Does Formal Work Pay?
The Role of Labor Taxation and Social Benefit Design in the New EU Member States

Johannes Koettl
Michael Weber

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Johannes Koettl
World Bank
and IZA

Michael Weber
World Bank

ABSTRACT

Does Formal Work Pay? The Role of Labor Taxation and Social Benefit Design in the New EU Member States[1]

The analysis presented in this paper defines three different synthetic measurements of disincentives for formal work: two standard measurements, namely the tax wedge and the marginal effective tax rate (METR); and a new, innovative measurement called formalization tax rate (FTR). The novelty of the latter is that it measures disincentives stemming not only from labor taxation, but also from benefit withdrawal due to formalization. A descriptive analysis across a large number of OECD and Eastern European countries reveals that the disincentives for formal work – when measured through the FTR – are especially high for low-wage earners. This suggests that formal work might not pay in this segment of the labor market, in particular for the so-called mini-jobs and midi-jobs (low paying part-time work). Another novelty of the paper is its empirical approach. Using EU-SILC 2008 data and OECD Tax and Benefit data for six Eastern European countries (Bulgaria, Czech Republic, Estonia, Latvia, Poland, and Slovakia), we match disincentives for formal work to individual observations in a large data set. Applying a probit regression, the analysis finds a significant positive correlation between FTR or METR and the incidence of being informal. In other words, controlling for individual and job characteristics, the higher the FTR or the METR that individuals are facing is, the more likely they are to work informally. The tax wedge, on the other hand, yields a negative correlation. This indicates that the tax wedge is not sufficiently capturing disincentives for formal work. We also conclude that in cross-country analysis, it might be more useful to use the tax wedge that applies to low wage earners as opposed to average wage earners.

Corresponding author:

Johannes Koettl
E-mail: jkoettl@worldbank.org

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1 Introduction

This paper investigates the question if—given the high levels of informality and inactivity in some European countries—it is actually "worthwhile" for the working age population to engage in income-generating activities. If so, what are the incentives that employers, the self-employed, and workers have to actually register these activities and pay taxes and contributions on the income generated?

There are a number of reasons why employers, the self-employed, and workers might decide not to register their activities. First, regulations in the product and labor market—like product licensing, employment protection legislation (EPL), and minimum wages—might be too stringent, so in order to circumvent these regulations, people might decide to operate outside the formal economy (Perry et al. 2007, OECD 2004, Schneider and Klinglmair 2004, Terrell and Grindling 2002, Bertola et al. 1999). Second, certain administrative procedures related to paying taxes, accounting, and completing statistical questionnaires might deter people from operating in the formal sector (Bassanini and Duval 2006, Djankov et al. 2002). Third, people and firms might want to avoid paying taxes on revenues, income, profit, or property and social security contributions (Davis and Henrekson 2004, Betcherman and Pagés 2007). Fourth, formal income might lead to a withdrawal of social benefits—like social assistance or unemployment benefits—so that people might prefer informal or no work over formal work (EC 2003, EC 2004, OECD 2004). Fifth, enforcement of existing legislation on regulations and taxation might be lax, therefore the risks of circumventing regulations and avoiding taxes might be low (Schneider and Enste 2000, Hanousek and Palda 2003).

To answer the main question of the paper whether formal work pays, we focus on the role of labor taxation and social benefit design in explaining the incidence of informal employment. More specifically, we investigate what disincentives for formal work might be provided to people in working age so they choose to "exit" into informality (Perry et al. 2007). Since labor taxation and social benefit design only partly explain informality, the analysis presented below highlights how for lower wage earners the value of formal social security benefits that come with formal employment would at times have to be enormously high to offset the opportunity costs of formalization. The conclusion is that formal (part-time) jobs at low wage levels—so-called mini-jobs and midi-jobs—are not economically viable for low-wage earners in some countries. This lack of economic viability might exclude a substantial part of the working-age population from formal employment and social security coverage. In this latter sense, informality and inactivity might not only be a deliberate choice of exit, but are also a matter of "exclusion" (Perry et al. 2007).

The analysis starts by examining which incentives or disincentives the informally employed and their employers face when considering formal work. For the informally employed, switching to formality will have a number of implications for both workers and firms. First, it implies that workers and their employers will enter as contributors to social security. This means that both the employer and the worker have to contribute to pension funds, health insurance funds, and unemployment insurance funds. The decision on contributions will strongly be influenced by the value that informal workers attach to being covered by social security. Second, workers will have to pay personal income tax on their

formal gross wages. This decision will be influenced by the value informal workers put on public services and social norms about paying taxes (Torgler 2003, Torgler and Schneider 2009). Paying social security contributions and income tax combined will decrease workers' take-home pay when compared to their informal wage. Third, informal workers after formalizing might no longer be eligible to a number of income-tested benefits such as social assistance, family benefits, or housing benefits. Firms, finally, which are formalizing informal workers, will have to generate additional formal revenues by switching informal revenues to formal revenues. This implies paying additional taxes in the product market, like sales or value-added taxes.

In the New Eastern European Member States of the European Union (NMS) informality is high[2] and the demographic transition will considerably increase the need for participation in the formal sector in the future. For the social contract of these countries to survive, more people will need to contribute through taxes and social security contributions. Those who currently do not work and those who work informally will need to be activated and convinced to participate in the formal sector of the labor market. Arguably, one pre-condition for participation in the formal sector is that formal work has to pay. In other words, the incentives for formal work that originate in the tax and benefit system of a country have to be aligned to encourage formal work. Incentives alone, though, might perhaps not be the binding constraint. Labor taxation and benefit design are but two pieces of the puzzle that explain high levels of informality among the working age population of the NMS. We are not trying to identify which of these potential reasons are the main causes for high levels of informality, but we narrowly focus on the incentives and disincentives for formal employment provided by the labor taxation and benefit system. For a very recent discussion on drivers of informal employment and potential policy options to address them see Lehmann (2010).[3]

One indication that at least taxation in general plays a prominent role in income-generating activities comes from enterprise surveys. For example, the World Bank Enterprise survey for 2009 (World Bank 2011b) reveals that on average, 45 percent of firms in the NMS cite tax rates as a one of the major obstacle for doing business. The question in the survey refers to all types of taxes, and, hence, not specifically to labor taxes. Nevertheless, the results indicate that in the NMS, tax rates are perceived as a greater obstacle to doing business than any other impediment in the ranking, like tax administration (24 percent), competition from informal enterprises (23 percent), licensing (14 percent), labor regulations (14 percent), and trade regulations (8 percent). Therefore, although the results of this enterprise survey are not a direct measurement of obstacles to formal employment, they give an indication that tax rates could be perceived as a constraint for creating new formal jobs.

The contribution of this paper is twofold: First, we present a detailed descriptive analysis of the tax and benefit systems of the NMS, describing disincentives for formal employment stemming from labor taxation and social benefit design. In doing so, we not only analyze standard measurements of

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[2] See, for example, Hazans (2011), as well as descriptive statistics presented further below in this text.
[3] Lehmann (2010) establishes that employment protection legislation (EPL), the tax wedge, and union density have positive impacts on the level of informal employment in transition countries and quantifies these impacts.

disincentives like the tax wedge and the marginal effective tax rate (METR), but we also develop a new and innovative measurement of disincentives for formal work, the so-called formalization tax rate (FTR). The FTR goes beyond the usual measurements of the tax wedge and METR by combining both. It expresses the opportunity costs of formal employment by measuring what share of informal income is being taxed away—in terms of income tax, social security contributions *and* withdrawn benefits—when formalizing, and therefore how much workers have to gain in return for formalization in terms of social security benefits and employment protection. For this exercise, the analysis relies on the Organization of Economic Co-operation and Development (OECD) Tax and Benefit model, which is available for most OECD countries as well as the Baltics, Bosnia and Herzegovina, Bulgaria, Macedonia, Romania, and Serbia (OECD 2011, Immervoll 2007).[4] This descriptive analysis is presented in Section 2.

Second, we present an empirical analysis that combines the synthetic measurements of the FTR, the METR, and the tax wedge with actual informality patterns by using data from the European Union Statistics on Income and Living Conditions (EU-SILC; Eurostat 2008), investigating the question if and how much these disincentives matter for informal employment. To this end, the analysis matches these synthetic measurements to individual observations for six countries in the EU-SILC 2008 data: Bulgaria, Czech Republic, Estonia, Latvia, Poland, and Slovakia. In other words, for each individual in the survey, we define synthetic measurements of disincentives for formal work stemming from the tax and benefit system of his or her country of residence. The empirical analysis then explores the correlation between disincentives for formal work and the incidence of informal employment in these six countries. This analysis is presented in Section 3.

The main finding of the descriptive analysis is that the disincentives for formal work—when measured through the FTR—are especially high for low-wage earners. This suggests that formal work might not pay in this segment of the labor market, in particular for the so-called mini-jobs and midi-jobs (low paying part-time work). The empirical analysis finds a significant positive correlation between FTR or METR and the incidence of being informal. Controlling for individual and job characteristics, the higher the FTR or the METR that individuals are facing is—that is, the higher disincentives for formal work—the higher the likelihood to work informally. The tax wedge, on the other hand, yields a negative correlation, suggesting that the tax wedge is not sufficiently capturing disincentives for formal work.

2 Measurements of Informality and Disincentives for Formal Work

This section offers a descriptive analysis of the tax and benefit systems in the NMS and benchmarks them against other OECD countries. The section starts by discussing various definitions of informal employment. Next, the theoretical foundations of the decision between formal and informal

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[4] The models for the non-OECD countries were developed under a recent research partnership between the OECD and the World Bank.

employment are outlined. Finally, three different measurements of work disincentives are introduced and discussed.

2.1 Definition of Informal Employment

The definition of informal employment is not straightforward. A comprehensive and widely accepted definition was provided by the International Labor Organization (ILO) in 2003. It includes: (i) own-account workers and employers employed in their own informal sector enterprises; (ii) unpaid family workers, irrespective of whether they work in formal or informal sector enterprises; (iii) members of informal producers' cooperatives; (iv) own-account workers engaged in the production of goods exclusively for own final use by their household; and, finally, (v) employees holding informal jobs in formal sector enterprises, informal sector enterprises, or as paid domestic workers employed by households. In this last category, informal jobs are those not subject to legislation, income taxation, social protection, nor entitlements to codified benefits such as advance notice of dismissal, severance pay, paid annual or sick leave (ILO 2003, Hussmanns 2004).

This comprehensive definition of informality is constrained by data availability. Particular measurement challenges are: (i) measuring the status of self-employed, own-account workers, and employers, as this requires identifying if their enterprise is registered or not; and (ii) measuring the status of employees, as this requires identifying the nature of their employment contract. With regard to the self-employed, if it is not possible to determine the legal status of the enterprise, a variety of alternative measures have been developed. The most widely used is the size of the enterprise, with employers or self-employed of enterprises with less than 5 or 10 employees defined as informal, all others as formal. Another measurement developed by Hazans (2011) qualifies the firm size measurement by combining it with the professional status of self-employed or employers—only *non-professional* employers or self-employed with a small enterprise are defined as informal. With regard to employees, the most common measurement defines those with no written employment contract as informal. Alternatively, informal employment is sometimes also measured as those employees who do not contribute to social security. If neither measurement is available, the firm size is again the most common measurement, defining all employees in firms with less than 5 or 10 employees as informal. Unpaid family workers, finally, are relatively easy to measure directly from surveys.

In this paper, two related definitions of informal employment are used. For the descriptive analysis of this section, we use the legalistic definition: informally employed are all those who do not report any of their labor income to tax and social security authorities. These are all self employed, employers, own account workers, unpaid family workers, and employees who *completely* conceal their labor income and pay neither social security contributions nor personal income taxes. Section 2 uses only data from the OECD Tax and Benefit model (OECD 2011) and analyzes synthetic measurements. These synthetic measurements are exclusively derived from legislation—that is, they measure what individuals *should* pay in taxes and what benefits individuals *should* be entitled to according to the law; it does not measure the actual incidence of tax payments and entitlement consumption.

For the econometric analysis of Section 3 survey data from EU-SILC (Eurostat 2011) is used. Data limitations require deviating from the preferred legalistic definition of informal employment with regard to the self-employed. Informal employees, as previously defined, are those for whom no social security contributions are being paid by their employers. Also, unpaid family workers are identified as informal. However, for the self-employed the definition deviates from the legalistic definition of the descriptive analysis. Due to data restrictions, a less precise "productivity" definition as suggested by Hazans (2011) is applied. Accordingly, all non-professional employers who employ five or fewer workers (including those with no employees) are identified as informal.

Applying this productivity definition to the informal self-employed yields rather high informality rates among the self-employed (see below). This productivity definition could therefore potentially overestimate informality rates for this group. As a robustness check, the analysis is performed restricting the sample to either only the self-employed or only employees. The results do not differ substantially from those for the whole sample. Hence, the behavior of the self-employed, using the productivity definition, corresponds to the behavior of employees with regard to work disincentives and informal employment. This suggests that the productivity definition used to identify informal self-employed does not conflict with the results using the legalistic definition for employees.

2.2 The Comparison between Formal and Informal Employment

This paper attempts a comparison between two theoretically identical workers, one working formally and one informally. The formal worker faces certain costs for working formally which are measured by the overall and marginal taxes that need to be paid. The informal worker does not have to pay taxes. So, how much the informal worker's theoretical formal twin has to pay in overall taxes (the tax wedge) or in marginal taxes (the marginal effective tax rate) are important indicators for formal work disincentives. Similarly, the difference in net income of the informal worker and the informal worker's formal twin is a comprehensive indicator for how much income is taxed away through formalization (the formalization tax rate). Each of these three measurements centers on the individual worker. Therefore, the focus of the analysis is primarily on the worker's choice between formal and informal employment. The key question is how to construct two identical workers. That is, what income would an informal worker have in the formal sector, and what income would a formal worker have in the informal sector?

We assume that two workers are identical if they generate the same total labor cost for the employer. This approach has some important implications. In particular, it implies that the entire tax wedge is born by the formal worker and therefore enters in its entirety as an opportunity cost of formal work. Such an interpretation assumes that the employer has a very strong bargaining position and is able to roll over all taxes to the worker. In other words, the labor supply curve is infinitely inelastic. Empirical evidence suggests that labor supply could indeed be relatively inelastic in the low wage segment, but not so much in the higher wage segment (see for example, Betcherman and Pagés 2007). This could suggest that in the higher wage segment, the empirical analysis might be less adequate.

The suggested methodology might make it difficult to interpret the decision process between formal and informal employment. We model this primarily as the worker's decision, which in turn depends on

the financial disincentives provided by the tax and benefit system. In reality, the decision will clearly also build upon preferences—in particular time preferences—about the value of social security benefits, employment protection, and risk. Yet, for the analysis these preferences cannot be measured with the available data, which means that we assume that the marginal product of labor is equal among the two identical workers. This further implies that the decision between formal and informal employment can only take place within the same firm, if one further assumes that the marginal product of labor of the worker is firm-specific. In that sense, the informality decision as modeled in this paper would only apply to the limited case where workers are formalized within the same firm. If, on the other hand, one assumes that the marginal product of labor is not firm-specific, but tied to the worker's abilities, the informal worker could also move to other firms when formalizing. This position implies a more competitive labor market in which workers are able to move relatively freely between jobs and, therefore, are confronted with an integrated labor market (Maloney 1999, 2004). This assumption also implies that there is no wage gap between the formal and informal sector. Empirical evidence suggests that the latter might not be the case, at least not for employees. Perry et al. (2007) find that there is a considerable wage gap between formal and informal salaried workers in Latin American countries and a considerable segmentation in the labor market.

Despite this imprecision and difficulties in interpretation, we consider the measurement concepts put forward as sufficiently adequate to allow for a meaningful analysis. The central question then is how to measure these opportunity costs or disincentives of formal work. As mentioned above, we investigate three measurements: first, the tax wedge; second, a new indicator, called the formalization tax rate (FTR); and third, a marginal measurement, the marginal effective tax rate (METR).

2.3   Labor Taxation: the Tax Wedge

Labor taxes in the NMS are high at lower wage levels. A comparison with other EU, OECD, and neighboring countries shows that the tax wedge on labor at lower wage levels (33 percent of a country's average wage) tends to be relatively high (see Figure 1).[5] The tax wedge is a so-called synthetic measurement, meaning it is purely based on legislation and therefore measures what individuals are *supposed* to pay, not what they actually pay, in taxes and social security contributions. It measures the difference between total labor costs and take-home pay as a percentage of total labor costs. This difference consists of personal income tax and social security contributions paid by the worker and the employer. Hence, the tax wedge t is defined as

$$t = \frac{TLC^E - NI^W}{TLC^E} = \frac{IT^W + SSC^W + SSC^E}{TLC^E}$$

where TLC^E is the total labor costs paid by the employer, NI^W is the net income of the worker, IT^W is the income tax paid by the worker, SSC^W is the social security contribution paid by the worker, and

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[5] In many countries, full-time work at 33 percent of the average wage is below the legal minimum wage. Nevertheless, the same tax wedge applies to someone receiving average wage, but working 33 percent part-time, although there can be slight variations of the tax wedge for part-time workers when compared to full-time workers.

SSC^E is the social security contribution paid by the employer. It therefore expresses the costs of social security contributions by employers and employees and the personal income tax of employees as a share of total labor costs, or the share of total labor costs that is "taxed away".

In the case of informal employment, neither the worker nor the employer has to pay any taxes or social security contributions so that the worker's net income equals total labor costs and the tax wedge is zero. The tax wedge is therefore a good first approximation to measure incentives faced by employers and workers for informal employment. It measures the gains of informal employment. Although it cannot give any information on how these gains can potentially be shared between the worker and the employer, it nevertheless gives valuable information on the incentives that workers and employers face when choosing between formal or informal employment.

Figure 1: Labor taxation tends to be relatively high for low-wage earners (at 33 percent of average wage) in the NMS
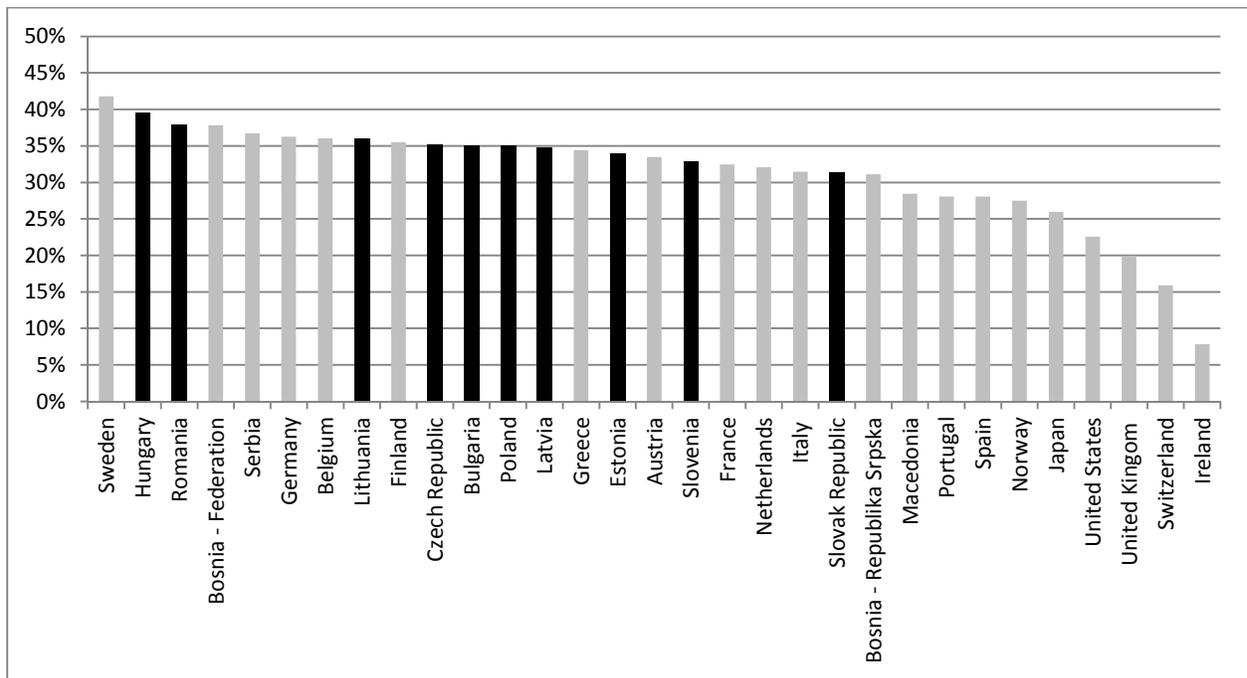
Note: Columns represent the tax wedge for low-income earners (singles with no children at 33 percent of average wage) in 2008 (for Bosnia, Macedonia, and Serbia, 2009). NMS depicted in black.
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

The tax wedge varies depending on family type and wage level. The OECD Tax and Benefit model calculates (i) income tax and social security contributions paid by the employer and the worker, (ii) for 10 different family types, (iii) for individuals earning between 0 and up to 367 percent of average wage, and (iv) for most OECD countries. This data reveals that for single persons with no children receiving a gross wage of 33 percent of the average wage, only a few EU-15 countries—like Sweden, Germany, Belgium, and Finland—charge higher taxes than most of the NMS. Also, labor taxation in the NMS is not very progressive. While in most other countries, labor taxes increase significantly with the wage level in the NMS, labor taxes increase by less than 10 percentage points. For most EU-15 countries, taxes

increase by over 10 percentage points between 33 and 100 percent of average wage level. Although countries with a high tax wedge at lower wage levels can be expected to display less progressivity, the NMS display especially low levels of progressivity. All NMS except for Hungary and Slovenia are below the trend line in a cross-county comparison (see Figure 2).[6] In particular, for single workers without children, Bulgaria stands out with zero progressivity of labor taxes. This is important because low progressivity means that there is some room for lowering the tax wedge for low-wage earners in a fiscally neutral way by increasing progressivity.

Figure 2: In the NMS, labor taxation tends to be not very progressive
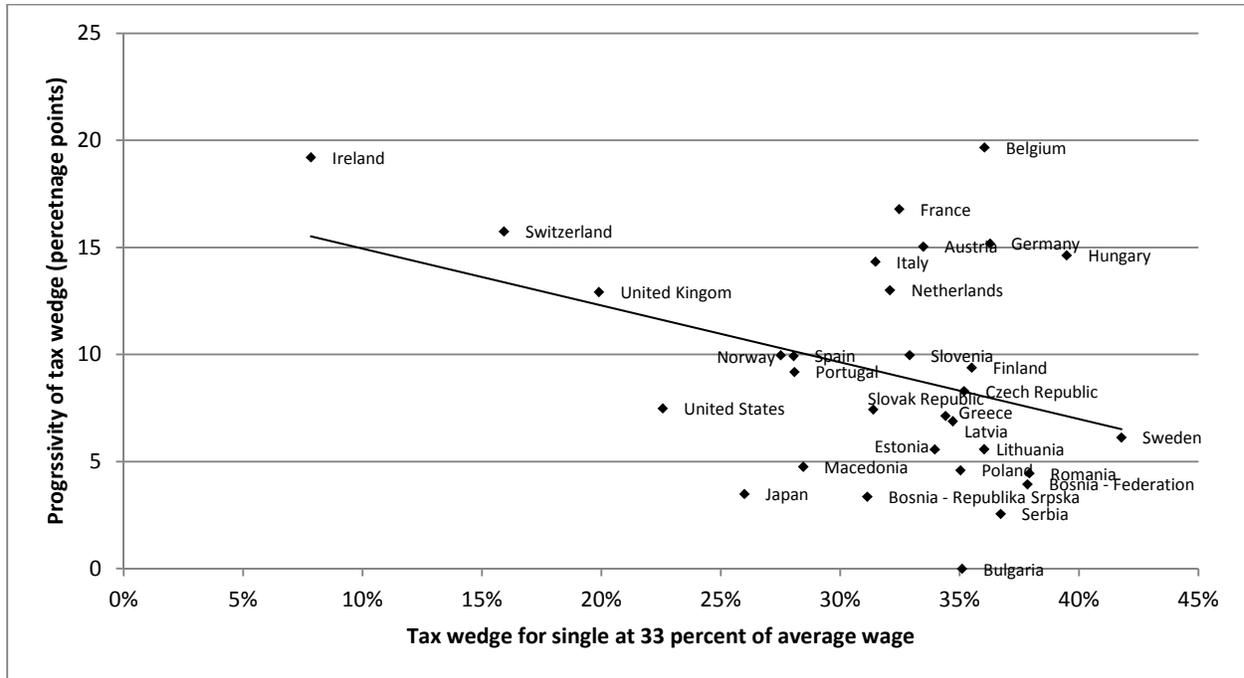
Note: Data points represent the tax wedge for low-income earners (single person with no children at 33 percent of average wage; x-axis) in relation to a country's progressivity of the tax wedge (the percentage point increase of the tax wedge between 33 and 100 percent of average wage; y-axis) in 2008 (for Bosnia, Macedonia, and Serbia, 2009).
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

Nevertheless, with the exception of Bulgaria in all countries labor taxation displays some degree of progressivity.[7] A typical graph of the tax wedge over the wage level for the NMS is depicted in Figure 3—in this case, for Estonia and Latvia.[8] As can be seen, the tax wedge is lower for low-wage earners (around 26 percent for Estonia and Latvia) and starts to significantly increase from a certain wage level onwards

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[6] The assumed relationship is that tax systems need to raise a certain fixed amount of resources, and those that put higher taxes on lower wages have less of need to increase taxes at higher wages and hence display less progressivity.
[7] Exceptions are Hungary and the Netherlands, which have a social security contribution floor. Such a floor has to be paid independent of actual wages earned and therefore increases the tax wedge significantly at lower wage levels.
[8] For the sake of illustration, the countries chosen in this and the following graphs are rather contrasting. That is, for the NMS, countries with fairly high disincentives in the low-wage sector have been chosen; for the OECD, countries with rather low disincentives in the low-wage sector have been chosen.

(around 20 percent of average wage) to levels of about 40 to 45 percent of total labor costs. What is interesting, though, is that some countries display much lower tax wedges for low wage earners, as in the case of Australia and the United Kingdom (see Figure 3).[9] Both have a tax wedge of 0 percent for low-wage earners, and only for wage levels above 20 percent of average wage the tax wedge is increasing significantly.

Figure 3: In Estonia and Latvia, the tax wedge for low-wage earners is higher than in Australia or the United Kingdom.
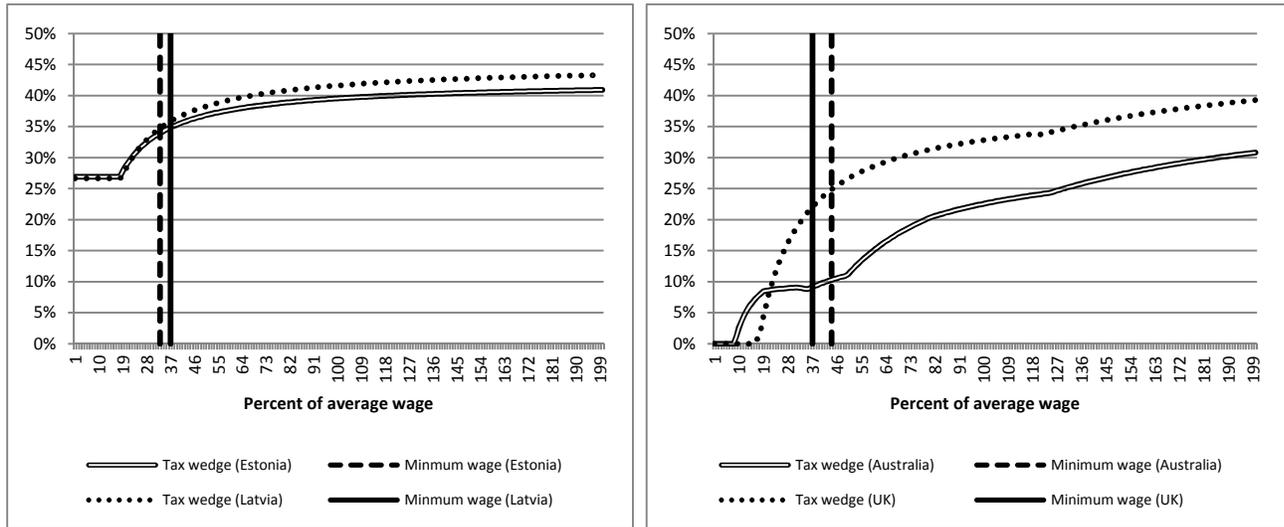
Note: Graphs show the tax wedge for single person with no children. Countries have been chosen to illustrate contrasting examples.
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

A closer look at Figure 4 reveals that in the NMS, the tax wedge tends to be high for a relatively large spectrum of low-wage earners. The wage level from where onwards the tax wedge starts to increase significantly is also relatively high. In many high-income OECD countries, to the contrary, the tax wedge is low for the lowest-wage earners, but the tax wedge also tends to increase across the whole wage spectrum.

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[9] The four countries are chosen as illustrating examples, with typical yet contrasting tax wedges.

Figure 4: In the NMS, the tax wedge for the lowest-wage earners tends to be high, and the wage level where the tax wedge increases significantly is relative high.
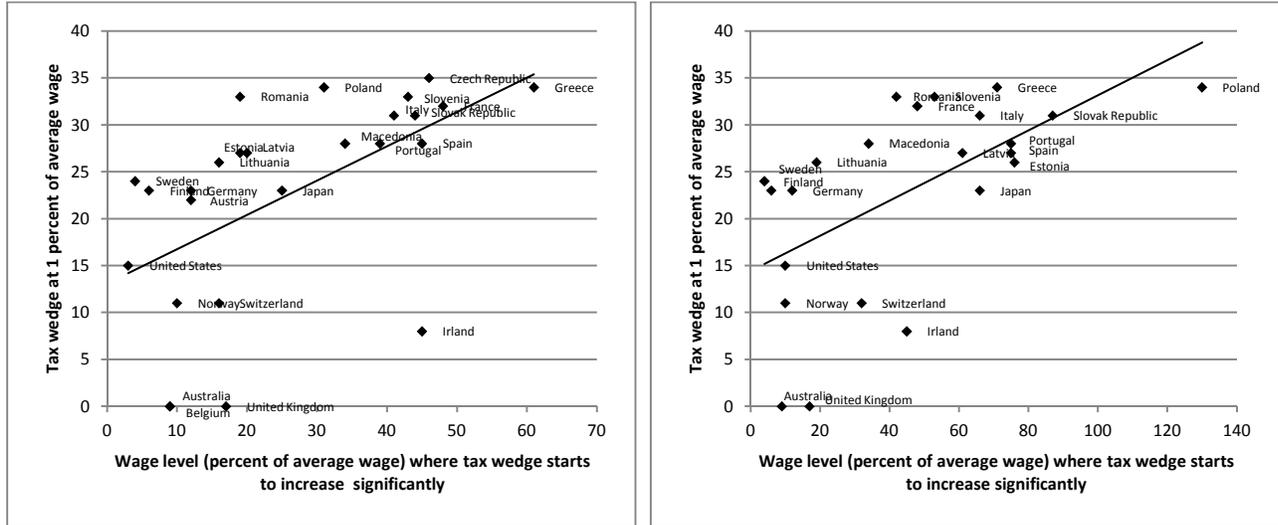
| Single person with no children | One-earner couple with two children |

Note: The scatter plot depicts the wage level where the tax wedge starts to increase (x-axis) versus the tax wedge at 1 percent of average wages (y-axis). Hungary, the Netherlands, and Serbia featuer falling tax wedges at low-wage levels and are not depicted, just like Bulgaria which has a flat tax wedge. Austria, Belgium, and Canada have partly negative tax wedges at low wage levels, especially for families, and are also not included in the right scatter plot (Canada also in the left).
Source: Authors' calculation based on OECD Tax and Benefit model (OECD, 2011).

2.4   Social Benefits

Aside from the tax wedge, the withdrawal of social benefits is the main contributor to the opportunity costs of taking up formal work for individuals with low skills/earnings potential. Consider an informal worker who earns a certain level of informal wage.[10] If this worker were to work in the formal sector, various implicit opportunity costs occur to the worker and the worker's employer. First, assuming that the marginal labor product does not change because of formalization, total labor costs of the informal worker have to be the same as for the formalized worker. For the informal worker, total labor costs are the informal wage. For the formalized worker, total labor costs are the net wage plus the income tax and both the worker's and the employer's social security contributions. That is, the net wage plus the entire tax wedge. Comparing the informal wage with the worker's potential formal net wage, the entire tax wedge enters as an opportunity cost of formal work for the informal worker and the worker's employer. Second, informal workers also face implicit opportunity costs because they might lose parts of certain income-tested benefits—most importantly social assistance, housing benefits, and family benefits—once they have a formal income on record. For example, if an informal worker receives a

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[10] Only worker who are not registered at all are considered; partially formal workers who underreport their wages are not considered.

certain amount of social assistance, this benefit will be decreased or completely withdrawn if the worker formalizes. This amount of the withdrawn benefit also enters as an opportunity cost of formal work.

Therefore, both of these losses—the tax wedge and withdrawn benefits—have to be taken into account when considering the implicit opportunity costs of formalization. At the same time, though, informal workers gain from formalization: they gain a future right to an old-age pension and they gain immediate rights with regard to disability insurance, workers compensation, health insurance, and unemployment insurance.[11]

Arguably, the most important of these potential gains are old-age pension and health insurance. With regard to old-age pensions, though, one has to keep in mind that especially low-wage earners tend to discount future benefits more because their concerns are focused on short-term income and, in cases of poverty, day-to-day consumption.[12] Also, any means-tested social pensions for the elderly might further discount the value of a vested old-age pension. In addition, especially in developing and transition countries, workers might discount the value of pension benefits because of a lack of trust in social security contributions.[13] Finally, the value attached to the most important benefit, health insurance, could be low because in many countries it can be accessed for free. Nevertheless, there is no reliable concept of measurement available at this point that can properly quantify the value that workers attach to these formal benefits—may it be short-term or long-term social security benefits or other benefits like employment protection. In the analysis presented below, this shortcoming has to be kept in mind.

Regarding the potential role of benefit withdrawal, Table 1 and Table 2 provide information on the coverage and generosity of the social benefits considered for some of the countries analyzed in Section 3. Overall the family benefits seem to be the most important type of benefit, reaching between 21 and 47 percent of the total population. Social assistance and housing benefits seem less important for the population at large but do reach between 6 and 15 percent of the poorest income quintile. For these poorest households, social assistance benefits finance between 10 (Poland) and 40 (Estonia) percent of total household consumption.

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[11] To the extent that these benefits are also offered to informal workers for free or at low cost, they do not enter as opportunity costs of formal work (Levy 2008).
[12] See, for example, Lawrance (1991) on the relation between time preference and poverty.
[13] For an analysis on Bulgaria, see Perotti and Sanchez Puerta (2009).

Table 1: Coverage[1] of social benefit programs (percent, various years)

	Social Assistance		Family benefits		Housing benefits	
	Total population	Poorest Quintile	Total population	Poorest Quintile	Total population	Poorest Quintile
Bulgaria 2007	3.8	14.5	20.8	35.3	4.1	13.8
Estonia 2004[2]	2.0	6.7	47.2	57.5	-	-
Latvia 2009[2]	2.7	5.9	43.9	60.7	-	-
Poland 2008	4.4	14.2	21.3	51.2	3.8	9,4

Notes:
1. Coverage indicates the percent of individuals who receive social assistance transfers.
2. Social assistance includes housing benefit.
Source: World Bank (2011a).

Table 2: Generosity[1] of social benefit programs (percent, various years)

	Social Assistance		Family benefits		Housing benefits	
	Total population	Poorest Quintile	Total population	Poorest Quintile	Total population	Poorest Quintile
Bulgaria 2007	21.5	33.8	3.6	7.6	5.8	8.0
Estonia 2004[2]	26.3	39.9	7.0	18.0	-	-
Latvia 2009[2]	6.7	12.1	2.5	7.7	-	-
Poland 2008	7.7	9.6	3.1	5.2	3.4	4.4

Notes:
1. Generosity indicates the transfer as a share (percent) of total consumption of beneficiary households.
2. Social assistance includes housing benefit.
Source: World Bank (2011a).

2.5 The Formalization Tax Rate

As discussed above, the implicit costs of formalization for informal workers are a measurement of the necessary minimum value of social security benefits and employment protection they receive in return for formalization. The value of rights to pension and unemployment insurance—but also from formal employment protection legislation—they gain from formalization must exceed their implicit opportunity costs from formalization. Figure 5 depicts this implicit cost to the informal worker as a share of informal income, the so-called formalization tax rate (FTR). The formalization tax rate measures the difference between informal income (informal wage, social assistance, and family and housing benefits at the level of no formal wage) and formal net income (formal net wage, in-work benefits, social assistance, and family and housing benefits at formal wage level) as a share of informal income.[14] Just like the tax wedge, it is a synthetic measurement that is based on legislation on taxes and social benefits, measuring the difference in net income between an informal worker (informal wage and social benefits) and the theoretical income of the same informal worker if he or she were to formalize.

More precisely, the FTR $t^F(w)$ is defined as

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[14] For a more detailed definition and discussion, see Koettl (2009).

$$t^F(w) = \frac{NI^I(w) - NI^F(w)}{NI^I(w)}$$

where $NI^I(w)$ is the net income of an informal worker and $NI^F(w)$ is the income of a formal worker at a certain (gross) wage level w. The net income of an informal worker is the wage the worker receives plus any benefits the worker is entitled to. Since the benefit level depends on the level of formal wage, an informal worker can claim benefits at formal wage level $w = 0$, or

$$NI^I(w) = w + B(0)$$

where $B(w)$ is the benefit function. The question that arises is what the net income of a comparable formal worker at the same wage level would look like. Note that an employer will not consider two workers to be equal based on their gross wage, but based on total labor costs, in other words, two workers are equal if their marginal product of labor is equal. Hence, it will be useful to compare an informal worker with a formal worker whose total labor costs (and not gross) wage, equal the informal worker's wage. This means that the net income of a comparable worker in the formal sector not only has to be net of income tax and social security contributions paid by the worker, but also by the employer. Therefore, the net income of a comparable formal worker is

$$NI^F(w) = w - IT(w) - SSC^W(w) - SSC^E(w) + B(w)$$

where $IT(w)$ is the income tax, $SSC^W(w)$ the social security contribution paid by the worker, $SSC^E(w)$ the employer's social security contribution, and $B(w)$ the benefits claimed by the worker, all at formal gross wage level w.

Comparing these two workers described above leads to the following interpretation. A worker who earns a certain wage in the informal sector is discussing with his or her employer to formalize. Since the worker does not have any formal income, the worker also claims benefits as if he or she had no income. The employer and the worker now consider how much the worker would earn, net of income tax and social security contributions, in the formal sector. They also take into account any changes in benefits the worker could claim given his or her formal wage. The formalization tax rate measures how much of the informal income would be taxed away, through taxes, social security contributions, and changes in benefits if the worker were formalized.

How does the FTR look in different countries? In order to calculate and illustrate the FTR, the OECD Tax and Benefit model also provides all the necessary information on social assistance, housing, family, and in-work benefits. Consider the contrasting examples of Bulgaria and Romania on the one hand and Australia and the United States on the other (see Figure 5). For lower wage levels, the FTR in Bulgaria and Romania is higher than in Australia and the United States. In Bulgaria, the FTR for a single person with no children peaks at around 70 percent (around 60 percent for Romania) at a wage level of about 10 percent of average wage. This means that in Bulgaria, a single person with no children who earns less than the minimum wage in the informal sector has to give up between 50 to 70 percent of income to formalize. By contrast, in Australia and the United States, the FTR peaks at a lower value—around 40

percent in Australia and 30 percent in the United States— and at a higher wage level of around 30 to 40 percent (although in the case of the United States, the FTR continuous to increase at higher wage levels, yet at a slow rate).

Figure 5: For low-wage earners, the opportunity costs of formal work (formalization tax rate, FTR) are higher in Bulgaria and Latvia than in Australia and the United States.
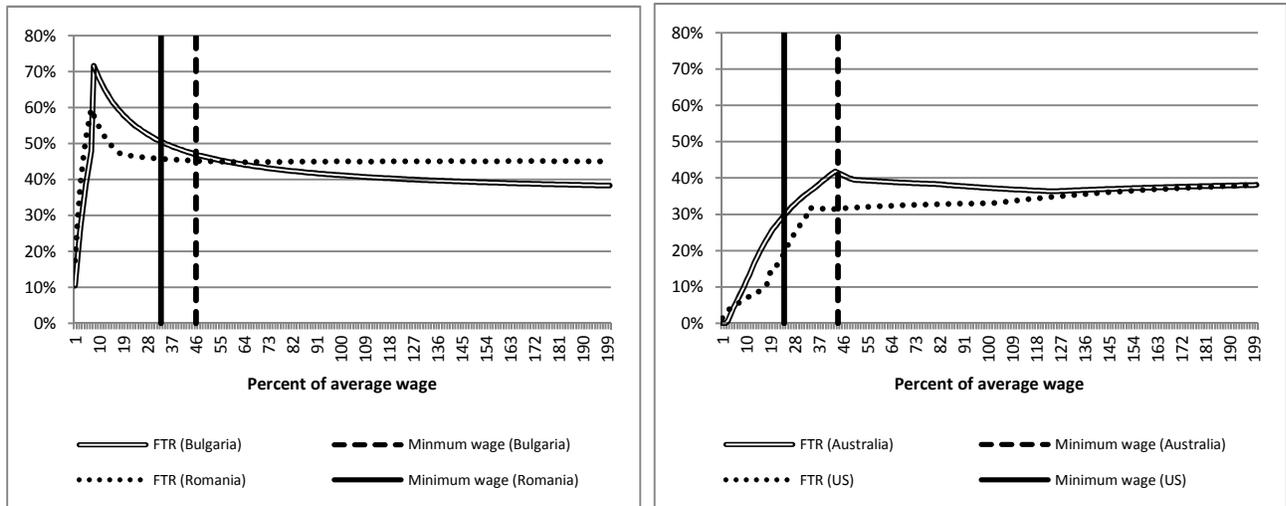
Note: Graphs show the formalization tax rate (FTR) for single person with no children. Countries have been chosen to illustrate contrasting examples.
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

A more comprehensive comparison shows that in the NMS the opportunity costs of formal work tend to peak at lower wage levels than in high-income OECD countries. Figure 6 reveals that both for single persons and one-earner couples with two children, the costs of formalization in the NMS generally tend to be highest for low wage earners (less than 30 percent of average wage for singles). In some countries, like Bulgaria, Hungary, and Romania, the FTR for singles is particularly high and peaks at around 70 percent. For families, the FTR tends to be lower and peak at somewhat higher wage levels.

Figure 6: In the NMS, the opportunity costs of formal work tend to be highest at lower wage levels.

Single person with no children   One-earner couple with two children
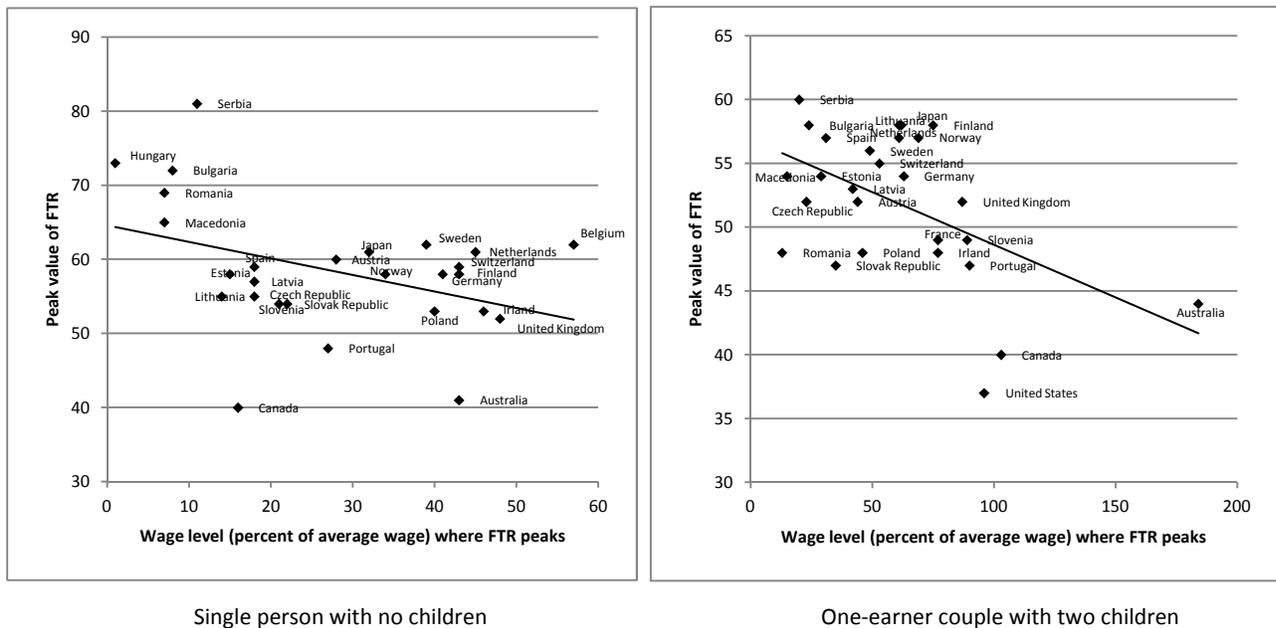
Note: The scatter plot depicts the wage level where the formalization tax rate (FTR) peaks (x-axis) versus the peak value of the FTR (y-axis). Countries with a continuously and significantly increasing FTR were omitted. In countries where the FTR froms a plateau and increases only slightly with the wage level, the lowest wage level at which the FTR stopps to increase significantly was chosen as the peak.
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

The main reasons for the high opportunity costs of formal work are labor taxation and the sudden withdrawal of social assistance and family benefits at higher wage levels. Labor taxation has already been discussed above as one of the potential obstacles to formal employment at the lower wage levels. The design of income-tested benefits also plays an important role; social assistance is often paid out as a top-up to earned gross income to guarantee a minimum gross income. Any earned household gross income is subtracted from social assistance that is paid out. This means that any formal mini-job at low wage levels does not pay. Likewise, for higher-paid midi-jobs, the net gain in income might not be very high because of the sudden loss of social assistance. A more phased-in withdrawal of social assistance through (formal) income disregards for all household members could decrease this disincentive. Income-tested family and housing benefits also contribute to the formalization tax rate if the formal income would exceed the threshold for eligibility.

2.6 The Marginal Effective Tax Rate

The marginal effective tax rate (METR) also suggests that formal work does not pay at lower wage levels. The METR measures at given wage levels how much of an *additional* dollar earned in formal gross wage is taxed away, either as labor tax or in the form of withdrawn benefits. It is therefore an indication of how much it pays for workers to earn more gross income, either by increasing work hours or receiving

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higher wages. Just like the tax wedge and FTR, also the METR is a synthetic measurement of disincentives for formal work, based on legislation—what people ought to pay in taxes and are entitled to—and not on actual income, tax, and benefit consumption data.

In many countries, at low wage levels (below 10 percent of average wage), every dollar earned is subtracted from entitlements to social assistance; hence a 100 percent of any additional dollar earned is taxed away. For example, in the Czech Republic and Slovenia, every additional dollar earned in formal income is a 100 percent taxed away through withdrawal of social assistance at wage levels below 20 percent of average wage (see Figure 7). In other countries, like Portugal and the United States, incentives for formal work are better for low-wage earners in these countries. In Portugal, only 50 percent of every additional earned dollar is taxed away and in the United States it is significantly less. In the United States, this is mainly achieved through so-called in-work benefits and tax credits that subsidize work at low wage levels.

Figure 7: For low-wage earners, the marginal effective tax rate (METR) is at 100 percent in the Czech Republic and Slovenia, while it is much lower in Portugal and the United States.
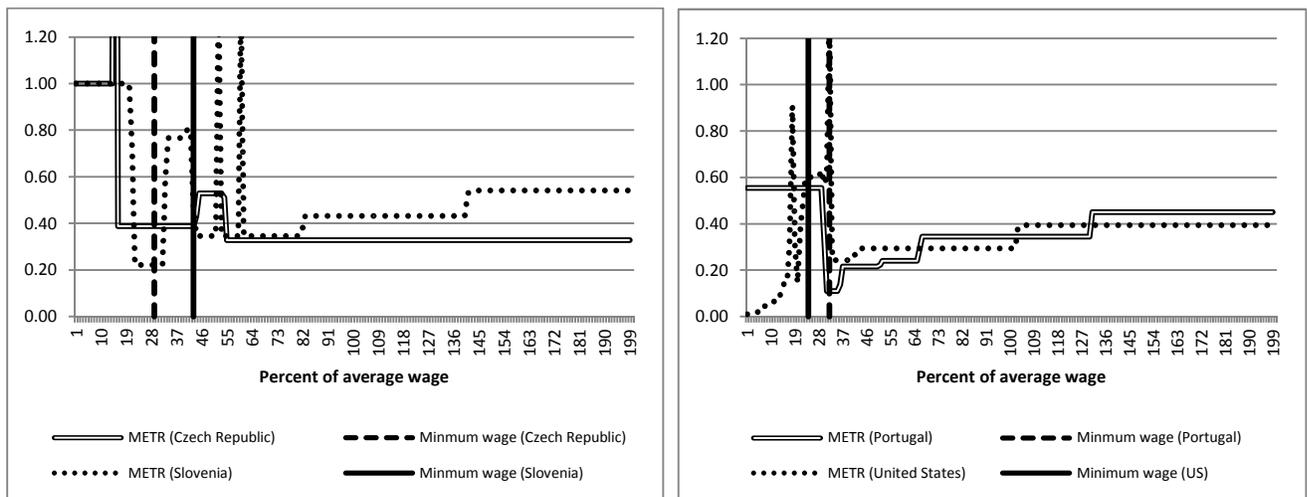
Note: Graphs show the marginal effective tax rate for single with no children. Countries have been chosen to illustrate contrasting examples.
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

Overall, the NMS tend to have high METRs—usually at 100 percent—at low wage levels, although the METR tends to drop at lower wage levels than in high-income OECD countries (Figure 8). A notable exception is Poland, which according to the OECD Tax and Benefit model has the lowest METR at low wage levels of all countries. This is due to an apparent lack of a comprehensive, federally administered social assistance program. Nevertheless, Poland might have a *locally* administered social assistance

program. If this is indeed the case, it is unfortunately not captured by the OECD Tax and Benefit model. So, the actual METR could be higher than predicted.[15]

Figure 8: In the NMS, the marginal effective tax rate (METR) tends to be high at low wage levels, but also tends to drop significantly at lower wage levels than in high-income OECD countries.

| Single with no children | One-earner couple with two children |
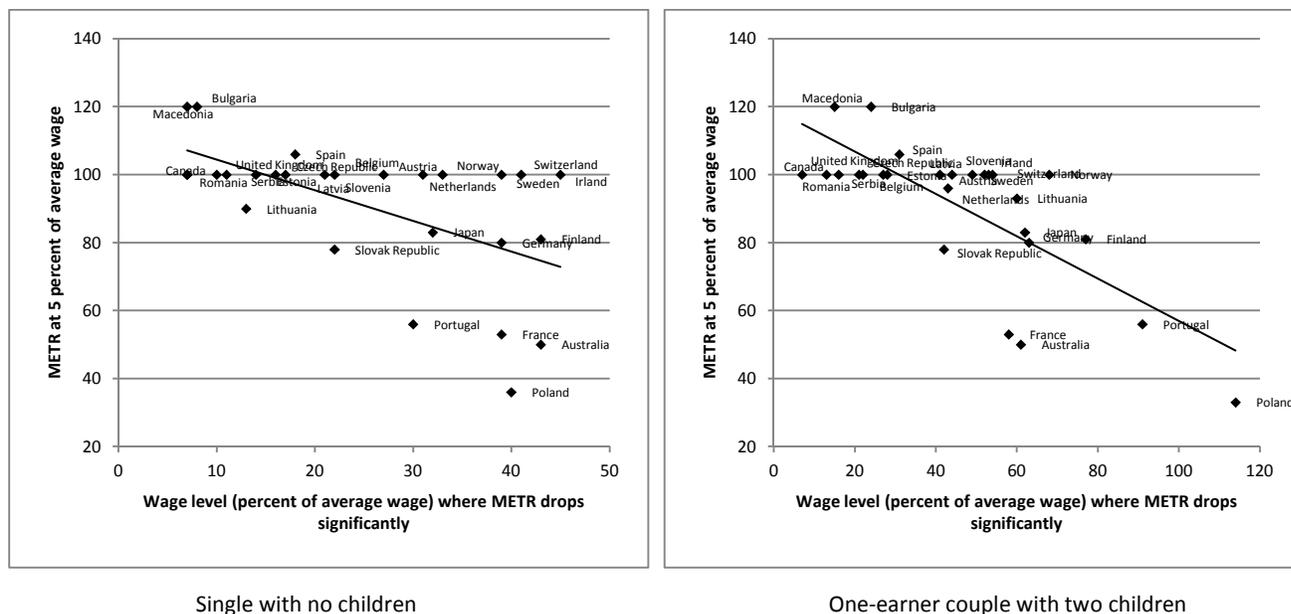
Note: The scatter plot depicts the wage level where the marginal effective tax rate (METR) drops significantly (x-axis) versus the value of the METR at 5 percent of average wage (y-axis). Countries with a METR that increases with the wage level even at lowest wage levels were omitted (Greece, Hungary, Italy, and the United States).
Source: Authors' calculation based on OECD Tax and Benefit model (OECD 2011).

3 Do Disincentives for Formal Work Matter?

This section performs an empirical analysis at the individual level that investigates how incentives correlate with informality, controlling for individual and job characteristics.

3.1 Data

The analysis is based on the European Survey for Income and Living Conditions (EU-SILC) for the year 2008. The survey covers a wide range of European countries and includes detailed questions on employment, income, taxes, and social security contributions. This allows to apply a comprehensive definition of informal workers and self-employed for a number of countries. In particular, the survey

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[15] Koettl and Weber (forthcoming)—an earlier version of this paper—provide a detailed overview of the tax wedge, the FTR, and the METR for a large number of OECD and Eastern European countries, including the NMS and some Western Balkan countries. It presents a graphical depiction of these synthetic measurements for disincentives for formal work for two family types across the 0 to 200 percent of average wage spectrum, country by country. Where available, an estimate of the informality rate—based on EU-SILC 2008—is included in the graphs.

includes a question on the amount of social security contributions paid by the employer on behalf of the worker. This question allows the identification of informal workers as those dependent employees for whom no social security contributions are paid. In addition, unpaid family workers are identified as informal. Finally, non-professional employers who employ five or fewer workers (including those with no employees) are also identified as informal.[16]

The analysis is performed for six NMS: Bulgaria, the Czech Republic, Estonia, Latvia, Poland, and Slovakia, which yields a total sample size of 48,865 employed individuals. The dependent variable is a binary indicator that takes the value of one for informal workers and zero for formal ones.

The independent variables for the regression are age, gender, education, geography (degree of urbanization), employment status of the spouse, citizenship, income, and sector. The age variable is grouped into five categories: age 15 to 24, 25 to 39, 40 to 54, 55 to 64, and 65 or older. Similarly, the education variable is grouped into three categories: high (post-secondary or tertiary education), medium (secondary education), or low (primary or pre-primary education).[17] For geography, the three categories are densely, intermediate, or sparsely populated area. The employment status of the spouse has four categories, namely formally employed, informally employed, inactive, or no spouse. Citizenship can either be the same as the country of residence (local), or of another EU country, or a non-EU country. The sector variable follows the NACE standard.[18]

Income groups are categorized based on income as a percentage of average wage of the country of residence. That is, income (employee and self-employment cash or near cash income) is calculated as a share of the official average wage. The average wage data is taken from OECD (2011). Note that for unpaid family workers, income is 0, while for some self-employed and employers, it can also be negative (in the case of a loss from self-employment or business activities). Income groups are then defined as those earning (i) 0 or less; (ii) more than 0 but less than 25 percent of average wage; (iii) 25 percent or more, but less than 50 percent of average wage; (iv) 50 percent or more, but less than 100 percent of average wage; (v) 100 percent or more, but less than 200 percent of average wage; and (vi) 200 percent of average wage or more.

The main innovation of the analysis stems from the attempt to measure incentives and disincentives for formal work that are being provided by the tax and benefit system at the *individual* level. That is, the FTR, METR, and the tax wedge are defined for each individual in the sample. This yields a synthetic measurement—purely based on *de jure* tax obligations and entitlements—of incentives and disincentives for formal work at the individual level.

To this end, we use the OECD Tax and Benefit model (OECD 2011) for the year 2008 for the six countries in the sample. The OECD Tax and Benefit model already provides the METR, and the FTR is calculated using the same model and according to the methodology developed by Koettl (2009) and described

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[16] The definition of informality for the self-employed and employers follows Hazans (2011).

[17] For Czech Republic and Slovakia, the employed are categorized only in the first two categories.

[18] NACE stands for "Nomenclature generale des activités économiques dans la Communauté européenne" and codes economic activity into various sectors and subsectors.

above. Both FTR and METR depend on three variables: (i) individual income, expressed as percent of average wage; (ii) household type (single or family); and (ii) the income of the spouse, if applicable. First, individual income as percent of average wage is calculated as outlined above, expressing the individual's cash or near cash income from dependent work and self-employment as a percent of average wage. The model is limited to the extent that the OECD Tax and Benefit model only provides calculations up to a certain level of income—for individuals, up to 200 percent of average wage, for certain types of families up to 367 percent of average wage. Since FTR and METR vary mainly at lower wage levels and are fairly constant from a certain income level onwards, we assume that individuals with income above the limitations set by the OECD Tax and Benefit model face the same incentives as those individuals at the boundary.[19]

Second, the OECD Tax and Benefit model is provided for 10 household types, from singles with or without children to one- and two-earner couples with or without children. For the latter type, the model is provided for three different income levels for the spouse.[20] These 10 OECD household types are matched to the household types provided in the EU-SILC data set. Certain assumptions have to be made in doing so. For example, the number of children is not taken into account, all individuals with children are assumed to face the same incentives as those with two children. In households with children, a couple, and additional adults, the children are matched to the couple while the additional adults are assumed to be singles. Finally, in households with children, but not couples, children are matched to those singles in a certain age group (35 to 45).

Third, for individuals with a spouse working in the formal sector, the spouse's income also has to be taken into account. The OECD Tax and Benefit model does so for three income levels of the spouse: 67, 100, and 167 percent of average wage. The spouse's income is then matched to 67 percent of average wage for all those earning more than 0 but less than 83.5 percent of average wage; to 100 percent of average wage for all those earning more than 83.5 but less than 133.5 percent of average wage; and to 167 percent of average wage for all those earning more than 133.5 percent of average wage. That is, we assume that all individuals face the same FTR and METR who have a certain income level and whose spouse works in the formal sector within the income brackets of (i) 1 and 83.5 percent of average wage; (ii) 83.5 and 133.5 percent of average wage; and (iii) above 133.5 percent of average wage.

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[19] This is obviously a simplifying assumption. Yet, the only variation that could occur at income levels beyond the boundary are higher income tax brackets or ceilings on social security contributions, which could shift both the FTR and METR to some limited extent.

[20] More precisely, the OECD Tax and Benefit model is provided for: (i) single; (ii) single with two children; (iii) one-earner couple with no children; (iv) one-earner couple with two children; (v) two earner couple with no children, spouse earning 67 percent of average wage; (vi) two earner couple with no children, spouse earning 100 percent of average wage; (vii) two earner couple with no children, spouse earning 167 percent of average wage; (viii) two earner couple with two children, spouse earning 67 percent of average wage; (ix) two earner couple with two children, spouse earning 100 percent of average wage; and (x) two earner couple with two children, spouse earning 167 percent of average wage;

3.2   Descriptive Statistics

According to EU-SILC 2008, the sample of around 49,000 is representative for about 27 million workers in Bulgaria, Czech Republic, Estonia, Latvia, Poland, and Slovakia. Of these, 28 percent are engaged in informal work (see Table 3). These 28 percent are largely made up of non-contributing workers (13 percent) and non-professional own-account workers (11 percent); the rest are family workers (2 percent) and non-professional employers in small firms (2 percent). The complement of 72 percent formal workers comprises largely of contributing workers (70 percent). Employers (in large firms or professionals in small firms) and professional own-account workers account for only 1 percent of all represented workers each.

Looking at gender, the share of males among informal workers is 63 percent. This is much higher than the corresponding share for formal workers (53 percent). This structural composition can be found in all countries represented in the sample. With respect to age, the group of 40 to 54 year olds holds the highest share (42 percent) among informal workers followed by the 25 to 39 year olds (37 percent). The age groups 15 to 24 and 50 to 64 account for 10 and 9 percent respectively, while the age group of 65 and older comprises only 2 percent of all informal workers. This distribution of workers and age is rather similar across all countries. Only the Czech Republic and Slovakia have slightly lower shares of informal youth (15 to 24 years) which are compensated by higher shares of workers in the age bracket of 40 to 54 years. Comparing the age distribution of informal workers with those of formal workers, no distinctive difference can be found in the sample. The overall informality rate of 28 percent is within a range of +/- 2 percent for all age groups except for those workers that are 65 years and more. The informality rate for this age group that only represents 1 percent of all workers is 48 percent. The informality rate of the young is 30 percent; the rate for the age group of 25-39 year olds is 26 percent, and around 28 percent for the remaining groups.

In addition to these demographic considerations, the composition of the informal workers by sectors and income groups provide further interesting insights. The agricultural sector holds with 26.1 percent the highest share of informal workers, while it represents only 2.4 percent of all formal workers. The informality rate for agriculture is consequently high, it amounts to 80.6 percent.[21] The second highest informality rate can be found in the construction sector. The rate is 38.2 percent and is followed by the rates of the categories 'Others' (33 percent), 'Trade and Repair' (32 percent), and the 'Accommodation and Food Services' (28.1 percent). All other sectors are below the overall informality rate of 28 percent.

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[21] In the literature, analysis on informal employment is often restricted to the non-agricultural sector. The analysis presented below focuses on disincentives in general and will therefore include the agricultural sector. Nevertheless, the analysis controls for sectors and therefore takes into account the particularly high incidence of informal employment in agriculture.

Table 3: Informality rates across different groups and countries

	Bulgaria	Czech Republic	Estonia	Latvia	Poland	Slovakia	Total
By employment status							
Self-employed	71.4%	82.8%	71.5%	70.9%	87.1%	81.5%	**83.9%**
Employees	7.3%	0.1%	3.3%	6.3%	27.1%	2.2%	**16.2%**
By sex							
Male	19.5%	17.1%	10.8%	15.9%	42.6%	14.2%	**31.5%**
Female	12.9%	8.9%	4.6%	8.6%	35.5%	6.0%	**23.7%**
By age							
15 to 24	19.3%	7.8%	6.9%	11.0%	44.6%	7.7%	**30.2%**
25 to 39	15.4%	12.2%	7.4%	12.6%	35.6%	10.2%	**26.2%**
40 to 54	15.7%	15.8%	7.8%	13.4%	40.5%	11.0%	**28.8%**
55 to 64	17.9%	13.2%	7.2%	9.7%	45.2%	10.5%	**28.0%**
65 or more	34.4%	30.8%	13.2%	11.1%	73.7%	25.2%	**48.4%**
By income group							
0 % of AW or less	79.8%	100.0%	67.8%	82.8%	92.7%	80.5%	**91.7%**
1 to 24 % of AW	37.6%	23.3%	29.1%	29.0%	66.6%	18.5%	**55.4%**
25 to 49 % of AW	17.1%	14.9%	5.9%	15.2%	40.4%	11.8%	**30.0%**
50 to 99 % of AW	11.8%	10.3%	3.0%	9.7%	29.2%	8.0%	**19.5%**
100 to 200 % of AW	11.2%	13.7%	6.9%	7.1%	29.3%	10.9%	**20.9%**
200 % of AW or more	29.8%	27.1%	24.2%	9.8%	25.7%	21.6%	**25.4%**
By sector							
Health services	3.3%	2.1%	1.9%	2.6%	17.8%	4.2%	**11.2%**
Mining, manufacturing	7.6%	7.7%	3.9%	7.8%	27.5%	8.3%	**18.3%**
Construction	22.6%	31.2%	14.4%	21.1%	49.7%	27.4%	**38.2%**
Trade and repair	24.4%	19.0%	8.4%	10.9%	42.9%	13.7%	**32.0%**
Transport and storage	13.6%	9.2%	10.3%	11.0%	40.1%	8.1%	**26.7%**
Accommodation and food	19.0%	19.1%	6.8%	10.9%	49.8%	7.6%	**28.1%**
ICT	10.0%	13.0%	9.4%	4.5%	25.6%	6.5%	**18.0%**
Financial services	1.3%	22.6%	7.1%	5.1%	24.1%	15.6%	**20.1%**
Professional services	14.1%	17.8%	5.0%	10.8%	31.7%	12.2%	**24.4%**
Public sector	1.6%	0.7%	1.0%	2.5%	21.1%	2.1%	**11.5%**
Education	1.1%	2.0%	1.1%	1.8%	15.8%	2.7%	**10.2%**
Agriculture	54.3%	26.9%	33.2%	46.7%	93.2%	15.4%	**80.6%**
Overall	**16.5%**	**13.6%**	**7.7%**	**12.3%**	**39.5%**	**10.4%**	**28.0%**

Source: Authors' calculations based on EU SILC 2008 and OECD 2011.

By income group, informality rates are highest for the three lowest income groups. These are '0 income of the average wage or less' with 92 percent, '1 to 24 percent of the average wage' with 55 percent, and '25 to 49 percent of the average wage' with an informality rate of 30 percent. The other income groups are below the average informality rate. The highest share of informal workers can be attributed to the groups '50 to 99 and '25 to 49' percent of the average wage. Their shares are 32 and 23 percent respectively, with the latter group covering a lower percentage range. In contrast, the groups '50 to 99' and '25 to 49' percent of the average wage represent 48 percent and 20 percent in the corresponding categories for formal workers. Consequently, the distribution of informal workers across the income groups is distinctively different from the distribution of formal workers with particularly high informality rates for the three lowest income groups.

3.3   Econometric Analysis

To quantify the effects of the explanatory variables on the dichotomous outcome variable, a generalized linear model with a probit link function was applied. For a binary outcome the probit equation is

$$P(Y_i = 1) = F(X_i^{'} \cdot \beta + \varepsilon_i)$$

with outcome variable Y_i and explanatory variables X_i for respondent i. $F(.)$ stands for the cumulative distribution function of the standard normal (probit model) distribution. [22]

It is important to highlight that characteristics such as preferences for working independently, for flexible working hours and the possibility to receive on-the-job training are not observed, which potentially could cause an omitted variable bias. However, we have made an effort to control for a large number of characteristics to reduce the potential bias as much as possible. In addition, the analysis does not establish a causal relationship, but mere correlations and should be interpreted with some caution. Causal relationships could point in either direction. High work disincentives might cause a high incidence of informal employment or high levels of informal employment might lead to high tax rates on formal labor, thereby increasing disincentives for formal work.

3.4   Expected Results

The interpretation and use of the tax wedge as a measurement of disincentives for formal work suggests that the higher the tax wedge, the higher the disincentives for formal work and, hence, the higher the incidence for informality. Consequently, one would expect a positive correlation between the tax wedge and the incidence of informality. However, the descriptive statistics regarding informality rates (Table 3) and the tax wedge (Figure 1 to Figure 3) point at a negative correlation. The tax wedge is lowest with low wage earners and strictly increases with income level (Figure 3). At the same time, the incidence of informality is highest among low wage earners (Table 3), which should lead to a negative correlation.

Does this imply that work disincentives do not matter? Not necessarily, since there could be an income effect or the tax wedge could be an insufficient measurement of disincentives for formal work. With regard to the income effect, low wage earners might earn so little that they cannot afford to forego any amount of income. So even giving up a relative small amount of income could effectively be a higher disincentive for a low wage earner than giving up a relatively larger amount of income for a high wage earner. With regard to insufficient measurement, the tax wedge does not take any loss of benefits into account, as already discussed. Figure 5 and Figure 7 show a less straightforward relationship between income on the one hand, and FTR or METR on the other when compared to the tax wedge.[23] Assuming that FTR and METR address the shortcomings of the tax wedge, a positive correlation between FTR or METR and the incidence of informality is expected.

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[22] A correlation analysis helped to explore pairwise collinearity. Moreover, multi-collinearity of the explanatory variables was explored by variance inflation factors (VIFs; Fox and Monette, 1992). None of the variables showed pairwise collinearity or multi-collinearity.

[23] For a detailed description of the tax wedge, FTR, and METR across many OECD and transition countries see Koettl and Weber (forthcoming).

Furthermore, the marginal effects of FTR and METR are expected to be higher for low wage earners than middle or high wage earners for two reasons. One is the income effect as described above with forgone income having a higher importance for low wage earners, resulting in a higher correlation between work disincentives and informality. The second reason is that the marginal effect not only depends on the coefficient but also on the incidence of informality. An estimation with a restricted sample of only low wage earners should yield higher marginal effects when compared to an estimation with the full sample.

3.5 Results

The results of the regression are presented in Table 4 for the full sample and Table 5 for low wage earners only. We report marginal effects, computed at the mean characteristics. Controlling for individual and job characteristics (income and sector) there is a significant positive correlation between FTR or METR and the probability of being informal. In particular, a 1 percentage point increase in the FTR (METR) increases the probability of being informal by 1.1 (0.8) for the full sample. For the low wage earners the correlation is stronger for both, FTR and METR. The marginal effects for the restricted sample are more than double compared to the ones for the full sample: 2.5 for FTR and 1.6 for METR. Estimations with a restricted sample of only high wage earners (100 percent of average wage or above) confirm that the correlation is less strong, with coefficients either smaller or negative or insignificant. This confirms the expectations as outlined above.

The marginal effect for the tax wedge is negative for both samples. As discussed above, the tax wedge increases with income, and because informality rates are lower at higher income levels, the overall correlation turns out to be negative. Therefore it seems that the tax wedge might not sufficiently capture individual differences in disincentives for formal work. In that sense, the tax wedge does not seem appropriate as a measure for individual disincentives for formal work. The rest of the discussion will therefore focus on the specifications using FTR and METR.

Table 4: Probit regression results with informality dummy as the dependent variable, reporting average marginal effects (full sample)

	(i)		(ii)		(iii)	
FORMALIZATION TAX RATE	0.011	***				
MARGINAL EFFECTIVE TAX RATE			0.008	***		
TAX WEDGE					-0.084	***
COUNTRY						
Bulgaria†						
Czech Republic	-0.095	***	-0.077	***	0.846	***
Estonia	-0.110	***	-0.101	***	0.176	**
Latvia	-0.086	***	-0.113	***	0.554	***
Poland	0.163	***	0.123	***	0.404	***
Slovakia	-0.028	**	-0.071	***	0.372	***
AGE GROUP						
15-24†						
25-39	0.017		0.010		-0.029	**
40-54	0.030	**	0.027	**	-0.012	
55-64	0.015		0.020		0.026	*
65+	0.120	***	0.137	***	0.181	***
SEX						
Male†						
Female	-0.076	***	-0.080	***	-0.079	***
EDUCATION LEVEL						
High†						
Medium	0.053	***	0.058	***	0.042	***
Low	0.111	***	0.107	***	0.089	***
EMPLOYMENT STATUS OF SPOUSE						
Formal†						
Informal	0.239	***	0.272	***	0.381	***
Inactive	0.002		0.032	***	0.144	***
No spouse	-0.018	*	0.017	*	0.365	***
DEGREE OF URBANIZATION						
Densely populated†						
Intermediate	-0.023		-0.021		0.060	
Thinly populated	0.040		0.038		0.066	
CITIZENSHIP						
Local†						
Other EU country	0.051	***	0.051	***	0.043	***
Others	0.037	***	0.039	***	0.030	***
INCOME GROUP						
0 % of AW or less†						
1 to 24 % of AW	-0.132	***	-0.183	***	-0.198	***
25 to 49 % of AW	-0.259	***	-0.289	***	-0.274	***
50 to 99 % of AW	-0.389	***	-0.393	***	-0.417	***
100 to 200 % of AW	-0.272	***	-0.278	***	-0.266	***
200 % of AW or more	-0.202	***	-0.209	***	-0.179	***
SECTOR						
Health services†						
Mining, manufacturing, utilities	0.055	***	0.053	***	0.046	***
Construction	0.281	***	0.282	***	0.248	***
Trade and repair	0.224	***	0.225	***	0.205	***
Transport and storage	0.150	***	0.151	***	0.144	***
Accommodation and food services	0.231	***	0.233	***	0.208	***
ICT	0.113	***	0.116	***	0.096	***
Financial services	0.142	***	0.143	***	0.116	***
Professional services	0.155	***	0.146	***	0.140	***
Public sector	-0.004		-0.008		0.002	
Education	-0.022		-0.020		-0.024	
Agriculture	0.502	***	0.509	***	0.444	***
Others	0.298	***	0.296	***	0.284	***
Number of observations =	47,065		47,065		47,065	
Wald chi2(37) =	5,865.19		6,393.39		4,876.38	
Prob > chi2 =	0		0		0	
Pseudo R2 =	0.2642		0.2878		0.5138	
Log pseudo-likelihood =	-20,023.73		-19,382.73		-13,231.89	
Mean dependent variable	0.2650287		0.2650287		0.2650287	

Statistically significant at: * 10 percent **5 percent ***1 percent

Note: † Baseline category. Regressions based on individual data from EU-SILC (Eurostat 2008) with matched data for individual FTR, METR, and tax wedge from OECD Tax and Benefit model (OECD 2011). Coefficients are interpreted as follows: In the specification with FTR, an increase of 1 percentage point of the FTR increases the probability of being informal by 1.1; living in the Czech Republic decreases the probability of being informal by 9.5 when compared to living in Bulgaria; being female decreases probability by 7.6; having low education increases the probability by 11.1 when compared to someone with high education; and so on.

Table 5: Probit regression results with informality dummy as the dependent variable, reporting average marginal effects (low-wage earner sample)

	(i)		(ii)		(iii)	
FORMALIZATION TAX RATE	0.025	***				
MARGINAL EFFECTIVE TAX RATE			0.016	***		
TAX WEDGE					-0.092	***
COUNTRY						
Bulgaria†						
Czech Republic	-0.197	***	-0.193	***	0.687	***
Estonia	-0.158	***	-0.193	***	-0.042	
Latvia	-0.109	***	-0.234	***	0.289	**
Poland	0.268	***	0.088	***	0.422	***
Slovakia	-0.003		-0.180	***	0.197	***
AGE GROUP						
15-24†						
25-39	0.029		0.010		-0.038	
40-54	0.083	***	0.089	***	0.167	
55-64	0.095	***	0.127	***	0.056	*
65+	0.162	***	0.205	***	0.127	*
SEX						
Male†						
Female	-0.088	***	-0.091	***	-0.120	***
EDUCATION LEVEL						
High†						
Medium	0.022		0.017		-0.003	
Low	0.036	**	0.060		0.054	
EMPLOYMENT STATUS OF SPOUSE						
Formal†						
Informal	0.154	***	0.083	***	0.426	***
Inactive	0.085	***	-0.132	***	0.212	***
No spouse	-0.102	***	-0.047	**	0.356	***
DEGREE OF URBANIZATION						
Densely populated†						
Intermediate	0.072	***	0.073	***	0.080	***
Thinly populated	0.046	***	0.051	***	0.046	**
CITIZENSHIP						
Local†						
Other EU country	-0.096		-0.090		-0.012	
Others	-0.009		-0.029		0.177	
INCOME GROUP						
0 % of AW or less†						
1 to 24 % of AW	-0.158	***	-0.320	***	-0.380	***
25 to 49 % of AW	-0.450	***	-0.529	***	-0.557	***
SECTOR						
Health services†						
Mining, manufacturing, utilities	0.131	***	0.127	***	0.112	***
Construction	0.332	***	0.318	***	0.273	***
Trade and repair	0.224	***	0.232	***	0.220	***
Transport and storage	0.231	***	0.209	***	0.227	***
Accommodation and food services	0.193	***	0.184	***	0.180	***
ICT	0.246	***	0.225	***	0.197	***
Financial services	0.333	***	0.332	***	0.291	***
Professional services	0.197	***	0.169	***	0.180	***
Public sector	-0.039		-0.091		-0.032	
Education	-0.011		0.008		-0.012	
Agriculture	0.545	***	0.558	***	0.500	***
Others	0.298	***	0.308	***	0.350	***
Number of observations =	14,328		14,328		14,328	
Wald chi2(34) =	2,267.19		2,810.70		4,261.33	
Prob > chi2 =	0		0		0	
Pseudo R2 =	0.3409		0.3976		0.5669	
Log pseudo-likelihood =	-6,373.44		-5,824.83		-4,187.99	
Mean dependent variable	0.4047872		0.4047872		0.4047872	

Statistically significant at: * 10 percent **5 percent ***1 percent

Note: † Baseline category. Regressions based on individual data from EU-SILC (Eurostat 2008) with matched data for individual FTR, METR, and tax wedge from OECD Tax and Benefit model (OECD 2011). Coefficients are interpreted as follows: For low-wage earners, in the specification with FTR, an increase of 1 percentage point of the FTR increases the probability of being informal by 2.5; living in the Czech Republic decreases the probability of being informal by 19.7 when compared to living in Bulgaria; being female decreases probability by 8.8; having low education increases the probability by 3.6 when compared to someone with high education; and so on.

As for the individual characteristics, the correlation with sex (male being the baseline category) clearly stands out as significant and negative. That is, women are clearly less likely to work informally. For the full sample, being female decreases the probability of being informal by 7.6 (specification with FTR) and 8 (METR). For low wage earners, the correlation is stronger with 8.8 and 9.1, respectively. This is in contrast to findings in other developing countries. Perry et al. (2007), for example, find that in Latin America, women seem to value informal self-employment because the flexibility of the informal sector allows them to better balance their home and income-earning roles. Accordingly, informality rates in Latin America tend to be higher among women when compared to men. In transition countries, though, this seems not to be the case, as also confirmed by Hazans (2011).

In terms of age, there seems to be no clear correlation between informality and age. The only consistent effect across specifications is observed for the age group 65 and older, which is more likely to be in informal employment compared to the 15 to 24 age group. With regard to education, the low and medium educated are significantly more likely to be informal when compared to the highly educated in the full sample.

The results regarding the employment status of the spouse are somewhat surprising: there is a clear positive correlation between working informally and having an informally working spouse. This suggests that households do not make strategic decisions along the line of one partner working formally (and receiving employment and social protection, including for dependents) while the other one works informally. This result is robust with regard to restricting the sample to various sub groups, the agricultural or non-agricultural sector, low-wage earners, employees, or self-employed. Regarding inactive spouses or being single, the results are more ambiguous.

Other individual characteristics like geography (rural or urban) and citizenship did not yield any significant correlations. Although for the full sample there seems to be no correlation between informality and geography, for low wage earners the probability of being informal is higher when living in less densely populated areas. With regard to citizenship, the full sample suggests a highly significant positive relation between foreign citizenship (both EU and non-EU) and being informal, yet this is not the case in the restricted sample.

The income variable confirms the expected relationship between income and informality. Those with no or negative income are clearly most likely to be informal, which is certainly explained by all unpaid family workers falling into this category. For the other income groups, the likelihood of being informal decreases with income and is lowest for the income group earning 50 to 99 percent of average wage. For those earning more than average wage, though, the likelihood of being informal seems to increase again. One possible explanation is that enforcement of tax and contribution collection is highest for those earning around average wage, because they are the largest group of contributors. In other words, tax revenue collection is geared towards the middle class.

Regarding job characteristics, agriculture consistently yields a significant and highly positive relationship with being informal. Other sectors with similar results are construction, trade and repair, transport and storage, and accommodation and food services. Public sector and education do not seem to have a

significantly higher probability of being informal, but one has to bear in mind that the baseline category is health services, which by itself is mainly public. This also applies to the education sector.

4   Conclusions and Policy Implications

The analysis presented defines three different synthetic measurements of disincentives for formal work: two standard measurements, namely the tax wedge and the marginal effective tax rate (METR); and a new, innovative measurement called formalization tax rate (FTR). The novelty of the latter is that it measures disincentives stemming not only from labor taxation, but also from benefit withdrawal due to formalization. A descriptive analysis across a large number of OECD and Eastern European countries reveals that the disincentives for formal work—when measured through the FTR—are especially high for low-wage earners. This suggests that formal work might not pay in this segment of the labor market, in particular for the so-called mini-jobs and midi-jobs (low paying part-time work).

Another novelty is the empirical analysis that complements the descriptive analysis. Using EU-SILC 2008 data and OECD Tax and Benefit data for six Eastern European countries, we match disincentives for formal work that depend on income and family type to individual observations in a large data set. More precisely, EU-SILC data is matched with individual synthetic measurements of disincentives for formal work—namely the tax wedge, METR, and the FTR—coming from the OECD Tax and Benefit model. Applying a probit regression, the analysis finds a significant positive correlation between FTR or METR and the probability of being informal. In other words, controlling for individual and job characteristics, the higher the FTR or the METR is that individuals are facing, the more likely they are to work informally. The tax wedge, on the other hand, yields a negative correlation, indicating that the tax wedge is not sufficiently capturing disincentives for formal work. This also suggests that in cross-country analysis in which the tax wedge is used as an independent variable to explain informality levels, it might be more appropriate to use a tax wedge that is more representative for low wage earners, not for average wage earners. For example, calculating the tax wedge at 33 percent of the average wage would represent better the actual tax wedge faced by most informal workers.

These results lead to the question on how formal work can be made more viable for low-wage earners. The two main policy tools to make formal work pay are to decrease labor taxation at the lower wage levels and to reform benefit design for social assistance, housing, and family benefits. On the former, policies linked to wage subsidies, social security contribution credits, in-work or employment-conditional benefits (cash benefits or refundable income tax credits conditional on formal) for low-wage earners could play an important role (Immervoll and Pearson 2009). With regard to reforming the design of social assistance, housing, and family benefits, the key is to keep the marginal effective tax rate in mind when designing benefit withdrawal.

Finally, it should be pointed out that most of the reforms discussed above have fiscal costs. Given fiscal constraints, there might be little fiscal space available to push through these reforms. In particular, reforms that aim at making work pay at the low wage end—like wage subsidies or tax credits—can

considerably reduce tax revenues, including social security contributions, or increase public expenditures. In this regard, though, the NMS are in a favorable position: as shown above, their tax systems are relatively non-progressive. Making the relatively non-progressive tax system more progressive could make any future reforms along these lines fiscally neutral to a large extent.

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