime, etc.).

In the literature about tax compliance there are some theoretical and experimental results about a series of related questions, such as, how moral rules and sentiments guide individual decisions about tax returns; and how taxpayers' assessment of government expenditures and government corruption might influence compliance.

Spicer and Lundstedt (1976) and Smith (1992) hypothesize that a taxpayer will feel 'cheated' if he believes that his tax dollars are not well spent, and may reciprocate by refusing to pay his full tax liability. Alm, Jackson and McKee (1992) perform experiments to test this idea. They find a greater willingness to comply when participants perceive that they will receive benefits in public goods funded by the taxes collected. Using experimental methods Webley et al. (1991) also examine what role the taxpayers' satisfaction with government plays in the compliance to pay these taxes. They find that those participants whose responses to a survey taken several months before the experiments indicated an alienation from government or a negative attitude towards laws, were significantly more likely to have engaged in tax evasion during the experiments. Pommerehne, Hart and Frey (1994) found in a theoretical model that the greater the deviation between the individual's optimal choice of public goods provision and the actual level, the more the other taxpayers have underpaid their taxes; the higher the level of government waste in the previous period, the less the individual is willing to contribute in the present. Hanousek and Palda (2002) found in a survey investigation for the Czech and Slovak Republics, Hungary and Poland that those who believe they are getting quality government services also tend to evade taxes much less than those who do not believe they are getting quality services. The authors show that governments are constrained in their tax collection by the perceptions people have of the quality of government services they receive.

According to the above consideration we can state: a simple comparison of statutory tax rates across countries may be misleading since in this case we do not take into account the environment in which tax rates let their impact be felt. Here the environment means the way taxes are set and collected (coherence, transparency and orderly tax system and collection) and the way taxes are used in the provision of government services (again transparent, orderly and economical utilization). For a proper cross-country comparison of tax rates we define a new indicator, the so-called *subjective tax rate*, which combines the traditional tax rate with the level of inefficiency of the institutional environment.[4] The latter will be proxied by the level of corruption in the given country.

Let us assume that the corruption is considered by people as a burden and this burden is translated into tax-equivalent units. The tax-equivalent burden of corruption shows the effect of corruption as if it implied an additional tax.[5]

The size of corruption in tax-equivalent units can be expressed as follows:

(4.1) $t_k = a_1(k^*-k)$

or

(4.2) $ln\ t_k = a_2\,(ln\ k^*- ln\ k)$

where t_k : the cost of corruption expressed in tax-equivalent units, per cent
k : corruption index; a higher value means lower corruption (1, …. k*)
k*: maximal value of the corruption index, meaning a corruption-free environment

The subjective tax rate is the sum of the traditional tax rate and the tax-equivalent of corruption:

(4.3) $t_s = t + t_k = t + a_1\,(k^*-k)$

or

(4.4) $ln\ t_s = ln\ t + ln\ t_k = ln\ t + a_2\,(ln\ k^*- ln\ k)$

where t_s : subjective tax rate
t : traditional statutory tax rate

It is understandable why we call this rate a subjective tax rate: it reflects that the objective values of traditional tax rates are, as a rule, perceived or interpreted by economic agents in the light of the quality of public administration which sets, collects and spends these taxes and which can be proxied by the perceived corruption.

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[4] A similar concept was introduced in Johnson et al. (1999) where the authors develop a theoretical model of the informal economy in which tax rate and corruption are combined in one variable, the so-called generalized tax rate on output. As they write:'The generalized tax rate *t* includes taxation, regulation and corruption.' (p.4.)

[5] The idea of the tax equivalent of corruption is taken from Wei (1997) and Barth, Hall, Kurtzman, Wei and Yago (2001), where in the investigation of FDI in a cross-country perspective the opacity index is transformed into a tax equivalent.

While the subjective tax rate is primarily perceived at the micro level, its perception is communicated at large (as reflected also in the corruption indices characteristic of the countries), and therefore its impact can be felt and interpreted at the macro level as well. In the present paper we deal with the subjective tax rates at the macro level and use this indicator to make international comparisons.

The actual weight of the subjective tax rate compared to the traditional tax rate (the size of parameters a_1 or a_2) has to be defined empirically. The tax-equivalent unit of corruption can be assessed within a regressional framework, where particular variables are explained among other factors by the effects of the traditional tax rate and corruption. After identifying a_1 or a_2 we can say that in its effect on the explained variable one unit change in corruption intensity is equal to certain unit changes in the statutory tax rate.

According to our preliminary regressional analyses, the form of the subjective tax rate is close to that in (4.4), where a_2 is close to 1. Namely:

(4.5) $\quad ln\ t_s = ln\ t + ln\ t_k = ln\ t + ln\ k^* - ln\ k$

In the next sections of this paper we will test whether the subjective tax rate, constructed according to the above described formula, is really meaningful and operates in a sensible way in the labour market and public finances.

The scale of the subjective tax rate depends on the scales of its constituting factors. It reaches its maximum level in the case when the agent operates in the maximally corrupt environment and he is obliged to pay the largest physically possible tax from his revenue. Naturally, such an extreme situation does not occur in reality.

It is worth investigating, by looking at some examples, what values the subjective tax rates can have in reality. Taking the traditional statutory tax wedge (the ratio of income taxes and social security contributions to labour cost) and Transparency International's corruption index (which moves from 1 to 10; a higher index means lower corruption), we can see that, in an international comparison, the highest traditionally measured and recorded tax wedge is close to 50%. In this case the subjective tax rate is 50% in a corrupt-free, while 500% in a maximally corrupt environment. In the case of a medium level of corruption (corruption index = 5), the subjective tax rate is 100%. The lowest internationally recorded tax wedge is 5% and is applied in South Korea. Here the lowest subjective tax rate would be 5% (in a corrupt-free environment), while the highest would be 50%. We can see that the values of the subjective tax rate move between 10% and 110% in reality.

Figure 3

Traditional and subjective tax wedges in the OECD countries, 1997

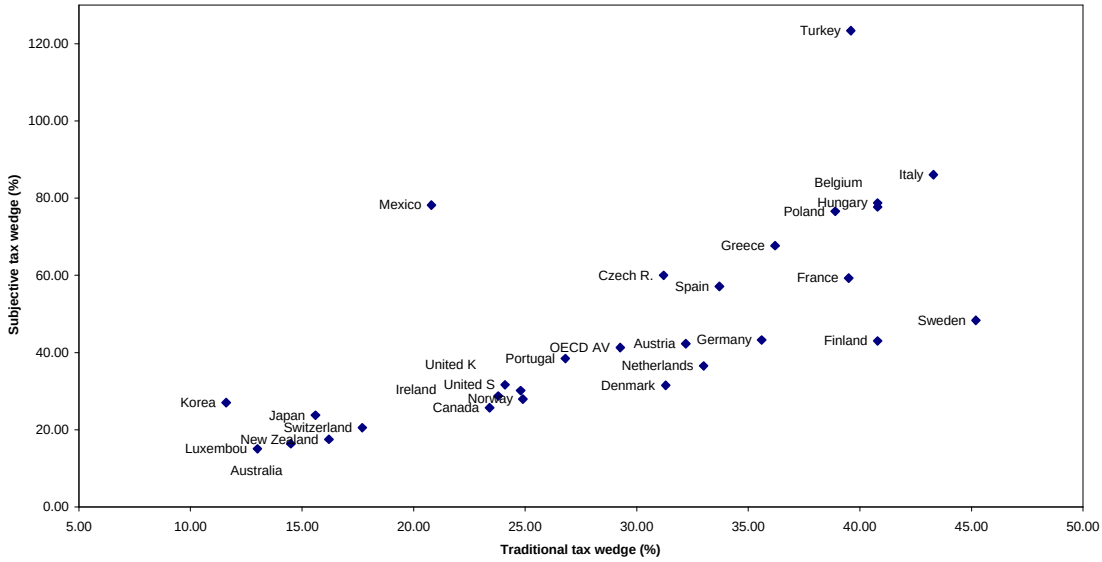
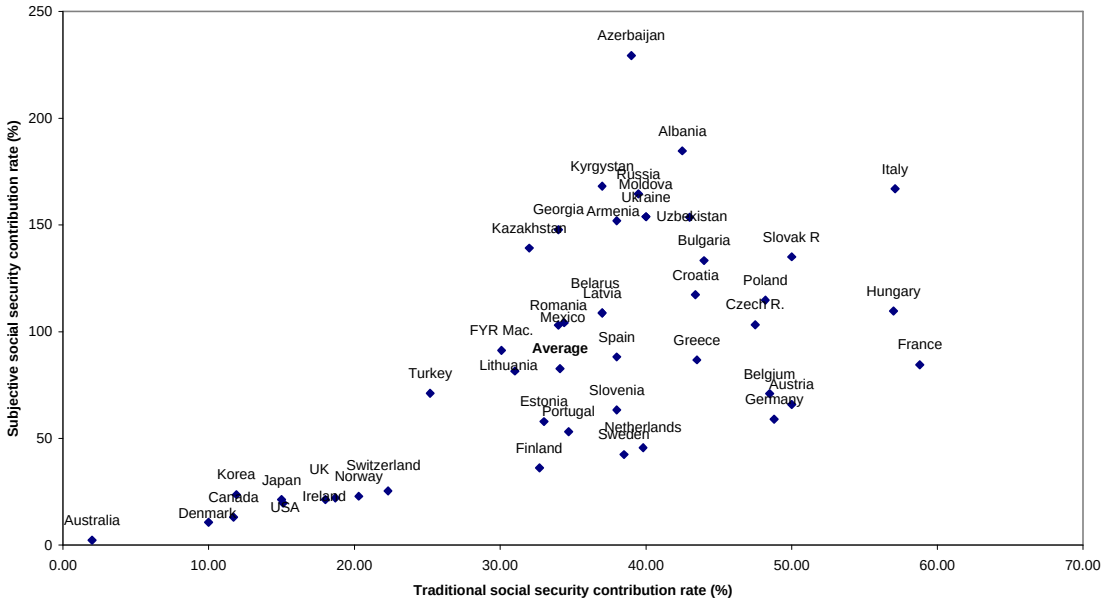


Figure 3 presents cross-country data for the traditional tax wedge and the corresponding values of the subjective tax wedge in a joint coordinate system. Here we also show the average values of both tax rates (OECD AV). We can see that Sweden has the highest traditional tax wedge, but with respect to the subjective tax wedge, it is close to the OECD countries' average value. Germany, the Netherlands and Denmark also have higher traditional tax wedges than the average, but the values of their subjective tax wedges are below the OECD average. Mexico is the opposite example: its traditional tax wedge is below-average, but according to its subjective tax wedge it is exposed to a much higher subjective tax burden than the average of the OECD countries.

With the help of a broader group of countries (OECD and transition economies, altogether 44 countries) we can show the traditional rate of the social security contributions (paid by both employers and employees) in per cent of gross wages, and their corresponding subjective tax rates (Figure 4). Here one can see that most of the post-socialist countries have not only above-average traditional social security contribution rates (AVERAGE in the figure), but their subjective tax ratios are also much higher than the average of this group.

Figure 4

Traditional and subjective social security contribution rates



5 The impact of the subjective tax rate on different segments of the labour market

5.1 Hidden economy

The starting point of this study was the paradoxical observation that there is no connection between the size of the hidden economy and the tax rates. According to these studies (Johnson et al., 1998,1999; Friedman, 2000) a high level of corruption and weak performance of the legal and institutional environment induce people to work in the hidden economy. In this section of the study we show – with the help of different indicators of taxes and three different samples of countries – that the subjective tax rate exerts a strong influence on the size of the hidden economy. (In all three samples data for the size of the hidden economy are given from different estimations.) Indeed, the tax rate affects the decision to work in the official or hidden economy not simply due to its size, but through the perception of the actors of the economy who evaluate the tax obligation in their own environment. This feature is captured by the subjective tax rate.

The first sample of countries investigated is the one used by Friedman et al. (2000): 33 countries including 18 developed, 8 developing and 7 transition countries. We set up the regression functions in a different way than did Friedman et al.; we work with

logarithmic values and filter out two obvious outliers (Poland and Slovakia).[6] Despite these modifications we get basically similar results as Friedman et al.: while the separate individual tax rates (income tax and corporate tax rates) do not show a significant relationship with the size of the hidden economy, an increase in the corruption index (higher value means lower corruption) decreases significantly the size of the hidden economy. (See Table 1, columns [1] and [2].) In column [4] in Table 1 we can see the results from the regression, in which, instead of the traditional tax rates, we take into account the subjective tax rates. In this calculation the effect of the subjective tax rates on the size of the hidden economy is significant: with higher subjective tax rates the size of the hidden economy becomes also higher.

Table 1

Regressions explaining the size of the hidden economy, sample of 33 countries

Dependent variable: size of the hidden economy (per cent of official GDP)

Explanatory variable	Equations			
	[1]	[2]	[3]	[4]
ln GDP/capita	-18.4	-9.86	-12.21	-12.87
	[-12.39]	[-3.44]	[-452]	[-7.58]
ln INCOMETAX	2.28		3.97	
	[1.24]		[2.20]	
ln CORPTAX	6.24		3.81	
	[1.77]		[1.19]	
ln CORRUPTION		-9.31	-9.32	
		[-2.3]	2.39]	
ln SINCOMETAX				4.03
				[2.29]
ln SCORPTAX				4.47
				[2.16]
Dummy	Slovakia	Slovakia	Slovakia	Slovakia
	Poland	Poland	Poland	Poland
aR^2	0.85	0.81	0.86	0.86
RMSE	5.65	5.59	4.96	4.87
Method	OLS	OLS	OLS	OLS
n	35	34	33	33

Notes: t-ratios underneath estimated parameter; n: number of observations; OLS: Ordinary Least square method; RMSE: Root mean square error.

Source: Own calculations, data for hidden economy from Friedmann et al. (2000)

[6] Poland and Slovakia seem to be outliers with a wide margin. This may be connected with the problems of the Kaufmann-Kaliberda method (Kaufmann and Kaliberda, 1996) used for the estimation of the size of the hidden economy (see Eilat and Zinnes, 2000, Lackó, 1999).

The next sample contains 21 OECD countries, and here we make calculations with another type of tax rate, namely with the tax wedge, i.e. the combined ratio of income tax, employers' and employees' social security contribution to the labour cost. The calculations are shown in Table 2. The tax wedge and the corruption index explain the size of the hidden economy both separately and jointly in this sample. In column [3] we can also observe that the absolute size of the coefficient of the tax wedge is approximately equal to that of the coefficient of the corruption index.[7] From this coincidence one may derive that the subjective tax rate is the single relevant explanatory variable here. Inspecting this part of the estimated function, it can be seen, that

(5.1) a* ln TAXWEDGE – a* ln CORRUPTION = a* STAXWEDGE

Table 2

Regression equations explaining the size of the hidden economy, 21 OECD countries, 1996

Dependent variable: size of the hidden economy (per cent of official GDP)

Explanatory variable	Equations			
	[1]	[2]	[3]	[4]
ln GDP/capita	-11.1	-6.9	-6.7	-6.6
	[-5.8]	[-1.8]	[-2.6]	[-2.9]
ln TAXWEDGE	8.1		7	
	[3.2]		[3.45]	
ln CORRUPTION		-8.8	-6.7	
		[-2.5]	[-2.9]	
ln STAXWEDGE				6.9
				[4.9]
R^2	0.67	0.61	0.73	0.74
n	21	21	21	21
RMSE	3.7	4.03	3.45	3.36
method	H-W	H-W	H-W	H-W

Source: own calculations, data for hidden economy from Schneider (2000) H-W method: Huber-White estimation method with robust estimator of variance.

For this reason, when proceeding with the estimations, it comes as no surprise that the subjective tax wedge has a significant explanatory impact on the size of the hidden economy in this sample (see columns [4] in Table 2).

[7] We experienced the similar correspondence between the size of the coefficients of the tax rates on the one hand, and of the corruption index, on the other, in column [4] of Table 1.

The third sample consists of 18 transition countries. Here we investigate the impact of the social security contribution rate and of corruption on the size of the hidden economy. Although in this sample, according to the relevant coefficient, the nominal social security contribution rate has no significant impact on the size of the hidden economy *per se* (columns [1] and [2]) in Table 3), the *subjective* social security contribution explains significantly the size of the hidden economy (see column [3] in Table 3).

Table 3

Regressions explaining the size of the hidden economy
18 transition countries, 1997

Dependent variable: size of the hidden economy (per cent of total GDP)

Explanatory variable	Equations		
	[1]	[2]	[3]
ln GDP/capita	-25.77	-16.5	-17.2
	[-4.29]	[-3.09]	[-2.51]
ln SOCSC	16.74	17.9	
	[1.18]	[1.18]	
ln CORRUPTION		-20.2	
		[-1.74]	
ln SSOCSC			19.37
			[2.56]
DUMMY	Uzbekistan	Uzbekistan	Uzbekistan
	Slovakia	Slovakia	Slovakia
R^2	0.76	0.81	0.81
RMSE	9.7	8.9	8.6
n	18	18	18
method	H-W	H-W	H-W

Source: Own calculations; data for hidden economy from Johnson et al. (1999).

The calculations on the three samples of countries above give a preliminary indication that the subjective tax rate is a relevant concept. However, the results have to be taken with caution in view of certain problems in the previous estimations:

(1) In the above-outlined calculations the variable of the size of the hidden economy was taken from outside, thus treated as exogenous, although we know very well that values for the size of the hidden economy in the literature are, as a rule, results of some estimation procedure. These estimations in turn usually take already account of the impact of different tax rates on the hidden economy. For this reason, when we investigate the impact of tax rates on the size of the hidden economy we can easily arrive at a tautological relationship. (An exception to the general use of tax impacts is

the estimation procedure of the size of the hidden economy based on the so-called total electricity method by Kaufmann and Kaliberda (1996).

(2) The above-mentioned similarity of the coefficients – the elasticity of the size of the hidden economy on tax rates and of the corruption index – may be accidental, determined by the actual sample we use.

(3) The causality of the relationship between the size of the hidden economy and the extent of corruption needs a thorough analysis.

For the above reasons, we carry out further investigations to show to what extent the subjective tax rate is a relevant concept. We focus on the determination of the behaviour of the different segments of the labour market – areas that are not as uncertain and invisible as the hidden economy. In the following sections of the study we analyse whether the subjective tax rates can contribute to explaining the cross-country differences in the rates of unemployment, employment and self-employment; we also show how the subjective tax rates affect developments in tax revenues of the budget.

5.2 Visible labour market segments

Various theories as well as empirical investigations of the labour market deal with the impact of tax rates and labour market institutions on the different segments of this market (see Leibfritz et al., 1997; Nickell, 1997; Jackmann, 2002; Daveri and Tabellini, 1997; Planas et al., 2003; Nickell, 2003).

It is well known that taxes on labour influence both workers' decisions about how much labour they supply and firms' decisions about how much labour they employ. Higher personal income taxes and employee social security contributions tend to reduce the return to working, which may discourage labour supply and depress potential output. Not only employment, but also wages may respond to the variation in labour taxes. The size and pattern of this response, however, depend on the institutional structure of wage bargaining, labour market policies and the degree of competition in the product markets. In the presence of rigidities on both labour and product markets, workers' resistance to taxes on their labour efforts can boost wage demands, thereby raising the labour costs for employers. At the same time, an increase in employer payroll taxes will raise labour costs directly, i.e. employers will not be able to offset them by lowering wages. Such shifting of taxes onto labour costs, in turn, decreases the demand for labour, as it decreases profitability and investment.

It is also well known that the individual groups of unemployed react differently to the wage rates in their employment decisions, because of the different elasticity of their labour supply. Females and young people have a more elastic labour supply because they tend

to be marginally employed. As the literature suggests, they react also more strongly to tax rates than do older males. In addition, Bertola, Blau and Kahn (2002) showed theoretically that the functioning of labour market institutions which are meant to improve workers' income share leads to larger disemployment effects when labour supply is more elastic. These authors also show empirically that the demographic groups other than prime-age males tend to be relatively less employed in more unionized and/or regulated labour markets.

Employee behaviour focusing on the subjective tax rate rather than on the usual taxes may modify these traditional effects of labour taxes: higher subjective taxes due to an increasingly corrupt environment may further discourage the supply of labour, but may also contribute to a lower demand for labour (e.g. through decreasing investment into new fixed assets due to higher costs or uncertainty caused by too high corruption).

In the following we will test these relationships for the different groups of participants of the labour market. The groups are formed by gender and age. We also investigate, however, a relationship so far not explored by others: we look for characteristic features of the different groups of participants of the labour market in terms of their reaction to the extent of corruption (the size of the corruption index) and of the subjective tax rate.

What follows are cross-country investigations on *unemployment rates*, for the full relevant cohort and by gender and sub-cohorts; on *employment rates*, again differentiating by gender and age cohorts; and *self-employment rates*, with and without unpaid family workers. The calculations are made on data for 28 OECD countries for the period 1995 to 2000. The factors tested are the usual explanatory variables in the literature, complemented by the level of the corruption indicator in the investigated countries as an element of the subjective tax rate. The regression equations are estimated by the Two-stage Least Squares method, with Huber-White-corrected standard errors in the presence of heteroscedasticity.

Since in the tested models the variable of corruption may be endogenous, it had to be instrumented. The selected instruments are cultural and institutional variables that are traditionally closely related to the extent of corruption according to the literature on corruption surveyed in section 2 of this study. These variables are: the average value of five different indices characterizing the level of ethno-linguistic fractionalization of the population; the legal origin of the Company Law or Commercial Code (English Common Law or continental-type law); the percentage of the population belonging to the Protestant religion; and the absolute value of the latitude of the country as a proxy for economic development.

5.2.1 Unemployment

In the explanation of cross-country differences in unemployment rates, labour taxes are, as a rule, important factors, along with the following ones: the generosity of the unemployment benefit system, the character of the wage bargaining system, the level of unionization, the strength of employment protection legislation, the importance of labour standards, and active labour market policies.

A generous unemployment benefit system increases the level of unemployment through two mechanisms: (1) it reduces the fear of unemployment and directly increases pressure on the wages paid by the employees; (2) it decreases the 'effectiveness' of unemployed people as potential fillers of vacancies, by allowing them to be choosier (Nickell, 1997).

The wage bargaining system has two sides, employees and employers. Depending on the strength and the coordination of the two sides the wage bargaining system has different effects on the labour market. Unions and the indicator reflecting the size of unionization, the so-called union coverage, may play an important role. High union coverage tends to contribute to raising the pay, and by this contributes to a rise in the unemployment rate. This effect, however, may not occur if the unions and employers coordinate the bargaining activities.

Nickell (1997) shows that neither employment protection legislation nor labour standards are as important in impacting unemployment as they are usually believed to be. He also shows that the sheer size of payroll taxes alone is not as important as are payroll taxes taken together with income tax and consumer taxes, the so-called tax wedge. In the calculations of this study *tax wedge* is defined as income tax plus social security contributions (employer + employee), and this will be considered as one of the most important tax variables.[8]

In Table 4 the results of different regression calculations are presented to explain the *unemployment rate* in the OECD countries in 1995-2000. Here we have three different regressions: one without the variable representing corruption (column [1]); one including the variable of corruption as an additional variable (column [2]); and finally one with the variable of corruption placed into the variable of the subjective tax wedge (columns [3] and [4]).

In the first regression the parameters of the following variables are significant and have the proper signs: the tax wedge, a proxy of the labour rigidities (based on the number of ILO convention regulations, protecting employees, that have been ratified by the relevant national parliament), the intensity of the employers' and employees' coordination in wage

[8] This complies with the use of the concept of tax wedge in OECD analyses and statistics.

bargaining, the inflation rate, and a time trend. The effect of the replacement ratio and the union coverage and union density variables turned out not to be significant. The R^2 is 0.66.

Table 4

Regressions for the unemployment rate

Dependent variable: ln unemployment rate

Explanatory variable	Equations			
	[1]	[2]	[3]	[4]
ln TAXWEDGE	0.88	0.7055		
	[7.17]	[5.62]		
ln CORRUPTION		-0.7087		
		[-3.64]		
ln STAXWEDGE			0.7067	0.711
			[8.39]	[9.22]
ln BENEFIT	0.015	0.2082	0.2078	0.214
	[0.196]	[2.44]	[2.67]	[3.15]
ILOCONV	0.0076	0.0056	0.0056	0.003
	[5.48]	[4.62]	[4.64]	[2.85]
ln COORDINATION	-0.7544	-0.9195	-0.9193	-0.853
	[-7.98]	[-9.98]	[-10.44]	[-11.7]
DENSITY	0.0019	0.0061	0.0061	0.007
	[1.48]	[3.90]	[4.90]	[5.25]
ln INFLATION	-0.081	-0.091	-0.0906	-0.091
	[-2.57]	[-2.23]	[-2.36]	[-2.49]
TREND	-0.05	-0.06	-0.06	-0.061
	[-3.23]	[-4.45]	[-4.46]	[-5.02]
DUMMY	GER,HU	GER,HU	GER,HU	GER,HU,SP
n	122	117	117	117
R^2	0.655	0.7479	0.748	0.8035
RMSE	0.2852	0.2461	0.2449	0.2173
METHOD	INST	INST	INST	INST

INST: Estimation with instruments.

Source: Own calculations.

If we take into account the corruption index as an additional variable (column [2]), the sign of this variable is negative, which means that more corruption is associated with a higher unemployment rate, *ceteris paribus*. The sign is reasonable and complies with our expectation. In regression [2] we can see that the variable of replacement ratio becomes significant, and the R^2 is 0.748, i.e. higher than that of regression [1]. It is interesting to note that the absolute values of the parameters of the tax wedge and the corruption index (column [2]) are very close to each other, and the signs are the opposite, as in the previous section dealing with the determination of the size of the hidden economy. This relationship

of the two parameters again implies that the combination of the variables of tax wedge and corruption, i.e. the subjective tax wedge, is the relevant variable in this model.

The regression results in column [3] confirm this expectation, because the subjective tax wedge is significant, and the R^2 value is much higher than in the previous regressions. Such a correspondence between theoretical concepts and mathematical statistical estimations is very rare; therefore this result should be interpreted as a confirmation that the subjective tax rate (wedge) is a meaningful concept that really lets its effect be felt in the developments in the labour market. In the regressions we used dummy variables for Hungary, Poland and Germany, those countries that have experienced transition in the period of investigation. For Poland such a transition dummy was found not significant, for Hungary it was negative, while for Germany it turned out positive. (Unfortunately, for the Czech and Slovak Republics data for some of the variables were missing, so we had to exclude them from the sample.)

The regression results in column [4] show that the parameter of the subjective tax wedge is also significant when we use a dummy for Spain. In regressions [2], [3] and [4] the replacement rate and union density are also significant.

Table 5 presents regression calculations that explain the cross-country differences in the long-term unemployment rate. In columns [1], [3] and [5] the regressions do not contain the union-coverage variable. In regressions [1] and [5] we can see that the effects of the traditional tax wedge and of the subjective tax wedge are similar, while the fitting value of the estimation is higher when we take into account the subjective tax rate. When we insert into the regression the variable reflecting union coverage, the traditional tax wedge becomes insignificant. The coefficient of the subjective tax wedge becomes smaller than in the regression without union coverage, but it remains significantly positive, as in the regression without the union coverage indicator. The replacement ratio (BENEFIT) is significant in all equations, except for those where the corruption variable – in its pure form – is missing.

Summarizing the results, the cross-country differences in the long-term unemployment rates closely correlate with the size of the subjective tax wedge, and with other institutional variables: these factors combined can explain 79-86% of the variation in long-term unemployment rates. In calculations where the union coverage is included, some multicollinearity appears between the tax wedge (traditional and subjective alike) on the one hand, and the variable of union coverage, on the other. This is no surprise if we realize that the correlation between the traditional tax wedge and the coverage indicator is 0.70.

Table 5

Regressions for the long-term unemployment rate

Dependent variable: ln long-term unemployment rate

Explanatory variable	Equations					
	[1]	[2]	[3]	[4]	[5]	[6]
ln TAXWEDGE	1.35	0.39	0.26	0.0021		
	[3.68]	[1.87]	[1.05]	[0.01]		
ln CORRUPTION			-3.03	-1.85		
			[-6.37]	[-6.38]		
ln STAXWEDGE					1.37	0.75
					[5.98]	[4.94]
ln BENEFIT	0.136	0.08	0.95	0.59	0.52	0.31
	[0.93]	[0.62]	[4.65]	[4.68]	[3.43]	[2.55]
ILOCONV	0.018	0.013	0.013	0.012	0.013	0.011
	[5.82]	[5.85]	[4.37]	[5.04]	[4.53]	[5.10]
ln COORDINATION	-1.09	-1.32	-1.51	-1.51	-1.34	-1.42
	[-5.31]	[-8.67]	[-6.2]	[-8.66]	[-6.33]	[-9.15]
DENSITY	0.0009	0.0044	0.0160	0.0120	0.0056	0.0057
	[0.30]	[2.39]	[6.03]	[6.55]	[3.02]	[3.92]
COVERAGE		0.78		0.56		0.58
		[7.72]		[5.68]		[6.08]
ln INFLATION	-0.15	-0.11	-0.31	-0.22	-0.24	-0.18
	[-2.85]	[-2.87]	[-2.98]	[-3.32]	[-3.52]	[-3.96]
TREND	-0.113	-0.118	-0.101	-0.11	-0.106	-0.11
	[-3.92]	[-5.06]	[-3.81]	[-5.48]	[-4.39]	[-5.35]
DUMMY	G,HU	G,HU	G,HU	G,HU	G,HU	G,HU
number of obs.	114	114	114	114	114	114
R^2	0.71	0.83	0.73	0.86	0.79	0.86
RMSE	0.51	0.394	0.4918	0.36	0.438	0.36
METHOD	INST	INST	INST	INST	INST	INST

Source: Own calculations.

Table 6 presents regression results for the explanation of the variation in the *female unemployment rate*. Here the tax wedge and the corruption index play the same significant role when they are used separately (columns [1] and [2]) as in the general unemployment equation. The role of the subjective tax rate is similarly confirmed here: there is a significant effect of the subjective tax wedge on the female unemployment rate. In the regressions [2] and [3] the replacement ratio (BENEFIT) has a strong positive effect, which means that a high replacement ratio is particularly 'encouraging' for females to move into unemployment. When we include the corruption index (in column [2]) the union density turns out significant, while the union coverage not (that is why it is left out in the table). When we do not

consider the corruption index, R^2 is 0.74, while it is 0.77-78 in both equations where the corruption index and the subjective tax wedge are used as explanatory variables.

Table 6

Regressions for the female unemployment rate

Dependent variable: ln female unemployment rate

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	0.98	0.74		0.92	
	[8.52]	[5.84]		[7.81]	
ln CORRUPTION		-1.11		-0.85	
		[-4.94]		[-4.67]	
ln STAXWEDGE			0.88		0.89
			[9.55]		[10.88]
ln BENEFIT	0.063	0.39	0.33	0.34	0.35
	[0.647]	[3.74]	[3.70]	[4.07]	[4.73]
ILOCONV	0.0064	0.0056	0.0056	0.0018	0.0019
	[3.66]	[3.60]	[3.60]	[1.63]	[1.65]
ln COORDINATION	-0.78	-0.89	-0.87	-0.78	-0.78
	[-8.16]	[-8.74]	[-9.28]	[-9.59]	[-10.19]
DENSITY	-0.0002	0.0042	0.0030	0.0043	0.0045
	[-0.206]	[2.97]	[2.55]	[2.92]	[3.76]
COVERAGE	0.141				
	[2.63]				
ln INFLATION	-0.042	-0.12	-0.107	-0.107	-0.109
	[-2.9]	[-2.5]	[-2.71]	[-2.84]	[-3.04]
TREND	-0.055	-0.062	-0.059	-0.061	-0.061
	[-3.23]	[-3.89]	[-3.74]	[-4.96]	[-4.99]
DUMMY	G,HU	G,HU	G,HU	G,HU,SP	G,HU,SP
number of obs.	112	112	112	112	112
R^2	0.736	0.7685	0.78	0.86	0.86
RMSE	0.284	0.2663	0.259	0.2078	0.2081
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

In a next step we investigate whether there is any difference in the determination of the *male unemployment rate* from that of the female unemployment rate in terms of factors that influence them. In Table 7 we show three regressions explaining the male unemployment rate. In column [1] the parameters of the traditional tax wedge, the proxy of

Table 7

Regressions for the male unemployment rate

Dependent variable: ln male unemployment rate

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	0.7	0.66		0.77	
	[5.72]	[5.00]		[5.60]	
ln CORRUPTION		-0.37		-0.22	
		[-1.86]		[-1.13]	
ln STAXWEDGE			0.55		0.55
			[6.49]		[6.49]
ln BENEFIT	-0.096	0.0066	0.054	-0.021	0.066
	[-1.24]	[0.074]	[0.64]	[-0.26]	[0.86]
ILOCONV	0.0076	0.006	0.006	0.0039	0.004
	[5.84]	[5.02]	[5.06]	[3.11]	[3.16]
ln COORDINATION	-0.81	-0.95	-0.96	-0.89	-0.92
	[-8.03]	[-10.57]	[-10.75]	[-11.14]	[-11.05]
DENSITY	0.0048	0.0074	0.0084	0.0075	0.0090
	[3.36]	[4.26]	[5.81]	[3.98]	[5.7]
ln INFLATION	-0.1	-0.083	-0.093	-0.0076	-0.094
	[-2.48]	[-2.14]	[-2.29]	[-2.15]	[-2.32]
TREND	-0.057	-0.068	-0.07	-0.067	-0.071
	[-3.42]	[-4.47]	[-4.66]	[-4.64]	[-4.92]
DUMMY	G,HU	G,HU	G,HU	G,HU,SP	G,HU,SP
n	115	112	112	112	112
R^2	0.62	0.72	0.71	0.76	0.74
RMSE	0.3	0.255	0.259	0.2372	0.2465
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

labour market rigidities (ILOCNV), the index of employers' and employees' coordination in the wage bargaining and the union density are all significant and have the proper signs. It is an important result that, contrary to the female unemployment rate, the replacement ratio has no effect on the male unemployment rate. If we include the corruption index (column [2]), we find that the coefficient of corruption is not significant, despite the fact that in the previous regressions (in the case of total unemployment rate, total long-term unemployment rate and female unemployment rate) it played a decisive and significant role in the explanation of the unemployment rates. However, if we consider the subjective tax wedge as one of the explanatory variables (see column [3]), the subjective tax wedge

turns out significant with a positive sign, although with a smaller parameter. The fact that male unemployed are less sensitive to the traditional tax rate is well known in the literature, but it is a surprise that male employed are similarly less sensitive to the corruption index. Basically similar results were obtained for the young (aged 15-25) unemployed (see Tables 8, 9 and 10).

Table 8

Regressions for the young unemployment rate

Dependent variable: ln young unemployment rate

Explanatory variable	Equations		
	[1]	[2]	[3]
ln TAXWEDGE	0.91	0.72	
	[5.76]	[5.22]	
ln CORRUPTION		-0.43	
		[-2.34]	
ln STAXWEDGE			0.61
			[8.34]
ln BENEFIT	-0.167	-0.0283	0.019
	[-1.73]	[-0.29]	[0.24]
ILOCONV	0.0125	0.0106	0.0105
	[8.72]	[8.17]	[8.37]
ln COORDINATION	-0.85	-0.933	-0.0936
	[-8.86]	[-9.96]	[-10.92]
DENSITY	0.0041	0.0061	0.0070
	[2.72]	[3.50]	[4.68]
COVERAGE	-0.055		
	[-0.88]		
ln INFLATION	-0.067	-0.073	-0.083
	[-2.40]	[-2.49]	[-2.68]
TREND	-0.03	-0.039	-0.041
	[-1.47]	[-2.09]	[-2.16]
DUMMY			
n	110	105	105
R^2	0.68	0.77	0.77
RMSE	0.3199	0.2726	0.2704
METHOD	INST	INST	INST

Source: Own calculations.

Table 9

Regressions for the young male unemployment rate

Dependent variable: ln young male unemployment rate

Explanatory variable	Equations		
	[1]	[2]	[3]
ln TAXWEDGE	0.86	0.767	
	[5.44]	[5.60]	
ln CORRUPTION		-0.204	
		[-1.19]	
ln STAXWEDGE			0.54
			[7.46]
ln BENEFIT	-0.27	-0.2029	-0.11
	[-3.14]	[-2.22]	[-1.43]
ILOCONV	0.0117	0.01	0.0102
	[8.80]	[8.15]	[8.53]
ln COORDINATION	-0.89	-0.985	-0.99
	[-8.86]	[-10.26]	[-10.34]
DENSITY	0.0057	0.0070	0.0086
	[4.04]	[4.45]	[5.87]
COVERAGE	-0.044		
	[-0.74]		
ln INFLATION	-0.084	-0.066	-0.087
	[-2.64]	[-2.28]	[-2.64]
TREND	-0.041	-0.05	-0.052
	[-2.07]	[-2.68]	[-2.88]
DUMMY			
number of obs.	108	103	103
R^2	0.6781	0.779	0.7796
RMSE	0.3138	0.2608	0.2589
METHOD	INST	INST	INST

Source: Own calculations.

Table 10

Regressions for the young female unemployment rate

Dependent variable: ln young unemployment rate

Explanatory variable	Equations		
	[1]	[2]	[3]
ln TAXWEDGE	1.04		0.75
	[6.01]		[4.57]
ln CORRUPTION			-0.79
			[-3.54]

(Table 10 continued)

Table 10 (continued)

Explanatory variable	Equations		
	[1]	[2]	[3]
ln STAXWEDGE		0.77	
		[8.85]	
ln BENEFIT	-0.074	0.17	0.176
	[-0.64]	[1.77]	[1.55]
ILOCONV	0.0128	0.0102	0.0102
	[7.27]	[6.74]	[6.71]
ln COORDINATION	-0.78	-0.87	-0.87
	[-7.67]	[-8.76]	[-8.71]
DENSITY	0.0016	0.0041	0.0043
	[0.95]	[2.65]	[2.26]
COVERAGE	-0.048		
	[-0.77]		
ln INFLATION	-0.063	-0.114	-0.116
	[-2.19]	[-3.22]	[-3.06]
TREND	-0.038	-0.058	-0.059
	[-1.48]	[-2.66]	[-2.67]
DUMMY			
n	107	102	102
R^2	0.66	0.7597	0.76
RMSE	0.3608	0.3063	0.3077
METHOD	INST	INST	INST

Source: Own calculations.

After investigating the determinants of unemployment rates of different groups of the labour force one by one, we now compare these rates' explanatory factors in a common framework. Table 11 shows selected results of the cross-country regressions for different segments of the unemployed concerning their reactions to the traditional tax wedge, to corruption, and the subjective tax wedge. Here the individual unemployment rates always show sensitivity to the variation in the subjective tax wedge. The strongest impact is experienced for total female unemployed, young female unemployed and long-term unemployed (if we exclude calculations in which multicollinearity appeared between the tax wedge and union coverage). These results confirm not only the prominent role of the traditional tax wedge, but also the role of corruption as a very important determining factor. Females and long-term unemployed are more sensitive than males not only to the traditional tax wedge, but to the level of corruption as well. Males are also special in so far as they are not attracted by a generous replacement ratio into the group of unemployed, as are females and long-term unemployed, who are less educated and have smaller wages on the labour market, *ceteris paribus*. In a later section we show an explanation to this interesting feature of the labour market, i.e. the specific attitude of the male employed towards taxes and corruption.

Table 11

The effect of traditional tax wedge, corruption and subjective tax wedge on the different segments of unemployed people

		Males	Young males	Females	Young females	Long-term	Long-term*
[1]	Tax wedge	0.7	0.86	0.98	1.04	1.35	0.39
		[5.72]	[5.44]	[8.52]	[6.01]	[3.68]	[1.87]
	R^2	0.62	0.68	0.74	0.66	0.71	0.83
[2]	Tax wedge	0.66	0.77	0.74	0.75	0.26	0.002
		[5.0]	[5.60]	[5.84]	[4.57]	[1.05]	[0.01]
	Corruption	-0.37	-0.2	-1.11	-0.79	-3.03	-1.85
		[-1.86]	[-1.19]	[-4.94]	[-3.54]	[-6.37]	[-6.38]
	R^2	0.72	0.78	0.77	0.76	0.73	0.86
[3]	Subjective	0.55	0.54	0.88	0.77	1.37	0.75
	tax wedge	[6.49]	[7.46]	[9.55]	[8.85]	[5.98]	[4.97]
	R^2	0.71	0.78	0.78	0.76	0.79	0.86

Note: * Regression with COVERAGE variable.

Source: Own calculations.

5.2.2 Employment

In the following regressions we investigate the determinants of the cross-country variation in the employment rate (the ratio of employed to the working-age population). We use the same explanatory variables as we did in the case of unemployment rates, but in addition to the tax wedge we also focus on the corporate statutory tax rates, and, according to our approach, on the subjective corporate tax rates.

Table 12 presents the results of five regressions carried out to explain total employment rates. The first regression (column [1]) does not include the corruption index. Here the coefficients of the traditional tax wedge on labour and the traditional corporate tax rate show significant negative effects. The coefficient of the replacement ratio is positive and significant, which means that there is a stronger tendency to participate in the labour market as employed if the replacement ratio for the unemployed is higher. This strongly contradicts the expectation that, if generous benefits attract people to the unemployment status, then they are not attracted at the same time to the employment status. We will return to this paradoxical result below when we analyse the impact of unemployment benefits on male and female employment rates. The parameter of the wage bargaining coordination variable is significantly positive, the union coverage is highly significant, and it has a negative parameter, as the proxy of labour market rigidities (ILOCNV) does. The variable reflecting union density has an insignificant parameter. R^2 is 0.76.

Table 12

Regressions for the employment rate

Dependent variable: employment rate

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	-5.63	-2.82			
	[-2.72]	[-1.69]			
ln CORPTAX	-3.11	-2.95			
	[-2.26]	[-2.72]			
ln CORRUPTION		15.88			
		[2.16]			
ln STAXWEDGE			-6.22	-8.52	
			[-4.63]	[-6.87]	
ln SCORPTAX			-3.83		-6.25
			[-3.56]		[-6.0]
ln BENEFIT	3.56	-0.857	0.66	0.746	2.28
	[3.08]	[-0.78]	[0.66]	[1.07]	[1.05]
ILOCONV	-0.065	-0.046	-0.045	-0.043	-0.069
	[-3.42]	[-3.05]	[-2.92]	[-2.62]	[-4.23]
COORDINATION	2.9	2.86	2.93	3.08	2.68
	[7.74]	[9.71]	[9.66]	[9.72]	[8.14]
DENSITY	-0.0058	-0.0503	-0.028	-0.012	-0.041
	[-0.273]	[-2.81]	[-1.67]	[-0.72]	[-2.22]
COVERAGE	-6.76	-4.62	-4.89	-4.81	-6.74
	[-8.14]	[-6.45]	[-6.67]	[-6.22]	[9.93]
ln INFLATION	-0.45	0.797	0.44	0.407	-0.152
	[-1.0]	[2.11]	[1.18]	[1.04]	[-0.39]
TREND	0.576	0.53	0.528	0.5	0.61
	[2.51]	[2.95]	[2.84]	[2.55]	[3.0]
n	114	114	114	114	114
R^2	0.761	0.85	0.84	0.83	0.81
RMSE	3.95	3.11	3.2	3.38	3.53
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

When we take into account the corruption index as an additional variable (column [2]) the positive parameter of the benefit variable disappears, it becomes insignificant, but the indicator of union density now turns out to be significant (negative). The explanatory power of regression equation [2] is much higher (0.85) than that of equation [1].

In columns [3], [4] and [5] we see results of the regression calculations explaining the differences in the employment rate, utilizing also the subjective tax rates. It turns out that growth in the subjective tax rates negatively influences the total employment rate: higher subjective tax rates go together with lower employment rates. The effect of the subjective tax wedge (the tax on labour) is stronger than the effect of the subjective corporate tax rate. We find a strong positive effect in the case of the index of coordination of wage

bargaining, and a negative effect from the side of the indicators representing union coverage and labour rigidities.

We have seen earlier that the unemployment rates of the two genders and of different ages react rather differently to changes in the various explanatory variables; in the case of employment rates we also investigate this variable interpreted for genders and for various age groups. Tables 13 and 14 show the results of a series of regressions that explain the variation of female and male employment rates.

Table 13

Regressions for the female employment rate

Dependent variable: female employment rate

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	-0.35	3.93			
	[-0.11]	[1.61]			
ln CORPTAX	-5.2	-4.95			
	[-2.60]	[-3.14]			
ln CORRUPTION		24.18			
		[7.69]			
ln STAXWEDGE			-3.85	-8.05	
			[-1.86]	[-4.1]	
ln SCORPTAX			-6.97		-8.47
			[-4.19]		[-5.72]
ln BENEFIT	5.45	-1.27	2.21	2.36	3.21
	[3.23]	[-0.80]	[1.42]	[1.40]	[2.15]
ILOCONV	-0.103	-0.075	-0.073	-0.068	-0.088
	[-3.73]	[-3.39]	[-3.04]	[-2.64]	[-3.82]
COORDINATION	3.05	3	3.14	3.42	2.99
	[5.60]	[7.01]	[6.73]	[6.83]	[6.39]
DENSITY	0.045	-0.022	0.028	0.056	0.019
	[1.45]	[-0.87]	[1.06]	[2.06]	[0.75]
COVERAGE	-9.45	-6.19	-6.81	-6.67	-7.95
	[-7.8]	[-5.94]	[-6.02]	[-5.45]	[-8.23]
ln INFLATION	-0.4	1.49	0.68	0.62	0.31
	[-0.64]	[2.73]	[1.19]	[1.0]	[0.57]
TREND	0.81	0.74	0.73	0.68	0.79
	[2.42]	[2.84]	[2.55]	[2.20]	[2.70]
n	114	114	114	114	114
R^2	0.69	0.81	0.77	0.74	0.77
RMSE	5.76	4.52	4.94	5.34	5.02
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

We find that in the determination of the female employment rate the traditional tax wedge has no effect, while the traditional corporate tax rate has a significant negative effect (see column [1] in Table 13). The former experience is connected with the multicollinearity between the tax wedge and the variable of union coverage. The level of union coverage seems to be a very important factor for the determination of female employment: higher coverage goes together with a lower female employment rate. The effect of union density is mostly insignificant.

In the explanation of the male employment rate the effect of the traditional tax wedge is very strong, while the traditional corporate tax rate has no effect at all. In the equation of male employment the density of the unions has a much stronger negative effect than in the case of the equation related to female employment. Interestingly the generosity of unemployment benefits has no explanatory power concerning male or female employment rates. While the generosity of unemployment benefits affects the rate of unemployment, especially female unemployment, it seems to have little impact on male and female employment, and is counter-intuitive – weakly positive effect – on total employment (see above). While high benefits lead to high unemployment rates, one may understand that they also have some – if not strong – impact on employment, because generous benefits make *participation* in the labour market as such more attractive. This is the case because participation is a necessary condition to be eligible for high unemployment benefits. Accordingly, a weak impact of benefits on the employment rate may occur, because a strong unemployment effect and a strong labour market participation effect tend to cancel out each other (cf. Nickell, 1997, p. 68).

When incorporating the corruption index, a similar (and surprising) feature emerges in the regressions. In column [2] in Tables 13 and 14 we can see that in the equations that take into account the corruption index, the magnitude of the coefficient of corruption is significantly different for the female and male employment rates: the effect of corruption on the male employment rate is one fourth of the effect experienced in the case of the female employment rate. If we go further to the equations including the subjective tax rates (and if we take into account the implications of the multicollinearity between the tax wedge and the union coverage), we can state that the subjective tax wedge has similar and negative effects on both the female and male employment rates, however, the subjective corporate tax rate has a much smaller effect on the male than on the female employment rate (see column [3] in Tables 13 and 14). The qualitatively smaller effect of corruption and of the subjective corporate tax rate on male employment is not only interesting, but also surprising, and needs some explanation.

Table 14

Regressions for the male employment rate

Dependent variable: male employment rate

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	-9.88	-8.73			
	[-5.76]	[-5.33]			
ln CORPTAX	-0.88	-0.81			
	[-0.77]	[-0.76]			
ln CORRUPTION		6.49			
		[3.06]			
ln STAXWEDGE			-7.7	-8.03	
			[-6.03]	[-7.21]	
ln SCORPTAX			-0.54		-3.53
			[-0.53]		[-3.37]
ln BENEFIT	1.78	-0.018	-0.48	-0.47	1.52
	[1.86]	[-0.017]	[-0.50]	[-0.48]	[1.43]
ILOCONV	-0.041	-0.033	-0.033	-0.033	-0.062
	[-2.58]	[-2.22]	[-2.23]	[-2.22]	[-3.86]
COORDINATION	2.43	2.42	2.4	2.42	2.1
	[7.83]	[8.37]	[8.33]	[8.53]	[6.33]
DENSITY	-0.061	-0.078	-0.085	-0.083	-0.101
	[-3.43]	[-4.51]	[-5.29]	[-5.35]	[-5.44]
COVERAGE	-3.65	-2.77	-2.69	-2.68	-4.98
	[-5.29]	[-3.95]	[-3.86]	[-3.87]	[-7.3]
ln INFLATION	-0.605	-0.096	0.011	0.0068	-0.72
	[-1.71]	[-0.26]	[0.03]	[0.019]	[-1.87]
TREND	0.298	0.281	0.28	0.279	0.39
	[1.57]	[1.56]	[1.60]	[1.58]	[1.89]
n	114	114	114	114	114
R^2	0.75	0.78	0.78	0.79	0.71
RMSE	3.28	3.05	3.05	3.04	3.55
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

We can see similar characteristic features in Tables 15 and 16, where we investigate the employment rates for the age group 25-50. In this age group the different reaction of female and male employment to the tax wedge and corruption is much more spectacular than in the case of employment not differentiated by age: while the employment rate of the 25-50 year old males is hardly sensitive to variations in the corporate tax rate and corruption, the employment rate of similar-age females is strongly sensitive to both. The other side of the coin is that, while male employment of this age group is sensitive to variations in the subjective tax wedge, for females this is not the case.

Table 15

Regressions for the female employment rate (25-50)

Dependent variable: female employment rate (25-50)

Explanatory variable	Equations					
	[1]	[2]	[3]	[4]	[5]	[6]
ln TAXWEDGE	7.99	-0.74	10.09			
	[2.88]	[-0.26]	[3.74]			
ln CORPTAX	-3.63	-3.03	-3.94			
	[-1.97]	[-1.39]	[-2.23]			
ln CORRUPTION			15.72			
			[4.09]			
ln STAXWEDGE				3.29	0.43	
				[1.44]	[0.197]	
ln SCORPTAX				-5.45		-4.35
				[-2.99]		[-2.62]
ln BENEFIT	1.62	1.39	-1.16	1.29	1.07	0.67
	[0.34]	[0.49]	[-0.66]	[0.74]	[0.59]	[0.4]
ILOCONV	-0.105	-0.153	-0.102	-0.092	-0.09	-0.082
	[-3.97]	[-5.13]	[-4.06]	[-3.46]	[-3.11]	[-3.18]
COORDINATION	3.32	3.25	3.21	3.39	3.64	3.51
	[6.49]	[5.40]	[6.54]	[6.61]	[6.91]	[6.88]
DENSITY	0.035	0.045	-0.013	0.039	0.06	0.044
	[1.21]	[1.36]	[-0.46]	[1.36]	[2.19]	[1.53]
COVERAGE	-7.02		-4.75	-5.62	-5.64	-4.6
	[-6.28]		[-3.95]	[-4.50]	[-4.35]	[-4.45]
ln INFLATION	0.319	0.37	1.48	0.68	0.61	0.99
	[0.56]	[0.59]	[2.39]	[1.09]	[0.95]	[1.70]
TREND	1.01	0.938	1.02	0.976	0.94	0.947
	[3.22]	[3.41]	[3.41]	[3.09]	[2.87]	[2.99]
n	108	108	108	108	108	108
R^2	0.63	0.48	0.66	0.62	0.59	0.62
RMSE	5.26	6.2	5.03	5.3	5.5	5.3
METHOD	INST	INST	INST	INST	INST	INST

Source: Own calculations.

All these unexpected differentiations between the employment behaviour of males and females need some explanation. We shall attempt to provide a sufficiently satisfactory rationalization of this puzzling behaviour below.

Table 16

Regressions for the male employment rate (25-50)

Dependent variable: male employment rate (25-50)

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	-6.67	-6.84			
	[-6.16]	[-6.04]			
ln CORPTAX	0.048	0.073			
	[0.068]	[0.099]			
ln CORRUPTION		-1.25			
		[-0.78]			
ln STAXWEDGE			-4.34	-4.02	
			[-4.82]	[-4.93]	
ln SCORPTAX			0.625		-0.826
			[0.871]		[-1.11]
ln BENEFIT	1.27	1.5	0.6	0.62	1.42
	[1.54]	[2.04]	[0.87]	[0.91]	[1.87]
ILOCONV	-0.032	-0.032	-0.036	-0.037	-0.049
	[-3.08]	[-3.03]	[-3.46]	[-3.55]	[-4.25]
COORDINATION	2.09	2.1	2.03	2	1.88
	[10.47]	[10.22]	[10.04]	[10.07]	[8.22]
DENSITY	-0.094	-0.091	-0.11	-0.113	-0.117
	[-8.46]	[-7.25]	[-9.78]	[-10.48]	[-9.14]
COVERAGE	-0.38	-0.56	-0.24	-0.248	-1.56
	[-0.88]	[-1.12]	[-0.50]	[-0.50]	[-3.45]
ln INFLATION	-0.61	-0.707	-0.42	-0.41	-0.83
	[-2.7]	[-2.73]	[-1.70]	[-1.68]	[-3.18]
TREND	0.339	0.338	0.356	0.36	0.39
	[2.77]	[2.69]	[2.86]	[2.91]	[2.79]
n	108	108	108	108	108
R^2	0.75	0.74	0.74	0.75	0.67
RMSE	2.06	2.11	2.09	2.08	2.38
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

5.2.3 Self-employment

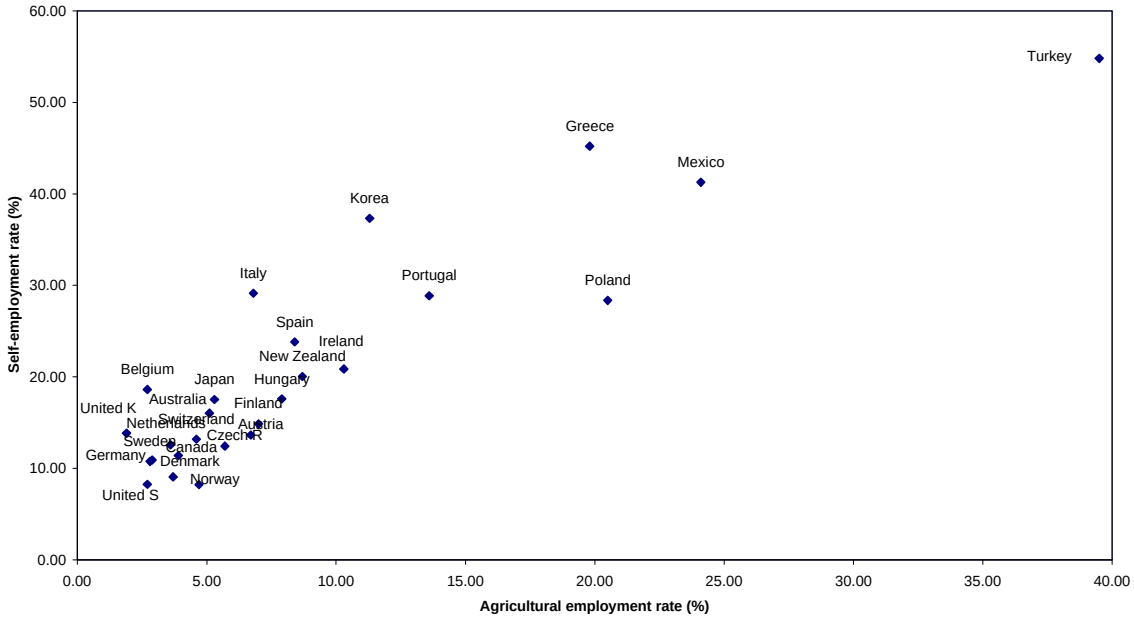
First we summarize the literature on the factors that may explain the cross-country differences in self-employment rates. Following this we analyse the relationships between the subjective tax rates and self-employment rates.

The agricultural sector usually has a relatively high proportion of self-employed workers. This international experience is illustrated by Figure 5: a higher share of agricultural

employment is usually associated with a higher share of self-employment in total employment. (For data used in Figure 5 the self-employment rate includes self-employed workers in both the agricultural and non-agricultural sectors plus unpaid family workers.) During the 1990s, however, non-agricultural self-employment grew faster than civilian employment as a whole in most OECD countries with the effect of increasing the share of non-agricultural self-employed. A number of overlapping reasons have been put forward for the explanation of this renaissance in self-employment (cf. OECD, 2000a).

Figure 5

Agricultural employment rate and self-employment rate, 1997



(1) There have been suggestions that it could have been a reaction to the overly-rigid labour and product markets and to the high level of taxation. To some extent the growth of self-employment may have been generated by the opportunities it offers to pay less tax to the state.

(2) Some analysts have pointed to changes in industrial organization. Greater stress on outsourcing non-core activities may have increased the amount of work subcontracted to the self-employed, because self-employment business has shown greater flexibility and speed of response than traditional firms.

(3) It has been argued that the increase in the number of self-employed is best understood as a response by individuals to the newly emerged business opportunities in the OECD countries.

Cross-country studies always emphasize that there is a strong negative correlation between the level of GDP per capita and the share of non-agricultural self-employment without unpaid family workers (Kuznets, 1966, Schultz, 1990, Bregger, 1996). A low level of prosperity coincides with a low wage level, implying little pressure to increase efficiency or increase the average scale of enterprise activities. At this stage of development a major route for ambitious wage earners to increase their income is to set up an own shop and become an entrepreneur. Economic development subsequently leads to rising wages, which stimulates enterprises to work more efficiently and to reap economies of scale and scope. An additional effect of rising wage levels is an increased attraction of wage-employment: the opportunity cost of becoming self-employed increases. Iygun and Owen (1998) argue that fewer individuals are willing to risk becoming an entrepreneur since more secure professional earnings rise simultaneously with economic development.

Cross-sectional econometric investigations explain the differences in the self-employment rates with several additional explanatory variables: the unemployment rate, the proportion of women in the labour force, the share of GDP produced in the service sector, average tax rates, and marginal tax rates (Acs, Andretsch and Evans, 1994, Staber and Bogenhold, 1993, Robson and Wren, 1999).

In these models the sign of the coefficient of the unemployment rate is *a priori* uncertain, since the unemployment rate may either decrease or increase together with the self-employment rate depending on the segments of the labour market from which the flow of people moves towards the self-employment status. Estimates concerning the effect of the unemployment rate on the self-employment rate vary from study to study. Investigations at the micro-level show, however, that most self-employed people were previously in wage and salary employment, and a substantial proportion of self-employed enter or re-enter to the segment of wage and salary employment. Only a very small proportion of unemployed people find employment through self-employment, while the chances of people in wage and salary employment are much higher to continue their career in the self-employment status.

In the regressional equations explaining self-employment the proportion of women in the labour force is expected to have a negative sign; for the share of the service sector in GDP a positive sign is expected – although not all such calculations can confirm these plausible expectations.

In the literature on self-employment activity, econometric investigations already arrived at the result that the size of the average tax rate as an explanatory variable may have a positive coefficient: higher average tax rates provide more incentive to find ways of avoiding and evading taxes through self-employment. This result is found by some (see Robson and Wren, 1999; OECD, 2000a; Scharle, 2002), but not all analysts. In the

investigations about self-employment and tax-rates, the tax variable is usually proxied by the ratio of general government outlays to GDP, rather than the statutory tax rates proper.

The OECD (2000a) study incorporates two additional variables to explain the self-employment rate in its econometric analysis. These are the proportion of value added accounted for by capital, and the average unemployment benefit replacement rate. According to the OECD study, the proportion of value added accounted for by capital may be expected to have a positive sign, as it reflects the rate of return to capital as opposed to labour. Since self-employment earnings include a component accruing to capital as well as one accruing to labour, higher returns to capital may be an incentive for wage earners to reap also the share of capital in value added. The replacement ratio may be expected to have a negative sign: an increase of this variable should tend to increase the attractiveness of wage employment, since if business opportunities turn to worse, self-employed have no opportunity to get unemployment benefits, while wage earners may pull back to this shelter if they lose their job. The authors of the OECD study admit that, although they use these two new variables compared to the earlier literature in the regressions explaining the self-employment rate, they have failed to find a consistent set of explanatory variables explaining non-agricultural self-employment on a time-series basis across countries.

A recently published study by Norderhaven, Thurik, Wennekers and van Stel (2003) explains the cross-country differences of self-employment rates by the same factors that were already used in the literature: GDP per capita, unemployment rate, female labour share, labour income share, and population density. This study, however, takes into account a socio-psychological factor as well, namely the level of dissatisfaction with life and/or with democracy. The authors hypothesize and test econometrically that higher levels of dissatisfaction with life and/or with democracy in a country are associated with higher rates of non-agricultural self-employment. The causality from dissatisfaction to becoming self-employed is assumed because the reverse causality of self-employment causing low satisfaction is ruled out by ample empirical evidence. In many studies (Blanchflower and Oswald, 1998; Frey and Benz, 2002; OECD, 2000 a) the job satisfaction of self-employed is on average found to be higher, or at least not lower, than that of salaried employees. This seems to be the case in spite of longer work hours and poorer working conditions (OECD, 2000a). Apparently, these inferior conditions are compensated by other factors such as autonomy and the possibility of becoming wealthy.

Now we turn to the relationship between the self-employment rate and the subjective tax rates. The results of the study by Norderhaven et al. (2003) were presented above because we had the impression that their using a socio-psychological variable – the dissatisfaction with life and/or democracy – as an explanatory variable for the cross-country differences of the self-employment rate was very similar to our approach.

Considering the level of corruption as an explanatory factor for self-employment can be seen similar to the inclusion of a socio-psychological factor in the analysis. As a matter of fact, the variable of the subjective tax rate expresses the combination of the size of the taxes and the rational or emotional dissatisfaction with how this contribution is used or misused by the state after its collection.

As a next step of our analysis we investigate regressions explaining self-employment rates in the OECD countries in 1995-2000. We have carried out regression calculations with three types of the self-employment rate: the ratio of all sectors' self-employed with unpaid family workers (SELF100) to the employed people, the ratio of all sectors' self-employed without unpaid family workers (SELF200), and the ratio of non-agricultural self-employed to the employed people (SELF300).

Table 17

Regressions for the self-employment rate (self100)

Dependent variable: self-employment rate (self100)

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	5.18	0.87			
	[4.05]	[1.01]			
ln CORPTAX	1.18	-0.26			
	[1.01]	[-0.49]			
ln CORRUPTION		-16.4			
		[-7.75]			
ln STAXWEDGE			4.49	5.66	
			[5.37]	[6.59]	
ln SCORPTAX			2.3		5.38
			[1.87]		[3.68]
BENEFIT	-0.149	-0.0099	-0.103	-0.122	-0.076
	[-5.16]	[-0.329]	[-4.46]	[-5.3]	[-2.9]
AGR	1.8	1.4	1.62	1.67	1.61
	[26.2]	[17.7]	[22.63]	[25.77]	[18.3]
DUMMY	HU,POL	HU,POL	HU,POL	HU,POL	HU, POL
n	112	107	107	107	107
R^2	0.82	0.9	0.89	0.88	0.86
RMSE	3.59	2.73	2.88	2.96	3.25
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

In Table 17 we present the results explaining the self-employment rate (SELF100) by the effects of tax rates on labour (TAXWEDGE), of tax rate on the profit of enterprises

(TAXCORP), the corruption index, the summary measure of the unemployment benefit system (BENEFIT), and the ratio of agricultural employment(AGR).

It turns out that the agricultural employment rate has a very strong positive effect in all regressions. This is no surprise: it is well known that to be self-employed in agriculture is a natural form of employment.

When our calculations exclude the impact of corruption (column [1] of Table 17) we find that the tax wedge has a positive and significant parameter, which means that higher traditional tax rates on labour induce, *ceteris paribus*, higher rates of self-employment. The reasons are twofold: the self-employment status offers ample opportunity to evade taxes by the self-employed, but it also offers opportunities for tax-avoidance by the enterprises, which push some employees to be self-employed and through this outsourcing setup avoid paying social security contributions for those employees. In the regression, the variable of unemployment benefit entitlement has a negative sign, implying that a more generous unemployment benefit, *ceteris paribus*, decreases the number of people who join or remain among the self-employed.

When we calculate the regressions including the subjective tax rates (columns [3], [4], [5] in Table 17), we can see that all coefficients are significant. According to these results, besides the agricultural employment rate also the cross-country differences in the self-employment rates can be explained by the subjective tax rates and the unemployment benefits. Higher benefits decrease the total self-employment rate, but a higher subjective tax wedge and subjective corporate tax rate induce higher self-employment rates. The fitting values are rather high, in fact higher than in the regression with traditional tax rates.

We arrive at similar results when we investigate the total self-employment rate without unpaid family workers (Table 18). The differences between these results and the results coming from the previous type of definition of the self-employment rate (Table 17) show that both the effects of agricultural employment rate and the unemployment benefits are significantly stronger in the explanation of the self-employment rate *with* unpaid family workers than without them, which means that both variables have much power explaining why unpaid family workers join their relatives who work as paid self-employed.

We have investigated the non-agricultural self-employment rate without unpaid family workers, too. (The data source is OECD, 2000a.) Here we take into account additional variables, while the variable representing the role of agriculture was naturally excluded. According to the results in the relevant literature summarized above, we selected as additional variables GDP per capita and the proportion of value added accounted for by capital. It was observed in various studies that the self-employment rate tends to decrease as economies become more developed. For the other additional explanatory variable, the

proportion of value added accounted for by capital, one can expect a positive impact on self-employment (see OECD, 2000a. Norderhaven et al. (2003) used the complement or inverse of this variable, the labour income share. This is considered a pragmatic proxy for earning differentials between wage-employment and self-employment. The higher the labour income share, the smaller the share of the national income made up by profits, and hence the less attractive it is to become self-employed.

Table 18

Regressions for the self-employment rate (self200)

Dependent variable: self-employment rate (self200)

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	4.05	1.34			
	[3.68]	[1.35]			
ln CORPTAX	1.55	0.71			
	[1.99]	[1.40]			
ln CORRUPTION		-9.3			
		[-5.44]			
ln STAXWEDGE			3.08	4.085	
			[3.74]	[5.43]	
ln SCORPTAX			1.91		4.17
			[2.49]		[4.55]
BENEFIT	-0.08	-0.002	-0.044	-0.06	-0.022
	[-3.26]	[-0.10]	[-2.19]	[-3.17]	[-0.92]
AGR	1.37	1.18	1.26	1.3	1.24
	[21.9]	[17.7]	[19.75]	[18}	[22.89]
DUMMY	HU, POL	HU,POL	HU,POL	HU,POL	HU,POL
n	118	113	113	113	113
R^2	0.79	0.85	0.84	0.84	0.81
RMSE	2.98	2.58	2.64	2.69	2.82
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

The results of the regressions for non-agricultural self-employment are presented in Table 19. The sign of the parameters are as we expected: the replacement rate for the unemployed and GDP per capita have significant negative coefficients, while the variable of the proportion of value added accounted for by capital has a positive parameter. In regressions [1] and [2] the traditional tax rates (tax wedge and corporate tax rate) have significantly positive coefficients showing that these factors push people to become and remain self-employed. In regression [2] the corruption index turns out to be no significant variable; however, the main reason for this is the multicollinearity between the corruption index and GDP per capita. The next three regressions (columns [3], [4], [5] in Table 19) indicate that when we incorporate the corruption index into the subjective tax rates, it

shows a significant impact (naturally, together with the different tax rates) on non-agricultural self-employment rate. There is an interesting result concerning the relative importance of the different taxes. While in the regressions of total self-employment rates (total self-employment rate with and without unpaid family workers) the tax wedge on labour and its subjective form have more, or equal, explanatory power compared to the corporate tax rate, in the regression of the non-agricultural self-employment rate (without unpaid family workers) the corporate tax rate and its subjective form has significantly more power than the explanatory power of the tax wedge.

Table 19

Regressions for the self-employment rate (self300)

Dependent variable: self-employment rate (self300)

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]
ln TAXWEDGE	3.39	3.02			
	[7.44]	[1.85]			
ln CORPTAX	9.75	11.55			
	[3.06]	[3.47]			
ln CORRUPTION		-0.47			
		[-0.17]			
ln STAXWEDGE			0.24	2.11	
			[0.27]	[2.23]	
ln SCORPTAX			5.35		5.58
			[4.32]		[4.50]
BENEFIT	-0.13	-0.127	-0.078	-0.126	-0.076
	[-4.44]	[-3.44]	[-4.7]	[-6.46]	[-4.48]
ln GDP/capita	-4.44	-10.04	-10.71	-10.23	-10.79
	[-1.9]	[-4.11]	[-5.05]	[-3.88]	[-5.08]
SCVA	56.4	42.82	34.23	44.65	34.09
	[7.3]	[4.71]	[4.54]	[5.81]	[4.53]
n	59	57	57	57	57
R^2	0.76	0.83	0.85	0.81	0.85
RMSE	2.76	2.41	2.35	2.63	2.33
METHOD	INST	INST	INST	INST	INST

Source: Own calculations.

Now we return to the puzzles experienced earlier in the course of explaining the rates of unemployment and employment for various genders and cohorts. We obtained, unexpectedly, that the male unemployment rate is much less sensitive (in the case of employed males aged 25-54 not sensitive at all) to the extent of corruption, while the female, long-term, and young female unemployed react to this factor rather strongly. In addition, in the case of the male employment rate we have seen that the men's labour supply is not sensitive at all to the corporate tax rate.

We believe that the puzzle can be solved in a satisfactory manner if we properly take into account the results that we have arrived at for the self-employed. For the OECD countries, statistical data prove (see Table 20) and several studies show (see Blanchflower, 2000; Blanchflower and Oswald, 1998) that the probability of being self-employed is higher among men than women, and it also rises with age: in most countries it is common that self-employment is dominantly male, and is more prevalent among prime-age groups than among the young.

Table 20

Non-agricultural self-employment by gender

(per cent)

	1990-1997	
	Women	**Men**
Australia	32.9	67.1
Belgium	28.9	71.1
Canada	32.7	67.3
Finland	31.1	68.9
France	26.0	74.0
Germany	28.3	71.7
Greece	19.4	80.6
Ireland	20.1	79.9
Italy	23.4	76.6
Japan	33.9	66.1
Korea	30.3	69.7
Mexico	33.8	66.2
Netherlands	32.8	67.2
Norway	28.3	71.7
Spain	26.8	73.2
Sweden	25.7	74.3
Turkey	6.8	93.2
United Kingdom	24.8	75.2
United States	37.0	63.0
Unweighted average	29.2	70.8

Source: OECD (2000a).

The basic unit of living and subsistence is the family, and male employment is obviously critical for earning the living for the rest of the family. This condition already defines the difference between the employment behaviours of the two genders. The results of our investigations indicate that, if high traditional tax rates combined with a high level of corruption (and the implied worse conditions of employment) make the employee status less available and/or less attractive, female workers choose or accept to become unemployed, or unpaid family workers, or they may completely leave the labour market.

Under similar conditions, male participants, however, make another choice: in order to maintain a certain flow of (declared) earnings for the family, they become, as a rule, self-employed.

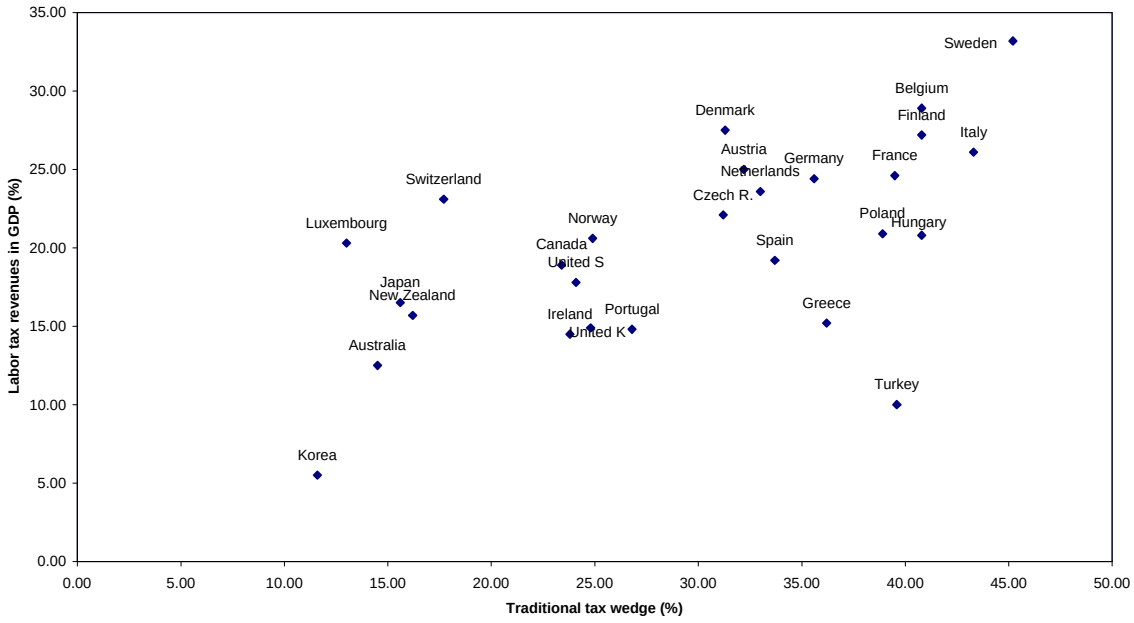
6 Subjective tax rates and the tax revenues

In the previous sections we have dealt with the relationships between the subjective tax rates and different segments of the labour market. We have seen that the subjective tax rates are relevant explanatory factors when we try to explain the cross-country differences in the unemployment rate, different employment rates (according to age and gender) and self-employment rates.

Now we turn to the investigation of the development of budgetary revenues from different types of taxes. We hypothesize that the subjective tax rates are also relevant determining factors when we analyse the cross-country differences in relative tax revenues (tax revenues as a per cent of GDP).

Figure 6

Traditional tax wedge and labour tax revenues in GDP

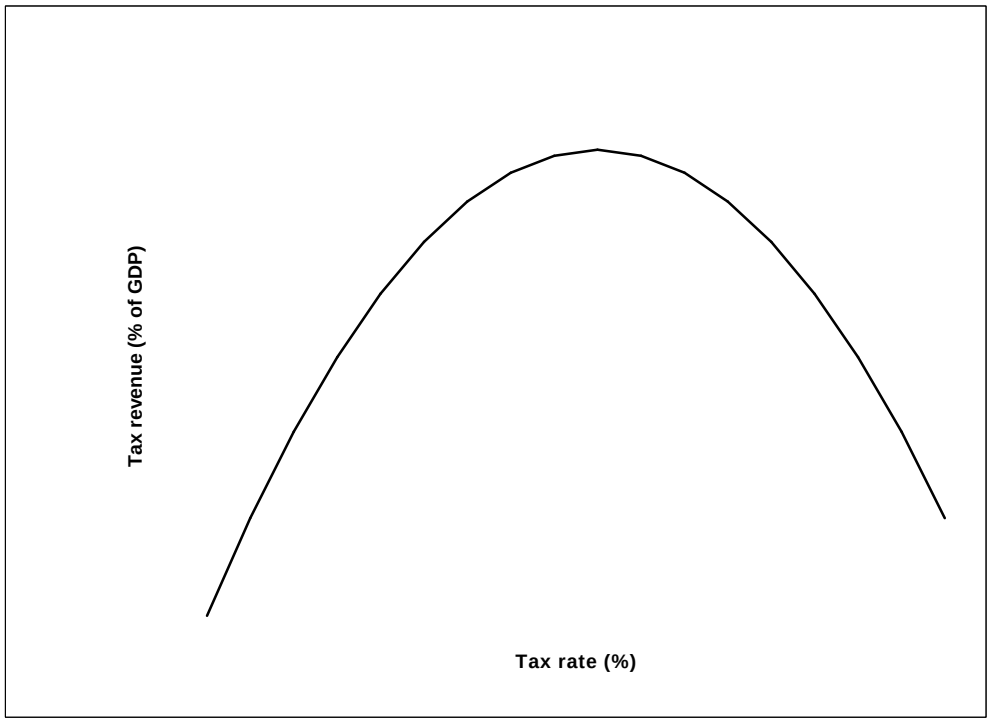


First we deal with those tax revenues that are closely related to the labour market. The tax revenues from income as well as social security contributions from employers and employees are generated by the statutory tax rates on labour, which is called the 'tax wedge'. In Figure 6 we present the relationship between the average statutory tax wedge and the ratio of proper tax revenues to the GDP in the OECD countries in the year 1997. Here we experience a slight positive relationship across countries: a higher tax wedge is associated with higher tax revenues in GDP. In this figure, we see no evidence of any Laffer-type relationship.

The Laffer curve is a popularly known curve which shows how tax rates and tax revenues are related. The idea behind the Laffer curve has been around for a long time, as long as 200 years by some accounts (see Fullerton, 1982; Blinder, 1981).

Figure 7

A hypothetical Laffer curve



Legend has it that in November 1974 Arthur Laffer, a young economist, drew a curve on a napkin in a Washington bar, linking average tax rates to total tax revenue (see Figure 7). Initially, growing tax rates would increase revenue, but at some point, further increases in tax rates would cause the revenue to fall, for instance due to high taxes discouraging people from additional work efforts or encouraging them to hide their income. The curve became an icon of supply-side economics. Some economists said that the curve proved that most governments could raise more revenue by cutting tax rates, an argument that was often cited in the 1980s by the tax-cutting governments of Ronald Reagan in the USA

and Margaret Thatcher in the UK. Other economists reckoned that most countries were still at a point on the curve at which raising tax rates would increase revenue. For the lack of empirical evidence, however, nobody could really be certain where the USA and other countries were on the Laffer curve at the given point of time. Still, it was an important episode in this debate that, after the Reagan administration had cut tax rates, tax revenues of the US were falling. Several analysts interpreted this prominent episode, emphasizing that the American tax rates had already been low compared to many countries, especially continental Europe, therefore it remained possible that these countries stood at a phase on the Laffer curve where cutting tax rates would pay.

Fullerton (1982) summarizes the Laffer-curve literature. In his opinion, for the most part this literature was comfortable with the assumption that tax revenues adjust smoothly to tax rate changes. Strong assumptions about the shape of individual preferences and production functions of firms were employed by theorists and empiricists alike. This literature also tended to use mostly static frameworks. Thus, the focus of the research was to empirically investigate the shape of the Laffer curve and determine where the current tax rates were on this curve. The majority of papers found that for the USA, income tax rates were on the upward-sloping portion of the Laffer curve. Thus, it was assumed that a reduction of income tax rates would lower tax revenues.

Becsi (2000) steps out from this static picture by saying that in the real world, tax rates are usually not changing in isolation. What the government does with the revenues it collects will also determine at what point revenues are maximized. So far it had been assumed in the literature that the government did nothing with its revenues, thus expenditures had no effects on revenues. Becsi (2000) developed a simple neoclassical growth model and used it for the analysis of the long-run effects of government expenditures and income taxes. It was shown that the reduction of tax rates would increase income accruing to labour and private capital, and subsequently would increase output. The ensuing reduction in public capital formation, however, will tend to lower private inputs and production, and thus lower income tax revenues, and eventually reduce the tax revenues derived from an original cut in income tax rates.

In this model the larger the productivity of public capital, or the more precipitous its decline, the likelier it is that tax revenues will fall. By this argument, cutting income taxes at a time when public investments are falling and government consumption is rising, as occurred in the US the 1980s, increases the likelihood of the government losing tax revenues.

Various analyses have suggested that for an understanding of the Laffer curve, it is important how the government spends its tax revenues. In fact, a different Laffer curve is associated with the different ways revenues are spent, and it is important to know which curve is in operation when the government wants to re-design its tax policies.

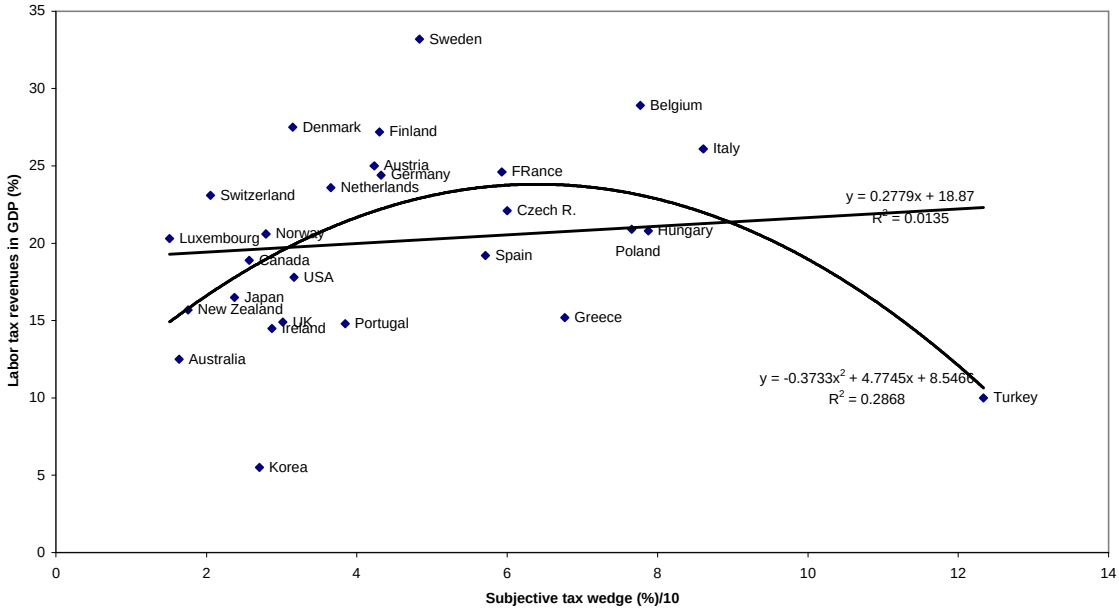
Friedman et al. (2000) build a simple model for an entrepreneur's decision about operating officially or unofficially. In this model, the authors take into account the effectiveness of the legal system, which in turn is influenced by the size of tax revenues. They also show a 'Laffer equation', in which tax revenues depend on the productivity of the official sector, the effectiveness of the legal system, and the tax rates. The latter variable is set in a quadratic form.

Sanyal, Gang and Goswani (1999) focus on gathering, rather than on the expenditure, of tax revenues when investigating the theoretical framework of the Laffer curve. They argue that in a corrupt tax administration, a rise in the tax rate sets off complicated strategic moves both by taxpayers and administrators. It is shown that in some circumstances, this may bring about Laffer-like behaviour of the overall tax revenue, i.e. a higher tax rate results in smaller net revenues for the government.

We now return to our own investigation. Although we do not intend to build any theoretical model, but focus on the empirical analysis of cross-country data, our approach is close to the theories mentioned above: the subjective tax rates reflect the institutional environment in the economy in which the tax revenues are both collected and spent.

Figure 8

Subjective tax wedge and tax revenues in GDP



In Figure 8 we present the relationship between the measure of *the subjective tax wedge* (income tax rate, employers' and employees' social security contributions) and the tax revenues from income, employers' and employees' social contributions as a per cent of GDP. In the figure we show two trend lines, one linear, the other polynomial containing a

quadratic element. Not only by sight one gets the impression, but also the calculated trend lines show that here we have a parabolic, reversed U-shaped curve. The shape of the curve suggests that initially, a higher subjective tax wedge leads to a higher ratio of revenues, but beyond some point higher subjective tax rates are accompanied by less revenue.[9]

Now we take another sample of countries and carry out the same analysis for a narrower tax, namely the sum of the employers' and employees' social security contributions. The sample now has 44 countries, both OECD and transition (or post-socialist) countries.

Figure 9

Traditional social security contribution rate and revenues in GDP

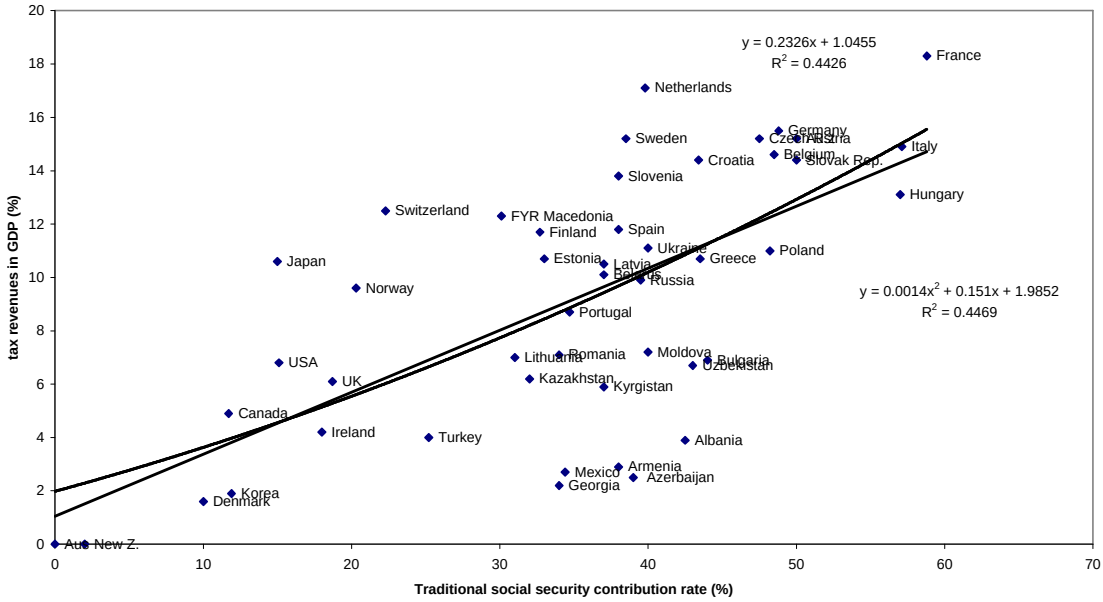


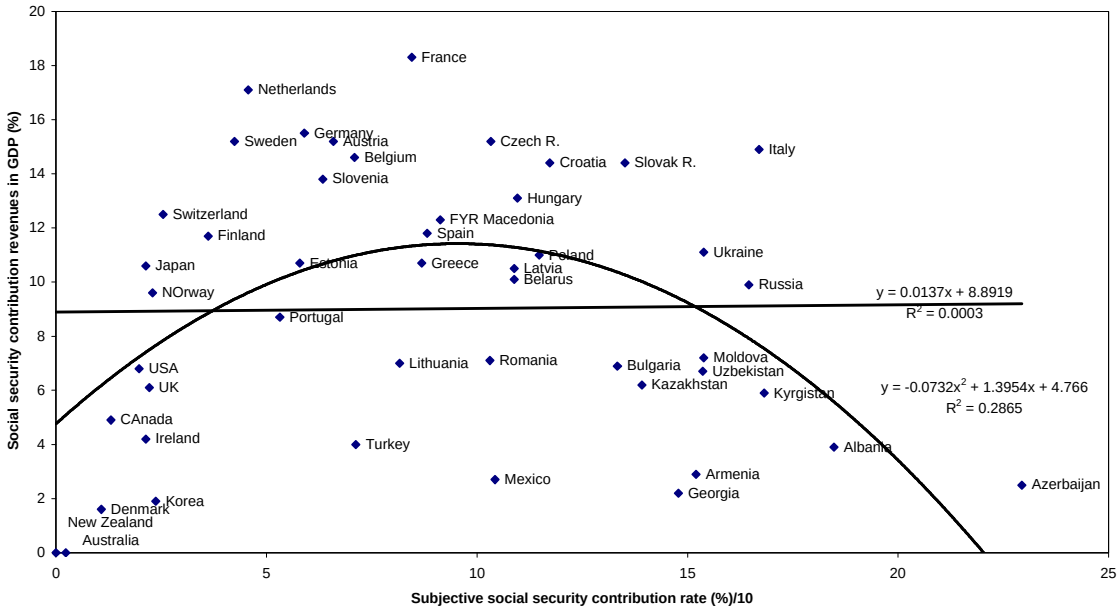
Figure 9 shows the relationships between the *traditional social security contribution rates* and the proper tax revenues in per cent of GDP. Clearly, we do not experience a Laffer-type curve.

In Figure 10, however, we present the relationship between the *subjective social security contribution rate* and the social security contribution revenue (in per cent of GDP). Here the Laffer-type curve is much more obvious even at first sight.

[9] In Figure 8 it seems that the values of the variables of tax revenue and subjective tax rate of Turkey 'cause' the downward part of the Laffer curve. Below we will see that when we control for the agricultural employment rate (this causes the very low level of tax revenue in Turkey), the Laffer relationship between the subjective tax rate and the tax revenue remains significant for the sample.

Figure 10

Subjective social security contribution rate and tax revenues in GDP



It is important to mention that most of the Central and East European transition countries are found on the downward part of this curve. We also know from the literature (see sections 3 and 5.1) that most of transition countries have larger hidden economies than the developed market economies, although measuring the size of the hidden economy has serious problems in both types of countries. Independently from the difficulties of these estimations, we can see from the Laffer type relationship between the subjective tax rate and proper tax revenues that, above a certain value of subjective social security contribution rate, tax revenues are decreasing with increasing contribution rates because of either tax evasion or tax avoidance.

We now turn to the investigation of the relationships between the traditional and the subjective value added tax rate on the one hand, and proper tax revenues (as a per cent of GDP) on the other. Figure 11 shows the *traditional VAT rates* and the ratio of VAT revenues to GDP. According to the main rule, a higher traditional VAT rate is accompanied by higher relative revenues. However, certain countries (especially some post-Soviet economies, such as Azerbaijan, Kazakhstan, Armenia, Georgia and Tajikistan) have high VAT rates, but the realized revenues are much lower than in other countries. In Figure 11 we fitted two trend lines to the data, a linear and a polynomial one. In contrast to the previous experience with other traditional tax rates, where the linear trend gave the best fitting, here the polynomial line has a better fitting value. This reflects a minimal Laffer-type behaviour between the traditional VAT rate and the VAT revenues.

Figure 11

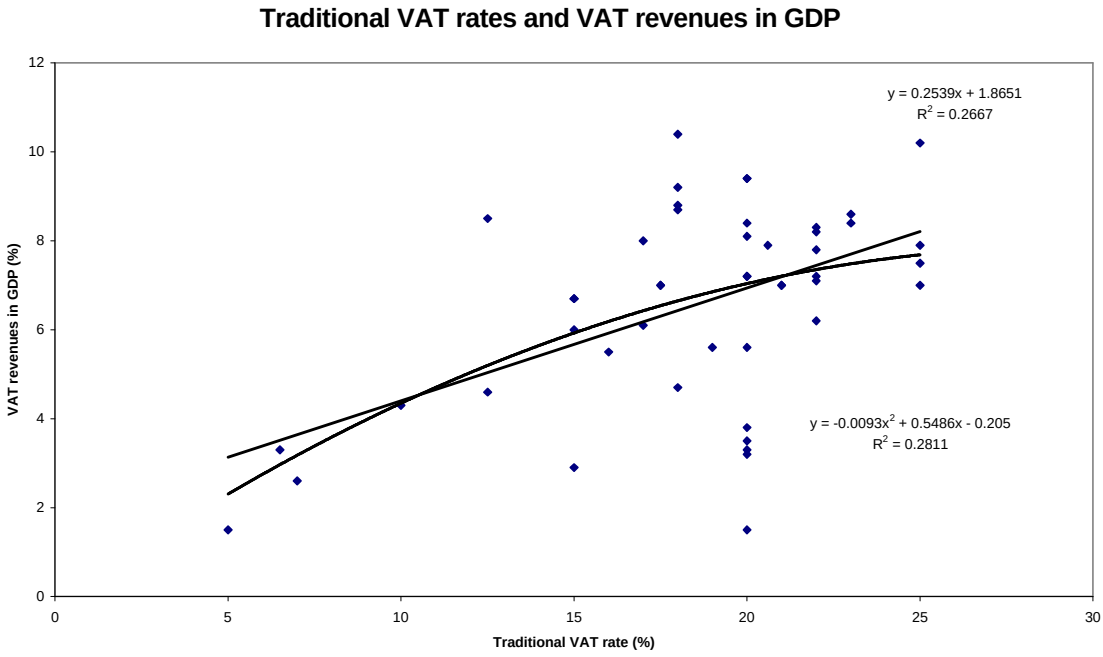
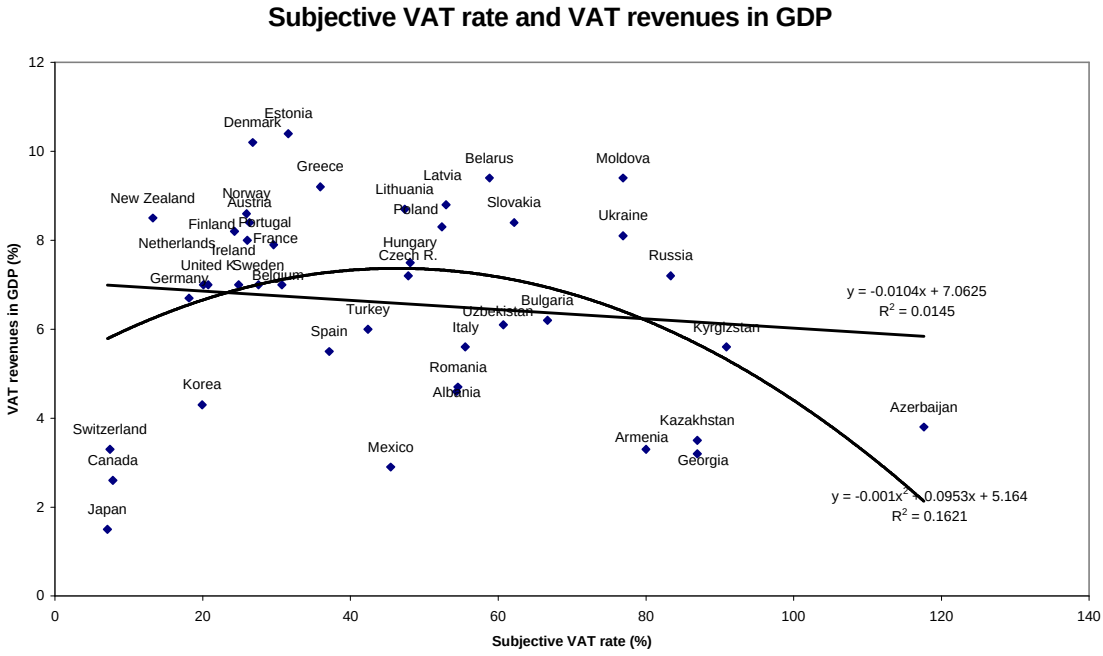


Figure 12



In Figure 12 we present the relationship between the *subjective VAT rate* and the relative VAT revenues on the same sample as above (i.e. 44 countries). The fitted trends are also shown and we can see that here the Laffer-type trend has again a better fitting value than the linear one. We have to mention, however, that this Laffer curve is flatter than the

previous subjective tax related curves (i.e. the subjective tax wedge and the subjective social security contribution rate, Figures 8 and 10).

The explanation for the finding that the VAT Laffer curve is flatter than the other two may be connected with the following facts:

(1) VAT revenues are much easier to collect, and therefore its payment is much more difficult to evade.

(2) A certain part of evaded income taxes and social security contributions becomes disposable income which is spent in the same year in the formal economy. From this spending the state collects additional VAT revenues.

Not only the trend lines show that the subjective tax rates and revenues (ratio of revenues to GDP) form a reversed U-shaped curve, but *stricter econometric investigations* also prove this Laffer-type relationship.

Table 21 contains results of regression calculations that explain the ratio of labour tax revenues (taxes from income, employers' and employees' social security contributions) to GDP in OECD countries. These first calculations were made by the OLS estimation method. Equation [1] explains the ratio of tax revenues to GDP by different *traditional tax rates* and the agricultural employment rate. The coefficient of the traditional tax wedge is significantly positive, the corporate tax has a significantly negative coefficient, and the agricultural employment rate also has a negative influence on the labour tax revenues.

The negative impact of the corporate tax rate is connected with a variable not directly involved here in the calculation: the employment rate, especially the female employment rate. The investigations above showed that a higher corporate tax rate is associated with a lower (female) employment rate, thus leading to lower labour tax revenues. This is one channel between the corporate tax rates and labour tax revenues. The other channel goes from the corporate tax and agricultural employment to the ratio of self-employed and further to tax revenues from labour taxes. Our earlier results above showed that corporate tax rates and the agricultural employment rate, *ceteris paribus*, increase the ratio of self-employed in total employment and this, in turn, leads to lower labour tax revenues. Agricultural employment, an explanatory variable in equation [1], can also decrease labour tax revenues on its own, because tax rules in agriculture are often different from (and laxer than) the rules applied in other employment segments of the labour market. We also calculated a regression (equation [2]) in which the square of the tax wedge as additional explanatory variable was taken into account, but this new factor was significant only at 30% level.

Table 21

Regressions for relative labour tax revenues

Dependent variable: ln ratio of labour tax revenues to GDP

Explanatory variable	Equations						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
ln TAXWEDGE	0.64	0.62	0.65				
	[14.22]	[12.97]	[18.12]				
ln $TAXWEDGE^2$		-0.06					
		[-1.08]					
ln CORPTAX	-0.14	-0.14	-0.13				
	[-2.14]	[-2.66]	[-2.15]				
ln CORRUPTION			0.23				
			[3.99]				
ln STAXWEDGE				0.52	0.52	0.38	
				[8.55]	[9.47]	[9.08]	
ln $STAXWEDGE^2$					-0.14	-0.21	
					[-2.19]	[-2.96]	
ln SCORPTAX				-0.39	-0.38		-0.104
				[-6.63]	[-6.72]		[-1.85]
AGR	-0.02	-0.02	-0.02	-0.03	-0.02	-0.027	-0.019
	[-10.13]	[-10.13]	[-6.96]	[-10.05]	[-8.50]	[-9.24]	[-7.43]
DUMMY	-1.41	-1.42	-1.3	-1.49	-1.52	-1.73	-1.58
	[15.18]	[-13.77]	[-13.23]	[-16.48]	[-17.92]	[-27.75]	[-21.5]
n	124	124	124	124	124	130	124
aR^2	0.9	0.89	0.91	0.86	0.87	0.8	0.68
RMSE	0.164	0.164	0.15	0.198	0.195	0.23	0.29
RESET omitted variables test	0.056	0.088	0.05	0.001	0.084	0.77	0.021
METHOD	OLS	OLS	OLS	OLS	OLS	OLS	OLS

OLS: Ordinary Least Square Method.

Source: Own calculations.

Accordingly, with the traditional tax wedge the Laffer-type behaviour of tax revenues (i.e. the reversed U-shaped curve) was not proved in this calculation. In regression [3] the corruption index is an additional variable. The corruption index has also a significant coefficient: a higher corruption index (which implies a lower level of corruption) is associated with a higher ratio of tax revenues to the GDP.

In column [4] we can see the regression including the variable of the *subjective tax rate*; the sign of the coefficient remains the same as in the equation with the traditional tax rate. While the fitting values are high for these regressions (columns [1], [3], [4] in Table 21) the RESET omitted variable test shows that our specification has some problem, namely some variables are missing from the explanation of the ratio of labour tax revenues to GDP. In

this respect only regression [2] proves to be acceptable, but here the coefficient of one theoretically important variable, the square of the tax wedge, proved to be insignificant.

In the next regression (column [5] in Table 21) we extend the regression with the variable of the square of the subjective tax wedge. We expect that the coefficient of this variable should be negative, since previously we have seen from Figure 8 that the relationship between the subjective tax wedge and the ratio of labour tax revenues to GDP formed a reversed U-shaped curve. In the course of the calculations it turned out that in this polynomial regression the variable of the subjective tax wedge and its square value are closely related, thus causing multicollinearity. Econometric handbooks recommend the method of 'centering' as a strategy for reducing multicollinearity in polynomial regressions. 'Centering' involves subtracting the mean from the original values of the given variable before creating the squared term. This creates a new variable centered on zero with the consequence that it is much less correlated with its own squared values. The results are as we expected: regressions [5] and [6] show that the relative labour tax revenues run along a Laffer curve, preserving the prominent role of the subjective tax wedge in that case too, when we control for other variables (the subjective corporate tax and agricultural employment rate). In these regressions the problem of omitted variables disappears, but some multicollinearity emerges between the subjective tax wedge and the subjective corporate tax rate. This is why we calculated regression [6] in which there is no multicollinearity, and no problem with the omitted variable. Regression [7] shows that the subjective corporate tax rate taken alone as an explanatory variable is significant only at the 13% level.

In the relationship of corruption (or subjective tax rates) and tax revenues one cannot avoid the examination of endogeneity. Strong corruption erodes tax revenues which, in turn, make less public service provision possible, the cause of corruption becoming even stronger. This circular causation questions the validity of the explanations of tax revenues by corruption (or the subjective tax rates, for that matter). To filter out endogeneity one has to find appropriate instrumental variables which explain corruption in an exogenous manner.

In Table 22 we show the results of regressions that were calculated by instrumental variables explaining the cross-country differences in the corruption index. These instrumental variables are the variables describing the dominance of protestant religion, English common law, intensity of ethnological fractionalization, and latitude. The results are more convincing than those with the OLS estimations: a more clear Laffer-type relationship presents itself between the subjective tax wedge and labour tax revenues.

Table 22

Regressions for relative labour tax revenues

Dependent variable: ln ratio of labour tax revenues to the GDP

Explanatory variable	Equations		
	[1]	[2]	[3]
ln STAXWEDGE	0.52	0.42	
	[10.87]	[6.62]	
ln STAXWEDGE^2	-0.39	-0.45	
	[-4.34]	[-4.79]	
ln SCORPTAX	-0.32		-0.094
	[-5.29]		[-1.66]
AGR	-0.021	-0.023	-0.019
	[-6.9]	[7.0]	[-7.03]
DUMMY	-1.6	-1.78	-1.58
	[-14.5]	[-31.6]	[-21.5]
n	119	119	119
R^2	0.84	0.78	0.69
RMSE	0.2141	0.25	0.29
METHOD	INST	INST	INST

Source: Own calculations.

We can illustrate a similar Laffer-type relationship between a certain type of subjective tax rate and the relative size of tax revenues on another sample of countries as well. Here we investigate the cross-country differences in the ratio of the social security contribution revenues to GDP in 35 countries (both OECD and transition countries). The regressions contain the linear and quadratic form of the subjective social security contribution, the subjective corporate tax rate, and the agricultural employment rate as explanatory variables.

The various regressions show the impact of the traditional tax rates (column [1] in Table 23), the traditional tax rates and the corruption index as an additional variable (column [2]), and the subjective tax rates (columns [3] and [4]). The Laffer-type curve appears clearly where the variable of the social security contribution rate and its quadratic form have significant positive and negative coefficients, respectively (column [4] in Table 23). For comparison, in column [5]* in Table 23 we present the Laffer-type regression from the previous investigation (Table 21, column [5]), where we looked at the determinants of labour tax revenues for the OECD countries. The parameters in both calculations are very similar; the only difference is that in the large sample of 35 countries the quadratic variable of the subjective social security contribution rate has a larger negative coefficient than the relevant coefficient of the subjective tax wedge in the sample of the OECD countries. This difference is no surprise, since one could detect it by comparing Figures 8 and 10, and it stems from the differences of the two samples.

Table 23

Regressions of social security contribution revenues
(35 countries, OECD and transition countries, 1997)

Dependent variable: ln ratio of social security contribution revenues to the GDP

Explanatory variable	Equations				
	[1]	[2]	[3]	[4]	[5]*
ln SOCSC	1.09	1.04			
	[5.70]	[5.63]			
ln CORPTAX	-0.38	-0.27			
	[-2.09]	[-1.50]			
ln CORRUPTION		0.12			
		[1.21]			
ln SSOCSC			0.82	0.51	0.52
			[4.80]	[3.06]	[9.47]
ln $SSOCSC^2$				-0.28	-0.135
				[-2.36]	[-2.19]
ln SCORPTAX			-0.55	-0.3	-0.38
			[-3.18]	[-2.11]	[-6.72]
AGR	-0.03	-0.015	-0.03	-0.03	-0.024
	[-3.65]	[-3.76]	[-6.7]	[-5.34]	[-8.50]
DUMMY	MEX	MEX	MEX	MEX	MEX
	KOR	KOR	KOR	KOR	
number of obs.	36	35	35	35	124
R^2	0.82	0.88	0.83	0.88	0.87
RMSE	0.3	0.24	0.27	0.235	0.195
method	H-W	H-W	H-W	H-W	OLS

* Regression explaining the labour tax revenues by subjective tax wedge, OECD countries (from Table 21).

Source: Own calculations.

7 Subjective tax rates and the size of the implied repressed economy

In the course of our series of investigations we have now arrived back at the starting point of this study. This was concerned with the hidden economy. In Section 3 we showed that in the literature that has investigated the effects of tax rates and corruption on the size of the hidden economy, it was found that tax rates as such were not a determining factor, while corruption was an important explanatory determinant. After defining our new concept, the subjective tax rate, we showed that the size of the hidden economy coming from different estimations has a close relationship with the subjective tax rate. We illustrated through several examples (econometric investigations) that tax rates, together with the level of corruption, influence the size of the hidden economy. But we did not stop there, since we recognized the problems behind the estimations of the size of the hidden economy, estimations that produced the data with which we made the regression calculations for the strong relationship between the subjective tax rates and the size of the hidden economy. In

Section 5 we showed that the concept of the subjective tax rate is valid in the analysis of various developments in the labour market of OECD and transition economies. It turned out that it has explanatory power for the development of different visible segments of the labour market (the segment of unemployed, employed and self-employed people of various gender and cohorts). In section 6 it was also proved that the subjective tax rate has a decisive impact on the relative size of tax revenues, too.

Given the proved strong relationship between the subjective tax rates and all kinds of decisions about participation in the labour market and generating tax revenues, it seems obvious or inevitable that we make use of the new results in a new attempt to estimate the size of the hidden economy. Because we have already investigated the relationships between the subjective tax rates on the one hand, and the segments of the labour market and the relative size of tax revenues on the other, two known estimation methods of the size of the hidden economy have to be considered: the MIMIC method and the TRAM method. The MIMIC method makes extensive use of the proven relationships to estimate the unknown variable (the hidden economy), while the TRAM method is based on cross-country comparison and calibration of tax revenues and their constituting elements.

7.1 The MIMIC method

The MIMIC (multiple indicators, multiple causes) model was introduced into the literature by Zellner (1970) . The pioneers of using the MIMIC approach for the estimation of the size of the hidden economy are Weck (1983), Frey and Weck (1983a, 1983b) and Frey and Weck-Hannemann (1984). These authors applied this approach to a cross-section data set for 24 OECD countries, for various years.

The MIMIC model consists of two parts: the measurement model that links the unobserved variables to observed indicators, and the structural equations model which specifies casual relationships among the unobserved variables. In the course of the investigation of the hidden economy there is one unobserved variable, the size of the hidden economy. There is a large body of literature (Thomas, 1992; Schneider 1994, 1997, 2002; Johnson et al., 1998, 1999; Giles, 1999a, 1999b) on the possible *causes* and *indicators* of the hidden economy, in which the following three types of causes have been distinguished (see Schneider, 2002).

(1) The burden of direct and indirect taxation: a rising burden of taxation is a strong incentive to work in the hidden economy.

(2) The burden of regulation by the state: it is assumed that increases in the burden of regulation give a strong incentive to enter the hidden economy.

(3) ‘Tax morality’ (citizens’ attitudes toward the state): it is assumed that declining tax morality tends to increase the size of the hidden economy.

In the literature the following three types of indicators have been identified.

(1) Monetary indicators: if activities in the hidden economy rise, additional monetary transactions are required.

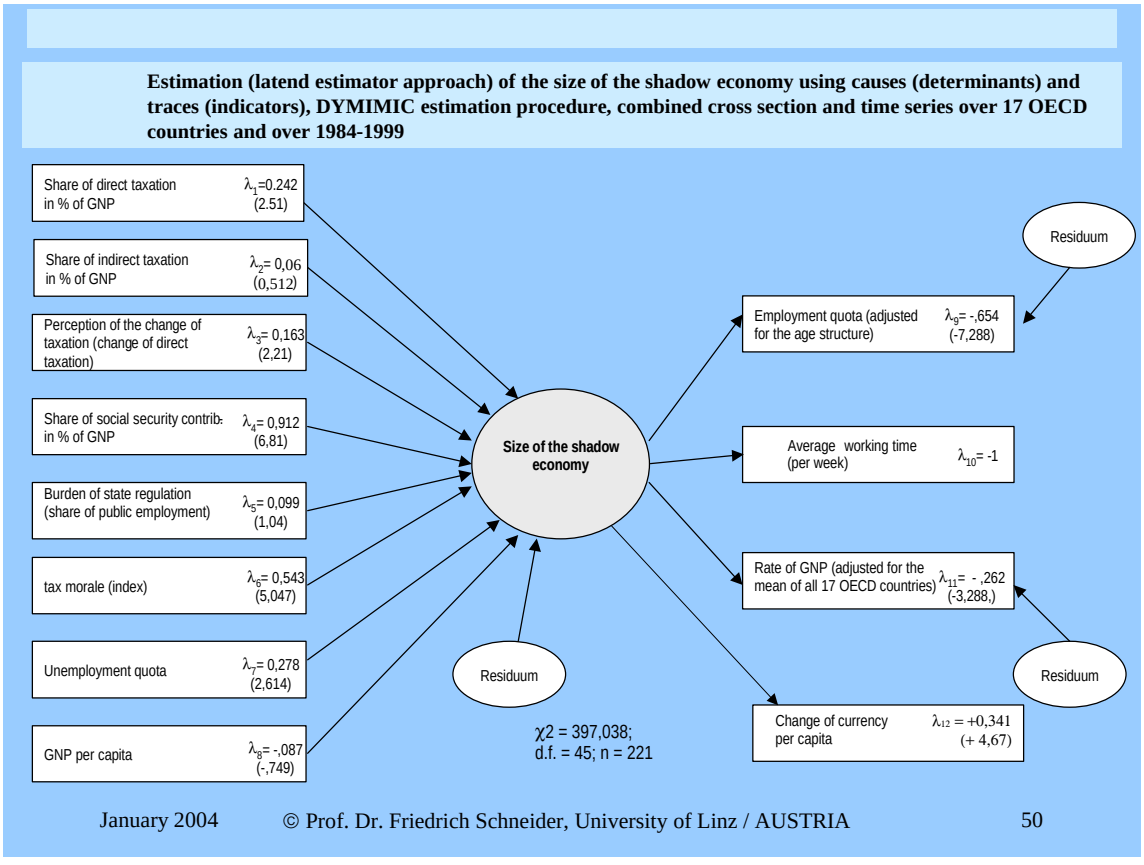
(2) Labour market indicators: increasing participation of workers in the hidden sector results in a decrease in the participation in the official economy. Similarly, increased activities in the hidden economy may be expected to be reflected in shorter working hours in the official economy.

(3) Product market indicators: an increase in the hidden economy means that inputs (especially labour) move out of the official economy and this displacement may have a depressing effect on the growth rate of the official economy.

Recently the MIMIC model approach was used in the context of the hidden economy by Giles (1999a, 1999b), and Schneider (2002).

Figure 13

Causes and indicators in Schneider's estimation



Source: Schneider (2004), p. 50.

All scholars who use the MIMIC and DYMIMIC methods, including Schneider, are well aware of the fact that there are serious objections to these methods, such as:

- instability in the estimated coefficients with respect to sample size changes;
- unstable estimated parameters with respect to alternative specifications;
- difficulty in obtaining reliable data on variables other than taxes;
- no strong reliability of 'causes' and 'indicators' in explaining the variability of the hidden economy (cf. Schneider and Klinglmair, 2004; Schneider, 2004).

Based on the experience of our own earlier investigations, we have to support these objections, in particular the last one. In the DYMIMIC estimation of the hidden economy by Schneider and Klinglmair (2004) and Giles (1999a, 1999b), the middle-aged (25-50) male employment rate is one of the 'indicator' variables. Our investigation in Section 5.2.3 showed, however, that this variable contains one part, namely the group of self-employed, which is influenced by the subjective tax rates in a similar way as the unobserved hidden economy. High subjective tax rates are associated with high self-employment rates within total employment; therefore the negative influence of subjective tax rates on total visible employment cannot be robust.

There are some problems with the 'cause' variables, too. Schneider and Klinglmair (2004) and Schneider (2004) use the ratio of tax revenues to GDP as a cause variable. Our investigation, however, showed that the ratio of labour tax revenues to GDP moves along a Laffer-type curve if explained with the subjective tax wedge (see Section 6). As a consequence, if the subjective tax wedge grows above an optimal level, the ratio of labour tax revenues to GDP declines. To use this low rate of tax revenues as a cause variable may be misleading. Our investigations show that the relative size of tax revenues is much more an 'indicator' variable than a cause variable. Schaffer and Turley (2000), who attempt to measure the effectiveness of tax administration in transition economies, also take tax revenues as an 'indicator' variable. They measure the effectiveness of the tax administration by comparing statutory tax rates with effective tax yields; the methodology involves calculating an effective/statutory tax ratio.

Similar considerations are behind the estimation of the size of the hidden economy by the so-called Tax Revenue Anchor Method (TRAM), which is described below.

7.2 The TRAM approach

A form of TRAM is to compare tax revenue developments in per cent of GDP across countries. If one uses estimates of the statutory tax burden on agents of the economy and assumptions on the share of the hidden economy in a base country, differences in actual tax revenue rates can provide a rough estimate of the hidden economy in countries other

than the base country. The IMF country report on Albania (IMF, 2003) and Christie and Holzner (2003) use this method to measure the size of the hidden economy associated with households in the Balkan countries.

Christie and Holzner (2003) start their analysis with estimating the personal statutory tax rate (PST).[10]

(7.2.1) PST= AIT+ESS+ (1-AIT-ESS) *0.95 *(VAT+1/3AET)

where AIT: average income tax rate
ESS: employee social security contribution rate
VAT: average value added tax rate
AET: average excise tax rate

The value of personal tax revenue (PRT) is taken from the tax revenue statistics:

(7.2.2) PRT=IRT+SSR+VAR+ETR

where IRT: personal income tax revenue
SSR: employee social security contribution revenue
VAR: value added tax revenue
ETR: excise tax revenue

With the help of TRAM and data for the share of the hidden economy in the anchor country, the share of the hidden economy (SSE) in another country can be calculated in the following way:

(7.2.3) $SSE_i+\beta_{Hi}\,\lambda_{Hi}+\beta_{Oi}\,\lambda_{Oi}=SSE_j+\beta_{Hj}\,\lambda_{Hj}+\beta_{Oj}\,\lambda_{Oj}$

where *i* – anchor country
j – country other than the anchor
$\beta_{Hi}\,\lambda_{Hi} = PTR_i/PST_i$
$\beta_{Hj}\,\lambda_{Hj} = PTR_j/PST_j$

and β_H = THI/GDP the total household income (THI) in GDP,
β_O = TOI/GDP total other income (TOI) in GDP,
DHI is declared household income
λ_H = DHI/THI the household income declaration rate,
DOI is declared other income
λ_O = DOI/TO the other income declaration rate,
$\beta_H\,\lambda_H$ declared household income as a share of GDP,
$\beta_O\,\lambda_O$ declared other income as a share of GDP.

[10] This and the subsequent equations used for estimation are based on very strong, not always well-established assumptions about the personal savings rate, spending on VAT and excise taxes, etc.

All these are based on the following decomposition of GDP:

(7.2.4) GDP= THI+TOI-Δ= DHI+UHI+DOI+UOI-Δ

where : UHI undeclared household income
UOI undeclared other income
= -TLSP+NCVA+OHI

where TLSP : taxes less subsidies on products
NCVA: non-captured value added
OHI: other household income

(7.2.5) SSE= (UHI+UOI)/ GDP

These are the base-identities in the TRAM model. With the help of some additional restrictive assumptions one can calculate the share of the hidden economy in a cross-country comparative way. Christie and Holzner (2003) apply two sets of restrictive assumptions to calculate the share of the hidden economy in GDP. The first set of the restrictive assumptions contains $\beta_{Hi}=\beta_{Hj}$, $\beta_{Oi}=\beta_{Oj}$, $\lambda_{Oi}=\lambda_{Oj}$, and then:

(7.2.6) $SSEj = SSE_i+\beta_{Hi}(\lambda_{Hi}-\lambda_{Hj})$,

which means that the share of the hidden economy in country *j* equals the share of the hidden economy in the anchor country *i,* plus the declared household income as a share of GDP in the anchor country *i,* minus the declared household income as a share of GDP in country *j*.

7.3 The Household Income Taxation Method (HITM)

The other set of assumptions is connected with the fact that the official GDP already contains some inputted income coming from the hidden economy. To utilize this information Christie and Holzner (2004) try to estimate the share of the hidden economy pertaining to households with the help of the following identities:

(7.3.1) PTR=DHI* PST

(7.3.2) PTR/GDP= DHI/GDP* PST

(7.3.3) $(PTR/GDP)/PST= DHI/GDP= THI/GDP * DHI/THI= \beta_H \lambda_H$

Now the authors make a direct estimation of THI, the total household income based on the final consumption in the national account system according to the assumption that the official GDP already contains certain hidden activities. After the estimation of THI, Christie and Holzner were able to determine λ_H, the household income declaration rate. The share of the hidden economy pertaining to households can also be known based on the following equation:

(7.3.4) SSEH= UHI/GDP= THI/GDP- DHI/THI= β_H- β_H λ_H=β_H*(1-λ_H)

By using the methodology outlined above, Christie and Holzner (2004) calculated the share of the hidden economy relating to households for the Balkan, Baltic and Eastern European countries, and they arrived at interesting and plausible results.

7.4 Modified Tax Revenue Method estimations of the repressed economy

Utilizing the previous experiences with both the tax revenue methods (TRAM and HITM) developed by Christie and Holzner (2003, 2004) and our own concept of subjective tax rates, we develop below an estimation method for the size of the repressed economy implied by the subjective tax rates and the actually collected tax revenues. We introduce a new concept: the *repressed economy*. The basic idea behind this is that tax revenues in an economy are lower than ideally expected not only because of hidden economy activities that aim at evading tax payment, but also because certain people become discouraged from work at all, thus avoiding income- and tax-generating activities. We cannot say with absolute certainty that all those who are not working in the official economy are engaged in the hidden economy: considering the unattractive conditions, they may have withdrawn from all types of economic activity. Accordingly, when we deduce estimations from the comparison of actual and expected tax revenues, we will estimate the size of the 'repressed economy', which is wider than the 'hidden economy'. It contains also the 'held-back economy' as well as 'losses of performance due to inferior productivity in the hidden economy'. In the following we will limit our analysis to taxes on labour and the revenues collected from this source.

We set out from the following identity at the macro level:

(7.4.1) LTR/TGDP= LTAX*(DLC/TGDP)

where LTR: labour tax revenues
LTAX: average of statutory labour tax rate (in % of labour costs)
TGDP: total GDP= official GDP+non-official GDP
DLC: declared labour costs

Let us assume that TGDP= γ GDP, where γ>1.

By inserting this into (7.4.1) and making the necessary reduction and some rearrangements we get:

(7.4.2) LTR/GDP= LTAX * (DLC/GDP)

(7.4.3) (LTR/GDP)/LTAX= DLC/GDP= (DLC/TLC)*(TLC/GDP)= λ_{LC} * β_{LC}

where TLC: total labour cost
λ_{LC} =DLC/TLC, the declaration rate of labour cost
β_{LC} = TLC/GDP, the ratio of total labour cost to GDP

The expression (7.4.3) is very similar to the expression (7.3.3) used by Christie and Holzner (2004) in their HITM estimation.

From the identity (7.4.3) we know only LTR/GDP, LTAX and accordingly DLC/GDP. This means that we know the $\lambda_{LC} * \beta_{LC}$ product, but we have no information about λ_{LC} and β_{LC} separately. Accordingly, when applying the (7.4.3) identity to estimate a part of the repressed economy we have to make some assumptions, the same way as Christie and Holzner did in their estimation.

It is obvious that $\lambda_{LC} * \beta_{LC}$, the product of the declaration rate of labour cost and the share of total labour cost in GDP, is closely related to the visible and non-visible segments of the labour market. In order to clarify the relationship between $\lambda_{LC} * \beta_{LC}$, i.e. the *relative declared labour cost* and the visible segment of the labour market, we perform some regressional equations. The regression in Table 24 shows that we can explain this product by the employment rates in the visible segments of the labour market and the GDP per capita. The latter indicator is taken as a proxy for the wage levels in a cross-country comparison.

Table 24

Regression explaining the ratio of labour tax revenues (in GDP) to the statutory labour tax rate

Dependent variable: ln(LTR/GDP)-ln (LTAX)

Explanatory variable	Equation [1]
Employment rate	0.014
	[5.10]
Self-employment rate	-0.007
	[-2.82]
ln GDPper capita	0.225
	[4.25]
Dummy variable	-1.26
	[-9.51]
R^2	0.84
RMSE	0.1833
n	128
METHOD	H-W

Source: Own calculations.

The results show, as we expected, that the product $\lambda_{LC} * \beta_{LC}$ is connected with the employment rate: a higher employment rate is associated with higher declared labour tax revenues. However, it also appears that when the self-employment rate is higher within the same population of employed, the relative declared labour cost will decrease. This seems

plausible, because the self-employment status indeed helps both the employers, using the self-employed for outsourcing, to avoid social security tax obligations, and the employees to evade paying taxes in general. It is also plausible that with higher GDP per capita, wages are also higher, and accordingly the tax-content of these wages is also higher. GDP per capita can also be considered a measure of the level of development, and a higher level of development implies a better institutional environment to collect taxes, thus contributing to increasing the relative size of the tax revenues.

In Section 5 we dealt with the relationships between various types of subjective tax rates and the visible segments of the labour market, and we proved that the subjective tax rates are relevant factors influencing the size of the different visible segments of the labour market. At the same time, it is justified to assume that the declaration rate of labour taxes and the size of the hidden economy, two indicators reflecting the non-visible parts of the labour market, are also strongly related to the subjective tax rates. Accordingly, in the following we re-formulate the equation explaining the relative declared labour cost, and show how cross-section differences of the relative declared labour cost depend on the subjective tax rates directly. We set up and carry out regression investigations in the same way as we did in the analysis of the visible segments of the labour market.

Tables 25a and 25b present the results of our regression equations. The tables differ in so far as in Table 25a the indicator of the development level of a country is proxied by the GDP per capita, while in Table 25b by the agricultural employment rate.

In columns [1a] and [1b] we can see the regressions explaining the variation of the relative declared labour cost with the explanatory variables of the traditional tax rates and GDP per capita (or the agricultural employment rate). The traditional tax rates have negative coefficients showing that higher tax rates, *ceteris paribus*, decrease the relative declared labour cost. The coefficients of GDP per capita and agricultural employment rate are also significant and have the expected signs (positive and negative, respectively).

In regressions [2a] and [2b] we included the corruption index as an additional variable. In the case of the first calculation (column [2a] in Table 25a) the coefficient of the corruption index is not significant, because of the – otherwise well-known – multicollinearity between GDP per capita and the corruption index. In the second calculation (column [2b] in Table 25b) the corruption index is significantly positive, which means that a lower level of corruption (this is equivalent to a higher value of the corruption index) will lead to a higher ratio of declared labour cost, i.e. higher tax revenues. Some multicollinearity between the corruption index and the agricultural employment rate also appears, but in this equation this does not disturb the level of significance of the various coefficients.

Table 25a

Regressions explaining the ratio of labour tax revenues in GDP to statutory labour tax rates

Dependent variable: ln(LTR/GDP)-ln(LTAX)

Explanatory variable	Equations				
	[1a]	[2a]	[3a]	[4a]	[5a]
ln TAXWEDGE	-0.347	-0.325			
	[-8.16]	[-8.33]			
ln CORPTAX	-0.146	-0.179			
	[-2.93]	[-3.16]			
ln CORRUPTION		0.101			
		[1.077]			
ln STAXWEDGE			-0.3	-0.3	
			[-7.8]	[-8.35]	
ln SCORPTAX			-0.068		-0.16
			[-1.45]		[-2.95]
ln GDP per capita	0.536	0.519	0.378	0.41	0.58
	[12.42]	[8.036]	[7.54]	[8.44]	[10.86]
DUMMY	-1.29	-1.2	-1.23	-1.15	-1.01
	[-13.41]	[-13.24]	[-12.67]	[-13.31]	[-9.39]
R^2	0.84	0.87	0.87	0.86	0.8
RMSE	0.1875	0.1684	0.1701	0.177	0.21
n	135	128	128	134	128
Method	INST	INST	INST	INST	INST

Source: Own calculations.

In regressions [3a] and [3b] in Tables 25a and 25b we can see that the subjective tax rates influence negatively and in a significant way the declared labour costs, and that both GDP per capita and agricultural employment appear also as important explanatory variables. If we compare the different regression calculations, we also experience that the fitting values are better when the dependent variable is explained directly by the subjective tax rate and not by the traditional tax rate or the corruption index separately.

Table 25b

Regressions explaining the ratio of labour tax revenues (in GDP) to statutory labour tax rates

Dependent variable: ln(LTR/GDP)-ln(LTAX)

Explanatory variable	Equations				
	[1b]	[2b]	[3b]	[4b]	[5b]
ln TAXWEDGE	-0.35	-0.34			
	[-8.93]	[-9.30]			
ln CORPTAX	-0.14	-0.142			
	[-2.63]	[-2.84]			
ln CORRUPTION		0.228			
		[2.90]			
ln STAXWEDGE			-0.31	-0.31	
			[-8.93]	[-10.13]	
ln SCORPTAX			-0.08		-0.196
			[-1.82]		[-3.61]
AGR	-0.024	-0.019	-0.016	-0.017	-0.0207
	[-14]	[-8.30]	[-8.35]	[-9.36]	[-8.87]
DUMMY	-1.41	-1.3	-1.21	-1.15	-1.19
	[-17.65]	[-15.61]	[-15.69]	[-13.36]	[11.78]
R^2	0.87	0.89	0.89	0.88	0.8
RMSE	0.1644	0.1513	0.1535	0.157	0.201
n	124	119	119	125	119
Method	INST	INST	INST	INST	INST

Source: Own calculations.

Now we turn to the exercise of estimating the size of the repressed economy implied by the subjective tax rates. Based on regression [3b] in Table 25b we estimate the fitted relative declared labour cost for each country $(\lambda_{LC} * \beta_{LC})_e$. Then we calculate an estimated tax revenues/GDP ratio according to (7.3.3) in the following way:

(7.4.4) $\ln (LTR/GDP)_e = \ln (\lambda_{LC} * \beta_{LC})_e + \ln LTAX$

In a next step we calculate that share of tax revenues in GDP for every country that would be realized if the country had the lowest realistically possible subjective tax rate (we take the actual subjective tax rate in Switzerland):

(7.4.5) $\ln (LTR/GDP)_s = \ln (\lambda_{LC} * \beta_{LC})_s + \ln LTAX$

Then we calculate the share of the repressed economy implied by the subjective tax rates according to the following expression:

$$(7.4.6) \quad R = \frac{\ln (LTR/GDP)_s - \ln (LTR/GDP)_e}{\ln (LTR/GDP)_e}$$

Table 26 contains the results of this estimation procedure.

Table 26

Estimated ratio of the repressed economy (R) implied by the subjective tax rates (% of GDP)

Country	R	Country	R
Austria	12.0	Korea	12.7
Belgium	19.4	Mexico	56.0
Canada	7.0	Netherlands	9.8
Czech R.	18.2	New Zealand	2.7
Denmark	7.8	Norway	6.8
Finland	10.1	Poland	20.3
France	15.0	Portugal	13.1
Germany	11.0	Spain	16.6
Greece	20.5	Sweden	10.8
Hungary	17.4	Switzerland	0.0
Ireland	8.7	Turkey	32.5
Italy	20.7	UK	8.4
Japan	8.3	USA	9.6

Source: Own calculations.

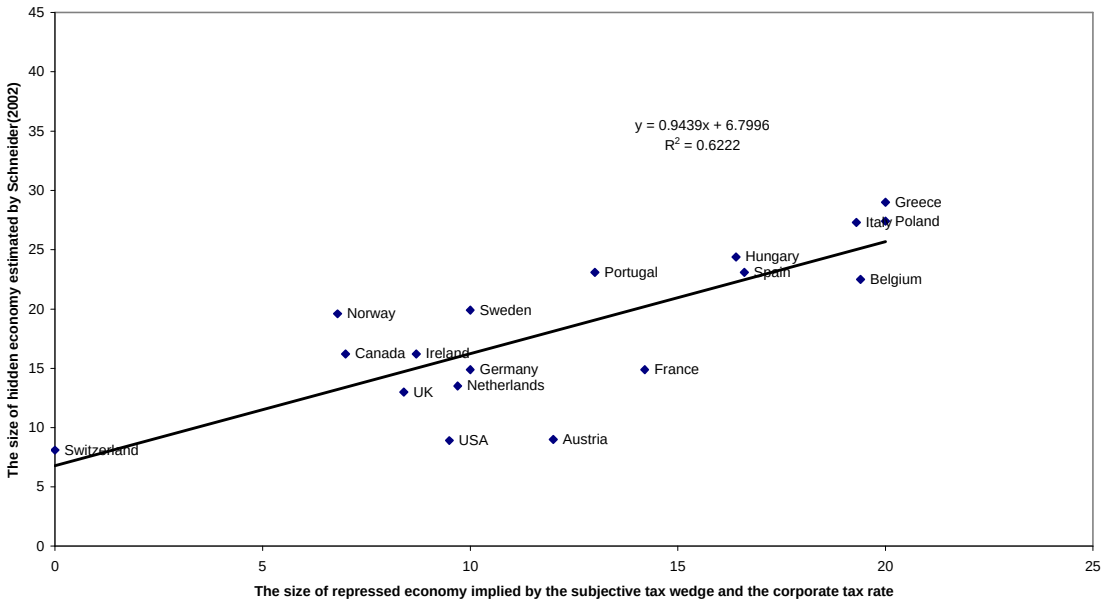
In this modified Tax Revenues Method the anchor country is Switzerland, because its subjective tax rates are the lowest in the investigated sample. From this choice it follows that *R* for Switzerland is 0, and this is a very strong assumption. But for experts who are familiar with the literature on the estimation of the size of the hidden economy, this type of strong assumption is not uncommon.

When we compare our results with the results of other estimations for the hidden economy, we have to calibrate the results of the other estimations to the assumption that Switzerland has 0 size of the hidden economy. When comparing the size of hidden economies estimated by Schneider (2002) and the size of repressed economies that are the results of our estimation method, the correlation is very strong (r=0.79, n=22). There are some 'outliers' though, namely the USA, France and Austria. In these countries the relative size of the hidden economy given by Schneider (by his DYMIMIC estimation method) is much lower than the relative size of their repressed economy according to our own results. This is evident from Figure 14, where the relative size of the hidden economy is compared to

the relative size of the repressed economy (for Switzerland: 0 hidden economy and 0 repressed economy).

Figure 14

Size of the repressed and hidden economies in 17 OECD countries



However, the most important message of our estimation is that Greece, Italy, Spain, Belgium, Poland and Hungary have the highest repressed and also hidden economies in the sample, while Switzerland, New Zealand, the UK and Canada have the lowest non-visible (repressed or hidden) economies.

In the estimation outlined above the relative size of the repressed economy implied by the subjective tax wedge and the subjective corporate tax rate was assessed on a sample of the OECD countries, and this sample contained only two transition economies.

We are in a position to carry out another exercise, this time with 20 developed and 15 transition countries for the year 1997. However, our database for this sample is limited to certain types of taxes. For this reason, in this estimation we deal with the social security contribution revenues and rates, instead of the labour tax revenues and the tax wedge as before.

Our estimation method is similar: we start with regression estimations where the dependent variable is the ratio of social security revenues to GDP divided by the social security contribution rate. The explanatory variables are: the subjective social security

contribution rate, the subjective corporate tax rate and the agricultural employment rate. (See the regression results in Table 27.)

Table 27

Regressions explaining the ratio of social security contribution revenues (in GDP) to statutory social security contribution rates

Dependent variable: ln(LTR/GDP)-ln(LTAX)

Explanatory variable	Equations					
	[1]	[2]	[3]	[4]	[5]	[6]
ln SOCSC	-0.18	-0.15				
	[-1.87]	[-1.66]				
ln CORPTAX	-0.31	-0.21				
	[-2.82]	[-1.44]				
ln CORRUPTION		0.09				
		[0.90]				
ln SSOCSC			-0.081	-0.18		
			[-0.82]	[-2.41]		
ln SCORPTAX			-0.13		-0.204	
			[-1.00]		[-2.72]	
lnSSOCSC+lnSCORPTAX						-0.1
						[-2.62]
AGR	-0.026	-0.017	-0.014	-0.01	-0.014	-0.014
	[-3.8]	[-4.5]	[-4.51]	[-4.90]	[-4.81]	[4.75]
DUMMY	DEN	DEN	DEN	DEN	DEN	DEN
	MEX	MEX	MEX	MEX	MEX	MEX
	KOR	KOR	KOR	KOR	KOR	KOR
R^2	0.76	0.83	0.82	0.7	0.8	0.82
RMSE	0.267	0.1834	0.185	0.229	0.1858	0.1821
n	36	35	35	36	35	35
Method	H-W	H-W	H-W	H-W	H-W	H-W

Source: Own calculations.

While the subjective tax rates, when used jointly, are not significant (see column [3] in Table 27), they show significantly negative coefficients when used separately (see columns [4] and [5]). This fact reflects multicollinearity between the different subjective tax rates. For this reason we add together these two variables and estimate the regression with this composite variable.[11] The result is reasonable and technically acceptable: see column [6] in Table 27. The coefficient of this composite tax variable in this regression is then used to estimate the size of the repressed economy implied by the subjective social security contribution and subjective corporate tax rates in the investigated countries the same way as we did in the previous sample with labour tax revenues and labour tax rates.

[11] We are aware of the weak point of this addition: the two tax rates are related to different tax bases. Nevertheless, in this context this inconsistency does not seem to cause any major distortion.

Figure 15

Size of the repressed economy in 17 OECD countries by two estimations

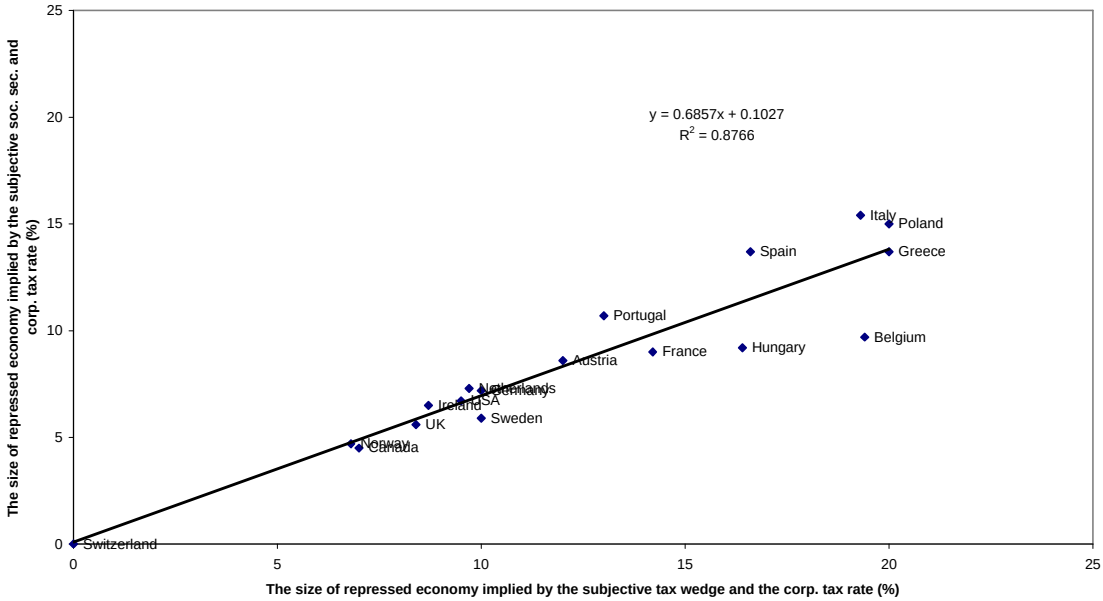
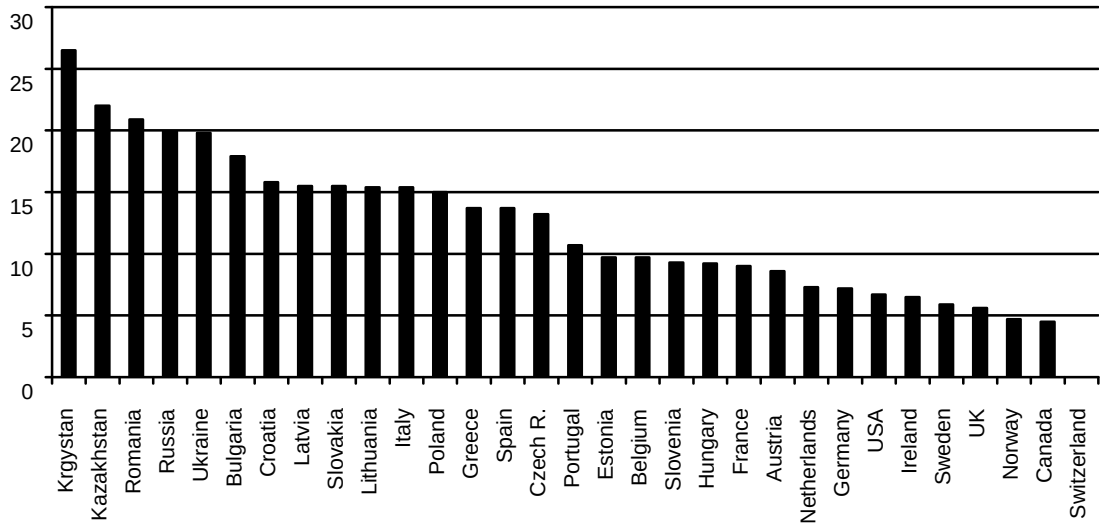


Figure 16

Repressed economy implied by the subjective social security contribution rate and the subjective corporate tax rate, 1997

(% of GDP, Switzerland = 0)



Since there are a number of countries that were used in *both* estimations assessing the size of the repressed economy, we can compare the results for these countries. We find that the results are very close to each other (see Figure 15). This experience allows us to take all the results estimated in the wider sample of countries seriously.

From Figure 16 it is clear that the relative size of the repressed economy in transition economies is much higher than in developed market economies. Particularly high are the repressed economies in the post-Soviet countries (Kyrgyzstan, Kazakhstan, Russia and Ukraine) and in the South East European economies (Romania, Bulgaria and Croatia).

8 Summary

The study attempted to explain how tax rates, the level of corruption and various institutional aspects of the labour market influence the relative size of different segments of the labour market (unemployment, employment, self-employment and the activity in the hidden economy). Another aim of the paper was to explain the tax revenues in both developed market economies and transition countries, with the help of the mentioned explanatory factors. Based on theoretical assumptions and methodological considerations, alternative regression investigations were carried out on data for 28 OECD countries and partly on 25 transition countries, for the period 1995-2000. A methodological novelty of the investigation was the establishment and testing of a new variable, the subjective tax rate.

According to the experiences in the literature about the hidden economy, simple comparisons of the statutory tax rates on economic activity across countries may be misleading if we do not take into account the environment in which they let their impact be felt. Here the environment means the way taxes are set and collected (coherence, transparency and orderly tax system and collection) and the way taxes are used in the provision of government services (again transparent, orderly and economical utilization). For a proper cross-country comparison of tax rates we defined a new indicator, the so-called *subjective tax rate*, which combines the traditional tax rate with the level of inefficiency of the institutional environment. The latter was proxied by the level of corruption in the given country.

Our empirical investigations showed that, beside other institutional differences in the labour market, subjective tax rates are relevant factors explaining the cross-country differences in unemployment, employment and self-employment rates, as well as the size of the hidden economy.

We found that these relationships are quite comprehensive, but also sophisticated. If high traditional tax rates along with a high level of corruption (and implied worse conditions of employment) make the employee status less available and/or less attractive, female and male employees respond differently. Female workers go into unemployment, or join the group of unpaid family workers within the self-employed sector, or even leave the labour market. In contrast, male participants as a rule become self-employed, because male employment is critical to earn a living for the rest of the family, if possible (at least partly) in the declared economy.

The same factors that affect the changing size of the hidden economy influence in a complex way the move of the potential labour force across the different visible segments of the labour market. For instance, high tax rates on labour combined with a high level of corruption may give rise to a large hidden economy segment, but these very factors may also contribute to a rise in the unemployment rate and the inactivity rate. At the same time, these factors may affect another segment of the employed, namely the self-employed persons, whose ratio in total employment may increase. This increase in self-employment may further increase the size of the hidden economy, since self-employed persons are able to evade and avoid taxes much more easily than employed persons. In this mechanism unemployment and self-employment develop in a parallel way. Another factor, the generosity of unemployment benefits, gives rise to contrasting developments in the various segments of the labour market. Generous unemployment benefits may contribute to an increase in the number of unemployed, but at the same time they induce, *ceteris paribus*, a drop in the self-employment rate. A high corporate tax rate combined with a high level of corruption may crowd people out of the employee status and increase the ratio of self-employed. These are the so-called false self-employed: in practical terms they are still employees, but are undeclared as far as payroll taxes are concerned. This transformation of the employee status enables both employees and employers to evade taxes, but the same combination of factors can also increase the share of non-employed people who (just like the self-employed) are prone to be engaged in the hidden economy.

The above outlined complex system of relationships in the labour market is reflected in the development of tax revenues. The investigated specific tax revenues (labour tax revenues, social security contribution revenues and value added tax revenues) and the relevant subjective tax rates (subjective tax wedge, subjective social security contribution rates and subjective value added tax rates) form a Laffer-type relationship in cross-country comparison. The presentation of the relationship by figures and by more articulate econometric investigations showed that higher subjective tax rates would initially increase tax revenues, but beyond a certain point further increases in the subjective tax rates would cause the revenue to fall. It became also clear that most of the transition countries (in particular the post-Soviet and South East European countries) are currently found on the downward part of the Laffer curve, but some OECD countries are also located on that part of the curve.

By utilizing the results obtained from the application of the concept of the subjective tax rate and applying special estimation methods of the hidden economy based on tax revenues (TRAM and HITM) we developed an estimation method for the relative size of the repressed economy implied by the subjective tax rates. (‘Repressed economy’ is a wider concept than ‘hidden economy’, because it also contains the ‘held-back economy’ and loss of performance due to inferior productivity in the hidden economy.) Our estimations show that among the OECD countries investigated, Italy, Spain, Greece,

Belgium, Poland and Hungary have relatively high levels of repressed economies. Among the transition countries particularly the post-Soviet and the South East European countries have large repressed economies, certainly larger than those transition countries which are already among the OECD countries (Poland, the Czech Republic, Slovakia and Hungary).

The main policy conclusion of this study is the following: Any characterization of tax rates according to their nominal size or even in international or timewise comparison is misleading. Taxes let their impact be felt on the decisions of economic agents (in our case on the various participants of the labour market and the entrepreneurs) in the context of the social environment in which these rates are set and the revenues are collected and redistributed. In an environment in which the participants do not believe in the efficient collection and utilization of the tax revenues, even small tax rates may be considered too high, while in an environment with the perception of excellent public services, even record-high tax rates would not induce participants of the economy to keep their efforts back or hide their activities.

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Appendix 1: Variables, definitions and sources of data

AGR: agricultural employment rate: ratio of employed persons in agriculture to the total employed people, per cent. Source: KILM (2001); World Development Indicators, 2001.

U: Unemployment rate: ratio of unemployed persons to the relevant labour force, per cent. Source: KILM (2001).

LU: Long-term unemployment rate: ratio of unemployed persons with continues periods of unemployment extending for a year or longer, to the overall labour force, per cent. Source: KILM (2001).

UM: Male unemployment rate: ratio of male unemployed persons to the relevant labour force, per cent. Source: KILM (2001).

UF: Female unemployment rate: ratio of female unemployed persons to the relevant labour force, per cent. Source: KILM (2001).

UY: Young unemployment rate: ratio of 15-25 aged unemployed persons to the relevant labour force, per cent. Source: KILM (2001).

UYM: Young male unemployment rate: ratio of 15-25 aged male unemployed persons to the relevant labour force, per cent. Source: KILM (2001).

UYF: Young female unemployment rate: ratio of 15-25 aged female unemployed persons to the relevant labour force, per cent. Source: KILM (2001).

E: Employment rate: ratio of employed persons to the labour force, per cent. Source: KILM (2001).

EM: Male employment rate: ratio of male employed persons to the relevant labour force, per cent. Source: KILM (2001).

EF: Female employment rate: ratio of female employed persons to the relevant labour force, per cent. Source: KILM (2001).

EP: Prime age employment rate: ratio of 25-50 aged employed persons to the relevant labour force, per cent. Source: KILM (2001).

EPM: Prime age male employment rate: ratio of 25-50 aged male employed persons to the relevant labour force, per cent. Source: KILM (2001).

EPF: Prime age female employment rate: ratio of 25-50 aged female employed persons to the relevant labour force, per cent. Source: KILM (2001).

SELF100: ratio of self-employed with unpaid family workers to the total employment, per cent. Source: KILM (2001).

SELF200: ratio of self-employed to the total employment, per cent. Source: KILM (2001).

SELF300: ratio of non-agricultural self-employed to the non-agricultural employment, per cent. Source: OECD (2000a)

INCOME TAX RATE: Top income tax rate, per cent. Source: Friedman et al. (2000).

LTR/GDP: ratio of labour tax revenues to the GDP, per cent. Source: OECD (2000b), National Accounts.

LTAX: Statutory labour tax rate in per cent of labour cost. Source: OECD (2001), Taxing Wages.

STAX: Statutory social security contribution rate, per cent. Source: Schaffer and Turley. (2000).

STGDP: Ratio of social security revenues to the GDP, per cent. Source: Schaffer and Turley (2000

VAT: Statutory value added tax rate, per cent. Source: Schaffer and Turley (2000) ; OECD (2000a).

VAT/GDP: Ratio of value added tax revenues to the GDP, per cent. Source: Schaffer and Turley (2000); OECD (2000a)

CORPTAXRATE: Statutory corporation tax rate, per cent. Source: Friedman et al. (2000) , KPMG Corporate tax database

TAXWEDGE: Tax wedge: Employees' and employers' social security contributions and personal income less transfer payment as a percentage of gross labour costs, paid by one earner married couple at APW wage level. Source: OECD (2001), Taxing Wages.

SOCSC: Social security contribution rates, per cent of gross wage. Source: Schaffer and Turley (2000).

SCVA: Share of capital in value added, per cent. Source: OECD (2000b), National Accounts.

CORRUPTION: Corruption Index: level of corruption ranked from a low of 10 to a high of 1. Source: Transparency International.

BENEFIT: OECD summary measure of benefit entitlements**:** weighted average of the gross replacement rates over seven possible unemployment durations. Source: OECD (2002), Benefit and wages; Vodopivec, Wörgötter and Raju (2003).

ILOCNV: ILO convention: Cumulative number of ILO conventions ratified by the country, based on legal documents. Source: Rama and Actecona (2002).

COORDINATON: Coordination (employers + employees**)**: the degrees of employer and union coordination are ranked from a low of 1 to a high of 3. Source: Riboud et al. (2002).

DENSITY: Union density: percentage of salaried workers that belong to a union. Source: Riboud et al. (2002).

COVERAGE: Union coverage index: 1: less than 25% of salaried workers are covered by collective agreements; 2: between 26 and 69% are covered, 3: 70% or more are covered. Source: Riboud et al. (2002).

INFLATION: Inflation rates**,** per cent. Source: OECD (2000), Economic Outlook.

EF: Ethno linguistic fractionalization: Average value of five different indices of ethno linguistic fractionalization. Its value ranges from 0 to 1. Source: Djankov et al. (2001).

ENGLISH: Legal origin: Identifies the legal origin of the Company Law or Commercial Code of each country. Source: Djankov et al. (2001).

PROT: Protestant religion: The percentage of the population of the country that belongs to the protestant religion. Source: Djankov et al. (2001).

LAT: Latitude: The absolute value of the latitude of the country, scaled to take values between 0 and 1. Source: Djankov et al. (2001).

HIDDEN: The size of the hidden economy, per cent of official GDP, Source: Schneider and Enste (2000), Schneider (2002), Johnson et al. (1999) Friedman et al. (2000).

GDP: GDP/capita: GDP per capita expressed in US dollar at PPP, OECD (2000b).

TREND: years: 1995-2000.

Appendix 2: Average minimum and maximum values of the variables

Variable	Dimension	Average	Minimum	Maximum
AGR	%	8.50	1.30	47.80
U	%	7.80	2.00	22.70
LU	%	3.00	0.24	13.00
UM	%	7.16	1.70	17.90
UF	%	8.72	1.60	30.60
UY	%	15.30	3.40	40.30
UYM	%	14.60	2.70	33.60
UYF	%	16.30	3.80	49.10
E	%	64.15	47.40	79.70
EM	%	73.80	60.20	87.40
EF	%	54.40	25.10	74.00
EP	%	76.20	56.20	86.30
EPM	%	87.30	76.80	95.40
EPF	%	65.20	26.60	81.70
SELF100	%	20.00	6.30	58.10
SELF200	%	16.00	6.30	33.80
SELF300	%	14.00	5.40	27.80
INCOMETAXRATE	%	22.10	5.00	45.00
LTR/GDP	%	19.50	5.30	33.20
LTAX	%	28.60	5.30	45.20
STAX	%	34.10	0.00	58.80
STGDP	%	8.80	0.00	18.30
VAT	%	18.50	5.00	25.00
VATGDP	%	6.50	1.50	10.40
CORPTAX	%	33.40	10.00	48.00
TAXWEDGE	%	28.60	5.30	45.20
SOCSC	%	34.10	0.00	58.80
SCVA	%	51.00	37.00	71.00
CORRUPTION		5.40	2.20	10.00
BENEFIT	%	30.70	10.00	67.00
ILOCNV		69.80	12.00	126.00
COORDINATION		3.76	2.00	6.00
DENSITY	%	41.50	9.10	91.10
COVERAGE		2.52	1.00	3.00
INFLATION	%	6.80	0.50	88.10
EF		0.12	0.00	0.38
ENGLISH		0.22	0.00	1.00
PROT	%	25.80	0.00	97.80
LAT		0.52	0.26	0.71
HIDDEN	%	28.20	5.80	76.00
GDP		20282	5949	50061

Source: See Appendix 1.

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