Does formal work pay?

The role of labor taxation and social benefit design in providing disincentives for formal work

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1 Introduction

This paper asks 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. And if so, what incentives have employers, the self-employed, and workers to actually register these activities and pay taxes and contributions on the income that is 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. Second, certain administrative procedures related to paying taxes, accounting, completing statistical questionnaires, and so on, might deter people from operating in the formal sector. Third, people and firms might want to avoid paying taxes on revenues, income, profit, or property and social security contributions. Forth, formal income might lead to withdrawal of social benefits—like social assistance or unemployment benefits—so that people might prefer informal or no work over formal work. Fifth, enforcement of existing legislation on regulations and taxation might be weak, so the risks of circumventing regulations and avoiding taxes might be low.

In answering the main question of this paper, the focus is put on the role of labor taxation and social benefit design, how it relates to informal employment and—as a logical extension—to inactivity, and what disincentives for formal work might be provided to people in working age so they choose to "exit" into informality or inactivity. Bearing in mind that labor taxation and social benefit design are but two pieces in the puzzle to explain informality and inactivity, 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. This leads to the conclusion 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 European 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".

The analysis starts from the question of what incentives or disincentives the inactive and the informally employed face when considering formal work. For the inactive, starting to work formally or not will be based on considerations of how any potential formal net wage and social security entitlements compare to the alternative of not working. Not working, though, might imply being eligible to income-tested benefits like social assistance, which they could (partially) lose when working formally, increasing the opportunity costs of formal employment.

For 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 be importantly 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 ("tax morale"). Paying social security contributions and income tax combined will decrease workers' take-home pay when compared to their informal wage. Third, just like the inactive, informal workers after formalizing might not be eligible any more to a number of benefits that are income-tested. When having no formal income on record, workers might be eligible to income-tested benefits like social assistance, family benefits, or housing benefits. Once informal workers are formalizing, though, they might lose all or parts of these benefits, reducing their formal income further and increasing the opportunity costs of formal work. 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.

The analysis presented below starts by first looking at the levels of informality and inactivity in the New Members States of Eastern Europe and Croatia (NMS) and makes the case that—given the future challenges of aging—it is vital for these countries to increase formal employment. By looking at firms' perceptions on the main obstacle of doing business, it is suggested that taxes could play a major role in constraining formal job creation. Without answering the question of what the binding constraints for

formal job creation really are, it seems that a necessary condition is that formal jobs have to offer a viable income opportunity for workers and employers—that is, formal jobs have to pay. The subsequent section investigates these incentives further by looking into the tax and benefit systems of the NMS. This section offers a new, innovative measurement of disincentives for informal work, the so-called formalization tax rate (FTR). The FTR goes beyond the usual measurements of the tax wedge and the marginal effective tax rate (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 World Bank partnered with the Organisation of Economic Co-operation and Development (OECD) to extend the OECD's Tax and Benefit model to the non-OECD NMS (the Baltics, Bulgaria, and Romania) and the three Western Balkan countries (Bosnia and Herzegovina, Macedonia, and Serbia). The subsequent section then relates the synthetic measurement of the FTR to actual informality patterns by using the EU Survey of Income and Living Conditions (EU-SILC), investigating the question if and how much these disincentives matter for informal employment. The final section concludes.

2   Taxes and Benefits: a Necessary Condition?

In the NMS and Croatia, not only informality is high (see, for example, Montenegro 2011 and Hazans 2011), but also inactivity. When compared to other EU countries, most NMS display participation rates below the EU average (see Figure 1). The demographic transition and aging—which is particularly severe in the NMS—will considerably increases the need for participation in the formal sector in the future. For the social contract of theses countries to survive, more people will need contribute through taxes and social security contributions—that is, 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. One—possibly necessary—pre-condition for participation in the formal sector is arguably 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 might arguably not be the binding constraint. Labor taxation and benefit design are but two pieces in the puzzle to explain high levels of inactivity and informality among the working age population of the NMS. Other reasons are related to regulations in the product and labor market, administrative burden related to taxes, regulations, or accounting, and taxation on revenues, profit, tradable goods, property, enforcement of laws, and so on. This paper is not trying to identify which of these potential reasons are the main causes for high levels of informality and inactivity, but narrowly focuses on the incentives and disincentives for formal employment provided by the labor taxation and benefit system.

Figure 1: Participation rates in the NMS and Croatia tend to be below EU average.
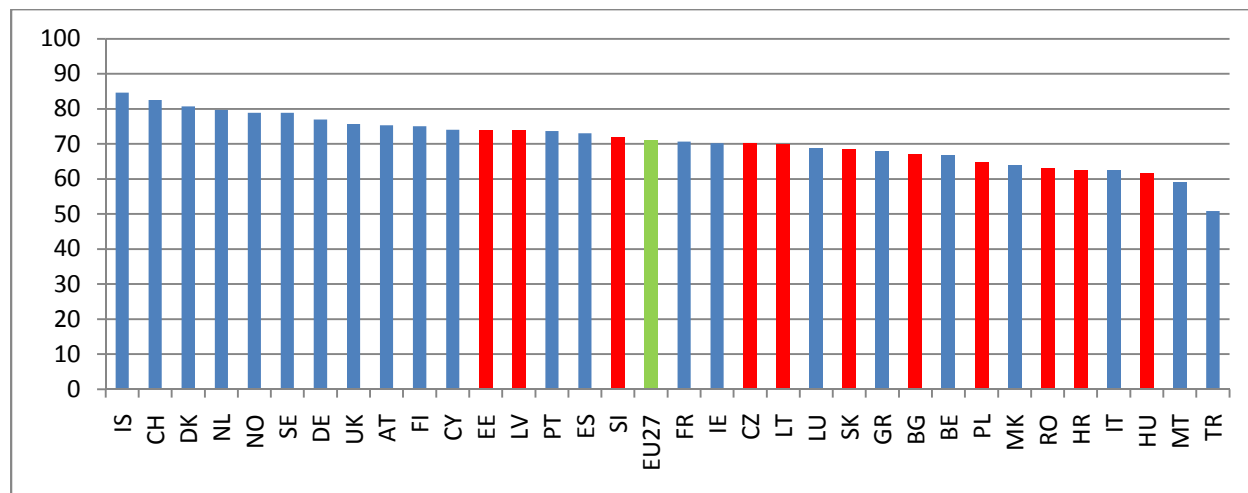

Note: Columns represent participation rates of the population aged 15 to 64 in the EU and EU Candidate countries (percent, 2009). Countries in red depict the NMS and Croatia.
Source: Author's calculation based on Eurostat.

One indication, though, that at least taxation in general plays a prominent role in income-generating activities comes from enterprise surveys. The World Bank Enterprise surveys reveal that on average, 45 percent of firms in the NMS and Croatia cite tax rates as a one of the major obstacle for doing business in 2009 (see Figure 2). The question refers to all types of taxes, and not specifically labor taxes. Nevertheless, the results indicate that employers perceive tax rates as high and as a greater obstacle to doing business than regulations and administrative procedures. Tax administration (24 percent) and competition from informal enterprises (23 percent) seem to play some role, but licensing (14 percent), labor regulations (14 percent), and trade regulations (8 percent) figure less prominently as an obstacle to doing business. 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 a constraint for creating new formal jobs.

Hence, there is some indication that disincentives—like high levels of taxation—could play an important role in explaining high levels of inactivity and informality in the NMS. But many other factors, like regulations, social norms and tax morale, the quality of institutions and governance, and so on, could also play an import—maybe even more important—role. Therefore, fixing the incentives for formal work might by no means be a sufficient condition to increase participation in the formal sector. Yet, if it is not a sufficient condition, than at least it might be a necessary condition: no matter what the other binding constraints are, at a minimum for more people to participate in the formal economy, formal work has to pay.

Figure 2: Employers identify high tax rates as the main obstacle to doing business.
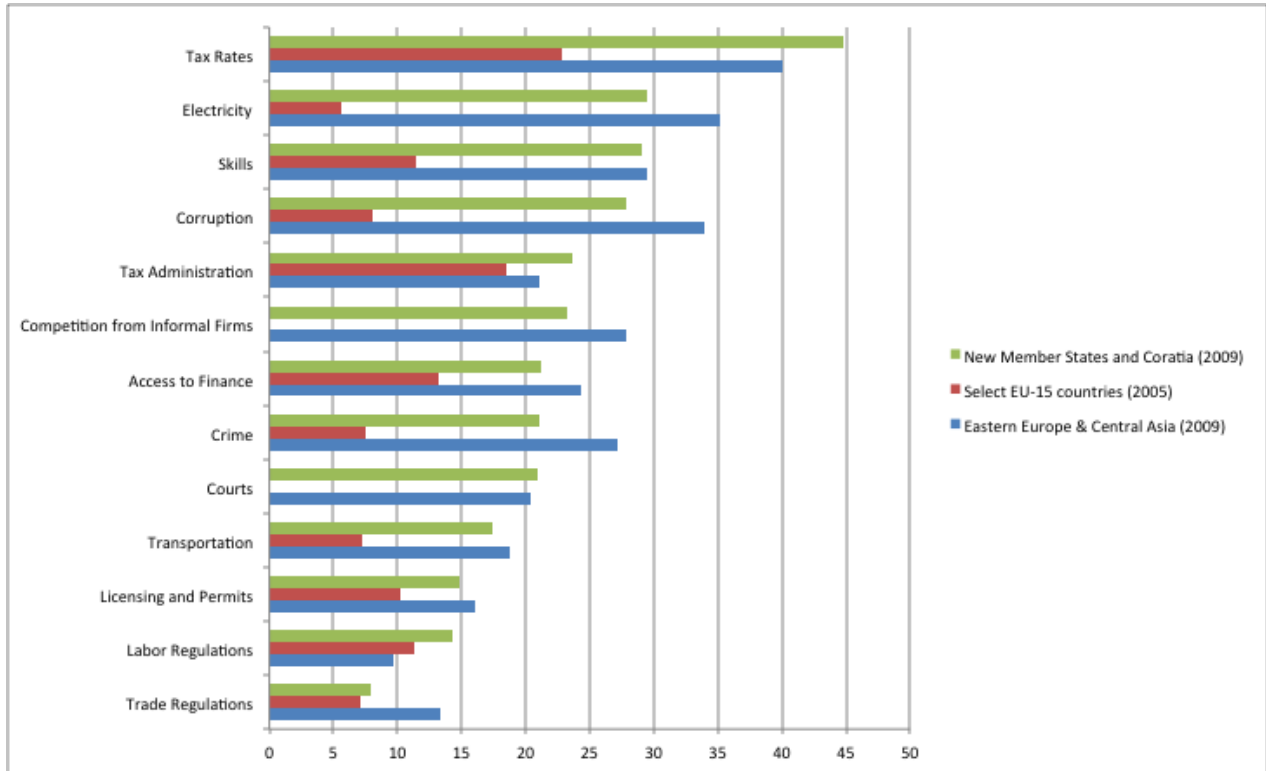
Note: The bars represent the percentage of firms that identify the respective issue as a main obstacle to doing business. Averages are unweighted. Select EU-15 countries are Germany, Greece, Ireland, Portugal, and Spain.
Source: Author's calculation based on World Bank Enterprise Surveys.

3   Disincentives for Formal Work

This section offers a closer investigation of the tax and benefit systems in the NMS, which will suggest that for low-wage earners, the value of the benefits secured through social security contributions that are associated with formal employment have to be rather high to offset the opportunity costs of formal employment. This is due to relative high labor taxation, but also due to the design of social assistance and family benefits. Taken together, informal workers at low wages have to give up a considerable amount of their informal wage in order to formalize, and it is unlikely that the value of social security entitlement (and other benefits like formal employment protection legislation) that they get in return for formalization exceed these implicit costs. The same holds for the inactive when considering formal work at low wage levels. In other words, so called-mini jobs and midi-jobs—that is, part-time and full-time jobs that pay less or just a little more than the full-time minimum wage—are hardly economically viable in the NMS. Hence, workers with low educational attainment and skills—like many of the

informally employed and the inactive—might be priced out of the formal market in the sense that formal net wages are too low when compared to informal wages and employers are unwilling to accept higher formal labor costs when compared to informal labor costs, given the low productivity of informal workers.

3.1   The Decision between Formal and Informal

How would a worker and his or her (potential) employer then decide about a formal or an informal job? Ignoring other considerations related to regulations, administrative burden, enforcement, and so on, for a low-paid (part-time) job both the employer and the worker have strong incentives to circumvent the high labor taxation and make the job an informal one. Nevertheless, various factors have to be considered when analyzing the decision between formal and informal work apart from labor taxes. Labor taxes decrease workers' take-home pay when compared to their informal wage, but also, just like the inactive, informal workers after formalizing might not be eligible any more to a number of benefits that are income-tested. When having no formal income on record, workers might be eligible to income-tested benefits like social assistance or family benefits. Once informal workers are formalizing, though, they might lose all or parts of these benefits, reducing their formal income further and increasing the opportunity costs of formal work. In addition, firms that 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.

The latter point regarding the need for firms to formalize revenues in response to formalizing workers is beyond the scope of this paper. The following analysis will focus on the incentives and disincentives provided by the labor tax and benefit system. In doing so, it will be useful to apply a more precise measure on what the advantages and disadvantages of formal and informal work are for employers and employees, not only at the extremely low wage level, but across the entire wage spectrum. This allows to obtain a sense of how high the opportunity costs of formal labor are—expressed in terms of informal wage and forgone income-tested benefits like social assistance. This in turn gives a sense of how the value of social security entitlements and employment protection that come with formal employment at least have to be to offset the opportunity costs of formal employment.

3.2   Labor Taxation

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 average wage) tend to be relatively high (see Figure 3).[2] The tax wedge measures the difference between labor costs and take-home pay of workers. It 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. These taxes

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[2] 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.

vary depending on family type and wage level. For a single with no children who receives a gross wage of 33 percent of the average wage, only few EU-15 countries—like Sweden, Germany, Belgium, and Finland—charge higher taxes than most of the NMS.
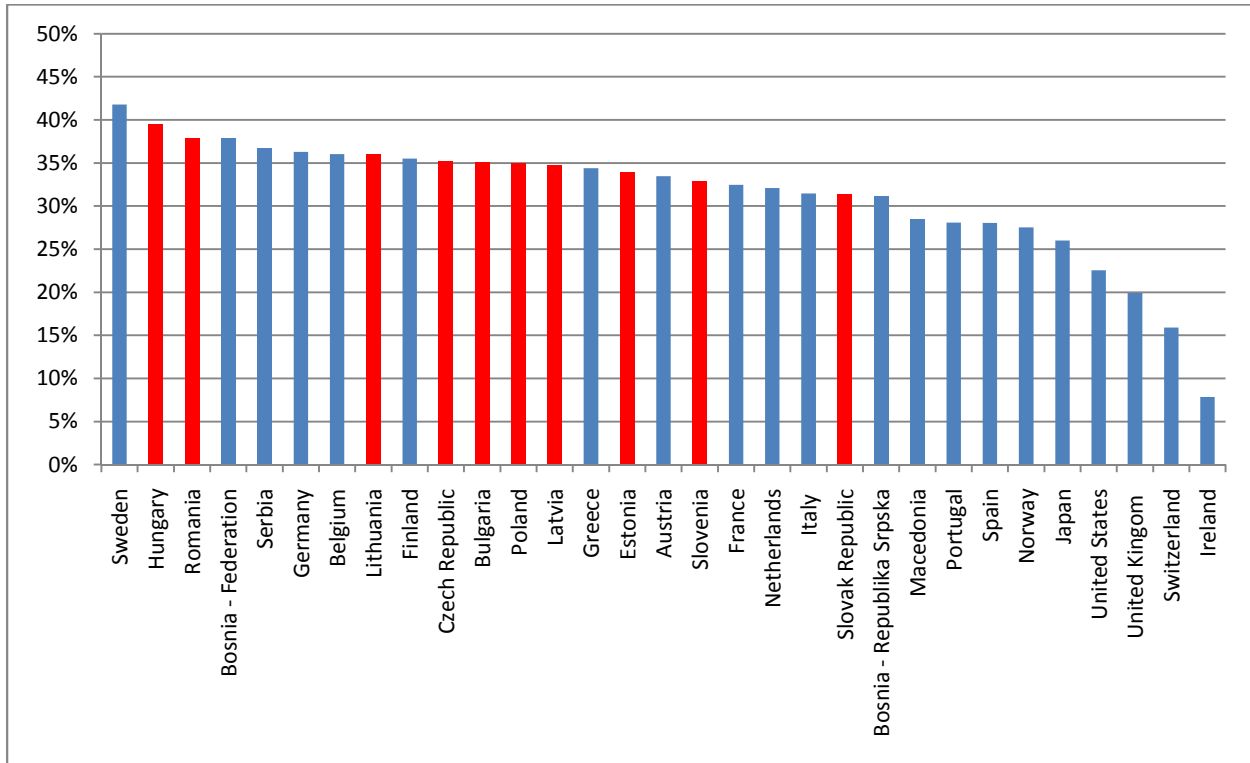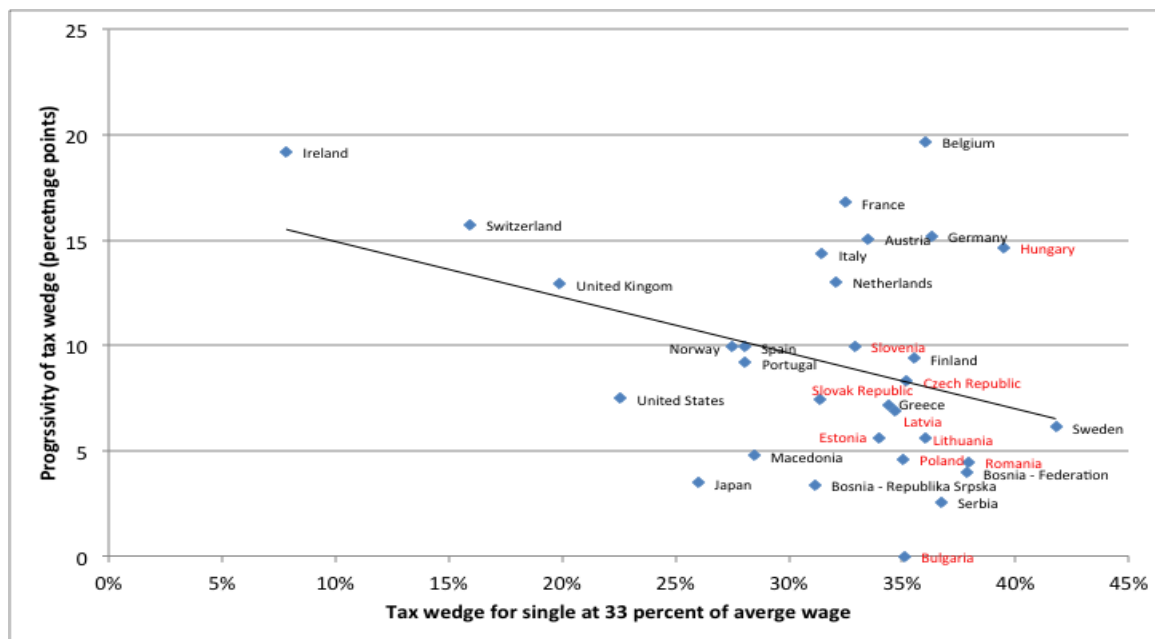
Note: Columns represent the tax wedge for low-income earners (singles with no children at 33 percent of average wage) in 2008 (for Bosnia, Macedonia, and Serbia, 2009). Countries in red depict the NMS.
Source: Author's calculation based on OECD Tax and Benefit model.

Also, labor taxation in the NMS is not very progressive. While in most other countries, labor taxes increase significantly with the wage level—for most EU-15 countries, by over 10 percentage points between 33 and 100 percent of average wage level—in the NMS, labor taxes increase by less than 10 percentage points. 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 are below the trend line in a cross-county comparison (see Figure 4).[3] In particular, for singles 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.

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[3] 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.

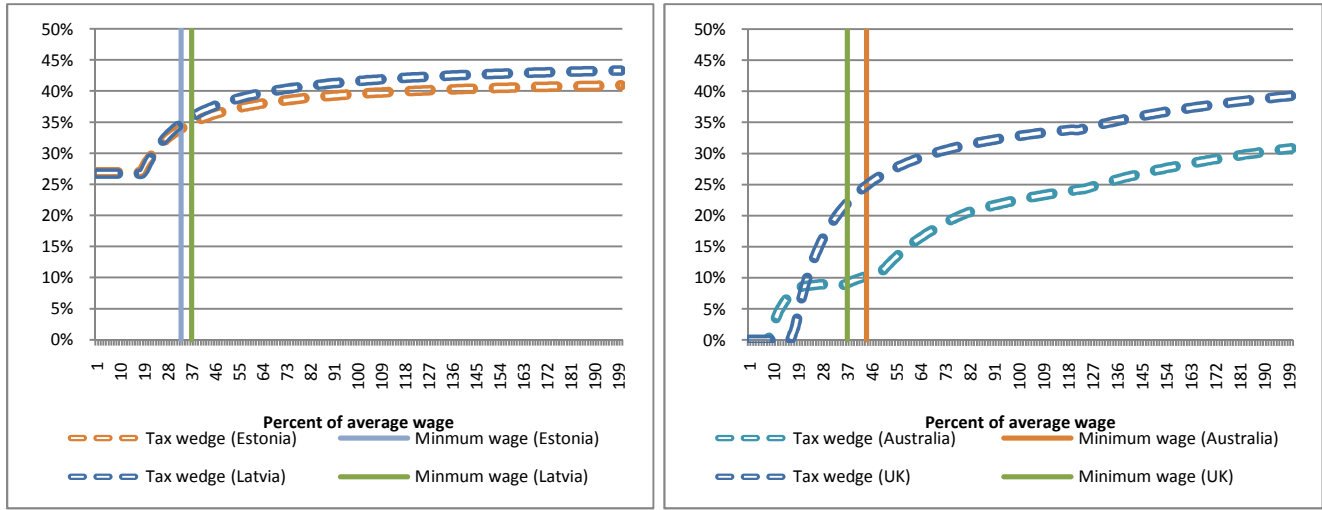**Figure 4: In the NMS, the tax wedge tends to be not very progressive**

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). Countries in red depict the NMS.
Source: Author's calculation based on OECD Tax and Benefit model.

Nevertheless, with the exception of Bulgaria in all countries labor taxation displays some degree of progressivity.[4] A typical graph of the tax wedge over the wage level for the NMS is depicted in Figure 5—in this case, for Estonia and Latvia. 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 (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 for Australia and the United Kingdom (see Figure 5). Both have a tax wedge of 0 percent for low-wage earners, and only for wage level above 20 percent of average wage the tax wedge is increasing significantly.

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[4] 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.

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Figure 5: 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.

Source: Author's calculation based on OECD Tax and Benefit model (2008).

Figure 6: 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.
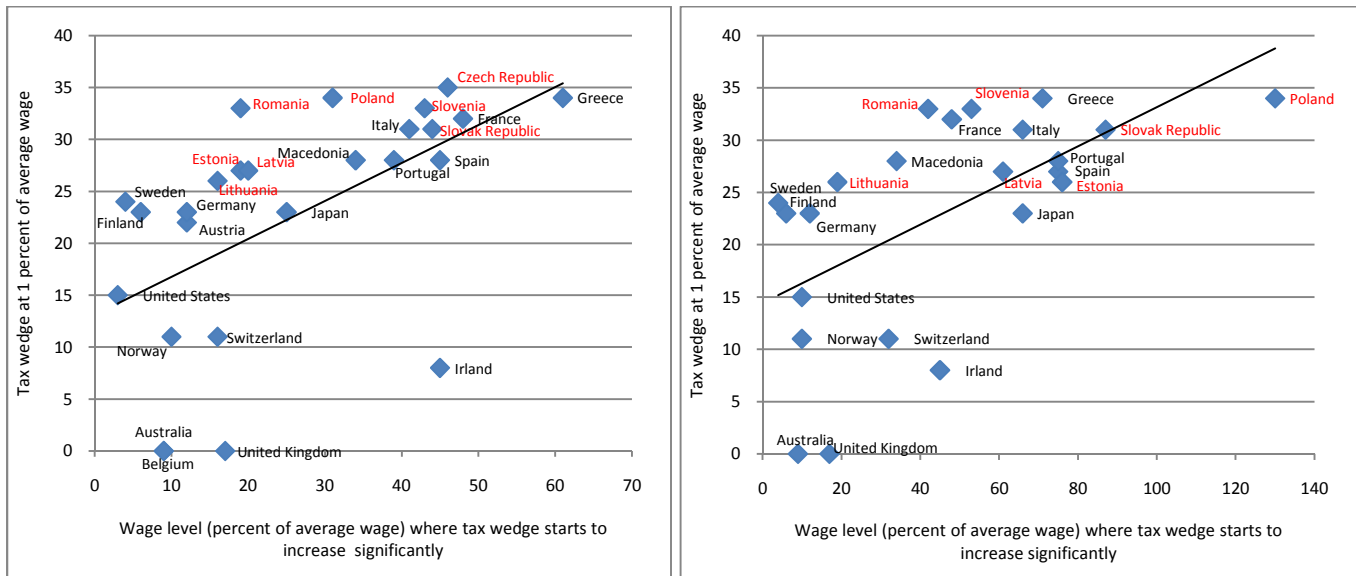
Single person with no children

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). The NMS are pictured in red.

Source: Author's calculation based on OECD Tax and Benefit model (2008).

A closer look 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 increases across the whole wage spectrum (see Figure 6). Figure A1 and A2 in the Annex give a more detailed picture of the tax wedge, country by country.

3.3 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.[5] If this worker were to work in the formal sector, various implicit opportunity costs occur: First, assuming that the value of 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—in other words, 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. 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 certain amount of social assistance, this benefit will be decreased or completely withdrawn if the worker formalizes and has an official income on record. 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 also gain from formalization: they gain a future right to an old-age pension, and they gain rights with regard to disability insurance, workers compensation, health insurance, and unemployment insurance.

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 strongly discount future benefits because their concerns are focused on short-term income, and in cases of poverty, day-to-day consumption. Also, any means-tested social pensions for the elderly might further discount the value of a vested old-age pension.

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

3.4   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 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. The red and orange, solid graphs in Figure 7 expresses this implicit cost to the informal worker as a share of informal income (the so-called formalization tax rate, FTR). That is, it 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.[6] It is therefore the share of informal income that an informal worker has to give up to formalize.

Figure 7: 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.
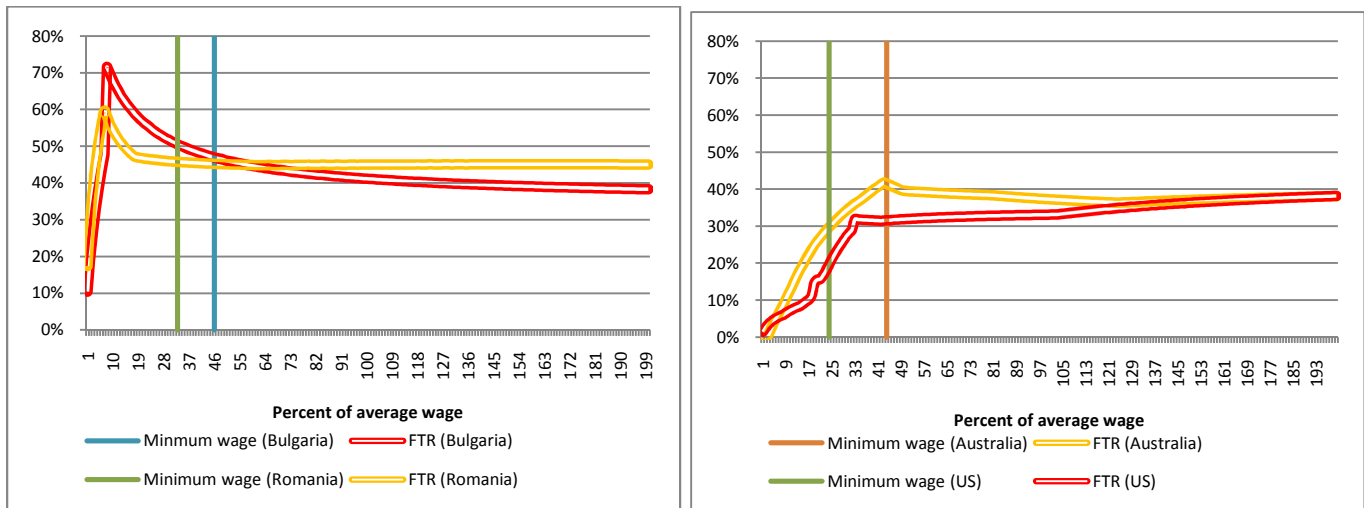
Note: Graphs show the formalization tax rate (FTR) for single person with no children.
Source: Author's calculation based on OECD Tax and Benefit model (2008).

Consider the contrasting examples of Bulgaria and Romania on the one hand and Australia and the United States on the other. 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 up to 70 percent of income to formalize. By contrast, in

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

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).

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 8 reveals that both for singles and one-earner couples with two children, the costs of formalization in the New Members States 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 8: 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
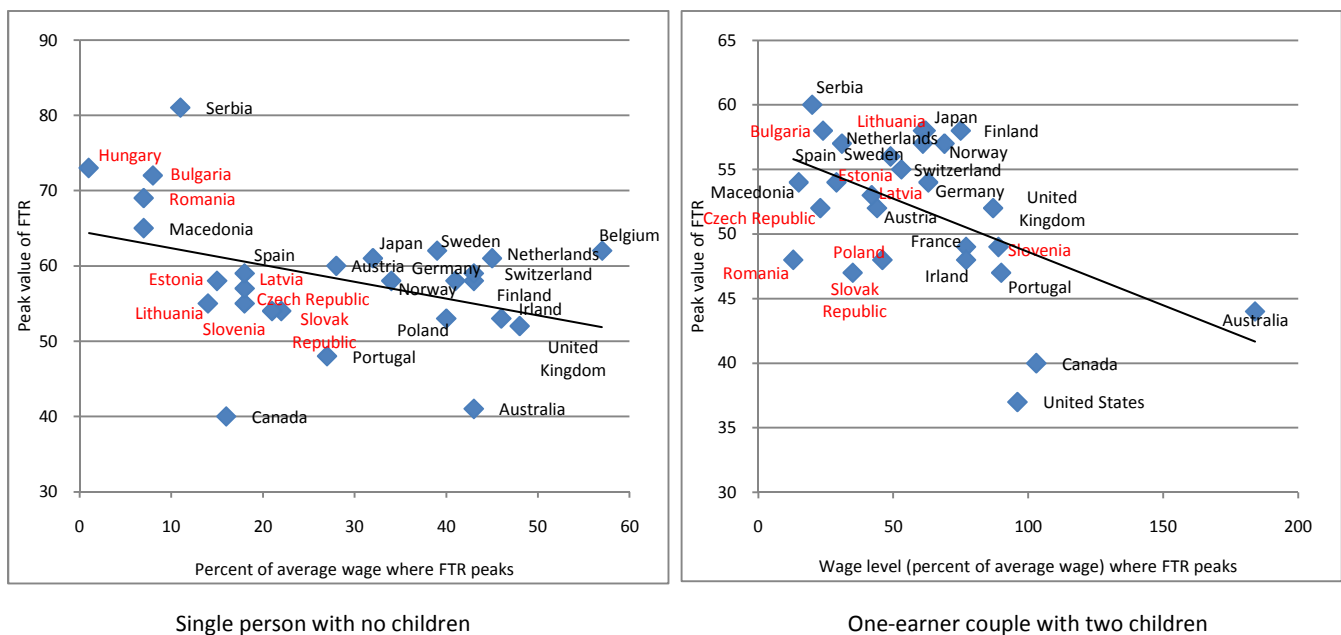
Note: The scatter plot depicts the wage level where the formalization tax rate (FTR) peaks (x-axis) versus the peak value of the FTR (y-axis). Countries with a continuiously and significantly increasing FTR were omitted. In countries where the FTR froms a plateau and increases only slightly with the wage level, the lowest wage level at which the FTR stopps to increase significantly was chosen as the peak. The NMS are pictured in red.
Source: Author's calculation based on OECD Tax and Benefit model (2008).

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 main obstacles to formal employment at the lower wage levels. Also the design of income-tested benefits 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.

3.5   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 a 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 higher wages.

In many countries, at low wage levels (below 10 percent of average wage), every dollar earned is subtracted from entitlements to social assistance; hence 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 100 percent taxed away through withdrawal of social assistance at wage levels below 20 percent of average wage (see Figure 9). In other countries, like Portugal and the United States, this is not the case. 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 though so-called in-work benefits and tax credits that subsidies work at low wage levels.

Figure 9: 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.
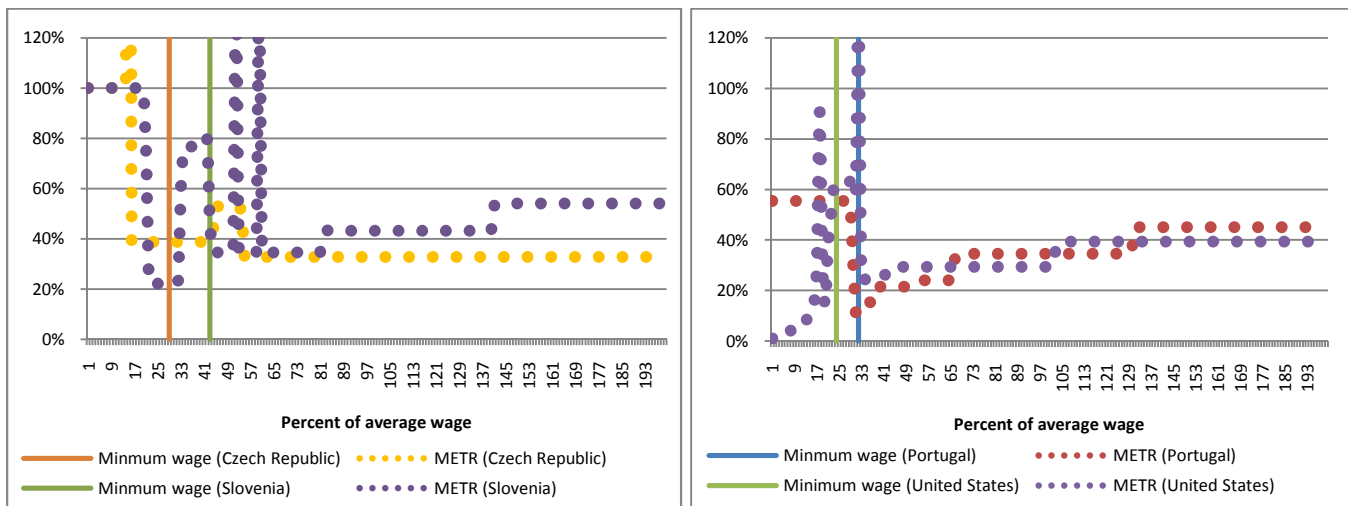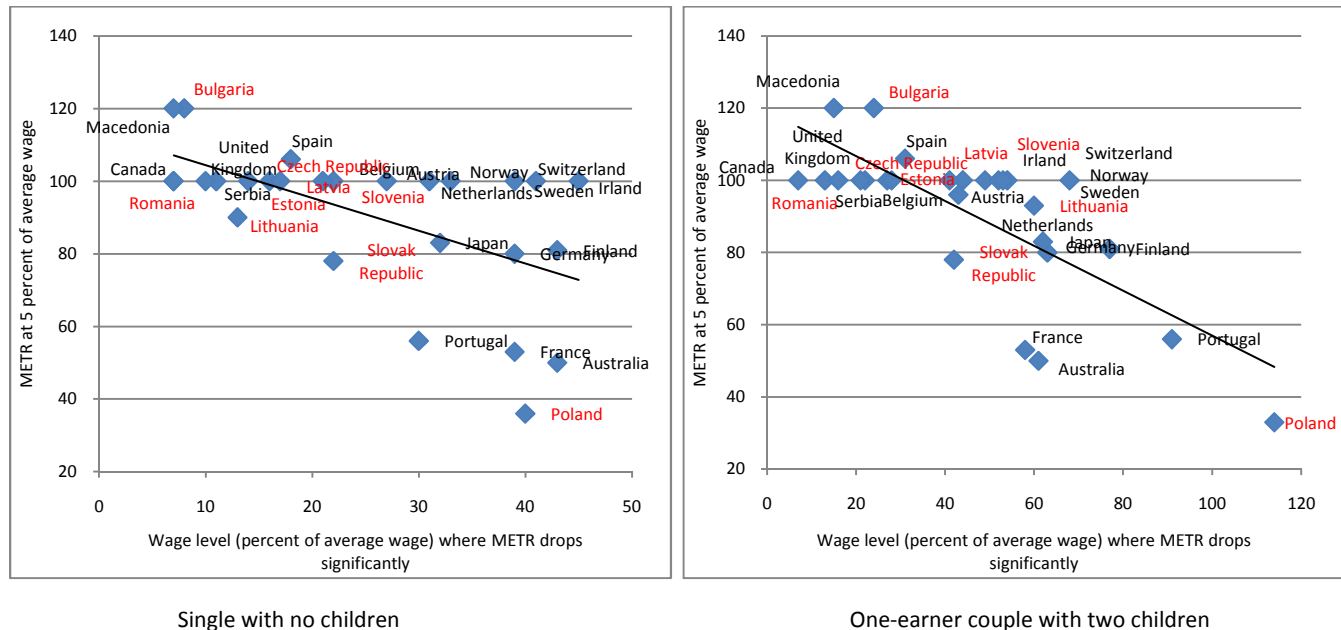

Note: Graphs show the marginal effective tax rate for single with no children.
Source: Author's calculation based on OECD Tax and Benefit model (2008).

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 10). A notable exception is Poland, which 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. There seems to be, though, a locally administered social assistance program, which unfortunately is not captured by the OECD Tax and Benefit model. The same issue might apply to other countries like, for example, Greece and Italy.

Figure 10: 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). The NMS are pictured in red.
Source: Author's calculation based on OECD Tax and Benefit model (2008).

3.6   Incentives for Formal Work: Conclusions

It is unlikely that the value that informal workers put on social security benefits and employment protection exceed the high implicit costs of formalization. The analysis above has shown that informal workers at low wage levels have to give up significant amounts of their informal wage in order to formalize, and it is unlikely that the rights they gain in return for formalization exceed these costs, particularly given the deterioration of average pension replacement rates in the past ten years. Besides employment protection, the most relevant protection they gain from formalization are old-age and disability pensions, health insurance, and unemployment insurance. Health insurance, which is arguably the most important social security entitlement with immediate—as opposed to future—benefits, can sometimes be obtained through a formally employed spouse or by registering as unemployed, so it

might not enter not into the value of formal benefits. The value of vested old-age pensions could be further discounted by non-contributory social assistance. The design of income-tested benefits like social assistance and family benefits also discourage formal jobs as formal income could easily lead to withdrawal of benefits.

In conclusion, formal mini-jobs and midi-jobs—that is, low-paying part-time jobs which earn less than minimum wage—do not seem economically viable in many NMS. This could lead many low-educated workers to either not work at all and be inactive, or work informally. Data analysis suggests that a substantial part of the informal labor force has indeed low educational attainment and might work exactly in these kinds of mini-jobs and midi-jobs.

4   Taxes and Benefits: a Sufficient Condition?

The previous section finds that there are considerable disincentives originating from tax and benefit systems for formal work for low-wage earners. As already discussed, it seems that improving these incentives and making work pay is a necessary condition to decrease informal employment. The question, though, is it also a sufficient condition? To what extent do incentives play a role in the decision to be informal? The paper cannot answer this question with certainty, but it can offer some additional insights from data and econometric analysis.

First, by looking at informality rates across income, it seems clear that indeed informality rates are considerably higher for low-income earners (see Figure 11). Yet, in order to determine more precise correlations between the incentives provided by the tax and benefit system and informality, a more detailed analysis is necessary. Therefore, the following subsection will present an econometric analysis on household level that investigates how incentives correlate with informality, controlling for individual characteristics like age, gender, education, geography, employment status of the spouse, citizenship, income, and sector.

4.1   Data

For the analysis, the European Survey for Income and Living Conditions (EU-SILC) 2008 is used. The survey covers a wide range of European countries and includes detailed questions on employment and income, including on 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 includes a question on the amount of social security contributions paid by the employer on behalf of the interviewee. This question allows identifying those who are dependent employees, but for whom no social security contributions are being paid as informal workers. In addition, unpaid family workers are identified as informal. Finally, non-professional self-employed and employers who employ five or fewer workers are also identified as informal.[7]

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

Figure 11: Low-income earners display higher informality rates
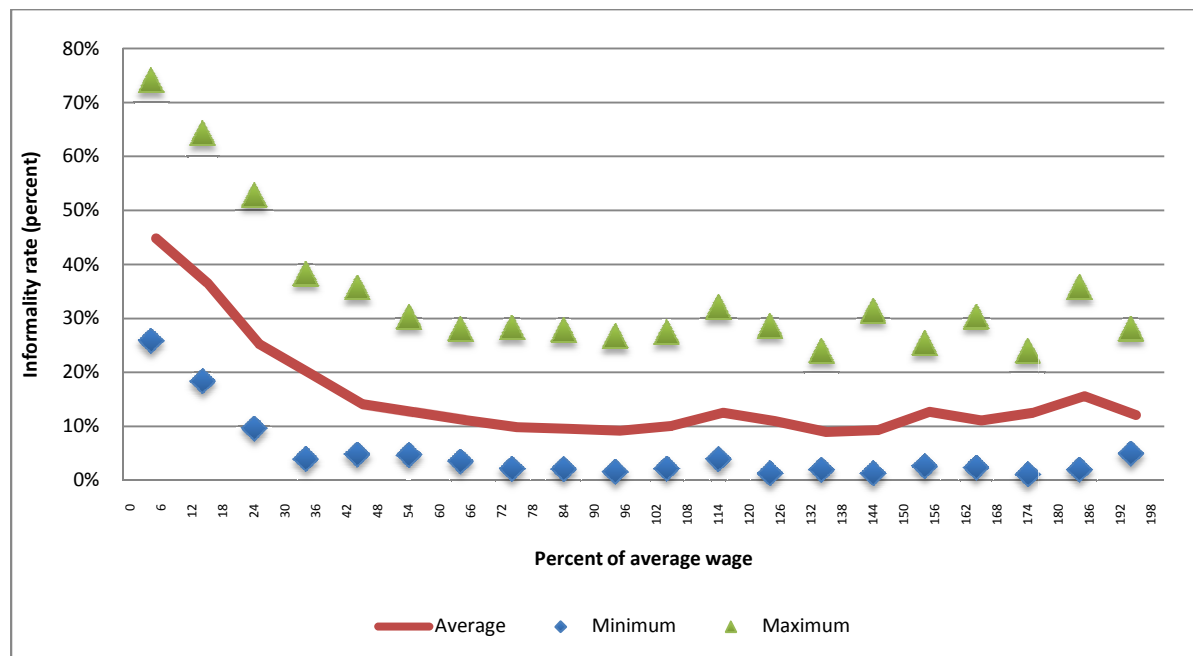
Note: Figure displays unweighted average, minimum, and maximum of informality rates for Bulgaria, Czech Republic, Estonia, Latvia, Poland, Slovakia, and Slovenia across income groups. Informality rate is defined as the number of informal wage earners (not paying social security contributions) and self-employed (with low education or with small firms) over all wage earners and self-employed, calculated for 20 income groups from 0 to 200 percent of average wage.
Source: Author's calculation based on EU-SILC (2008)

Applying this definition of informality, Figure A1 in the annex displays the informality rates by income level for two types of families (single persons and one-earner couples with two children) for a number of European countries. A more detailed profiling of the informally employed based on the same data and same definition of informality can be found in Montenegro (2011).

The econometric analysis is presented for seven countries: Bulgaria, the Czech Republic, Estonia, Latvia, Poland, Slovakia, and Spain. This yields a total sample size of 62,231 employed individuals that are identified as either formal or informal. The dichotomous formal/informal variable is the dependent variable for the analysis presented below.

The independent variables for the regression are age, gender, education, geography (rural/urban), 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). 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.[8]

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, it can also be negative (in the case of a loss from self-employment 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 this paper comes from the attempt to measure incentives and disincentives for formal work that are being provided by the tax and benefit system on an *individual* level. That is, the paper identifies the FTR and METR that have been discussed in the previous section 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 on an individual level.

To this end, the paper uses the OECD Tax and Benefit model (OECD 2011) for the year 2008 for the seven 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). Both FTR and METR depend on three variables: (i) individual income, expressed as percent of average wage; (ii) household type; 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, the paper assumes 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.[9]

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.[10] These 10 OECD household types are

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[8] NACE stands for "Nomenclature Generale des Activites Economiques dans l`Union Europeenne" and codes economic activity into various sectors and subsectors.

[9] 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.

[10] 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,

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 no 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. 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 mare than 133.5 percent of average wage. That is, the paper assumes that all individual with at a certain income level face the same FTR and METR if their spouse works in the formal sector and earns between 1 and 83.5 percent of average wage; and the same incentives if their spouse works in the formal sector and earns between 83.5 and 133.5 percent of average wage; and the same incentives if their spouse works in the formal sector and earns more than 133.5 percent of average wage.

Hence, for the econometric analysis the paper uses a sample of roughly 60,000 employed individuals from seven European countries. The dependent variable is a dichotomous variable that yields 1 for informally employed, and 0 for formally employed. The independent variables are a series of individual characteristics like age, gender, education, geography, citizenship, income, sector, and a synthetic measurement of the incentives or disincentives for formal work that the individual faces and that are originating from the country's tax and benefit system.

4.2   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

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

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

Instead of standard coefficients, marginal effects were calculated. These marginal effects provide the change in the probability of the outcome variable as a result of an infinitesimal change (like, for

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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;

example, a percentage point increase) of the independent metric or a discrete change of categorical variables. Marginal effects (also "margins of derivatives of responses") therefore describe changes in the outcome (response) for a change in one covariate that can be reported as a derivative, elasticity, or semi-elasticity. In calculating this marginal effect for one covariate, all other covariates are kept at specified values, usually the mean.

A correlation analysis helped to detect pairwise collinearity. Moreover, multi-collinearity of the explanatory variables was determined by variance inflation factors (VIFs; Fox and Monette, 1992). VIFs measure the effect of multi-collinearity on the variance of the regression coefficient of an explanatory variable. A higher but still acceptable degree of multi-collinearity is present in the dataset for a few variables only. These are in particular the variables income and age group. The influence of these variables and their collinearity on the overall probit model and the marginal effects is, however, negligible. The variables were therefore not removed since they have a high explanatory value. The pairwise collinearity for the other variables was not as severe.

The results of the regression are presented in Table 1 for the specification with country effects, and for each country in Table A 1 to Table A 7 in the annex. Controlling for individual characteristics, job characteristics (income and sector), and country effects, there is a significant correlation between FTR and 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 1.2 percent (0.3 percent). It's important, though, to point out that this effect varies considerably across countries (see annex). The correlation is not always significant, and the sign is not always positive. For Poland and Slovakia, the correlations of both FTR and METR with informality are significant and feature the expected positive relationship. For Latvia, the same is true, but the correlation for the FTR is not significant. For Bulgaria, the Czech Republic, and Spain, though, the correlation with FTR is negative and significant. For METR, on the overhand, the correlation is significant and positive for all countries except Spain (negative). This suggests important interactions between country effects—like the role and quality of institutions—and the impact of the FTR and METR.

As for the individual characteristics, the correlation with sex stands clearly out as significant and negative in all specifications. That is, women are clearly less likely to work informally. In terms of age, the specification with country effects suggest a non-linear relationship: the 15 to 24 age group is most likely to be informal, and the 40 to 54 the least likely. This relationship, though, is not significant in all countries. Similarly, the low and medium educated are more likely to be informal when compared to the highly educated, which is by and large also confirmed by the country regressions.[11]

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 is not only true in the specifications with country effects, but also in most country-specific regressions. This

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[11] In the Czech Republic and Slovakia, there are no low-educated individuals as defined above, and therefore the low education level is dropped in the regression.

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. Regarding inactive spouses or being single, the results are more ambiguous. In Bulgaria, the Czech Republic, and Spain, the correlation also seems to be positive and significant; in the other countries, though, it seems either negative or insignificant.

Other individual characteristics like geography (rural or urban) and citizenship did not yield any significant correlations.

Regarding job characteristics, agriculture consistently yields a significant and highly positive relationship with being informal. Other sectors with similar results are construction, and trade and repair.

Table 1: D-Probit regression results with informality dummy as the dependent variable with country effects

Left panel

Probit regression, reporting marginal effects

		Number of obs =	27967
		Wald chi2(37) =	3698
		Prob > chi2 =	0.0000
Log pseudolikelihood =	-13332.467	Pseudo R2 =	0.2473

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	0.012	0.001	13.510	0.000	42.566	0.010	0.014
COUNTRY							
Bulgaria*							
Czech Republic	-0.120	0.018	-6.020	0.000	0.098	-0.156	-0.085
Estonia	-0.139	0.017	-6.650	0.000	0.015	-0.173	-0.105
Spain	0.110	0.021	5.330	0.000	0.375	0.069	0.151
Latvia	-0.073	0.021	-3.150	0.002	0.023	-0.115	-0.031
Poland	0.239	0.020	12.230	0.000	0.377	0.200	0.277
Slovakia	-0.049	0.020	-2.360	0.018	0.055	-0.088	-0.010
AGE GROUP							
15-24*							
25-39	-0.351	0.015	-15.110	0.000	0.202	-0.381	-0.321
40-54	-0.431	0.019	-18.090	0.000	0.340	-0.467	-0.394
55-64	-0.376	0.014	-18.430	0.000	0.240	-0.404	-0.348
65+	-0.235	0.031	-4.040	0.000	0.007	-0.296	-0.175
SEX							
Male*							
Female	-0.090	0.010	-8.770	0.000	0.531	-0.110	-0.070
EDUCATION LEVEL							
High*							
Medium	0.103	0.013	7.710	0.000	0.689	0.078	0.128
Low	0.116	0.021	5.800	0.000	0.118	0.075	0.156
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.166	0.019	9.070	0.000	0.146	0.128	0.203
Inactive	-0.006	0.016	-0.380	0.705	0.168	-0.039	0.026
No spouse	-0.084	0.015	-5.600	0.000	0.377	-0.112	-0.055
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.051	0.014	3.650	0.000	0.190	0.023	0.079
Thinnly populated	0.038	0.011	3.480	0.001	0.425	0.017	0.059
CITIZENSHIP							
Local*							
Other EU country	-0.041	0.043	-0.920	0.356	0.015	-0.126	0.043
Others	-0.053	0.025	-2.060	0.039	0.041	-0.101	-0.005
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.187	0.020	-7.820	0.000	0.164	-0.227	-0.148
25 to 49 % of AW	0.070	0.017	4.060	0.000	0.430	0.036	0.104
50 to 99 % of AW	(dropped)						
100 to 199 % of AW	0.266	0.132	2.080	0.038	0.003	0.008	0.525
200 % of AW or more	0.164	0.153	1.130	0.257	0.001	-0.135	0.463
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.037	0.027	1.410	0.159	0.209	-0.015	0.090
Construction	0.180	0.032	5.860	0.000	0.090	0.117	0.243
Trade and repair	0.165	0.029	5.980	0.000	0.179	0.109	0.221
Transport and storage	0.153	0.036	4.460	0.000	0.046	0.082	0.224
Accomodation and food services	0.099	0.034	3.020	0.003	0.056	0.032	0.165
ICT	0.098	0.056	1.840	0.066	0.017	-0.012	0.207
Financial services	0.142	0.050	2.990	0.003	0.017	0.044	0.240
Professional services	0.050	0.032	1.600	0.109	0.069	-0.013	0.113
Public sector	0.342	0.037	9.180	0.000	0.041	0.270	0.414
Education	0.149	0.038	4.150	0.000	0.053	0.075	0.223
Agriculture	0.417	0.029	13.710	0.000	0.103	0.361	0.473
Others	0.474	0.028	14.590	0.000	0.066	0.419	0.530
*Baseline category							

Right panel

Probit regression, reporting marginal effects

		Number of obs =	27967
		Wald chi2(37) =	3999
		Prob > chi2 =	0.0000
Log pseudolikelihood =	-13277.185	Pseudo R2 =	0.2504

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	0.003	0.000	13.760	0.000	36.581	0.003	0.004
COUNTRY							
Bulgaria*							
Czech Republic	-0.061	0.018	-3.150	0.002	0.098	-0.097	-0.025
Estonia	-0.130	0.017	-6.370	0.000	0.015	-0.164	-0.096
Spain	0.100	0.021	4.860	0.000	0.375	0.059	0.141
Latvia	-0.072	0.021	-3.170	0.002	0.023	-0.114	-0.031
Poland	0.215	0.019	11.320	0.000	0.377	0.177	0.253
Slovak Republic	-0.086	0.018	-4.420	0.000	0.055	-0.121	-0.051
AGE GROUP							
15-24*							
25-39	-0.363	0.015	-15.580	0.000	0.202	-0.392	-0.333
40-54	-0.429	0.019	-17.770	0.000	0.340	-0.466	-0.391
55-64	-0.371	0.015	-17.790	0.000	0.240	-0.400	-0.342
65+	-0.228	0.036	-3.690	0.000	0.007	-0.298	-0.158
SEX							
Male*							
Female	-0.095	0.010	-9.110	0.000	0.531	-0.115	-0.074
EDUCATION LEVEL							
High*							
Medium	0.106	0.013	7.840	0.000	0.689	0.081	0.131
Low	0.113	0.021	5.660	0.000	0.118	0.073	0.154
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.234	0.017	14.100	0.000	0.146	0.200	0.268
Inactive	0.068	0.015	4.550	0.000	0.168	0.038	0.098
No spouse	0.009	0.012	0.750	0.453	0.377	-0.015	0.033
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.046	0.014	3.290	0.001	0.190	0.018	0.074
Thinnly populated	0.037	0.011	3.360	0.001	0.425	0.015	0.059
CITIZENSHIP							
Local*							
Other EU country	-0.040	0.043	-0.890	0.372	0.015	-0.124	0.044
Others	-0.050	0.025	-1.920	0.055	0.041	-0.099	-0.001
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.232	0.018	-10.080	0.000	0.164	-0.268	-0.196
25 to 49 % of AW	0.066	0.018	3.760	0.000	0.430	0.031	0.100
50 to 99 % of AW	(dropped)						
100 to 200 % of AW	0.246	0.131	1.940	0.053	0.003	-0.011	0.503
200 % of AW or more	0.135	0.151	0.940	0.347	0.001	-0.161	0.432
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.034	0.026	1.330	0.183	0.209	-0.017	0.086
Construction	0.180	0.031	5.990	0.000	0.090	0.119	0.242
Trade and repair	0.163	0.028	6.020	0.000	0.179	0.108	0.218
Transport and storage	0.158	0.036	4.640	0.000	0.046	0.088	0.228
Accomodation and food services	0.097	0.033	3.060	0.002	0.056	0.032	0.162
ICT	0.101	0.057	1.840	0.066	0.017	-0.012	0.213
Financial services	0.141	0.050	3.000	0.003	0.017	0.044	0.238
Professional services	0.047	0.031	1.550	0.122	0.069	-0.014	0.109
Public sector	0.352	0.036	9.430	0.000	0.041	0.281	0.423
Education	0.157	0.037	4.400	0.000	0.053	0.084	0.231
Agriculture	0.423	0.028	14.190	0.000	0.103	0.368	0.477
Others	0.478	0.027	14.920	0.000	0.066	0.424	0.531
*Baseline category							

Note: Regressions based on individual data from EU-SILC 2008 with matched data for individual FTR and METR from OECD Tax and Benefit model. 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 1.2 percent; living in the Czech Republic decreases probability of being informal by 12 percent when compared to living in Bulgaria; being female decreases probability by 9 percent; having low education increases probability by 11.6 percent when compared to someone with high education; and so on.

5 Policies to Make Formal Work Pay

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. With regard to lowering the tax wedge, Hungary seems to apply a minimum social security contribution at the very low wage levels (less than 20 percent of average wage). Among the EU-15 countries, only the Netherlands seems to have a similar floor, and also Serbia applies such a floor. Such a contribution floor increases the tax burden considerably for those in low-paying part-time jobs. In almost all EU and OECD countries— and also in other countries in the region, like Bosnia and Herzegovina and Macedonia—no such floor exists, at least not above the minimum wage. For part-time work at the minimum wage, the floor is usually adjusted by the actual hours worked, so that the tax wedge is not acting regressively at the lower wage end.

Other options would be to introduce policies linked to wage subsidies, social security contribution credits, or so-called in-work or employment-conditional benefits (cash benefits or refundable income tax credits conditional on formal) for low-wage earners. On the former policies—wage and social security subsidies—Germany has introduced a phased social security contribution schedule as part of the Hartz IV reforms in the early 2000s. Monthly wages of less than EUR 400 are not subject to social security contributions. For monthly incomes between EUR 401 and 800, the contribution rates rise gradually to the full share. The drawback of such reforms is that they can have a certain amount of stigmatization for workers who benefit. Also, they are fiscally expensive.

Another option is to channel credits or subsidies to workers via the personal income tax as tax credits. In the United States, for example, there are various refundable ("non-wastable") tax credits ("earned income credit" and "making work pay" credit) available to low-wage earners and their families. For example, for a taxpayer with one child, 34 percent of earned income of up to USD 9,000 is refundable, which amounts to the equivalent of a "cash" benefit of about USD 3,000. This refundable credit is phased out for an income of above USD 16,000. Similar benefits are available for other family types and single persons at the low wage end.

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. In other words, beneficiaries of social assistance, housing, and family benefits should gain from additional formal work—that is, any additional formal wage should also increase their net income, *including* benefits. If this is not the case, additional formal work does not pay, and beneficiaries will prefer to not work at all, or only informally, or underreport earnings. Arguably, the role of social assistance in providing disincentives for formal work for a large number of people might be limited in most NMS. Programs are usually tightly targeted to a small group of beneficiaries, so coverage—even among the poorest—is small. In addition, benefits are not overly generous. Categorical benefits like family benefits, though, seem to play a much more important role in the NMS and Croatia.

In order to reform benefits along these lines, withdrawal of benefit has to phase in as income increases, so no sudden drops in net income occur. Eligibility criteria that restrict, for example, family benefits to those below a certain income threshold—often times around 50 percent of average wage—result in very high METRs and a considerable drop in net income once the income threshold is crossed. The German Hartz IV reforms offer again a good example on how this can be avoided and how phased benefit withdrawal can be achieved (see also discussion above on social security subsidies).

Entitlements to free health insurance—if they exist—should be limited to the poor, and the entitlement be based on a means test, not an income test. It is important that the poor have access to free health insurance as sickness is a serious economic risk that can further deepen poverty. Yet, if free health insurance is easily accessible also by those who can afford to contribute to health insurance, it decreases the value of formal work and increases incentives to work informally. It is therefore important to base the decision on who should have access to free health insurance on the means that a household has at its disposal, and not formal income or formal employment status (like registered unemployment, as is the case in some Balkan countries). This requires robust means-testing mechanisms as opposed to income testing. This can either be done by proxy-means testing—like, for example, looking at electricity consumption—or by frequent contacts between a social worker and the applicant.

Finally, it should be pointed out that most of the reforms discussed above have fiscal costs. Given the current 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 wake subsidies, tax credits, and so on—can considerably reduce tax revenues, including social security contributions, or increase public expenditures. In this regard, though, the NMS are in the 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.

In the long run, many other positive effects of increased formalization (fiscal, social contract, social cohesion, participation in society, and so on). Crucial role of tax morale; requires good institution, good governance, and accountability.

6   References

Fox, J. and Monette, G. (1992). "Generalized collinearity diagnostics." *Journal of the American Statistical Association, Vol. 87, No. 417.* pp. 178-183

Hazans, M. (2011). "Informal Workers across Europe: Evidence from 30 European Countries". Prepared for World Bank. Mimeo.

Koettl, J. (2009). "The Role of Income Taxes and Social Protection in Providing Incentives for Informality. A First Glance at the Czech Republic, Hungary, Poland, and Slovakia. Prepared for World Bank. Mimeo.

Montenegro, C. (2011).

Organisation for Economic Development and Co-operation (OECD, 2011). <u>Tax/benefit policies: Detailed descriptions and reforms since 2001</u>. Online database. Available at http://www.oecd.org/document/29/0,3746,en_2649_34637_39618653_1_1_1_1,00.html. Last accessed June 6, 2011.

7   Annex

Bulgaria: Single with no children

Bulgaria: One-earner couple with two children

Czech Republic: Single with no children

Czech Republic: One-earner couple with two children

Estonia: Single with no children
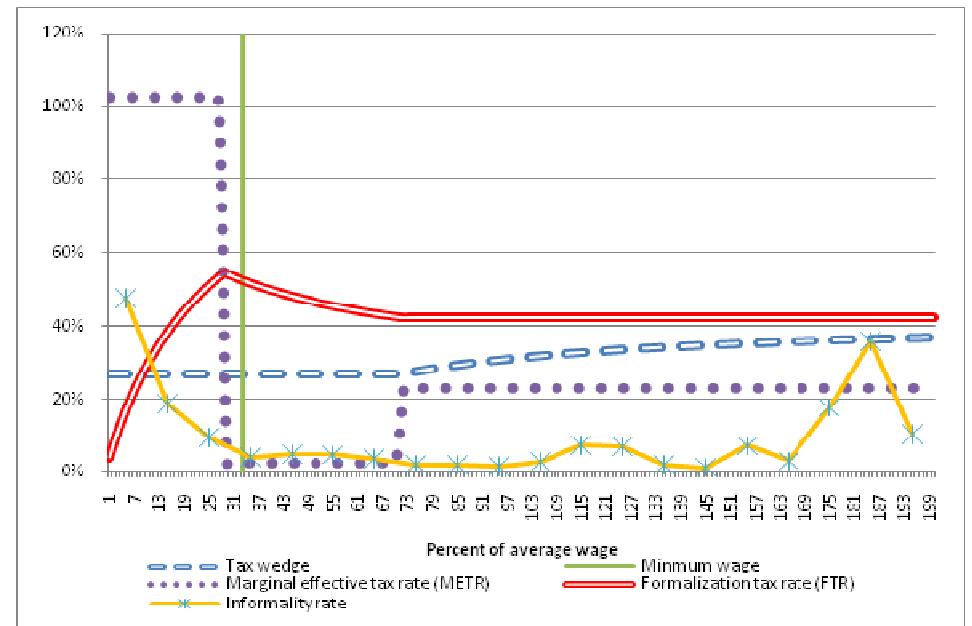
Estonia: One-earner couple with two children

Greece: Single with no children

Greece: One-earner couple with two children

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Latvia: Single with no children

Latvia: One-earner couple with two children

Netherlands: Single with no children
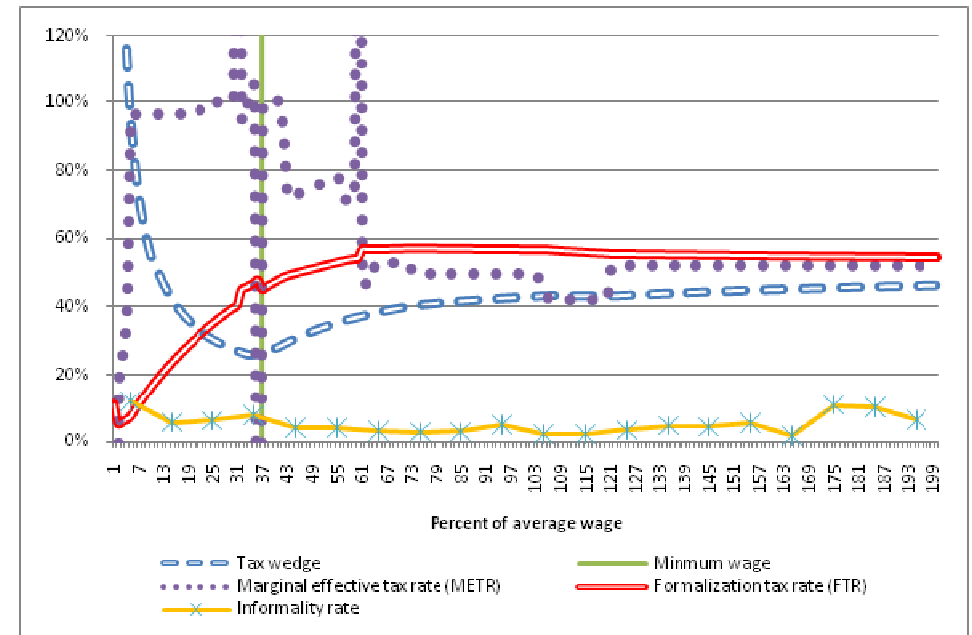
Netherlands: One-earner couple with two children

28
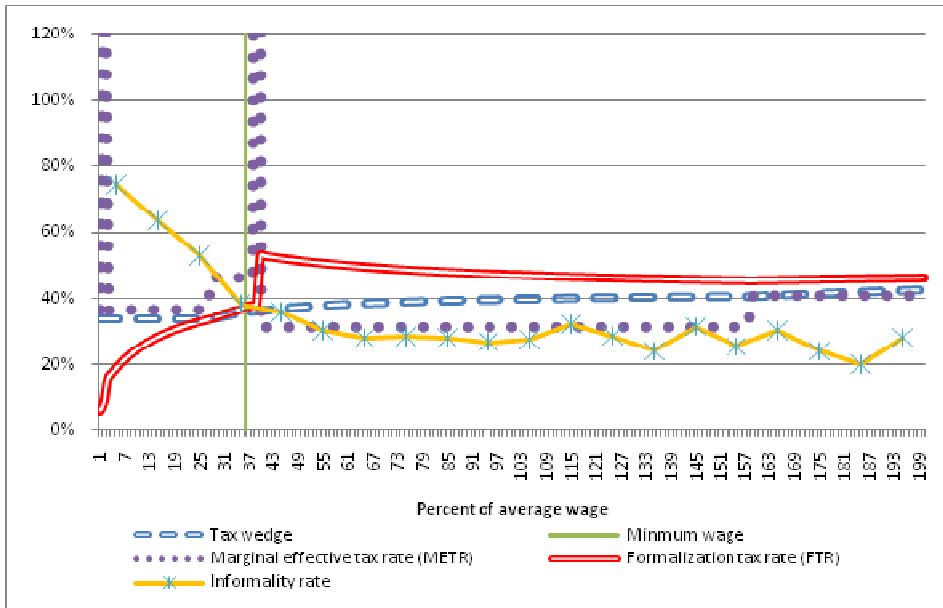
Poland: Single with no children
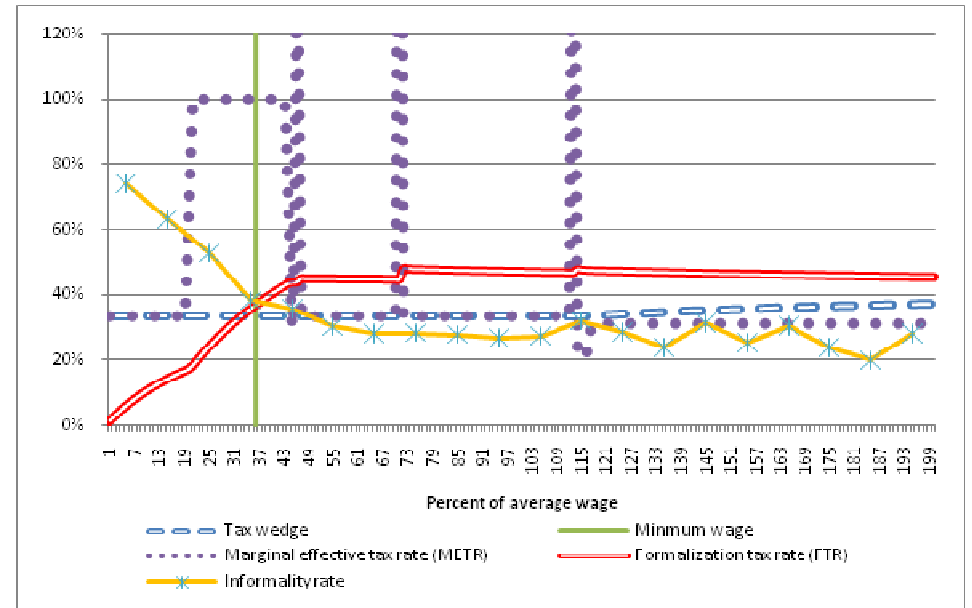
Poland: One-earner couple with two children
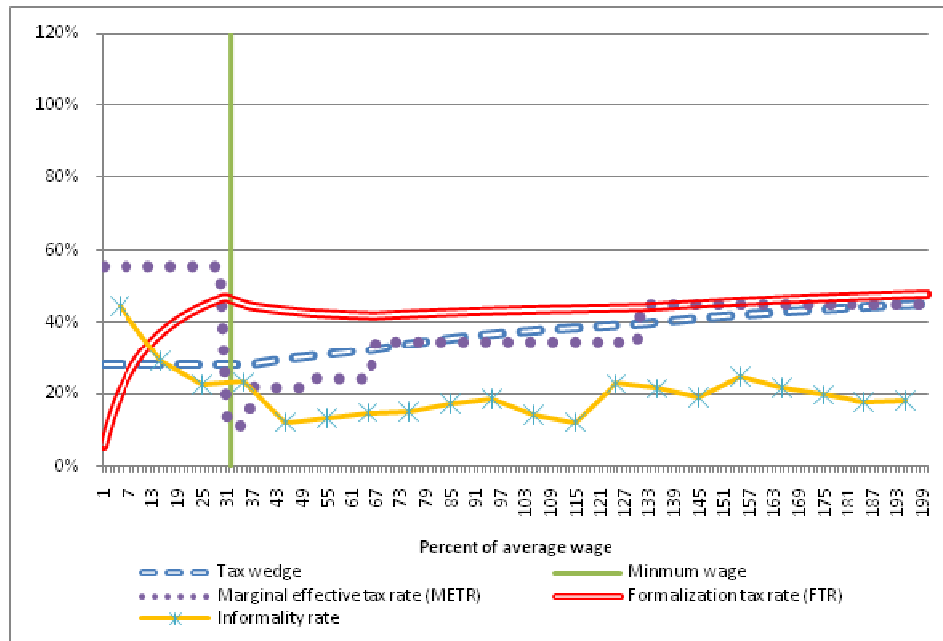
Portugal: Single with no children
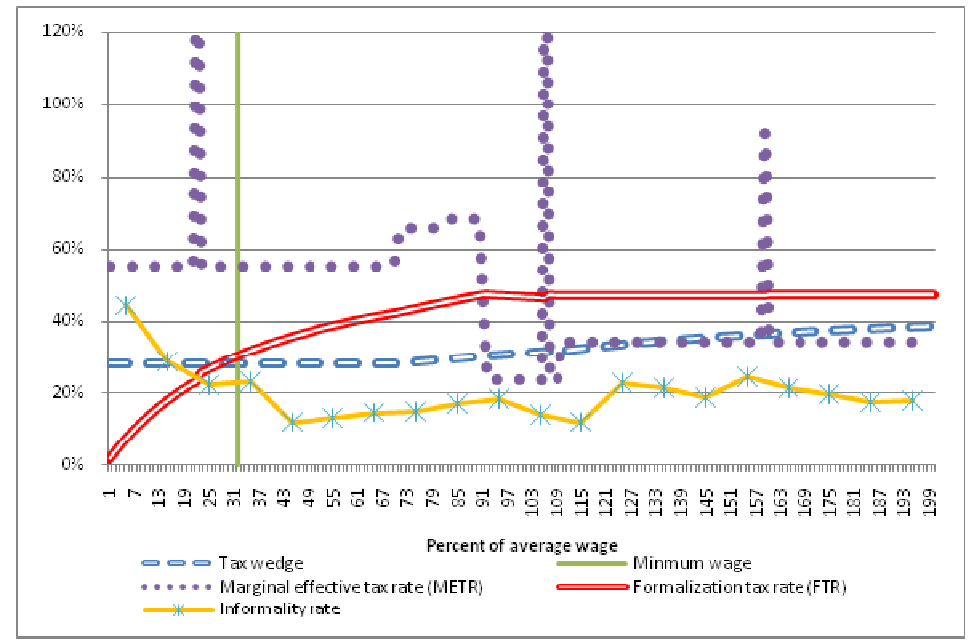
Portugal: One-earner couple with two children

29
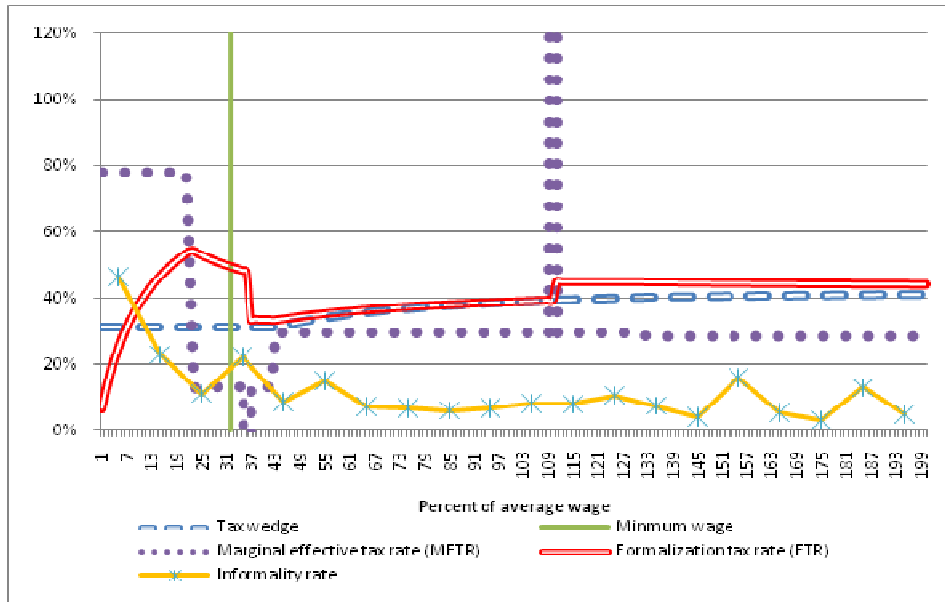
Slovakia: Single with no children
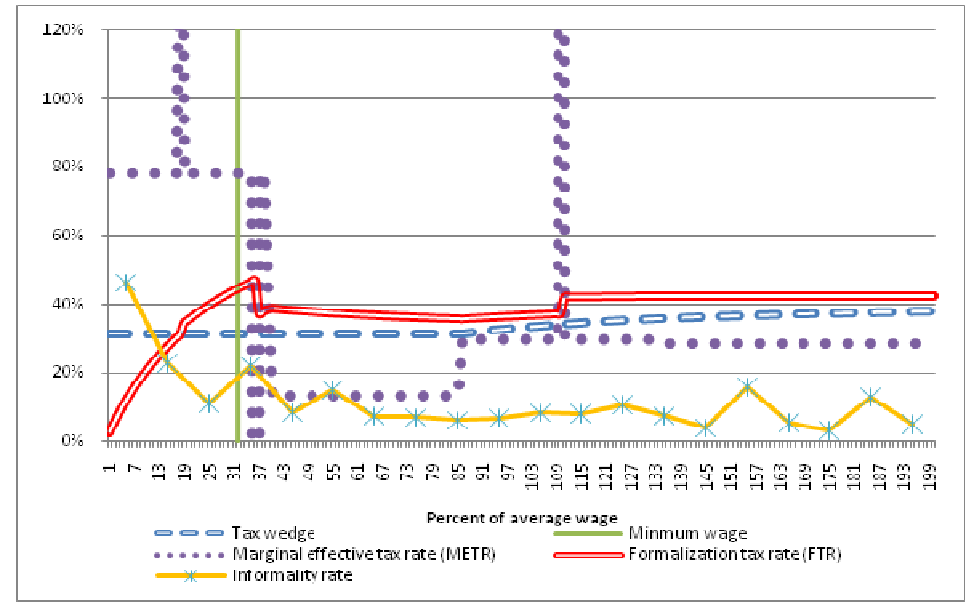
Slovakia: One-earner couple with two children
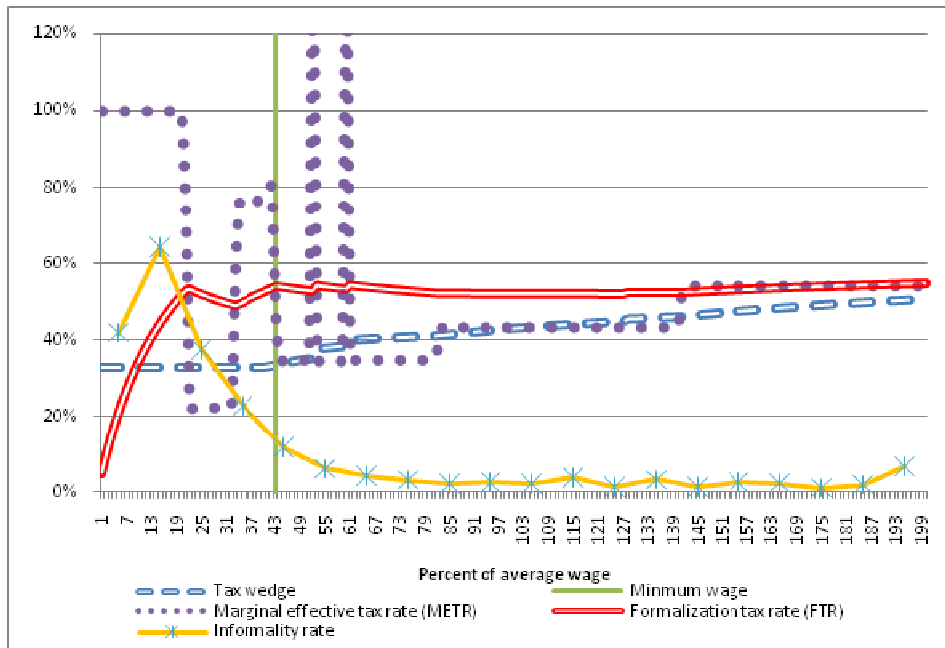
Slovenia: Single with no children
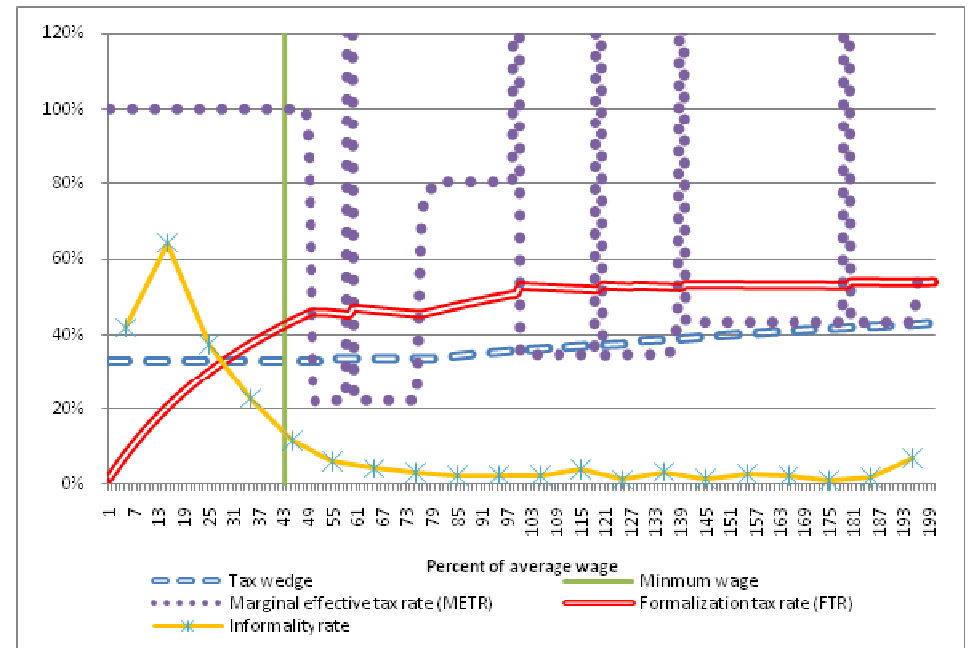
Slovenia: One-earner couple with two children

30
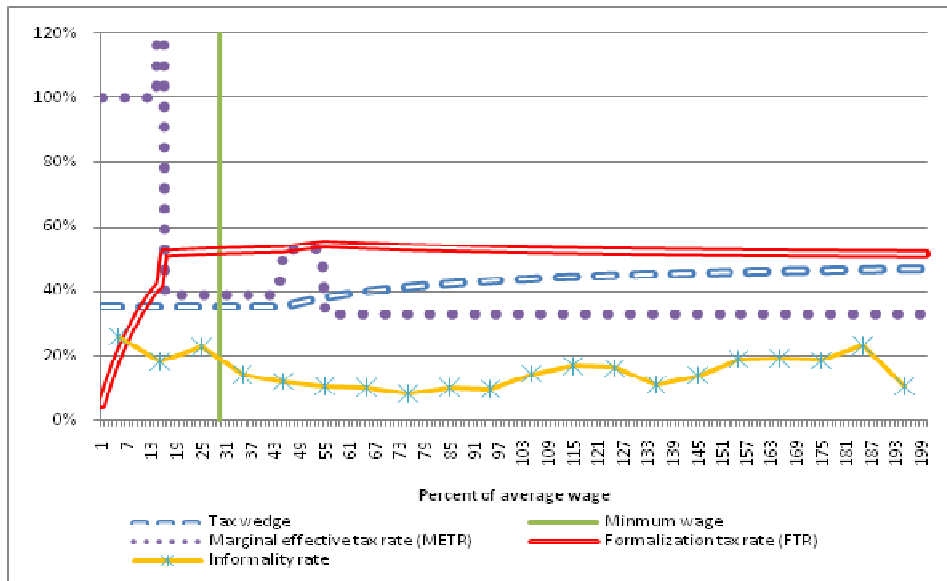
Spain: Single with no children

Spain: One-earner couple with two children

Figure A 2: Tax wedge, minimum wage, marginal effective tax rate (METR), and formalization tax rate (FTR) in other select countries (by family type)

Australia: Single with no children

Australia: One-earner couple with two children

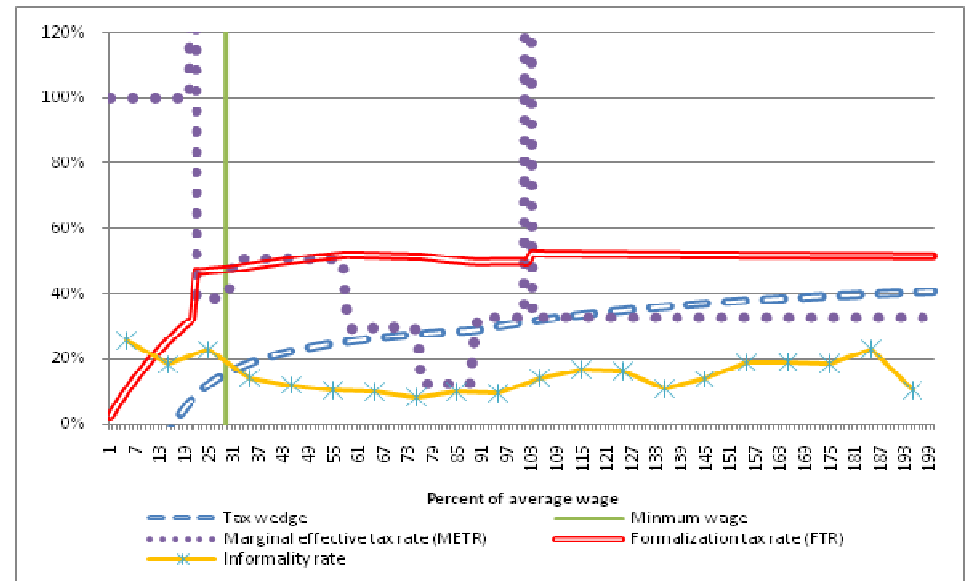Austria: Single with no children

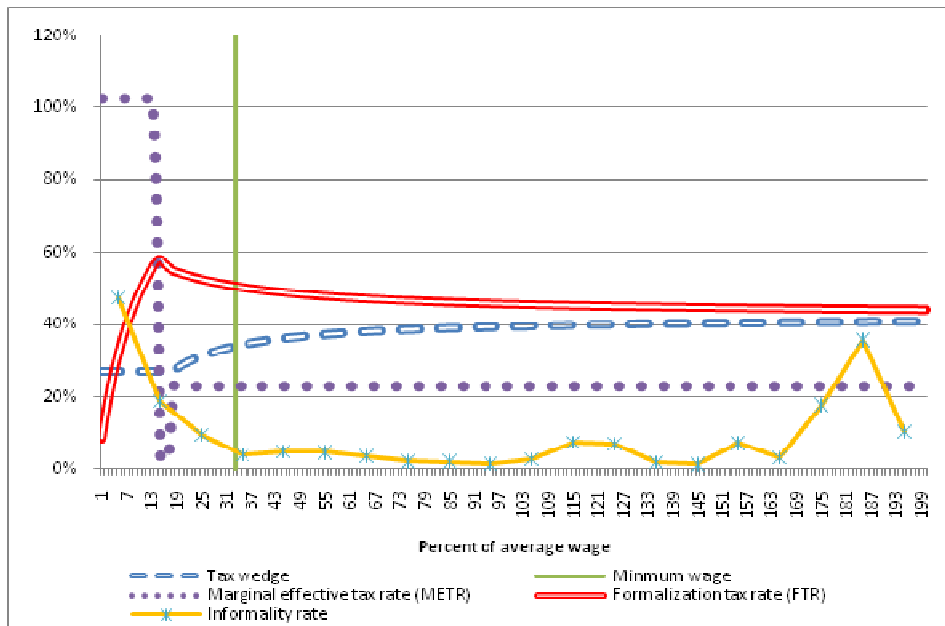Austria: One-earner couple with two children

Belgium: Single with no children
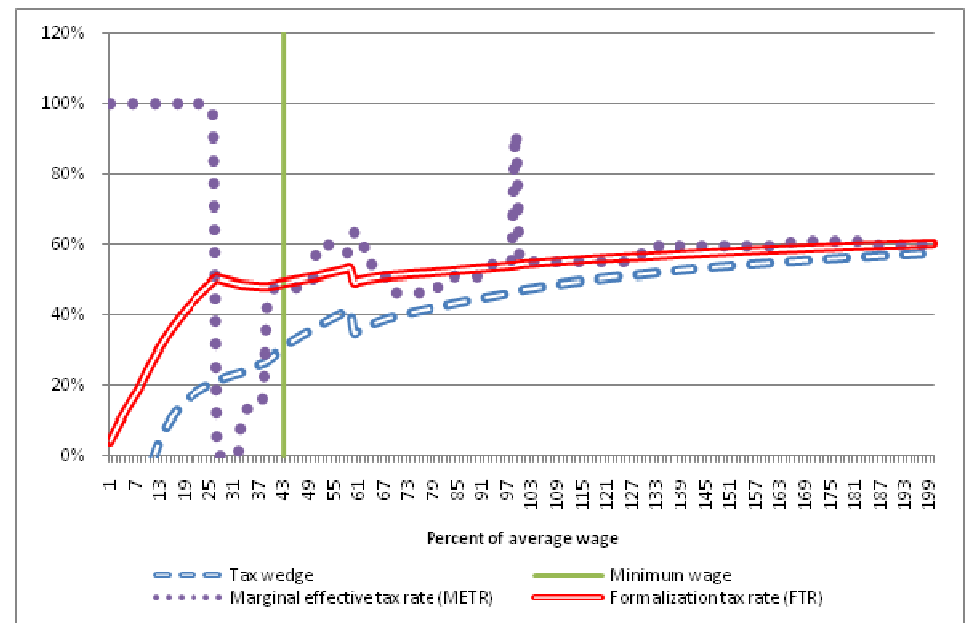
Belgium: One-earner couple with two children

Canada: Single with no children

Canada: One-earner couple with two children

33
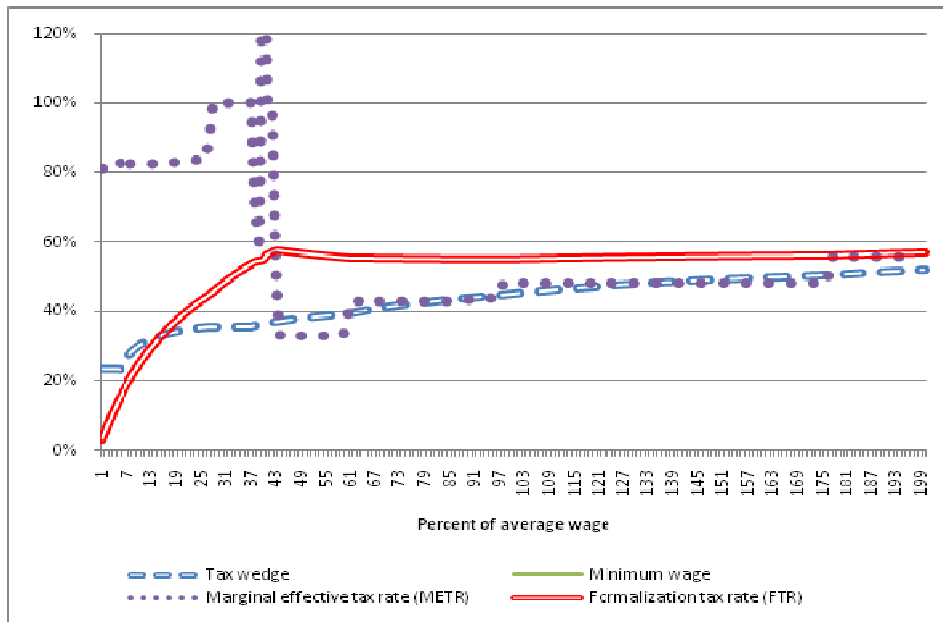
Finland: Single with no children

Finland: One-earner couple with two children

France: Single with no children

France: One-earner couple with two children

34

Germany: Single with no children

Germany: One-earner couple with two children

Hungary: Single with no children

Hungary: One-earner couple with two children
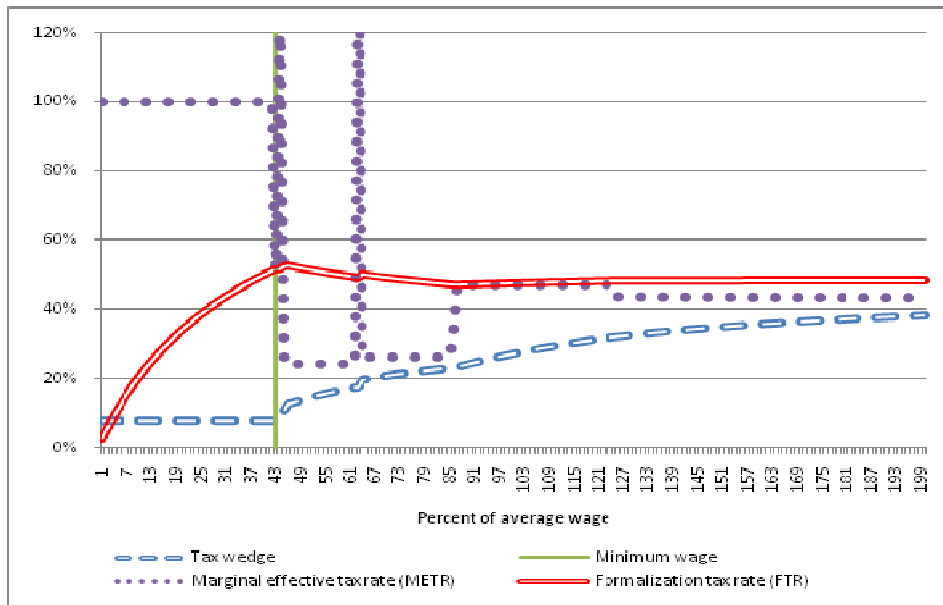
Ireland: Single with no children

Ireland: One-earner couple with two children
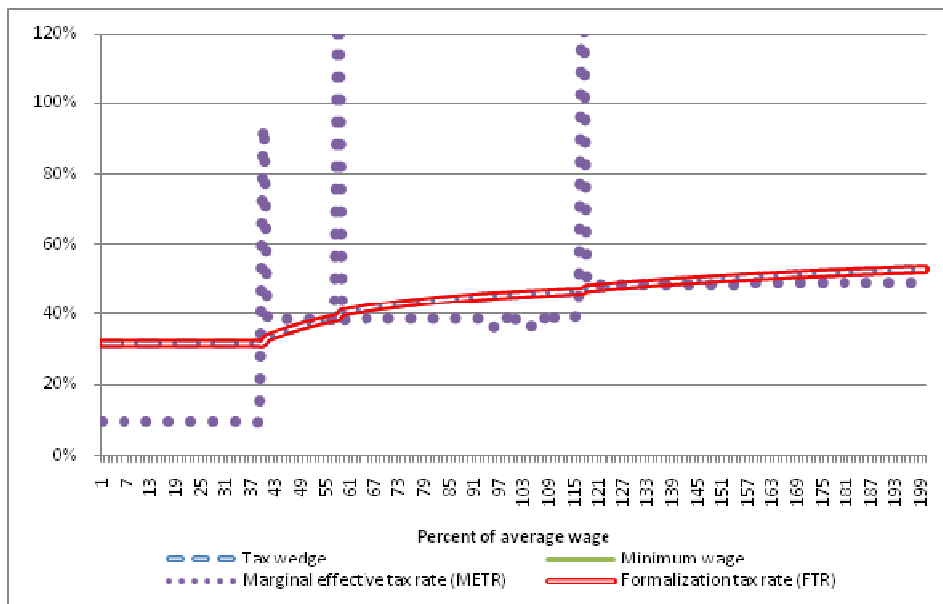
Italy: Single with no children

Italy: One-earner couple with two children

36

Japan: Single with no children

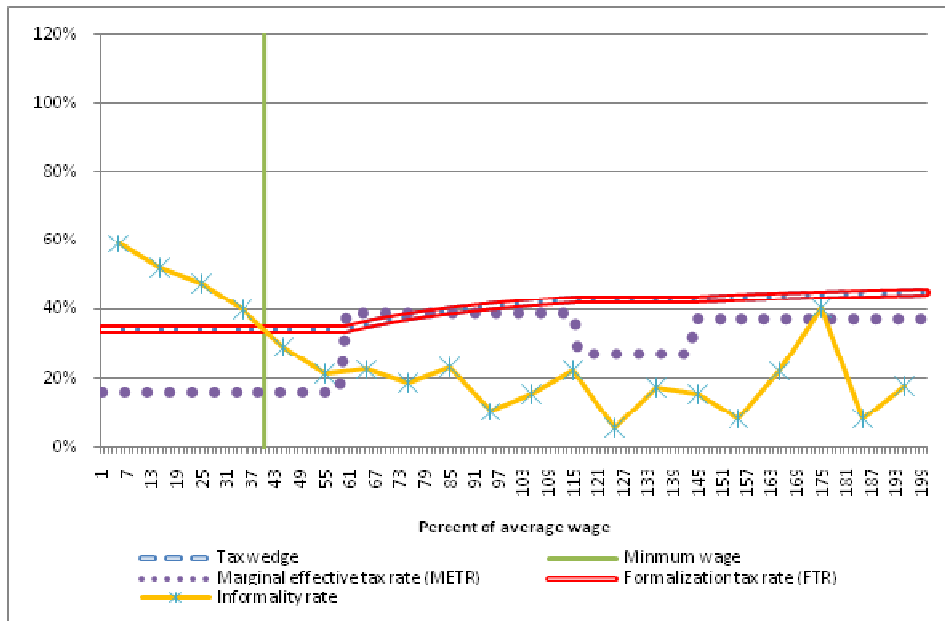Japan: One-earner couple with two children

Lithuania: Single with no children
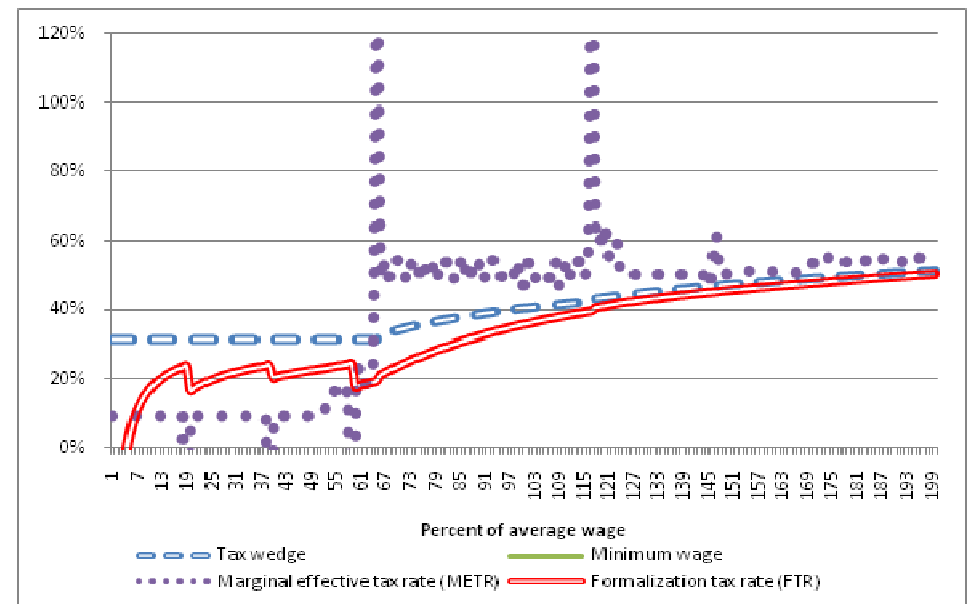
Lithuania: One-earner couple with two children
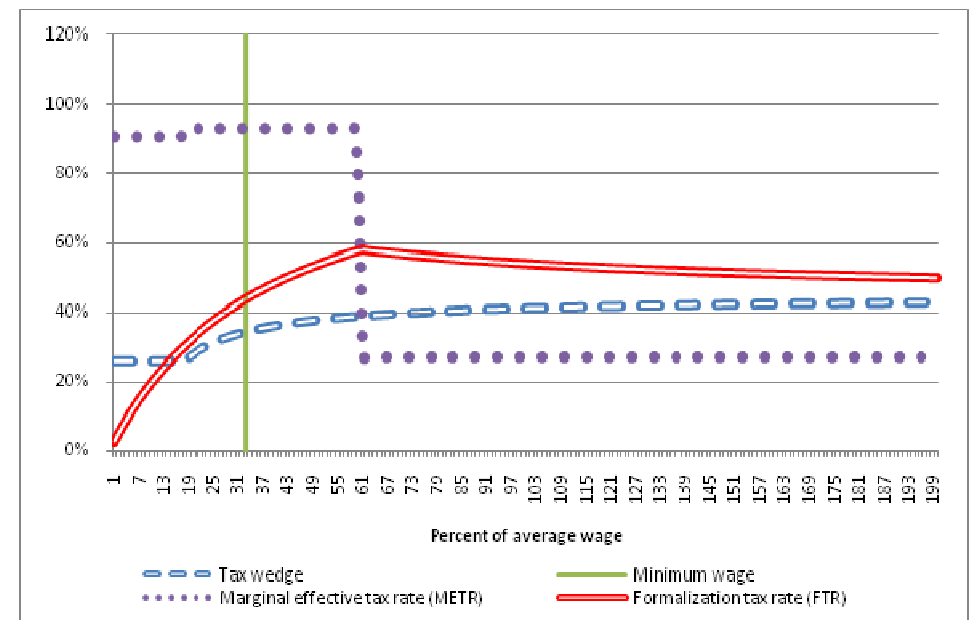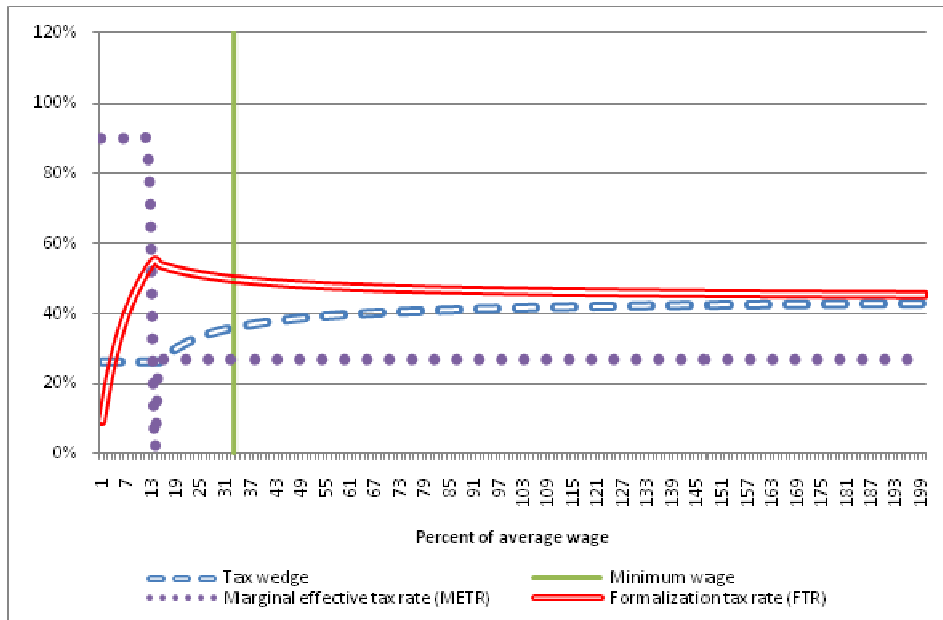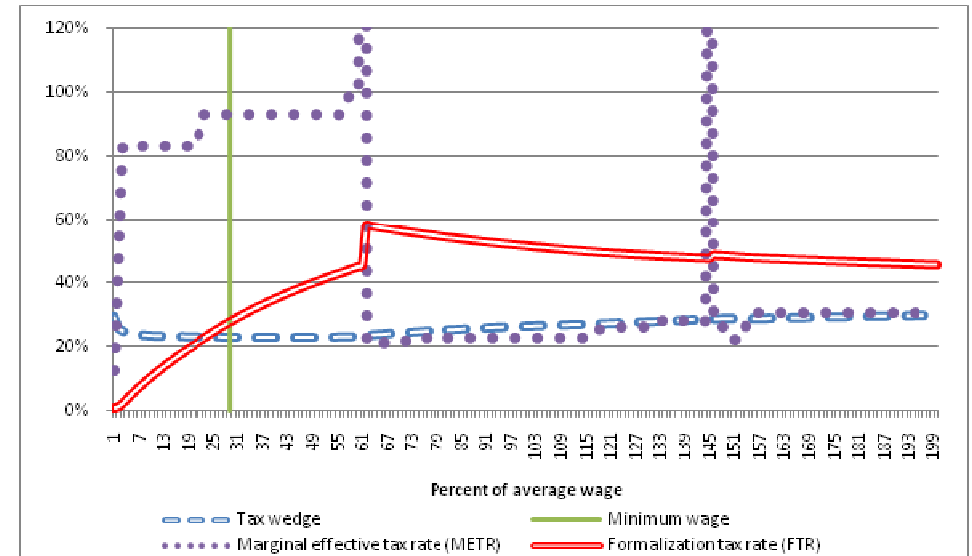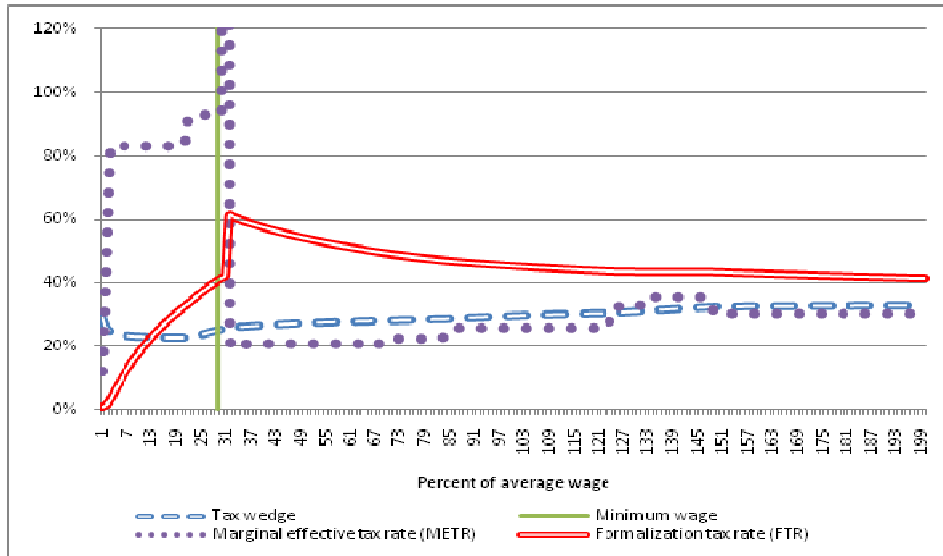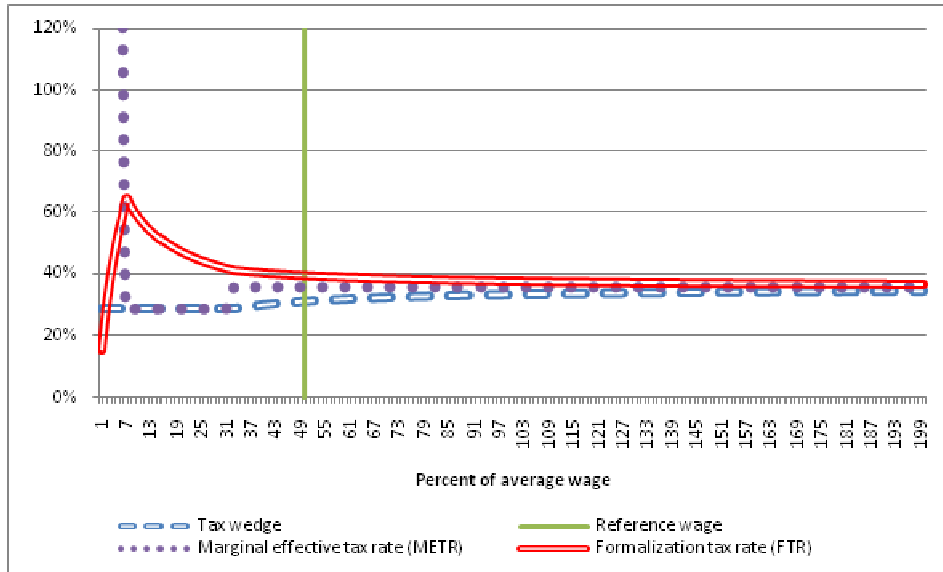
FYR Macedonia: Single with no children
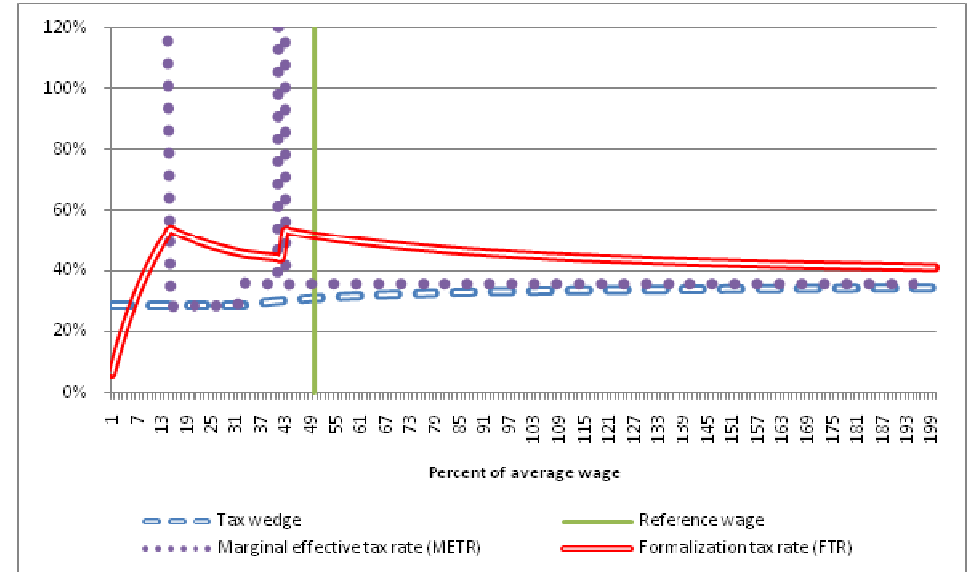
FYR Macedonia: One-earner couple with two children
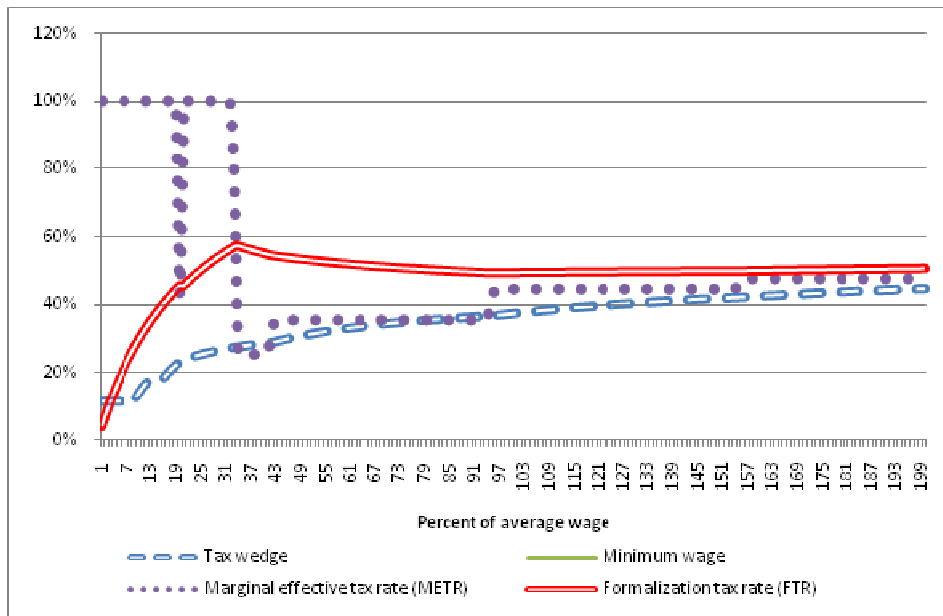
Norway: Single with no children
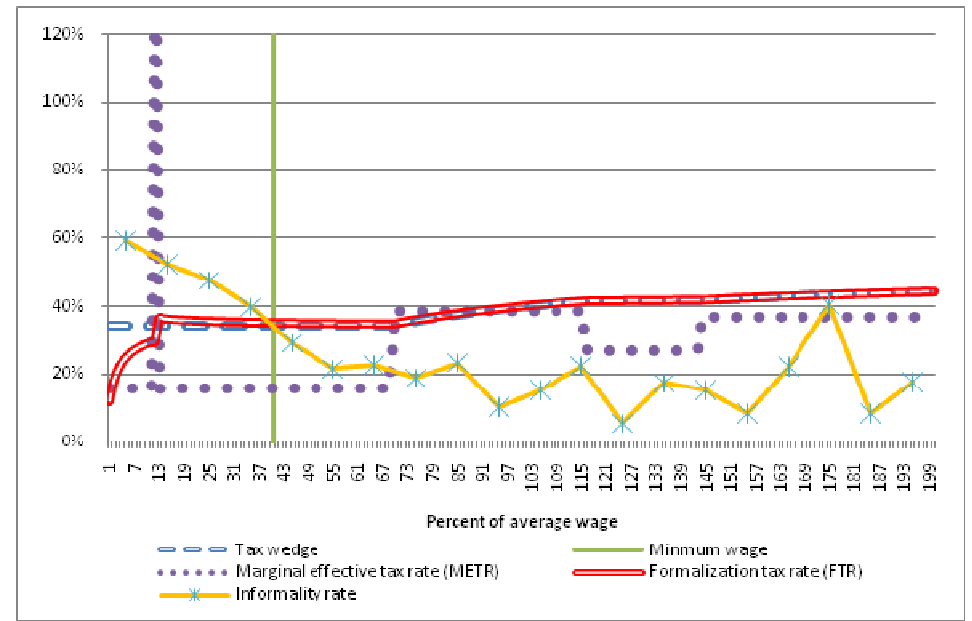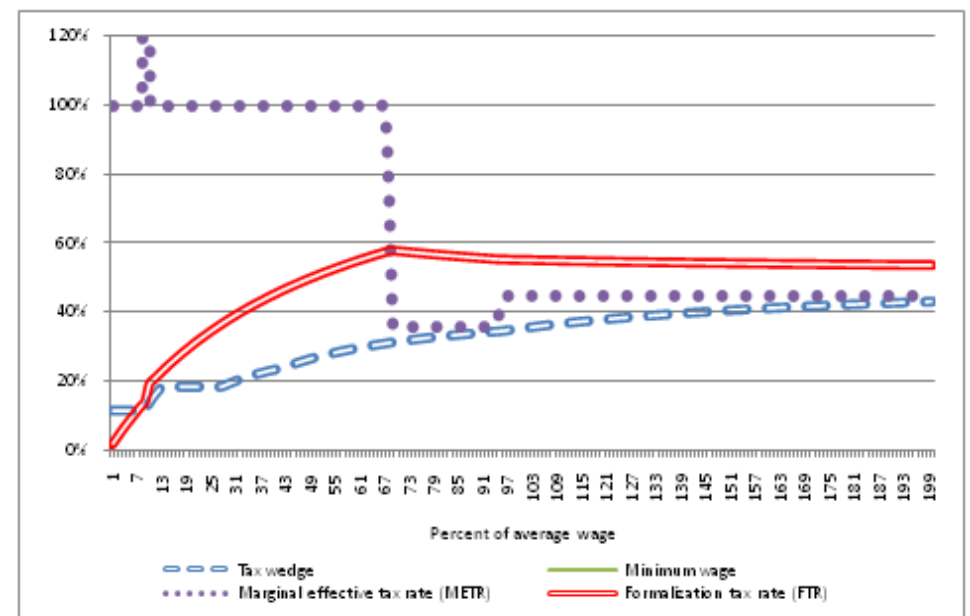

Norway: One-earner couple with two children
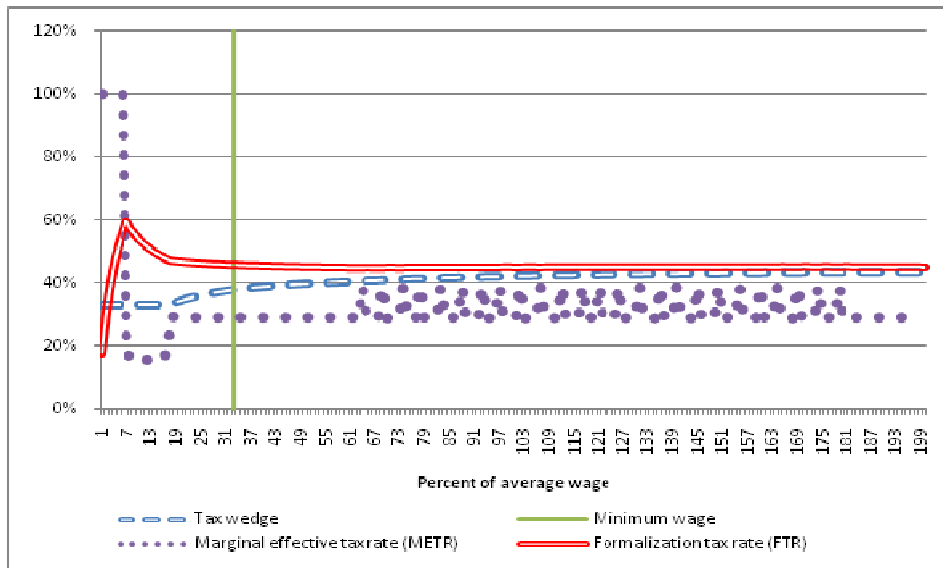
Romania: Single with no children
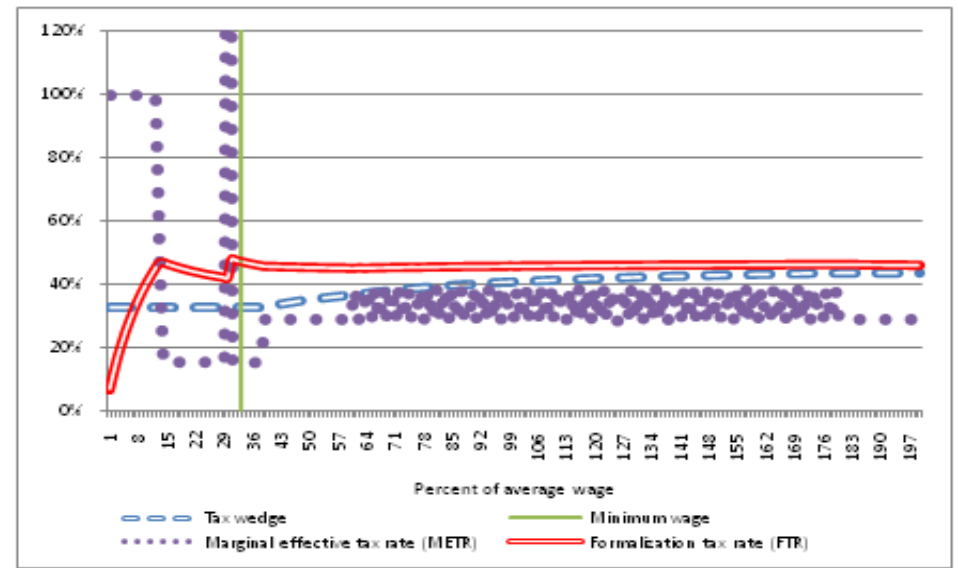
Romania: One-earner couple with two children
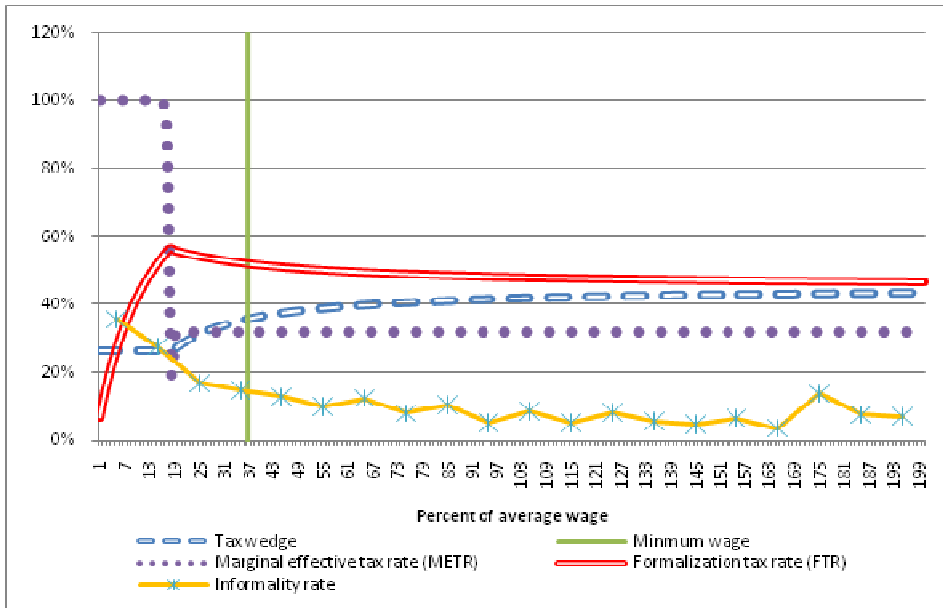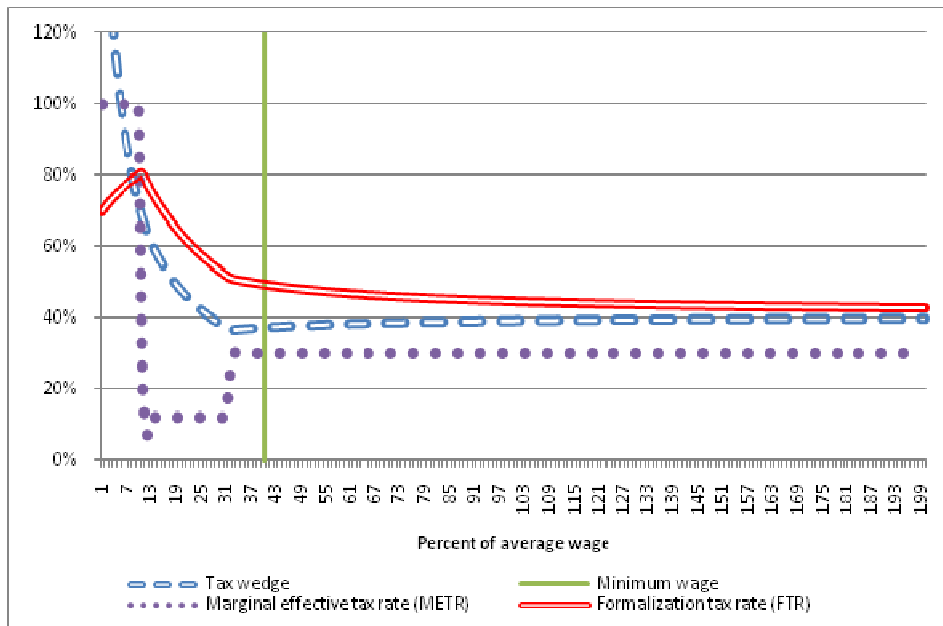

Serbia: Single with no children
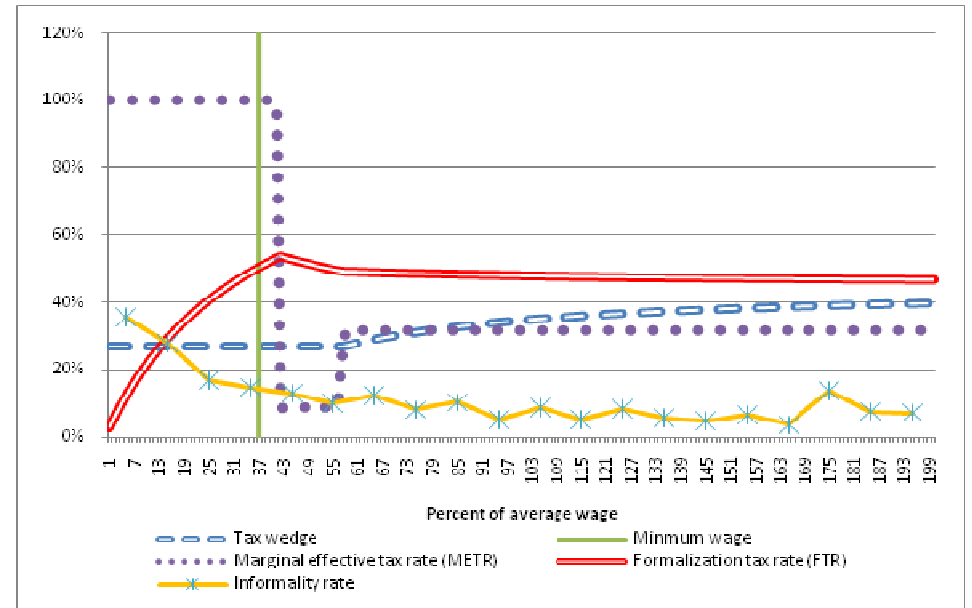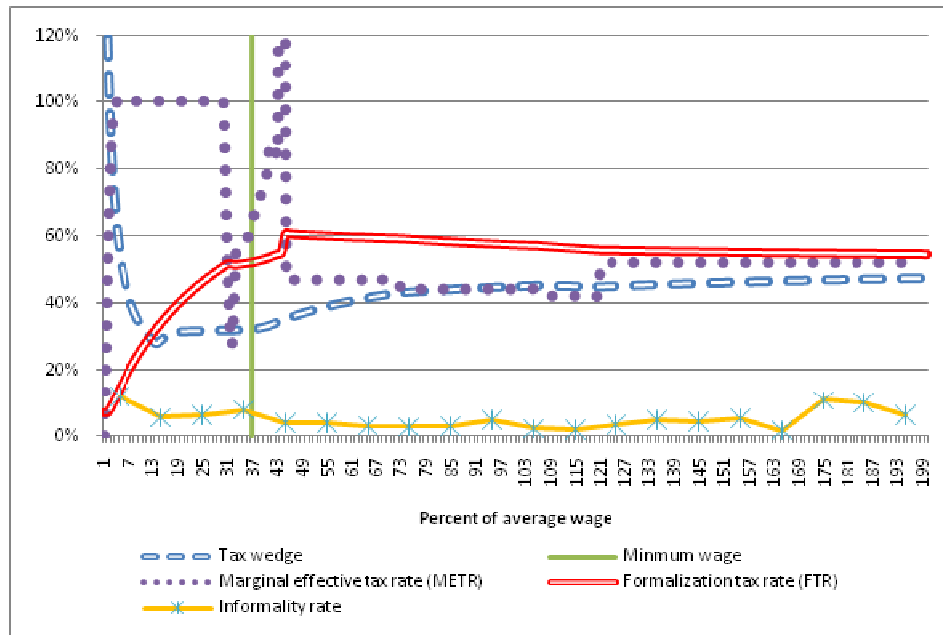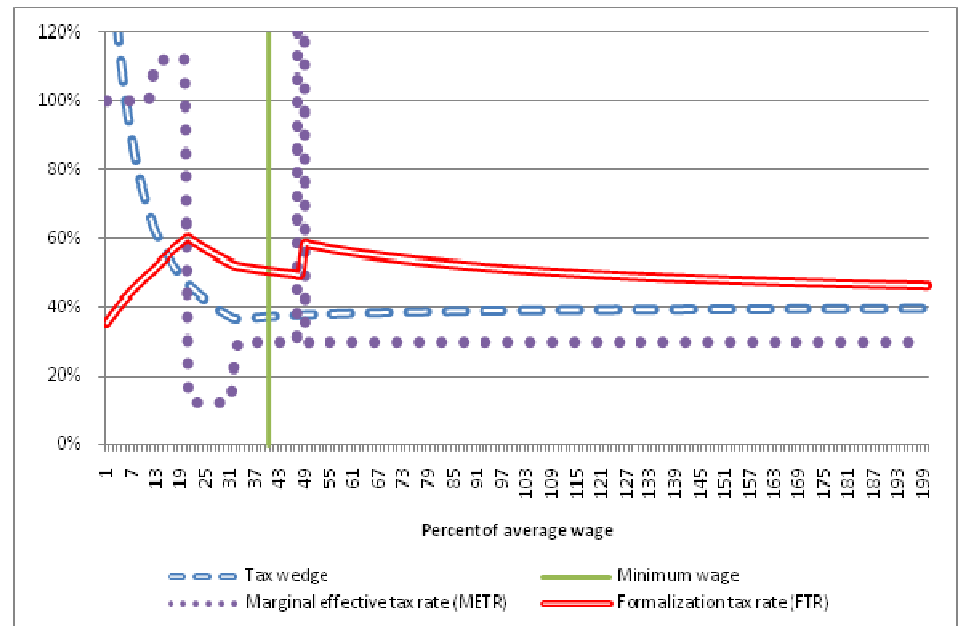

Serbia: One-earner couple with two children
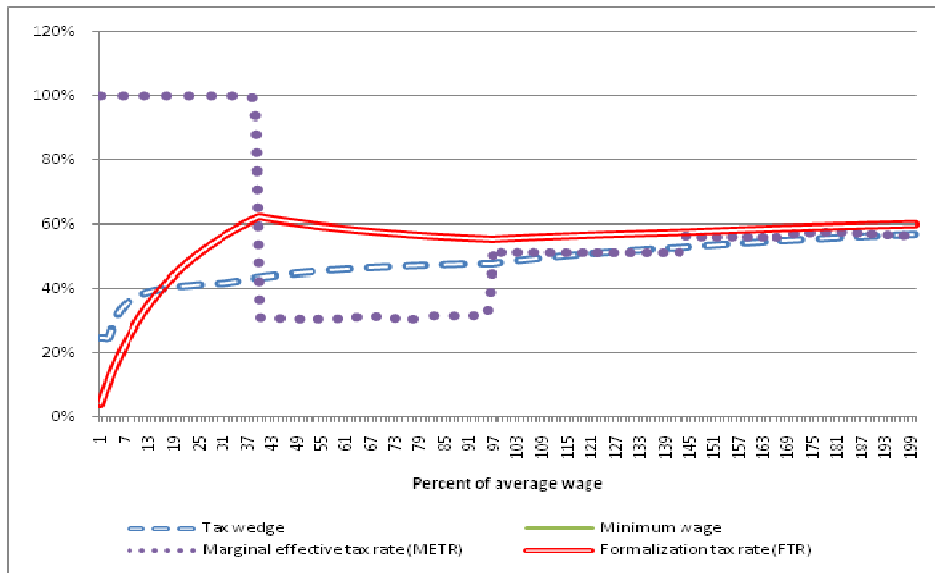
Sweden: Single with no children
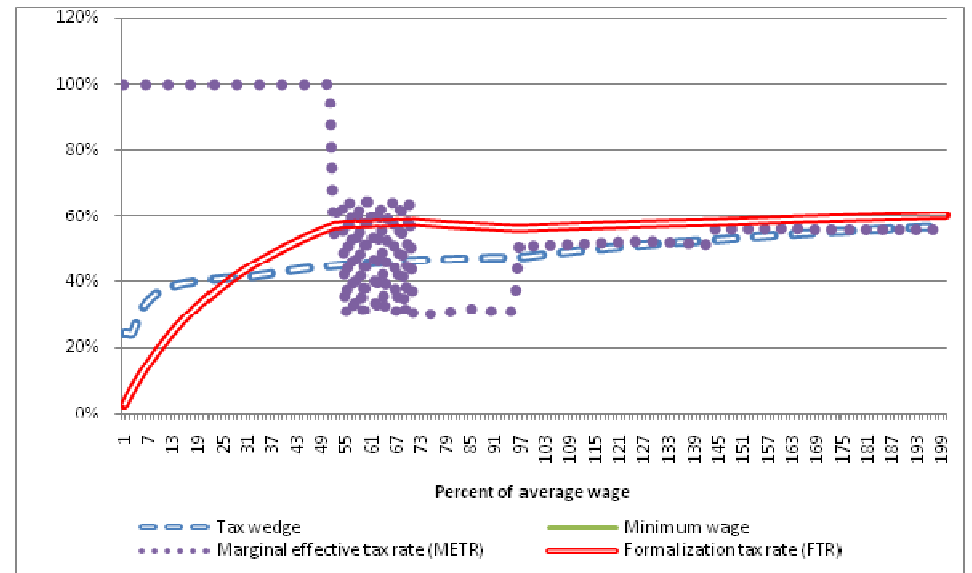
Sweden: One-earner couple with two children
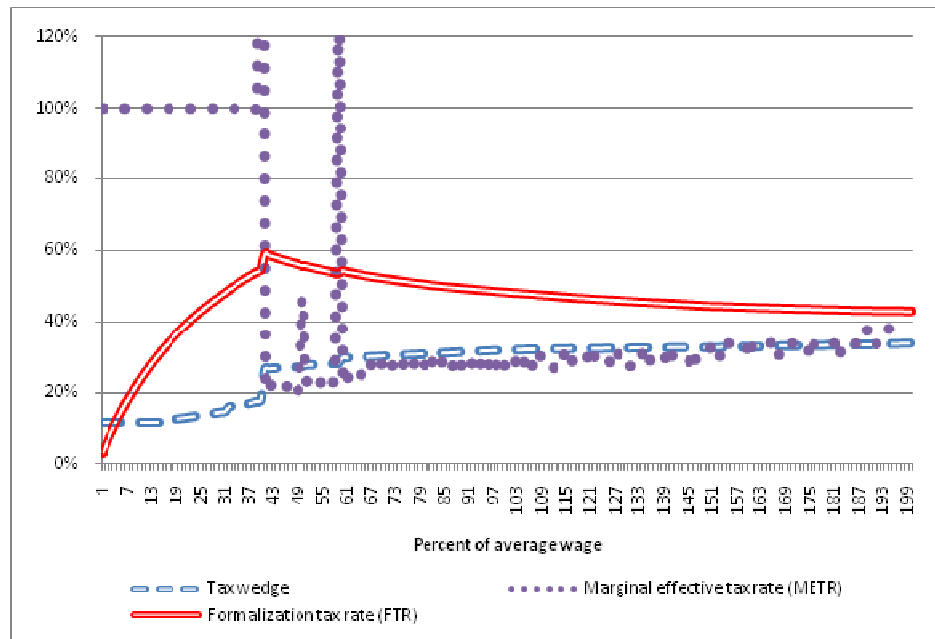
Switzerland: Single with no children
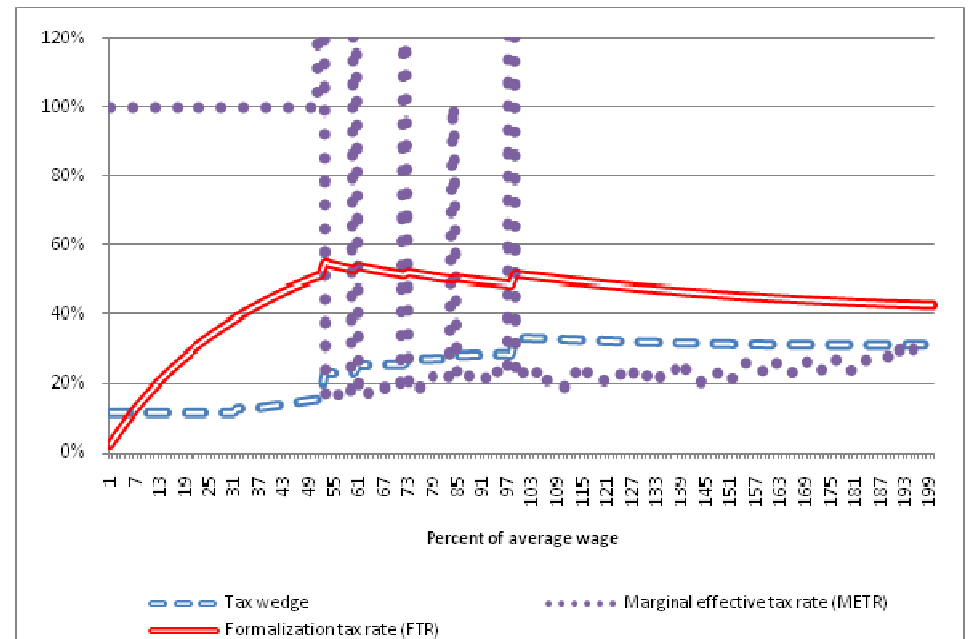
Switzerland: One-earner couple with two children
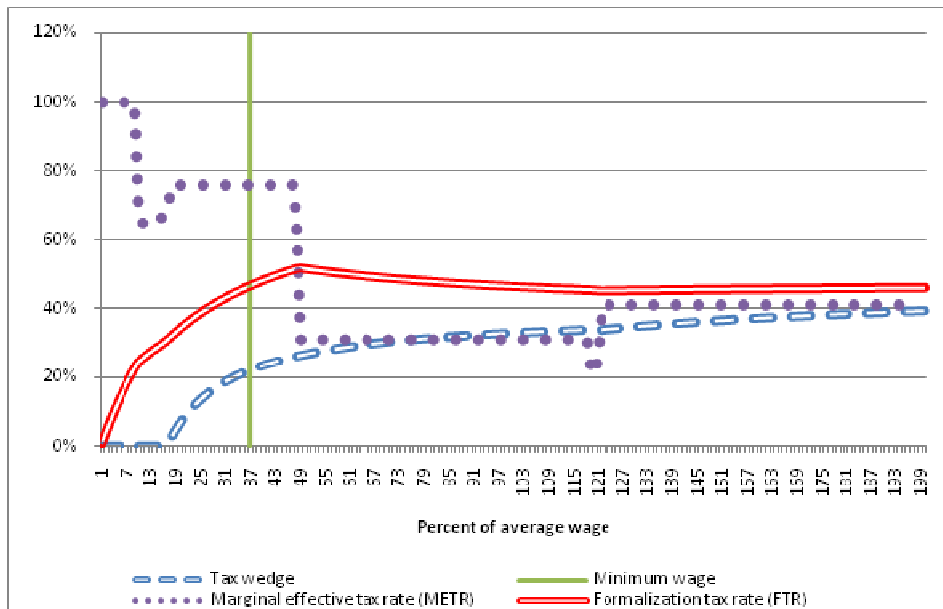
United Kingdom: Single with no children
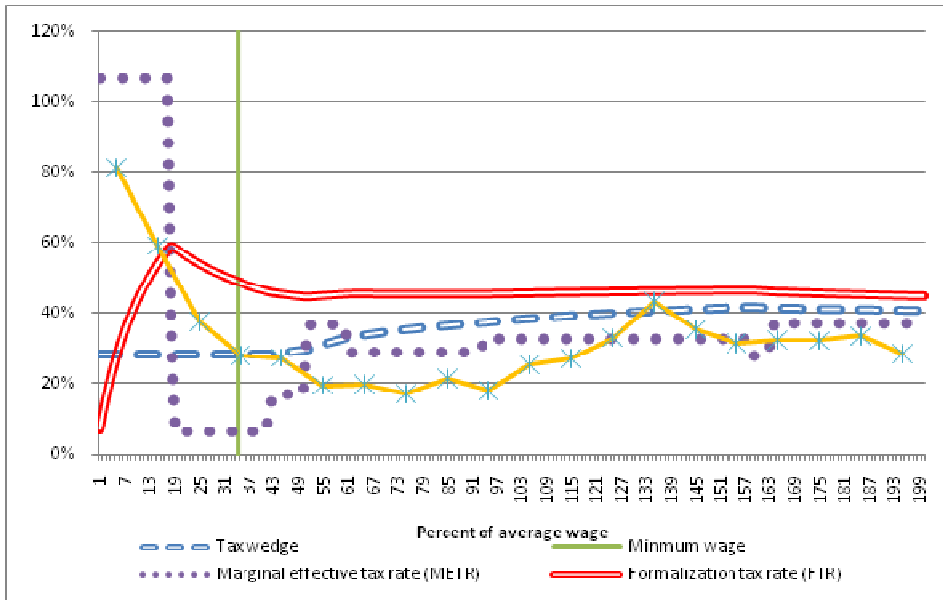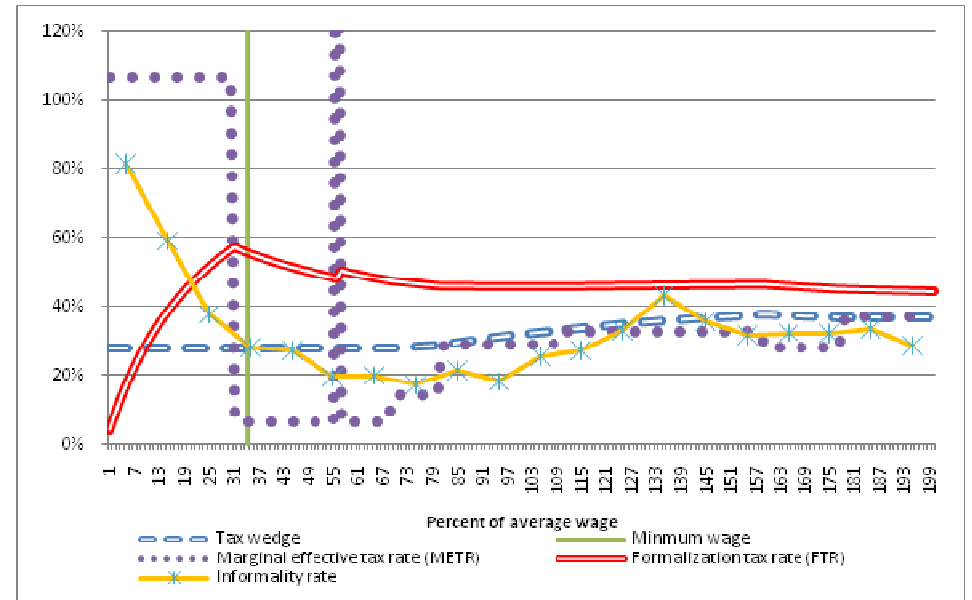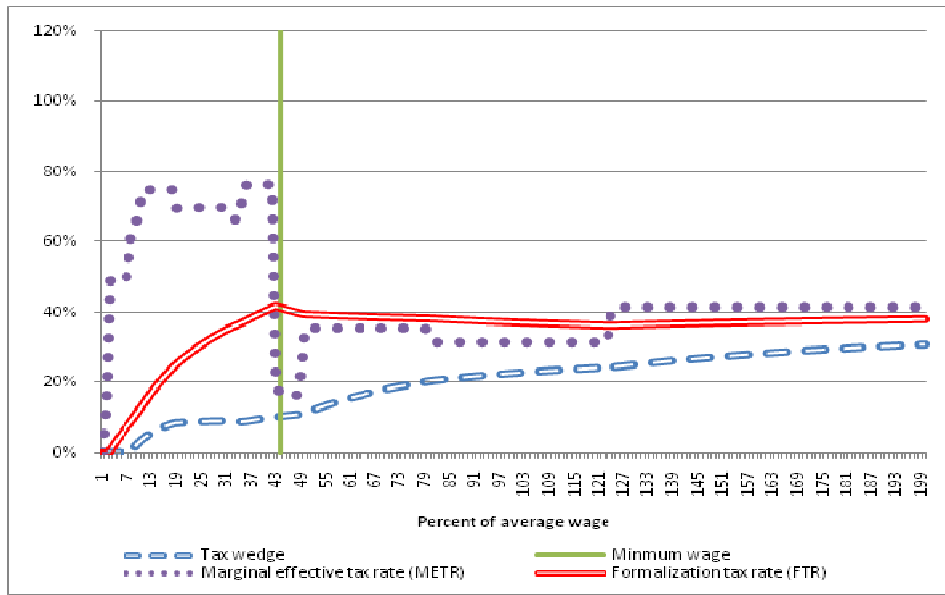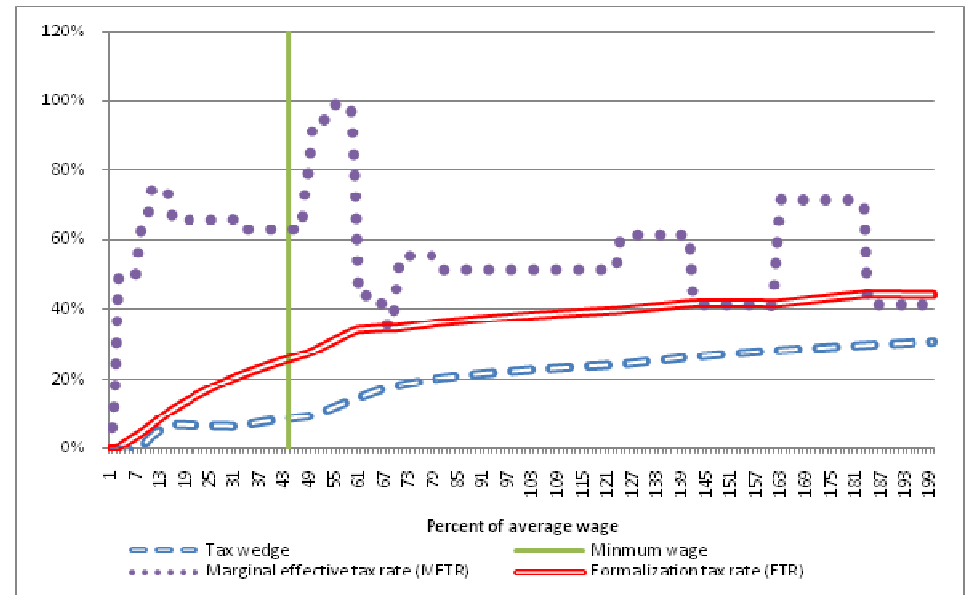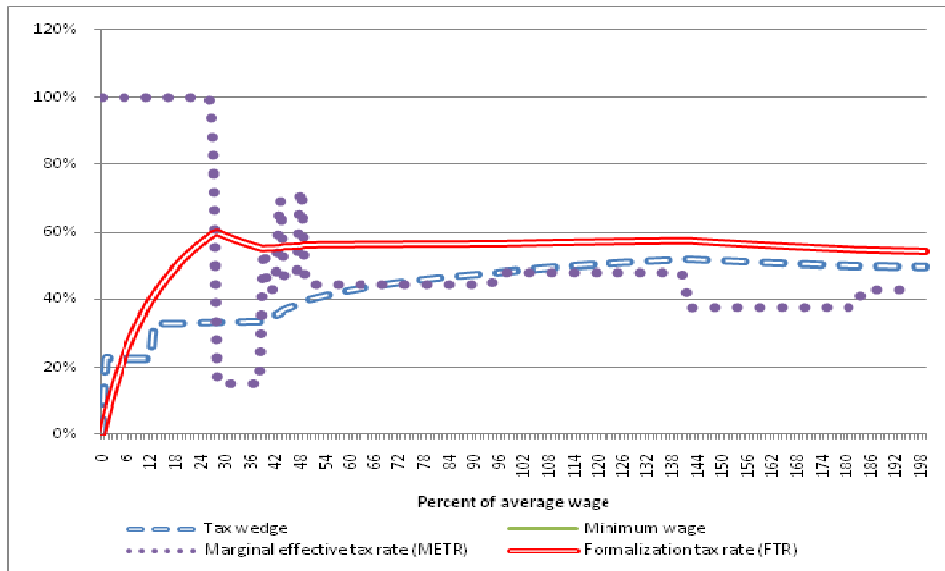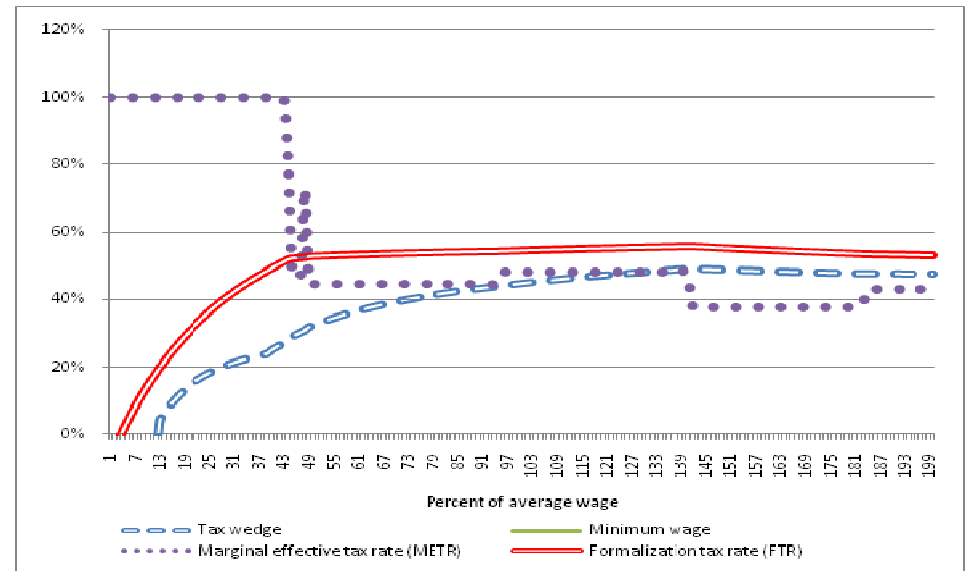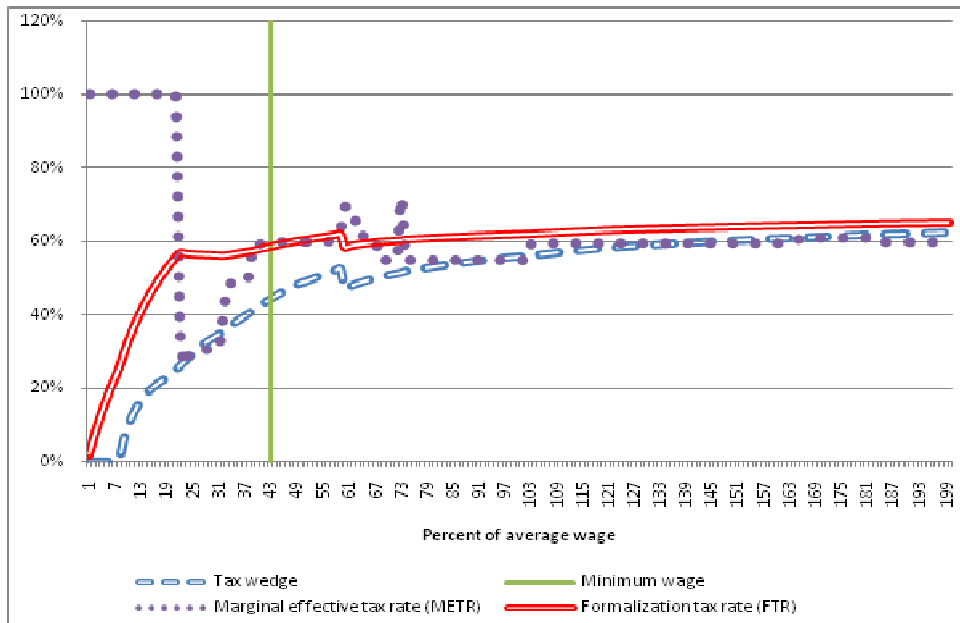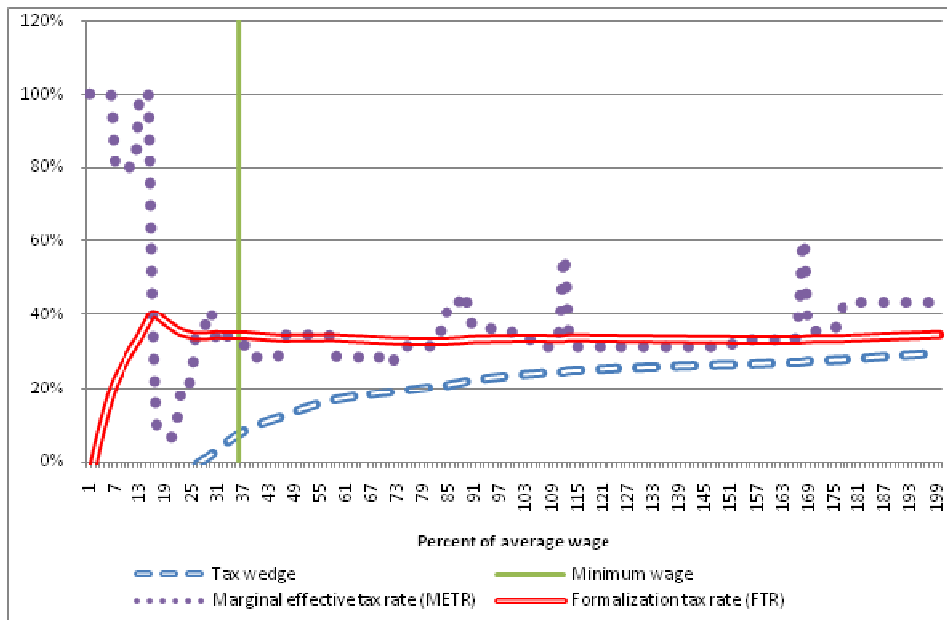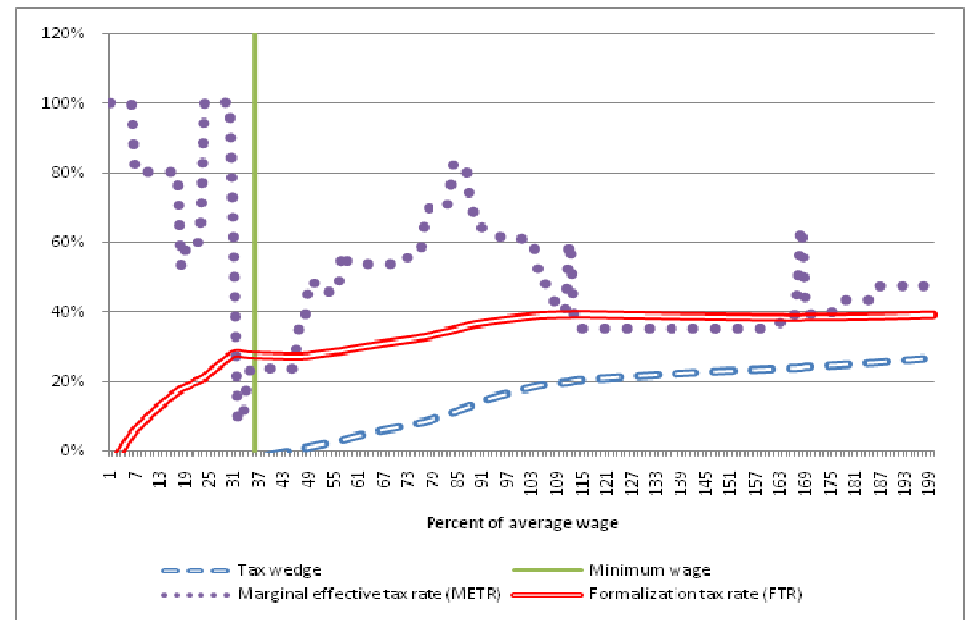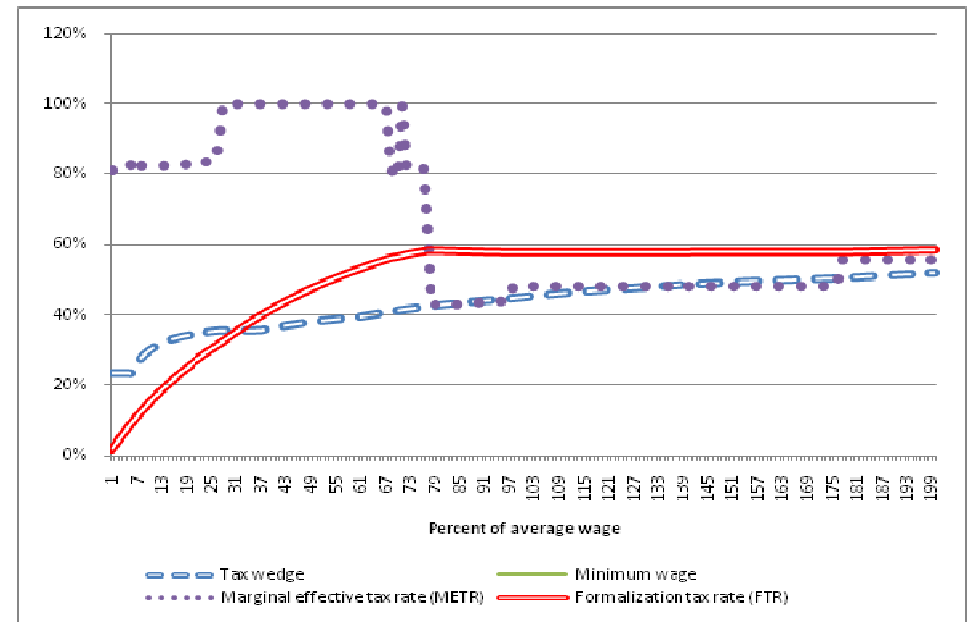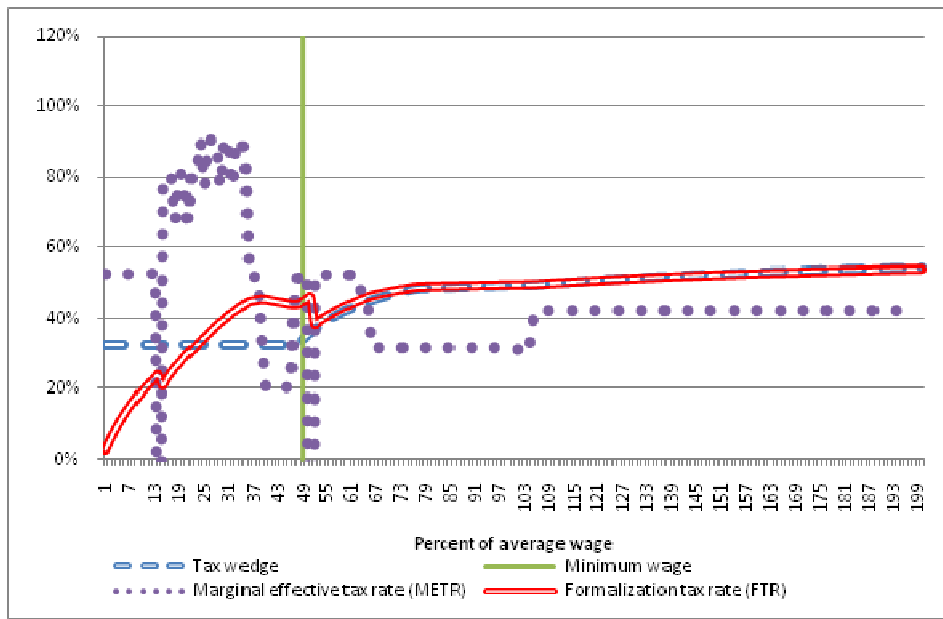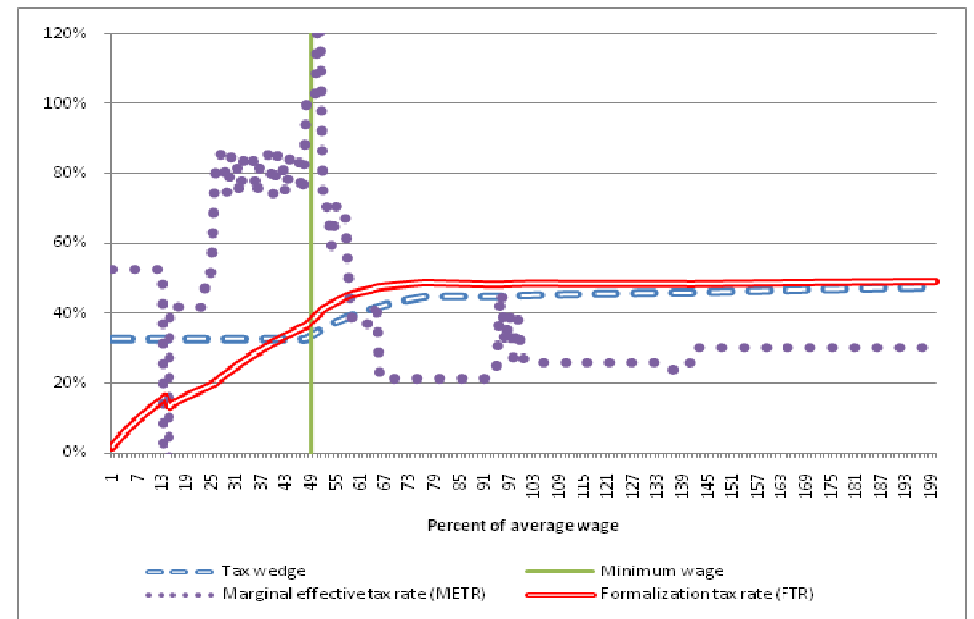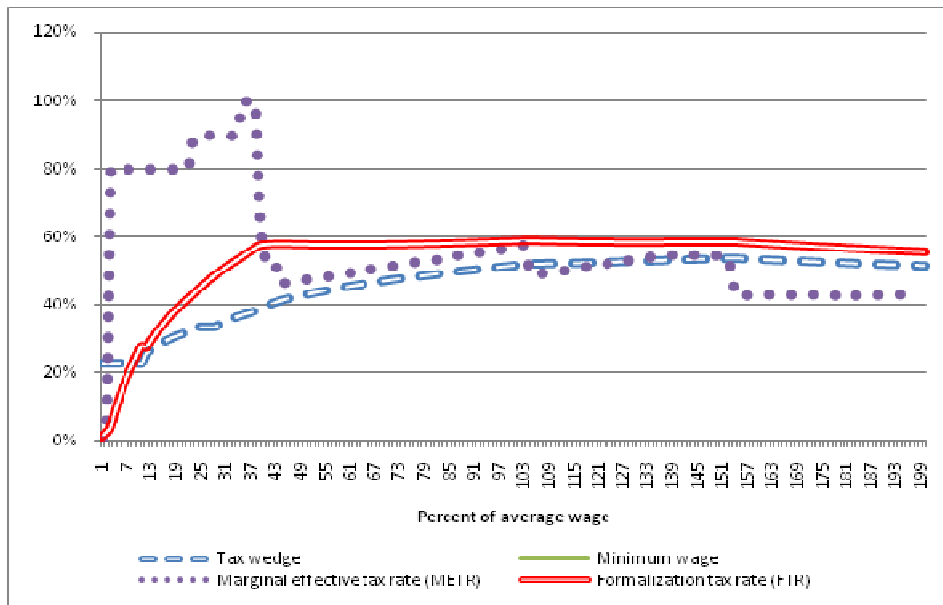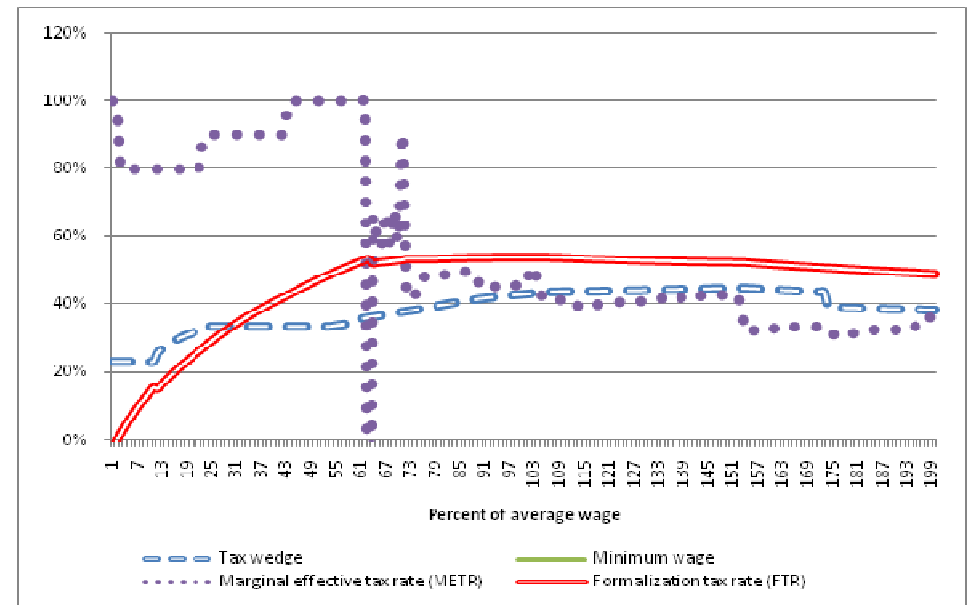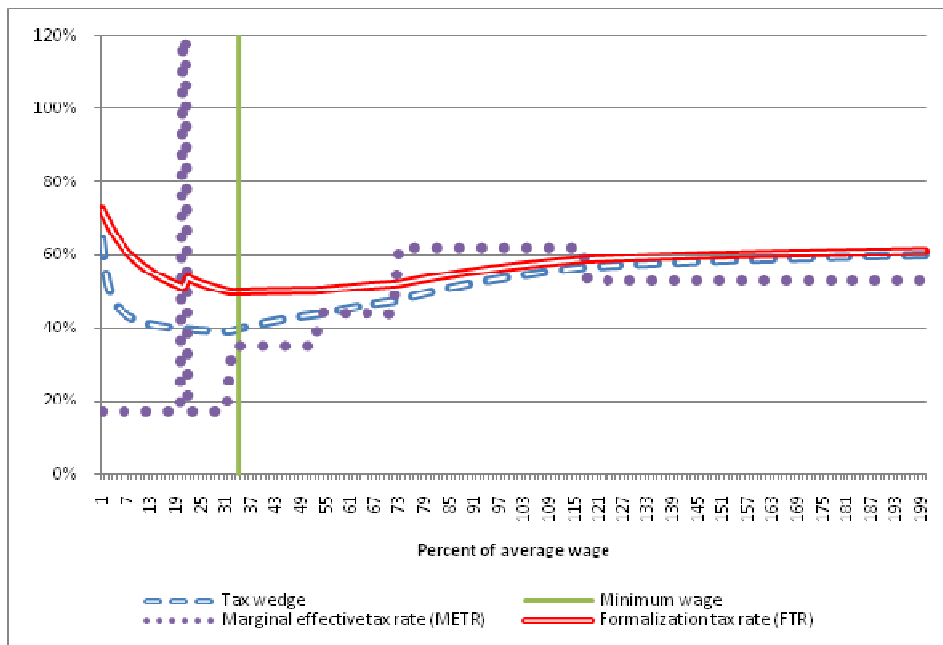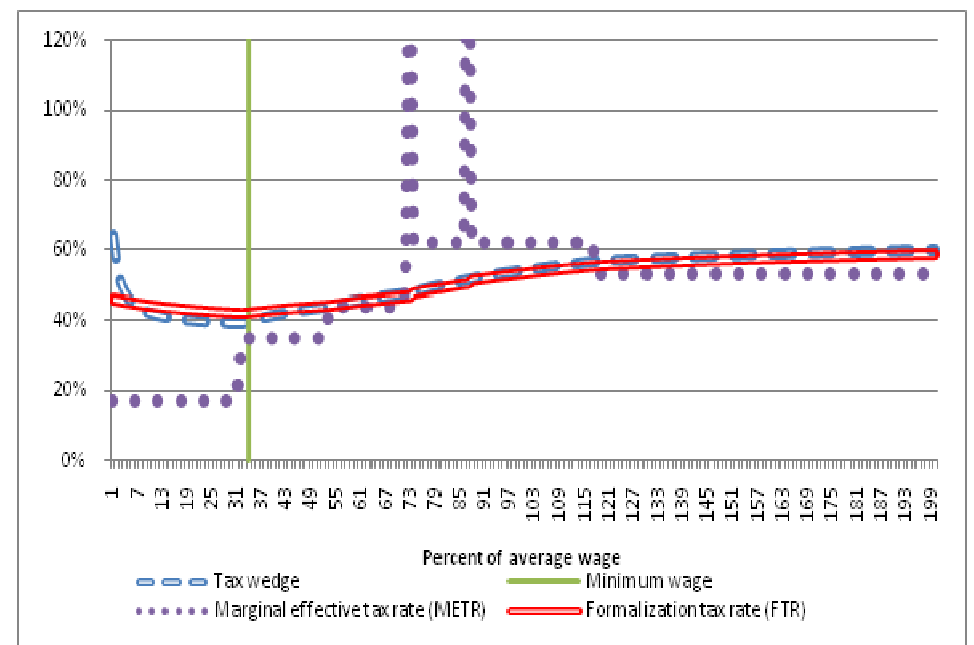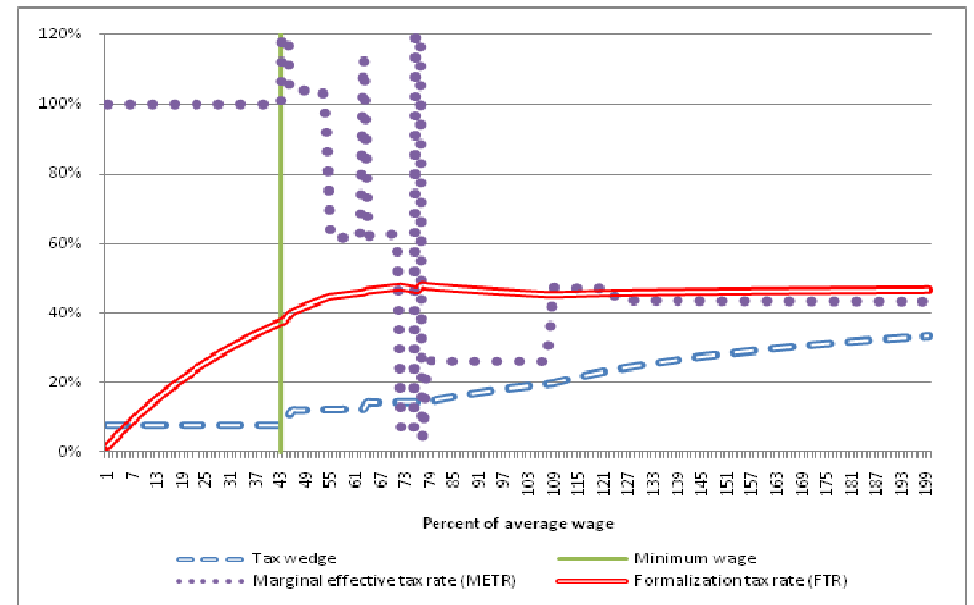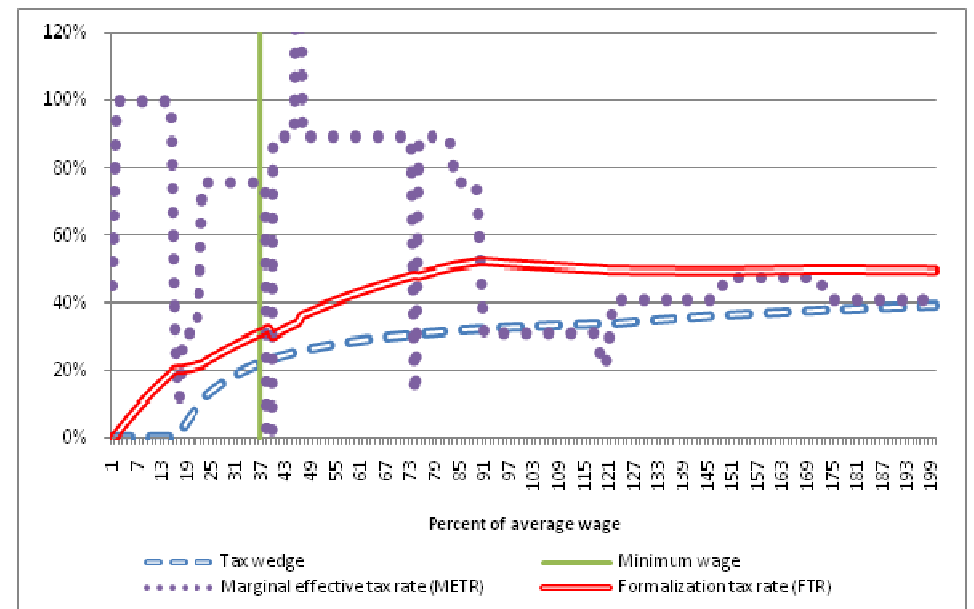

United Kingdom: One-earner couple with two children
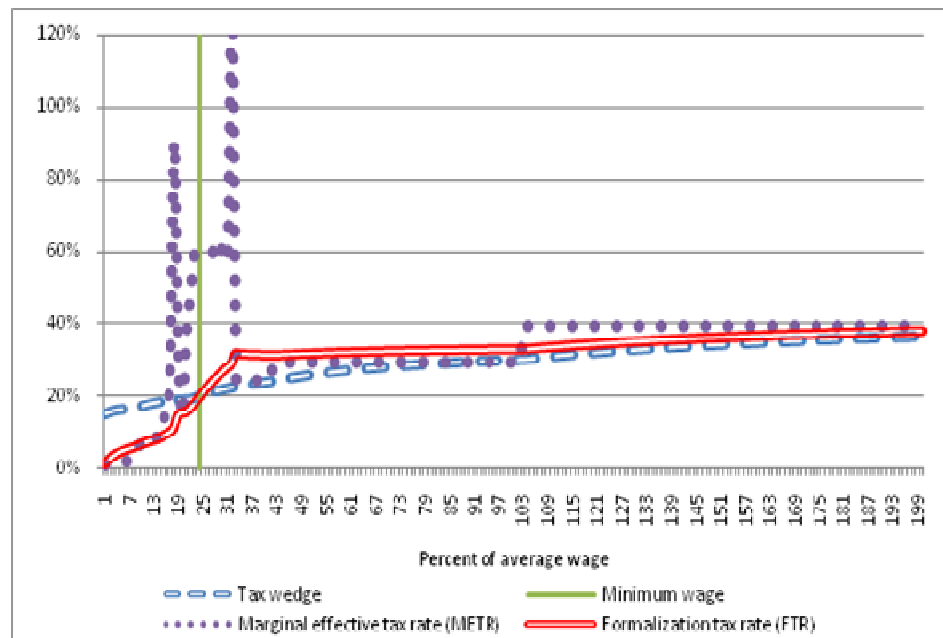
United States: Single with no children
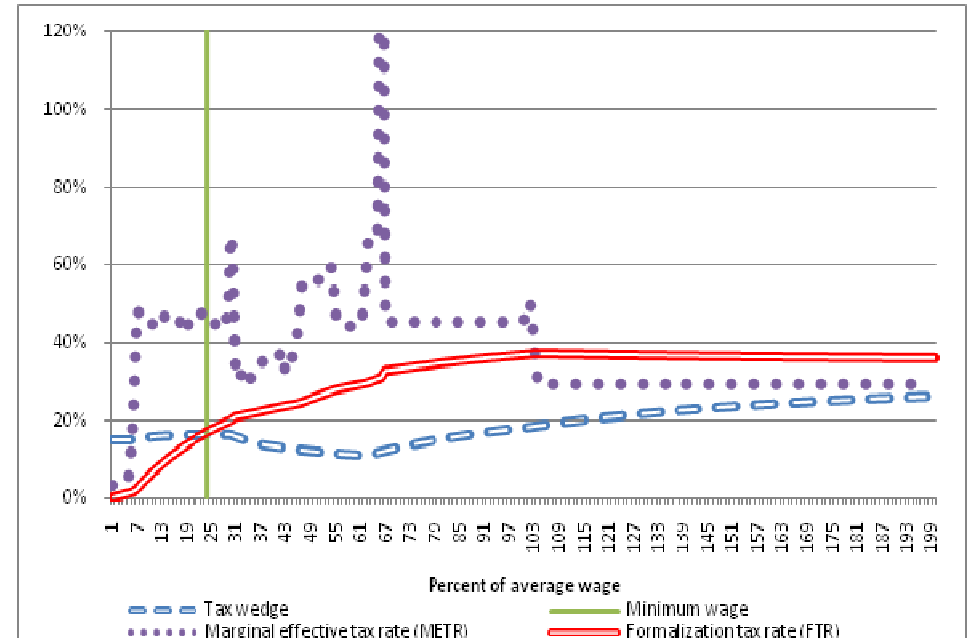
United States: One-earner couple with two children

Table A 1: D-Probit regression results with informality dummy as the dependent variable for Bulgaria

Probit regression, reporting marginal effects				Number of obs =		1740
				Wald chi2(29) =		210.05
				Prob > chi2 =		0.0000
Log pseudolikelihood =	-587.054			Pseudo R2 =		0.3155

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	-0.020	0.004	-4.670	0.000	39.959	-0.028	-0.011
AGE GROUP							
15-24*							
25-39	-0.152	0.059	-1.730	0.084	0.188	-0.267	-0.036
40-54	-0.253	0.089	-2.500	0.013	0.356	-0.427	-0.078
55-64	-0.231	0.067	-2.690	0.007	0.283	-0.362	-0.101
65+	-0.130	0.014	-2.230	0.026	0.012	-0.159	-0.102
SEX							
Male*							
Female	-0.051	0.023	-2.310	0.021	0.555	-0.096	-0.007
EDUCATION LEVEL							
High*							
Medium	-0.019	0.044	-0.450	0.654	0.827	-0.1042	0.066
Low	0.068	0.068	1.130	0.260	0.079	-0.0647	0.201
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.622	0.098	6.100	0.000	0.102	0.43101	0.814
Inactive	0.391	0.098	4.650	0.000	0.177	0.1998	0.583
No spouse	0.294	0.070	4.650	0.000	0.330	0.157	0.432
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.006	0.044	0.130	0.897	0.055	-0.081	0.093
Thinnly populated	0.027	0.023	1.130	0.258	0.586	-0.019	0.072
CITIZENSHIP							
Local*							
Other EU country	(dropped)						
Others	0.165	0.170	1.190	0.235	0.004	-0.168	0.498
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.137	0.053	-1.650	0.099	0.150	-0.241	-0.034
25 to 49 % of AW	-0.002	0.038	-0.060	0.953	0.442	-0.078	0.073
50 to 99 % of AW	(dropped)						
100 to 199 % of AW	0.521	0.237	2.370	0.018	0.007	0.056	0.987
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.098	0.070	1.550	0.121	0.218	-0.039	0.235
Construction	0.307	0.106	3.550	0.000	0.102	0.100	0.514
Trade and repair	0.179	0.080	2.610	0.009	0.179	0.021	0.336
Transport and storage	0.090	0.088	1.170	0.242	0.039	-0.083	0.262
Accomodation and food services	0.165	0.101	1.980	0.048	0.075	-0.032	0.363
ICT	0.121	0.182	0.790	0.429	0.012	-0.237	0.479
Financial services	0.007	0.102	0.070	0.947	0.007	-0.194	0.207
Professional services	0.031	0.098	0.330	0.738	0.048	-0.161	0.223
Public sector	-0.066	0.052	-1.010	0.311	0.058	-0.168	0.035
Education	-0.062	0.056	-0.890	0.373	0.056	-0.171	0.048
Agriculture	0.311	0.100	3.740	0.000	0.107	0.114	0.507
Others	0.133	0.111	1.430	0.153	0.031	-0.085	0.352
*Baseline category							

Probit regression, reporting marginal effects				Number of obs =		1740
				Wald chi2(29) =		555.97
				Prob > chi2 =		0.0000
Log pseudolikelihood =	-616.009			Pseudo R2 =		0.2817

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	0.016	0.001	14.110	0.000	25.067	0.013	0.019
AGE GROUP							
15-24*							
25-39	-0.238	0.052	-2.810	0.005	0.188	-0.339	-0.137
40-54	-0.374	0.083	-3.720	0.000	0.356	-0.536	-0.212
55-64	-0.331	0.062	-3.910	0.000	0.283	-0.453	-0.209
65+	-0.179	0.017	-2.620	0.009	0.012	-0.212	-0.147
SEX							
Male*							
Female	-0.050	0.027	-1.870	0.062	0.555	-0.103	0.003
EDUCATION LEVEL							
High*							
Medium	-0.007	0.052	-0.140	0.889	0.827	-0.109	0.094
Low	0.066	0.082	0.870	0.385	0.079	-0.095	0.227
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.295	0.061	5.470	0.000	0.102	0.176	0.414
Inactive	0.023	0.039	0.590	0.555	0.177	-0.054	0.099
No spouse	0.043	0.032	1.340	0.180	0.330	-0.021	0.107
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	-0.035	0.057	-0.580	0.563	0.055	-0.148	0.077
Thinnly populated	0.035	0.028	1.230	0.217	0.586	-0.020	0.090
CITIZENSHIP							
Local*							
Other EU country	(dropped)						
Others	0.324	0.188	1.960	0.050	0.004	-0.045	0.692
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.235	0.038	-3.270	0.001	0.150	-0.310	-0.161
25 to 49 % of AW	-0.016	0.049	-0.340	0.737	0.442	-0.112	0.079
50 to 99 % of AW	(dropped)						
100 to 199 % of AW	0.632	0.191	2.590	0.010	0.007	0.257	1.006
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.148	0.092	1.770	0.077	0.218	-0.031	0.328
Construction	0.386	0.116	3.670	0.000	0.102	0.159	0.613
Trade and repair	0.236	0.099	2.660	0.008	0.179	0.042	0.430
Transport and storage	0.128	0.117	1.240	0.217	0.039	-0.101	0.358
Accomodation and food services	0.142	0.117	1.380	0.168	0.075	-0.086	0.371
ICT	0.137	0.214	0.730	0.464	0.012	-0.282	0.557
Financial services	0.003	0.135	0.020	0.981	0.007	-0.262	0.268
Professional services	0.163	0.119	1.550	0.120	0.048	-0.071	0.397
Public sector	-0.072	0.076	-0.810	0.416	0.058	-0.221	0.077
Education	-0.092	0.074	-0.980	0.326	0.056	-0.237	0.053
Agriculture	0.403	0.111	3.960	0.000	0.107	0.186	0.620
Others	0.180	0.141	1.470	0.142	0.031	-0.096	0.457
*Baseline category							

Table A 2: D-Probit regression results with informality dummy as the dependent variable for Czech Republic

Probit regression, reporting marginal effects								Number of obs =	4733
								Wald chi2(28) =	428.92
								Prob > chi2 =	0.0000
Log pseudolikelihood =	-1580.422							Pseudo R2 =	0.1876
	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]			
FORMALIZATION TAX RATE	-0.003	0.001	-2.630	0.008	48.300	-0.006	-0.001		
AGE GROUP									
15-24*									
25-39	-0.205	0.059	-2.380	0.017	0.173	-0.322	-0.089		
40-54	-0.467	0.197	-2.520	0.012	0.420	-0.853	-0.081		
55-64	-0.325	0.120	-2.600	0.009	0.283	-0.560	-0.091		
65+	-0.098	0.007	-2.340	0.020	0.004	-0.111	-0.085		
SEX									
Male*									
Female	-0.145	0.015	-10.400	0.000	0.583	-0.174	-0.116		
EDUCATION LEVEL									
High*									
Medium	0.063	0.014	3.030	0.002	0.921	0.035	0.091		
Low	(dropped)								
EMPLOYMENT STATUS OF SPOUSE									
Formal*									
Informal	0.276	0.059	6.110	0.000	0.083	0.159	0.392		
Inactive	0.052	0.034	1.710	0.088	0.134	-0.015	0.120		
No spouse	-0.004	0.022	-0.170	0.867	0.359	-0.048	0.040		
DEGREE OF URBANIZATION									
Densly populated*									
Intermediate	0.027	0.017	1.630	0.103	0.262	-0.007	0.060		
Thinnly populated	0.036	0.014	2.440	0.015	0.466	0.007	0.064		
CITIZENSHIP									
Local*									
Other EU country	0.004	0.038	0.120	0.908	0.023	-0.071	0.080		
Others	0.028	0.101	0.300	0.766	0.010	-0.171	0.226		
INCOME GROUP									
0 % of AW or less*									
1 to 24 % of AW	-0.122	0.026	-2.240	0.025	0.118	-0.172	-0.072		
25 to 49 % of AW	0.235	0.206	1.270	0.204	0.459	-0.169	0.638		
50 to 99 % of AW	0.194	0.213	1.030	0.304	0.420	-0.223	0.611		
100 to 199 % of AW	(dropped)								
200 % of AW or more	(dropped)								
SECTOR									
Health services*									
Mining, manufacturing, utilities	0.066	0.041	1.730	0.083	0.321	-0.014	0.146		
Construction	0.321	0.077	5.350	0.000	0.079	0.171	0.472		
Trade and repair	0.218	0.061	4.400	0.000	0.171	0.098	0.338		
Transport and storage	0.082	0.061	1.590	0.112	0.052	-0.038	0.201		
Accomodation and food services	0.194	0.073	3.400	0.001	0.058	0.051	0.337		
ICT	0.268	0.115	3.060	0.002	0.018	0.042	0.495		
Financial services	0.457	0.111	5.040	0.000	0.018	0.240	0.674		
Professional services	0.316	0.089	4.610	0.000	0.054	0.142	0.490		
Public sector	(dropped)								
Education	0.014	0.054	0.280	0.780	0.061	-0.091	0.120		
Agriculture	0.214	0.078	3.550	0.000	0.048	0.061	0.366		
Others	0.541	0.082	7.420	0.000	0.051	0.380	0.702		
*Baseline category									

Probit regression, reporting marginal effects								Number of obs =	4733
								Wald chi2(28) =	566.79
								Prob > chi2 =	0.0000
Log pseudolikelihood =	-1449.582							Pseudo R2 =	0.2548
	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]			
MARGINAL EFFECTIVE TAX RATE	0.005	0.000	11.750	0.000	34.740	0.004	0.006		
AGE GROUP									
15-24*									
25-39	-0.200	0.061	-2.210	0.027	0.173	-0.320	-0.081		
40-54	-0.445	0.205	-2.310	0.021	0.420	-0.846	-0.044		
55-64	-0.320	0.124	-2.460	0.014	0.283	-0.562	-0.078		
65+	-0.097	0.007	-2.040	0.041	0.004	-0.111	-0.084		
SEX									
Male*									
Female	-0.130	0.015	-9.390	0.000	0.583	-0.159	-0.101		
EDUCATION LEVEL									
High*									
Medium	0.058	0.015	2.720	0.006	0.921	0.028	0.088		
Low	(dropped)								
EMPLOYMENT STATUS OF SPOUSE									
Formal*									
Informal	0.073	0.023	3.670	0.000	0.083	0.027	0.118		
Inactive	-0.041	0.011	-3.200	0.001	0.134	-0.063	-0.019		
No spouse	-0.070	0.010	-6.180	0.000	0.359	-0.090	-0.050		
DEGREE OF URBANIZATION									
Densly populated*									
Intermediate	0.032	0.017	1.930	0.054	0.262	-0.002	0.066		
Thinnly populated	0.037	0.014	2.530	0.012	0.466	0.008	0.065		
CITIZENSHIP									
Local*									
Other EU country	0.021	0.043	0.530	0.594	0.023	-0.062	0.105		
Others	0.030	0.099	0.330	0.740	0.010	-0.164	0.223		
INCOME GROUP									
0 % of AW or less*									
1 to 24 % of AW	-0.138	0.022	-2.870	0.004	0.118	-0.180	-0.096		
25 to 49 % of AW	0.170	0.202	0.910	0.362	0.459	-0.226	0.566		
50 to 99 % of AW	0.143	0.209	0.760	0.450	0.420	-0.266	0.553		
100 to 199 % of AW	(dropped)								
200 % of AW or more	(dropped)								
SECTOR									
Health services*									
Mining, manufacturing, utilities	0.049	0.037	1.370	0.171	0.321	-0.025	0.122		
Construction	0.301	0.074	5.240	0.000	0.079	0.156	0.446		
Trade and repair	0.192	0.057	4.140	0.000	0.171	0.080	0.305		
Transport and storage	0.043	0.052	0.910	0.361	0.052	-0.059	0.145		
Accomodation and food services	0.157	0.067	2.970	0.003	0.058	0.026	0.289		
ICT	0.215	0.114	2.490	0.013	0.018	-0.008	0.438		
Financial services	0.451	0.109	5.070	0.000	0.018	0.237	0.665		
Professional services	0.311	0.086	4.690	0.000	0.054	0.142	0.480		
Public sector	(dropped)								
Education	0.013	0.052	0.260	0.791	0.061	-0.088	0.114		
Agriculture	0.165	0.070	3.000	0.003	0.048	0.027	0.303		
Others	0.527	0.082	7.370	0.000	0.051	0.366	0.687		
*Baseline category									

Table A 3: D-Probit regression results with informality dummy as the dependent variable for Estonia

Left panel

Probit regression, reporting marginal effects

Number of obs =	2819
Wald chi2(28) =	347.55
Prob > chi2 =	0.0000
Log pseudolikelihood = -614.789	Pseudo R2 =	0.2731

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	-0.002	0.001	-2.980	0.003	41.136	-0.004	-0.001
AGE GROUP							
15-24*							
25-39	0.152	0.183	1.170	0.242	0.267	-0.207	0.512
40-54	0.121	0.148	1.070	0.284	0.337	-0.170	0.412
55-64	0.099	0.160	0.840	0.403	0.213	-0.214	0.413
65+	-0.024	0.040	-0.440	0.662	0.016	-0.103	0.055
SEX							
Male*							
Female	-0.062	0.014	-5.280	0.000	0.645	-0.088	-0.035
EDUCATION LEVEL							
High*							
Medium	0.016	0.010	1.470	0.142	0.689	-0.004	0.036
Low	-0.010	0.028	-0.320	0.747	0.008	-0.066	0.045
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.229	0.061	5.790	0.000	0.038	0.110	0.348
Inactive	0.061	0.028	2.780	0.005	0.156	0.006	0.116
No spouse	0.027	0.017	1.660	0.097	0.390	-0.007	0.061
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	(dropped)						
Thinnly populated	0.018	0.010	1.790	0.074	0.512	-0.001	0.037
CITIZENSHIP							
Local*							
Other EU country	(dropped)						
Others	-0.011	0.012	-0.850	0.395	0.189	-0.034	0.012
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.045	0.014	-2.330	0.020	0.156	-0.073	-0.018
25 to 49 % of AW	-0.373	0.166	-3.200	0.001	0.511	-0.698	-0.048
50 to 99 % of AW	-0.180	0.070	-3.030	0.002	0.317	-0.317	-0.044
100 to 199 % of AW	-0.036	0.023	-0.760	0.448	0.004	-0.080	0.008
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	-0.016	0.019	-0.780	0.436	0.230	-0.053	0.021
Construction	0.050	0.042	1.510	0.130	0.061	-0.033	0.132
Trade and repair	0.013	0.026	0.520	0.604	0.163	-0.039	0.064
Transport and storage	0.061	0.047	1.710	0.087	0.060	-0.031	0.153
Accomodation and food services	-0.006	0.023	-0.270	0.788	0.048	-0.051	0.038
ICT	0.134	0.178	1.140	0.254	0.009	-0.216	0.484
Financial services	(dropped)						
Professional services	0.000	0.025	0.020	0.985	0.082	-0.049	0.050
Public sector	-0.021	0.020	-0.830	0.408	0.040	-0.061	0.018
Education	-0.022	0.020	-0.900	0.369	0.118	-0.060	0.017
Agriculture	0.137	0.064	3.280	0.001	0.060	0.012	0.261
Others	0.052	0.046	1.470	0.142	0.065	-0.038	0.142
*Baseline category							

Right panel

Probit regression, reporting marginal effects

Number of obs =	2819
Wald chi2(28) =	525.53
Prob > chi2 =	0.0000
Log pseudolikelihood = -534.667	Pseudo R2 =	0.3678

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	0.003	0.000	10.610	0.000	25.317	0.002	0.003
AGE GROUP							
15-24*							
25-39	0.019	0.083	0.240	0.808	0.267	-0.143	0.181
40-54	0.025	0.081	0.340	0.737	0.337	-0.133	0.184
55-64	0.006	0.072	0.080	0.937	0.213	-0.136	0.148
65+	-0.044	0.009	-1.730	0.084	0.016	-0.061	-0.027
SEX							
Male*							
Female	-0.058	0.013	-5.050	0.000	0.645	-0.083	-0.032
EDUCATION LEVEL							
High*							
Medium	0.015	0.010	1.340	0.179	0.689	-0.006	0.035
Low	-0.003	0.036	-0.070	0.943	0.008	-0.073	0.068
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.059	0.032	2.420	0.015	0.038	-0.004	0.122
Inactive	0.001	0.014	0.100	0.918	0.156	-0.027	0.030
No spouse	-0.022	0.009	-2.270	0.023	0.390	-0.040	-0.004
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	(dropped)						
Thinnly populated	0.017	0.010	1.710	0.088	0.512	-0.002	0.036
CITIZENSHIP							
Local*							
Other EU country	(dropped)						
Others	-0.012	0.012	-1.000	0.318	0.189	-0.035	0.010
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.062	0.011	-3.750	0.000	0.156	-0.085	-0.040
25 to 49 % of AW	-0.254	0.116	-3.000	0.003	0.511	-0.481	-0.027
50 to 99 % of AW	-0.132	0.047	-2.820	0.005	0.317	-0.225	-0.039
100 to 199 % of AW	(dropped)						
200 % of AW or more	0.128	0.230	0.830	0.405	0.001	-0.323	0.579
SECTOR							
Health services*							
Mining, manufacturing, utilities	-0.007	0.023	-0.310	0.758	0.230	-0.053	0.038
Construction	0.055	0.050	1.420	0.157	0.061	-0.043	0.153
Trade and repair	0.012	0.027	0.460	0.647	0.163	-0.042	0.066
Transport and storage	0.064	0.052	1.640	0.102	0.060	-0.038	0.165
Accomodation and food services	0.002	0.029	0.080	0.940	0.048	-0.054	0.058
ICT	0.151	0.176	1.320	0.187	0.009	-0.194	0.496
Financial services	(dropped)						
Professional services	-0.001	0.027	-0.040	0.965	0.082	-0.055	0.052
Public sector	-0.019	0.024	-0.660	0.511	0.040	-0.065	0.027
Education	-0.016	0.024	-0.570	0.566	0.118	-0.062	0.031
Agriculture	0.145	0.074	2.970	0.003	0.060	0.000	0.291
Others	0.059	0.050	1.540	0.124	0.065	-0.040	0.158
*Baseline category							

Table A 4: D-Probit regression results with informality dummy as the dependent variable for Latvia

Probit regression, reporting marginal effects				Number of obs =	2547
				Wald chi2(29) =	276.47
				Prob > chi2 =	0.0000
Log pseudolikelihood =	-911.652			Pseudo R2 =	0.1878

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	0.001	0.001	0.910	0.365	44.295	-0.001	0.004
AGE GROUP							
15-24*							
25-39	0.080	0.104	0.840	0.403	0.268	-0.124	0.283
40-54	0.039	0.086	0.460	0.642	0.324	-0.131	0.208
55-64	-0.026	0.072	-0.340	0.731	0.194	-0.167	0.115
65+	(dropped)						
SEX							
Male*							
Female	-0.072	0.020	-3.610	0.000	0.578	-0.111	-0.032
EDUCATION LEVEL							
High*							
Medium	-0.011	0.023	-0.490	0.622	0.793	-0.056	0.034
Low	0.439	0.212	2.480	0.013	0.008	0.024	0.855
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.203	0.065	3.970	0.000	0.056	0.076	0.330
Inactive	-0.006	0.030	-0.210	0.834	0.147	-0.064	0.052
No spouse	0.016	0.030	0.550	0.582	0.448	-0.042	0.075
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	(dropped)						
Thinnly populated	-0.038	0.020	-1.980	0.048	0.521	-0.077	0.001
CITIZENSHIP							
Local*							
Other EU country	(dropped)						
Others	-0.023	0.021	-1.010	0.310	0.141	-0.065	0.019
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.178	0.028	-3.810	0.000	0.172	-0.233	-0.123
25 to 49 % of AW	-0.502	0.120	-4.190	0.000	0.483	-0.738	-0.266
50 to 99 % of AW	-0.325	0.071	-4.040	0.000	0.318	-0.465	-0.185
100 to 199 % of AW	-0.127	0.010	-4.930	0.000	0.015	-0.146	-0.107
200 % of AW or more	-0.118	0.010	-2.990	0.003	0.005	-0.138	-0.098
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.147	0.084	2.050	0.040	0.180	-0.018	0.312
Construction	0.352	0.113	3.850	0.000	0.094	0.131	0.573
Trade and repair	0.257	0.097	3.230	0.001	0.203	0.066	0.447
Transport and storage	0.206	0.106	2.420	0.016	0.064	-0.001	0.413
Accomodation and food services	0.155	0.104	1.820	0.069	0.054	-0.049	0.359
ICT	0.075	0.120	0.720	0.471	0.015	-0.161	0.310
Financial services	0.293	0.247	1.510	0.132	0.009	-0.192	0.778
Professional services	0.192	0.106	2.250	0.025	0.067	-0.015	0.400
Public sector	0.094	0.103	1.070	0.285	0.040	-0.109	0.296
Education	-0.014	0.068	-0.200	0.844	0.074	-0.148	0.120
Agriculture	0.533	0.107	5.500	0.000	0.096	0.324	0.743
Others	0.395	0.121	3.950	0.000	0.054	0.157	0.633
*Baseline category							

Probit regression, reporting marginal effects				Number of obs =	2547
				Wald chi2(29) =	665.08
				Prob > chi2 =	0.0000
Log pseudolikelihood =	-700.202			Pseudo R2 =	0.3762

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	0.007	0.000	16.080	0.000	36.699	0.006	0.008
AGE GROUP							
15-24*							
25-39	0.026	0.089	0.300	0.761	0.268	-0.148	0.201
40-54	-0.006	0.074	-0.070	0.940	0.324	-0.151	0.140
55-64	-0.021	0.068	-0.300	0.764	0.194	-0.154	0.112
65+	(dropped)						
SEX							
Male*							
Female	-0.085	0.021	-4.020	0.000	0.578	-0.127	-0.043
EDUCATION LEVEL							
High*							
Medium	-0.002	0.022	-0.080	0.936	0.793	-0.046	0.042
Low	0.470	0.212	2.680	0.007	0.008	0.055	0.886
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.082	0.049	1.960	0.051	0.056	-0.015	0.179
Inactive	-0.056	0.017	-2.710	0.007	0.147	-0.090	-0.022
No spouse	0.003	0.019	0.160	0.875	0.448	-0.034	0.040
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	(dropped)						
Thinnly populated	-0.031	0.020	-1.580	0.113	0.521	-0.072	0.009
CITIZENSHIP							
Local*							
Other EU country	(dropped)						
Others	-0.021	0.022	-0.950	0.344	0.141	-0.064	0.021
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.201	0.028	-4.910	0.000	0.172	-0.256	-0.146
25 to 49 % of AW	-0.379	0.130	-3.100	0.002	0.483	-0.634	-0.125
50 to 99 % of AW	-0.265	0.073	-3.210	0.001	0.318	-0.408	-0.122
100 to 199 % of AW	-0.112	0.009	-3.980	0.000	0.015	-0.131	-0.094
200 % of AW or more	-0.101	0.014	-2.020	0.043	0.005	-0.127	-0.074
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.188	0.063	3.700	0.000	0.180	0.064	0.312
Construction	0.401	0.085	5.940	0.000	0.094	0.234	0.568
Trade and repair	0.313	0.077	5.290	0.000	0.203	0.162	0.464
Transport and storage	0.235	0.087	3.490	0.000	0.064	0.063	0.406
Accomodation and food services	0.281	0.100	3.670	0.000	0.054	0.085	0.476
ICT	0.280	0.151	2.420	0.015	0.015	-0.016	0.576
Financial services	0.471	0.231	2.450	0.014	0.009	0.018	0.924
Professional services	0.246	0.087	3.670	0.000	0.067	0.075	0.416
Public sector	0.180	0.109	2.120	0.034	0.040	-0.034	0.394
Education	-0.002	0.049	-0.040	0.966	0.074	-0.099	0.095
Agriculture	0.549	0.080	7.790	0.000	0.096	0.391	0.706
Others	0.456	0.094	5.880	0.000	0.054	0.271	0.641
*Baseline category							

Table A 5: D-Probit regression results with informality dummy as the dependent variable for Poland

Probit regression, reporting marginal effects				Number of obs =	7129
				Wald chi2(31) =	1671.48
				Prob > chi2 =	0.0000
Log pseudolikelihood =	-3401.130			Pseudo R2 =	0.3082

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	0.040	0.002	24.450	0.000	42.428	0.037	0.043
AGE GROUP							
15-24*							
25-39	-0.014	0.343	-0.040	0.967	0.207	-0.686	0.657
40-54	-0.144	0.332	-0.430	0.670	0.318	-0.794	0.506
55-64	-0.131	0.327	-0.390	0.696	0.195	-0.773	0.510
65+	-0.163	0.189	-0.800	0.425	0.004	-0.534	0.209
SEX							
Male*							
Female	-0.052	0.019	-2.760	0.006	0.485	-0.089	-0.015
EDUCATION LEVEL							
High*							
Medium	0.068	0.024	2.810	0.005	0.706	0.021	0.115
Low	0.090	0.035	2.520	0.012	0.106	0.020	0.159
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.127	0.028	4.480	0.000	0.202	0.072	0.182
Inactive	-0.104	0.028	-3.670	0.000	0.187	-0.158	-0.049
No spouse	-0.185	0.026	-6.940	0.000	0.358	-0.235	-0.134
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.114	0.026	4.270	0.000	0.146	0.062	0.166
Thinnly populated	0.057	0.020	2.880	0.004	0.509	0.018	0.096
CITIZENSHIP							
Local*							
Other EU country	-0.422	0.086	-1.950	0.051	0.001	-0.592	-0.253
Others	0.006	0.175	0.040	0.972	0.002	-0.336	0.349
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	0.096	0.048	2.010	0.045	0.215	0.003	0.190
25 to 49 % of AW	-0.246	0.321	-0.740	0.461	0.434	-0.874	0.383
50 to 99 % of AW	-0.295	0.295	-0.920	0.360	0.287	-0.874	0.284
100 to 199 % of AW	0.106	0.252	0.420	0.677	0.002	-0.387	0.600
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.004	0.042	0.100	0.924	0.238	-0.079	0.087
Construction	0.180	0.046	3.770	0.000	0.086	0.090	0.269
Trade and repair	0.117	0.042	2.730	0.006	0.166	0.034	0.199
Transport and storage	0.146	0.052	2.740	0.006	0.049	0.045	0.248
Accomodation and food services	0.113	0.058	1.910	0.057	0.027	-0.001	0.228
ICT	0.077	0.087	0.880	0.379	0.013	-0.093	0.247
Financial services	0.165	0.068	2.330	0.020	0.016	0.032	0.298
Professional services	0.058	0.051	1.130	0.258	0.067	-0.042	0.157
Public sector	-0.114	0.054	-2.040	0.042	0.037	-0.220	-0.008
Education	-0.065	0.052	-1.240	0.215	0.058	-0.168	0.037
Agriculture	0.463	0.031	10.910	0.000	0.163	0.403	0.524
Others	0.124	0.058	2.090	0.036	0.030	0.010	0.238
*Baseline category							

Probit regression, reporting marginal effects				Number of obs =	7129
				Wald chi2(31) =	1478.76
				Prob > chi2 =	0.0000
Log pseudolikelihood =	-3313.007			Pseudo R2 =	0.3262

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	0.019	0.001	17.580	0.000	39.142	0.017	0.021
AGE GROUP							
15-24*							
25-39	-0.223	0.321	-0.670	0.505	0.207	-0.853	0.407
40-54	-0.277	0.316	-0.840	0.403	0.318	-0.897	0.343
55-64	-0.220	0.320	-0.660	0.509	0.195	-0.846	0.407
65+	-0.143	0.205	-0.680	0.496	0.004	-0.545	0.258
SEX							
Male*							
Female	-0.061	0.019	-3.180	0.001	0.485	-0.098	-0.023
EDUCATION LEVEL							
High*							
Medium	0.094	0.025	3.820	0.000	0.706	0.046	0.143
Low	0.108	0.035	3.000	0.003	0.106	0.039	0.176
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.115	0.028	4.070	0.000	0.202	0.061	0.169
Inactive	-0.078	0.028	-2.750	0.006	0.187	-0.133	-0.022
No spouse	-0.063	0.027	-2.320	0.020	0.358	-0.115	-0.010
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.116	0.026	4.270	0.000	0.146	0.064	0.167
Thinnly populated	0.066	0.020	3.280	0.001	0.509	0.026	0.105
CITIZENSHIP							
Local*							
Other EU country	-0.351	0.228	-1.150	0.249	0.001	-0.798	0.096
Others	-0.048	0.192	-0.250	0.802	0.002	-0.425	0.329
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.158	0.049	-3.190	0.001	0.215	-0.254	-0.063
25 to 49 % of AW	-0.196	0.326	-0.590	0.555	0.434	-0.835	0.443
50 to 99 % of AW	-0.169	0.327	-0.510	0.610	0.287	-0.809	0.471
100 to 199 % of AW	0.198	0.212	0.830	0.408	0.002	-0.218	0.614
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	-0.005	0.043	-0.120	0.905	0.238	-0.089	0.079
Construction	0.165	0.044	3.540	0.000	0.086	0.079	0.251
Trade and repair	0.106	0.042	2.480	0.013	0.166	0.024	0.188
Transport and storage	0.125	0.051	2.370	0.018	0.049	0.026	0.224
Accomodation and food services	0.105	0.058	1.740	0.081	0.027	-0.009	0.220
ICT	0.085	0.083	1.000	0.317	0.013	-0.078	0.247
Financial services	0.136	0.066	1.950	0.051	0.016	0.007	0.264
Professional services	0.037	0.052	0.700	0.484	0.067	-0.066	0.139
Public sector	-0.173	0.056	-2.980	0.003	0.037	-0.283	-0.064
Education	-0.053	0.056	-0.960	0.337	0.058	-0.162	0.056
Agriculture	0.469	0.025	12.040	0.000	0.163	0.420	0.519
Others	0.104	0.057	1.780	0.075	0.030	-0.007	0.215
*Baseline category							

Table A 6: D-Probit regression results with informality dummy as the dependent variable for Slovakia

Left panel

Probit regression, reporting marginal effects

			Number of obs =	3332
			Wald chi2(27) =	.
			Prob > chi2 =	.
Log pseudolikelihood =	-755.150		Pseudo R2 =	0.3574

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	0.015	0.001	15.280	0.000	36.572	0.013	0.017
AGE GROUP							
15-24*							
25-39	-0.064	0.009	-6.420	0.000	0.184	-0.082	-0.047
40-54	-0.112	0.025	-5.750	0.000	0.440	-0.161	-0.063
55-64	-0.074	0.013	-5.710	0.000	0.250	-0.099	-0.049
65+	-0.036	0.004	-8.300	0.000	0.002	-0.044	-0.028
SEX							
Male*							
Female	-0.038	0.008	-5.370	0.000	0.600	-0.053	-0.023
EDUCATION LEVEL							
High*							
Medium	0.024	0.007	2.540	0.011	0.888	0.010	0.037
Low	(dropped)						
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	-0.008	0.008	-0.940	0.348	0.068	-0.024	0.007
Inactive	-0.035	0.004	-6.370	0.000	0.100	-0.043	-0.026
No spouse	-0.083	0.008	-9.840	0.000	0.377	-0.098	-0.067
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	-0.012	0.007	-1.670	0.095	0.326	-0.026	0.002
Thinnly populated	-0.006	0.007	-0.840	0.404	0.443	-0.021	0.008
CITIZENSHIP							
Local*							
Other EU country	0.014	0.030	0.520	0.602	0.011	-0.044	0.072
Others	(dropped)						
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.057	0.006	-7.210	0.000	0.109	-0.069	-0.045
25 to 49 % of AW	-0.018	0.008	-2.410	0.016	0.512	-0.033	-0.003
50 to 99 % of AW	(dropped)						
100 to 199 % of AW	0.957	0.003	.	.	0.002	0.952	0.963
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	-0.005	0.014	-0.350	0.730	0.278	-0.031	0.022
Construction	0.070	0.034	2.970	0.003	0.076	0.004	0.136
Trade and repair	0.020	0.019	1.180	0.238	0.163	-0.018	0.057
Transport and storage	0.014	0.022	0.700	0.483	0.049	-0.030	0.058
Accomodation and food services	-0.012	0.015	-0.660	0.507	0.055	-0.042	0.018
ICT	0.012	0.036	0.360	0.720	0.015	-0.059	0.083
Financial services	0.058	0.053	1.520	0.129	0.015	-0.046	0.161
Professional services	0.023	0.026	1.040	0.297	0.047	-0.029	0.075
Public sector	-0.031	0.008	-2.150	0.032	0.077	-0.047	-0.015
Education	-0.019	0.012	-1.190	0.233	0.082	-0.043	0.005
Agriculture	-0.005	0.018	-0.270	0.786	0.035	-0.039	0.029
Others	0.095	0.045	3.130	0.002	0.042	0.006	0.184
*Baseline category							

Right panel

Probit regression, reporting marginal effects

			Number of obs =	3332
			Wald chi2(27) =	.
			Prob > chi2 =	.
Log pseudolikelihood =	-924.996		Pseudo R2 =	0.2129

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	0.003	0.001	6.520	0.000	29.604	0.002	0.004
AGE GROUP							
15-24*							
25-39	-0.136	0.013	-7.790	0.000	0.184	-0.162	-0.111
40-54	-0.254	0.037	-7.730	0.000	0.440	-0.327	-0.181
55-64	-0.168	0.020	-7.430	0.000	0.250	-0.207	-0.130
65+	-0.081	0.006	-9.170	0.000	0.002	-0.092	-0.070
SEX							
Male*							
Female	-0.084	0.013	-7.080	0.000	0.600	-0.109	-0.060
EDUCATION LEVEL							
High*							
Medium	0.039	0.013	2.330	0.020	0.888	0.013	0.066
Low	(dropped)						
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.115	0.029	5.100	0.000	0.068	0.058	0.172
Inactive	-0.004	0.017	-0.250	0.800	0.100	-0.037	0.028
No spouse	-0.024	0.011	-2.080	0.037	0.377	-0.046	-0.002
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	-0.021	0.012	-1.650	0.100	0.326	-0.045	0.003
Thinnly populated	-0.006	0.012	-0.460	0.645	0.443	-0.030	0.018
CITIZENSHIP							
Local*							
Other EU country	-0.012	0.030	-0.380	0.702	0.011	-0.071	0.046
Others	(dropped)						
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.106	0.009	-6.900	0.000	0.109	-0.123	-0.088
25 to 49 % of AW	(dropped)						
50 to 99 % of AW	-0.020	0.015	-1.300	0.194	0.512	-0.049	0.010
100 to 199 % of AW	0.923	0.006	.	.	0.002	0.912	0.933
200 % of AW or more							
SECTOR							
Health services*							
Mining, manufacturing, utilities	-0.001	0.025	-0.020	0.982	0.278	-0.050	0.049
Construction	0.149	0.053	3.730	0.000	0.076	0.046	0.252
Trade and repair	0.037	0.032	1.270	0.205	0.163	-0.026	0.099
Transport and storage	0.031	0.040	0.850	0.396	0.049	-0.048	0.109
Accomodation and food services	-0.006	0.031	-0.200	0.840	0.055	-0.068	0.055
ICT	0.015	0.056	0.290	0.769	0.015	-0.094	0.124
Financial services	0.089	0.065	1.730	0.083	0.015	-0.038	0.216
Professional services	0.079	0.050	1.940	0.052	0.047	-0.019	0.177
Public sector	-0.057	0.017	-2.200	0.028	0.077	-0.091	-0.023
Education	-0.036	0.023	-1.300	0.192	0.082	-0.081	0.009
Agriculture	0.008	0.038	0.220	0.823	0.035	-0.066	0.082
Others	0.182	0.064	3.890	0.000	0.042	0.058	0.307
*Baseline category							

Table A 7: D-Probit regression results with informality dummy as the dependent variable for Spain

Probit regression, reporting marginal effects
Number of obs = 5494
Wald chi2(31) = 855.23
Prob > chi2 = 0.0000
Log pseudolikelihood = -2362.634
Pseudo R2 = 0.3140

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
FORMALIZATION TAX RATE	-0.021	0.003	-6.150	0.000	42.446	-0.028	-0.014
AGE GROUP							
15-24*							
25-39	-0.317	0.117	-1.760	0.079	0.202	-0.547	-0.088
40-54	-0.357	0.163	-1.730	0.083	0.328	-0.678	-0.037
55-64	-0.313	0.150	-1.580	0.115	0.269	-0.608	-0.019
65+	-0.134	0.143	-0.740	0.457	0.007	-0.414	0.147
SEX							
Male*							
Female	-0.122	0.021	-6.010	0.000	0.542	-0.162	-0.082
EDUCATION LEVEL							
High*							
Medium	0.169	0.023	6.980	0.000	0.557	0.124	0.214
Low	0.153	0.033	4.810	0.000	0.196	0.088	0.218
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.477	0.053	8.360	0.000	0.135	0.373	0.581
Inactive	0.394	0.054	7.210	0.000	0.167	0.287	0.500
No spouse	0.175	0.050	3.550	0.000	0.402	0.077	0.272
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.026	0.023	1.130	0.259	0.235	-0.019	0.071
Thinnly populated	0.038	0.021	1.790	0.073	0.292	-0.004	0.079
CITIZENSHIP							
Local*							
Other EU country	-0.047	0.042	-1.050	0.295	0.033	-0.130	0.036
Others	-0.047	0.027	-1.660	0.098	0.089	-0.100	0.006
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.186	0.028	-5.310	0.000	0.134	-0.240	-0.131
25 to 49 % of AW	-0.058	0.242	-0.240	0.813	0.419	-0.532	0.416
50 to 99 % of AW	-0.152	0.223	-0.650	0.517	0.382	-0.588	0.285
100 to 199 % of AW	-0.006	0.282	-0.020	0.984	0.003	-0.558	0.547
200 % of AW or more	(dropped)						
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.031	0.073	0.430	0.669	0.142	-0.113	0.175
Construction	0.077	0.079	1.010	0.311	0.099	-0.078	0.231
Trade and repair	0.198	0.077	2.670	0.008	0.196	0.046	0.349
Transport and storage	0.200	0.092	2.300	0.021	0.041	0.019	0.381
Accomodation and food services	0.133	0.082	1.710	0.087	0.083	-0.028	0.293
ICT	0.158	0.122	1.380	0.167	0.021	-0.082	0.398
Financial services	0.057	0.114	0.520	0.606	0.021	-0.167	0.281
Professional services	-0.014	0.075	-0.190	0.853	0.080	-0.160	0.132
Public sector	0.727	0.025	10.000	0.000	0.042	0.678	0.775
Education	0.532	0.074	5.830	0.000	0.039	0.387	0.676
Agriculture	0.320	0.084	3.890	0.000	0.069	0.155	0.486
Others	0.622	0.056	8.260	0.000	0.117	0.513	0.731

*Baseline category

Probit regression, reporting marginal effects
Number of obs = 5494
Wald chi2(31) = 882.58
Prob > chi2 = 0.0000
Log pseudolikelihood = -2382.540
Pseudo R2 = 0.3082

	dF/dx	Robust Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
MARGINAL EFFECTIVE TAX RATE	-0.002	0.000	-3.750	0.000	37.743	-0.003	-0.001
AGE GROUP							
15-24*							
25-39	(dropped)						
40-54	-0.005	0.026	-0.180	0.857	0.328	-0.056	0.046
55-64	0.038	0.041	0.940	0.346	0.269	-0.043	0.119
65+	0.312	0.151	2.130	0.033	0.007	0.016	0.608
SEX							
Male*							
Female	-0.121	0.020	-6.020	0.000	0.542	-0.161	-0.081
EDUCATION LEVEL							
High*							
Medium	0.170	0.023	7.000	0.000	0.557	0.125	0.215
Low	0.160	0.034	4.990	0.000	0.196	0.095	0.226
EMPLOYMENT STATUS OF SPOUSE							
Formal*							
Informal	0.242	0.034	7.520	0.000	0.135	0.175	0.309
Inactive	0.145	0.029	5.220	0.000	0.167	0.088	0.203
No spouse	-0.052	0.021	-2.470	0.014	0.402	-0.093	-0.011
DEGREE OF URBANIZATION							
Densly populated*							
Intermediate	0.029	0.023	1.310	0.191	0.235	-0.015	0.074
Thinnly populated	0.038	0.021	1.820	0.068	0.292	-0.003	0.080
CITIZENSHIP							
Local*							
Other EU country	-0.050	0.043	-1.090	0.276	0.033	-0.134	0.035
Others	-0.052	0.027	-1.890	0.059	0.089	-0.104	-0.001
INCOME GROUP							
0 % of AW or less*							
1 to 24 % of AW	-0.178	0.029	-4.940	0.000	0.134	-0.234	-0.121
25 to 49 % of AW	-0.435	0.030	-12.240	0.000	0.419	-0.494	-0.376
50 to 99 % of AW	-0.486	0.033	-11.700	0.000	0.382	-0.551	-0.422
100 to 199 % of AW	-0.240	0.043	-1.880	0.060	0.003	-0.325	-0.155
200 % of AW or more	-0.238	0.048	-1.730	0.084	0.001	-0.333	-0.143
SECTOR							
Health services*							
Mining, manufacturing, utilities	0.029	0.074	0.400	0.688	0.142	-0.116	0.175
Construction	0.068	0.079	0.890	0.374	0.099	-0.087	0.223
Trade and repair	0.203	0.079	2.700	0.007	0.196	0.049	0.358
Transport and storage	0.177	0.093	2.020	0.043	0.041	-0.006	0.359
Accomodation and food services	0.127	0.083	1.610	0.108	0.083	-0.037	0.290
ICT	0.158	0.122	1.390	0.165	0.021	-0.081	0.397
Financial services	0.062	0.115	0.570	0.572	0.021	-0.163	0.288
Professional services	-0.010	0.077	-0.130	0.894	0.080	-0.161	0.140
Public sector	0.723	0.028	9.750	0.000	0.042	0.669	0.777
Education	0.529	0.076	5.700	0.000	0.039	0.380	0.678
Agriculture	0.330	0.086	3.930	0.000	0.069	0.162	0.498
Others	0.620	0.057	8.090	0.000	0.117	0.508	0.733

*Baseline category