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The Effect of Tax Progressivity on the Quality of Entrepreneurship

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The Effect of Tax progressivity on the quality of entrepreneurship:
How significant is the phenomenon of “poor entrepreneurship”?

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Abstract

We develop a simple theoretical model that analyzes the interaction between progressive taxation, effort and wealth creation. We show how progressive taxation, while not affecting the behavior of entrepreneurs with less profitable profit opportunities, leads entrepreneurs benefiting from good or fairly good opportunities to reduce effort in order to lower the tax burden they would face should they maintain higher levels of effort. We then test the model predictions using data from small and medium-sized Italian firms from the Lombardy region in Italy and use the values for return to assets (ROA) as proxy for entrepreneur’s effort. The empirical results suggest that, indeed, progressive taxation causes entrepreneurs to lower their effort.

Keywords: Taxation, quality of entrepreneurial activity, entrepreneur’s effort, Italian (Lombardy region) firm-level data

JEL classification*:* H25, L25, L26

1. Introduction: Good, bad and lazy entrepreneurs

Because entrepreneurship is rightly perceived by many as one of the main drivers of prosperity and welfare,[1] there exists a vast literature on its possible determinants. Rational individuals being sensitive to incentives, part of this literature has looked into the effects of taxation on entrepreneurship. Myriads of studies have hence flourished with the aim to analyze the impact of various taxation schemes on entrepreneurship.[2]

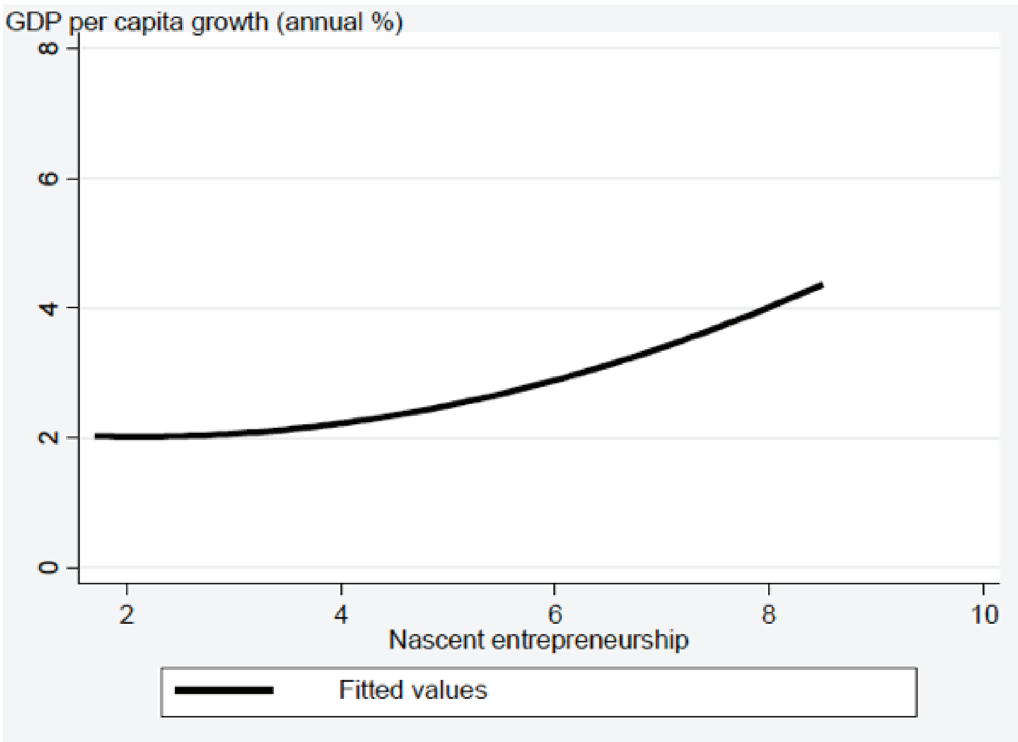
Quickly it appeared that, from a theoretical angle, the link between taxation and entrepreneurship is a complex one. For instance, if higher tax rates reduce the expected return from entrepreneurship they also reduce return on other activities and, because return from entrepreneurship are often easier to hide from fiscal authorities, one can think of settings in which higher tax rates would go with *more* entrepreneurship instead of less. Such "theoretical uncertainty" called for empirical testing and, unsurprisingly, there has been many such tests based on macro as well as micro level data.

When engaging in empirical investigations of the link between taxation and entrepreneurship, a recurrent question has been the choice of a good proxy for entrepreneurship.[3] A widely used—and somehow natural—proxy is the birth of new firms (nascent entrepreneurship); the idea being that the entrepreneur will often have to set up a firm in order to exploit the profit-generating innovation that he/she has perceived. The birth of new firms should therefore be highly and positively correlated with entrepreneurship.

[1] A large number of recent empirical studies have found a positive impact of entrepreneurship on growth. See, for example, Braunerjhelm and Borgman (2004), van Stel et al. (2005), Wong et al. (2005), Audretsch et al. (2006), and van Stel and Suddle (2008).
[2] See Baliamoune-Lutz and Garello (2014) for a recent survey of this literature.
[3] As a matter of fact, the problem is so intricate that it is tempting to test directly the correlation between taxation and growth, keeping entrepreneurship as part of the story used to explain the correlation.

As shown in Figure 1, the rate of nascent entrepreneurship[4] is positively correlated with growth (data are for 15 OECD countries over the period 2000-2008).

Figure 1. Growth and entrepreneurship



Source: Baliamoune-Lutz and Garello (2014)

Therefore, if it were possible to design a tax policy promoting nascent entrepreneurship we could by the same token promote wealth-creation. However, using firms' birth rate as a proxy for entrepreneurship is not without drawbacks and if we are able to find a better proxy for entrepreneurship, one should also be able to design an even more efficient tax policy.

One problem with using nascent entrepreneurship as a proxy is that entrepreneurship might

[4] Nascent Entrepreneurship Rate is the percentage of 18-64 population who are currently a nascent entrepreneur, i.e., actively involved in setting up a business they will own or co-own; this business has not paid salaries, wages, or any other payments to the owners for more than three months (see Baliamoune-Lutz and Garello, 2014 for more details).

also take place in large and well-established firms.[5] Secondly, one can start a business for reasons other than exploiting a new, growth-enhancing idea. As noted above, the main motivation to open a business could simply be to avoid taxes. Some might also be pushed towards self-employment by a long period of unemployment and the scarcity of job's openings.[6] As a consequence, a policy that promotes nascent entrepreneurship might promote simultaneously "bad and good" entrepreneurship.

Even assuming away the problem of "bad entrepreneurship", a third problem remains when we use the birth of new firms as a proxy for entrepreneurship. Indeed, the use of this proxy pushes us towards an overly simplistic vision of entrepreneurship: either the individual grasps the profit opportunity and becomes a wealth-creating entrepreneur or else she lets it pass and remains employed or unemployed depending on the case. In reality, however, to implement and develop the entrepreneurial idea requires effort, so that wealth creation is surely the result of *a combination* of smart vision—that might lead to the birth of a new firm—*and effort on the part of the entrepreneur*. Clearly, two entrepreneurs starting with the same "idea" will create greater or lesser wealth relative to each other depending on how much effort each one of them puts into the development of her enterprise.

Hence, taxation would potentially affect entrepreneurship—and beyond it wealth creation—through two channels: first it impacts the number of innovations and second it impacts how much effort goes into developing those innovative projects. It is the purpose of this study to investigate simultaneously these two channels. In other words, we wish here to better understand—using both the analytical and the empirical point of view—not only the impact of taxation on what can be called "entrepreneurial activity" but also on *the quality of entrepreneurial activity* where by quality we mean here the level of effort that the entrepreneur puts into her business.

[5] On the other hand, we also know that large firms develop often through acquisitions of smaller, innovative entities.
[6] Gohmann and Fernandez (2013); Thurik et al. (2008).

The rest of the paper is organized as follows. The next section presents a simple model that analyzes the interaction between progressive taxation, effort and wealth creation. We show how progressive taxation, while not affecting the behavior of entrepreneurs with less profitable profit opportunities, leads entrepreneurs benefiting from good or fairly good profit opportunities to waste part of their opportunity by choosing to lower their effort in order to reduce their tax burden. Hence progressive taxation does affect, if not the quantity of entrepreneurship, at least its quality, that is to say, the effect of entrepreneurship on wealth creation. The model allows us to better understand the impact of taxation on the quality of entrepreneurship (defined as the level of effort) and therefore on the level of wealth creation. In a context of progressive taxation, only those individuals facing a relatively modest profit opportunity will develop the wealth-maximizing level of effort. Those individuals facing a more serious profit opportunity will exercise a level of effort below the wealth-maximizing one and, in some cases, will even reduce their effort below what they would have done with a less interesting opportunity.[7]

The following section provides an empirical analysis of the link between the tax burden and the level of effort based on micro-data from Italian companies; a country where the tax burden has reached unprecedented levels (see data from PricewaterhouseCoopers Paying-taxes 2014, page 156 reproduced here as Annex A) and where growth remains slow.

We should note that this study is different from our previous work (Baliamoune-Lutz and Garello, 2014), where we focused on studying the impact of taxes and tax progressivity on nascent entrepreneurship without distinguishing between innovation-promoting entrepreneurship and 'poor quality' entrepreneurship. In addition, that study was mainly empirical and did not include a theoretical model.

[7] As noted in Baliamoune-Lutz and Garello (2014) "The story about wealth creation is in fact a story about productive versus unproductive entrepreneurship." Also see Baumol (1990) and Colombatto and Melnik (2008).

2. Progressive taxation and the quality of entrepreneurship: a simple model

To study the impact of progressive taxation on the decision making process of the entrepreneur we assume an individual who has already perceived an opportunity for profit and must decide whether or not to seize it. If she decides not to seize the opportunity we assume that her revenues will nonetheless reach a fixed and exogenous amount B.[8] If, on the other hand she opts for self-employment, she will also have to choose a level of effort, e, knowing that her before-tax revenues depend on both the quality of the opportunity, θ, and the amount of effort.[9] In addition, effort is costly and marginal cost of effort is supposed to be increasing. We will, accordingly, take for cost of effort the function: $C(e)=e^2$. With the above assumptions, the decision maker must choose one of the following two options:[10]

1. Reject the profit opportunity and receive a revenue B, or
2. Seize the opportunity, choose a level of effort e and receive as before-tax profit the amount: $\pi(\theta, e) = \theta e - e^2$

The focus of the model is on the choice of the level of effort knowing θ, and taking into account the fiscal constraint. Once a level of effort is chosen, the decision of whether or not to be self-employed follows trivially from a comparison with the outside opportunity, B.

The average rate of taxation is progressive. To simplify, it is assumed that for a revenue R the levies will be:

$T(R) = 0$ if $R < S$ and $T(R) = \tau(R-S)$ otherwise,

[8] This can be, for instance, her actual salary.
[9] Hence, the revenues from entrepreneurship are supposed to be known beforehand with certainty. Efforts are necessary to develop and increase the value of the business but not its chances of success.
[10] Costs other than those related to effort are supposed to be taken into account in the value of θ.

where S is some revenue-threshold, fixed by tax law, below which income is not taxable. As we know from previous literature, the impact of income taxes paid by the entrepreneur greatly depends on which expenses are tax-deductible, that is, on the definition of taxable income.[11] For this reason, we will first study the case where the cost of effort is deductible so that taxable income is $\theta e - e^2$. We will then study the case where taxable income is the entire θe.[12]

2.1. Impact of progressive taxation on entrepreneurship and effort when all costs are deductible

The entrepreneur seizing an opportunity θ is choosing a level of effort that maximizes after-tax profit. Given the above hypothesis, after-tax profit is given by:

$$\pi(\theta, e) = \theta e - e^2 \quad \text{if } \theta e - e^2 < S \tag{1}$$

$$\pi(\theta, e) = \tau S + (1-\tau)(\theta e - e^2) \text{ otherwise} \tag{2}$$

Clearly, the relationship between the optimal level of effort and the size of the opportunity, θ, will be the same whether or not the entrepreneur is taxable:

$$e^* = \text{argmax}_e \; \theta e - e^2$$

$$e^* = \theta/2 \tag{3}$$

This confirms a well-known result: when costs are deductible, taxation has no impact on the level of activity deployed inside the company. Here, to the extent that the cost of effort is entirely deductible, the level of effort is not affected by taxation.

[11] See, for instance, Stiglitz (1976).

[12] We assume here that effort is the only input so that the total cost to the company is a function of e only. We could alternatively assume a more general cost function $C(e)$. The conclusions will remain the same.

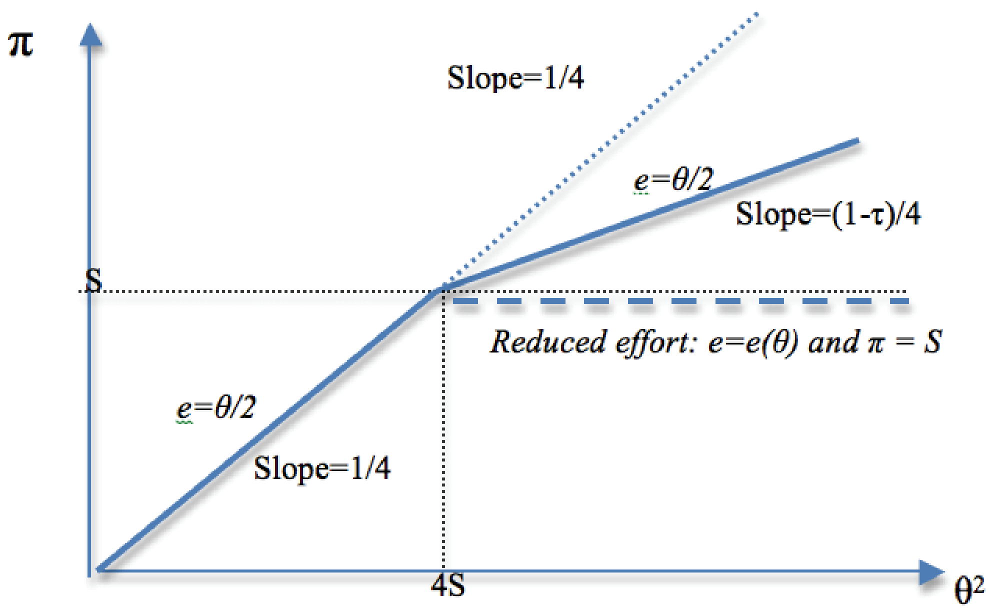
Replacing *e* with its optimal value *e** given in (3) gives optimal profit.

(4) $\pi(\theta) = \theta^2/4 \quad if\ \theta^2 < 4S$

(5) $\pi(\theta) = \tau S + (1-\tau)(\theta^2/4)\ if\ \theta^2 \geq 4S$

Since profit is a linear function of θ^2, we can easily visualize the evolution of profit as θ takes various values.

Figure 2: Evolution of profit and effort when cost of effort is deductible



Note that, when cost of effort is deductible, there is no incentive to reduce effort. The "reduce-my-effort-so-that-I-don't-pay-tax" strategy (the dashed line on figure 2) yields S which, for $\theta^2 \geq 4S$, is lower than what can be obtained if the wealth-maximizing level of effort $e = \theta/2$ is chosen and the entrepreneur pays taxes.

2.2. Impact of progressive taxation on entrepreneurship and effort when costs are not deductible

When cost of effort is not deductible from taxable income, after-tax profit is given by:

(1') $\pi(\theta, e) = \theta e - e^2 \quad if\ \theta e < S$

(2') $\pi(\theta, e) = \tau S + (1-\tau)\theta e - e^2\ otherwise$

Given a level of θ, the individual will select the level of effort that maximizes her after-tax profit. Again taking e^* as given in equation (3), two cases must be considered:

<u>Case 1:</u> $\theta e^* < S$ (i.e., given equation (3), $\theta^2/2 < S$)

In that case, the individual who decides to grasp the profit opportunity will perform the socially optimal (growth enhancing) level of effort and will not be taxed.

Let $\theta°$ denote the maximum value of θ for which this case applies. Here, $\theta° = (2S)^{1/2}$.

<u>Case 2</u>: $\theta e^* \geq S$ (i.e., $\theta^2/2 \geq S$ or equivalently $\theta \geq \theta°$)

The entrepreneur will have to choose the more profitable of two strategies:

- Reduce the level of effort just enough so that she does not pay taxes (strategy 1).
- Choose the optimal level of effort taking into account the fact that she will be taxed (strategy 2).

<u>Strategy 1</u>: "reduce-my-effort-so-that-I-don't-pay-tax"
Here the level of effort, noted e^{inf}, will be adjusted so that turnover remains low enough to avoid having to pay taxes. Namely, the level of effort is given by:

(6) $\theta e^{inf} = S$, or equivalently $e^{inf} = S/\theta$.

Clearly and as expected, the lower the threshold S above which the entrepreneurs is taxed, the lower the level of effort will be. Also, everything else being equal, the better the opportunity for growth is (i.e., the higher θ is), the more important will be the lowering of effort. If and whenever such strategy is used, entrepreneurship will not translate into significant economic growth.

From (1') and (6) we see that profit will be given by:

(7) $\pi_1(\theta) = S - (S/\theta)^2$

<u>Strategy 2</u>: "work hard and pay taxes"

In this case, the entrepreneur goes for the optimal level of effort given that taxes will have to be paid. The level of effort will therefore be e^{sup} such that:

(8) $e^{sup} = \text{argmax}_e \ \pi_2(\theta, e) = \tau S + (1-\tau)\,\theta e - e^2$

Hence:

(9) $e^{sup} = (1-\tau)\,\theta/2$

Not surprisingly, effort decreases when the tax rate, τ, increases, and is lower than what it would have been in the absence of taxes.

From (2') and (9) we deduce the after-tax profit:

(10) $\pi_2(\theta) = \tau S + (1-\tau)^2\,\theta^2/2 - (1-\tau)^2\,\theta^2/4 = \tau S + (1-\tau)^2\,\theta^2/4$

Keeping in mind that this level of profit is valid only for $\theta e \geq S$, the graph below visualizes the choice of the best strategy and the resulting profit when τ is set at ½.

Three zones appear:

- *for θ^2 below 2S*: we are in case 1. Effort is set at $\theta/2$ that maximizes $\theta e - e^2$ and profit is given by $\pi(\theta) = \theta^2/4$; a simple linear function of θ^2 as represented on the graph.
- *for θ^2 between 2S and 4S*: we are in case 2 and the entrepreneur chooses strategy 1. Effort is therefore reduced in such a way that no tax is paid ($e = S/\theta$). Profit is an increasing function of θ^2 given by $\pi(\theta) = S - (S/\theta)^2$

- *for θ^2 above 4S*: for such high values of θ strategy 2 becomes optimal. The entrepreneur chooses a level of effort which, she knows, will make her "taxable". Given our assumption that τ is set at ½, her level of effort will be $\theta/4$. Profit becomes again a linear function of θ^2 this time, however, with a lower slope compared to the first zone due to the combined effect of taxation and a level of effort that is less sensible to the size of the opportunity ($e(\theta) = \theta/4$ instead of $\theta/2$) .

Figure 3: Evolution of profit and effort when cost of effort is not deductible (τ=1/2)

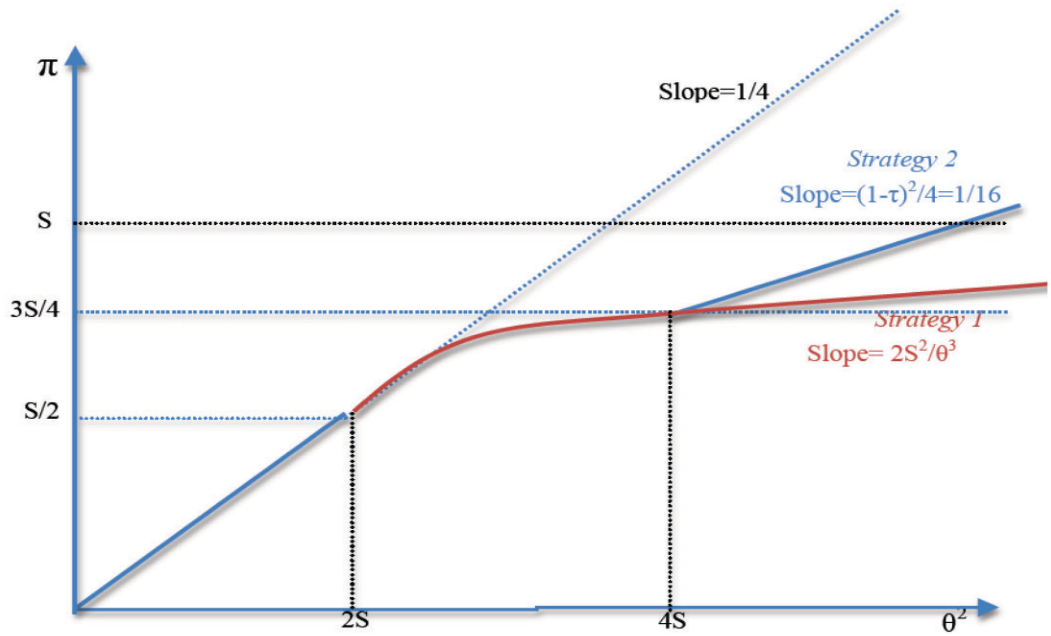
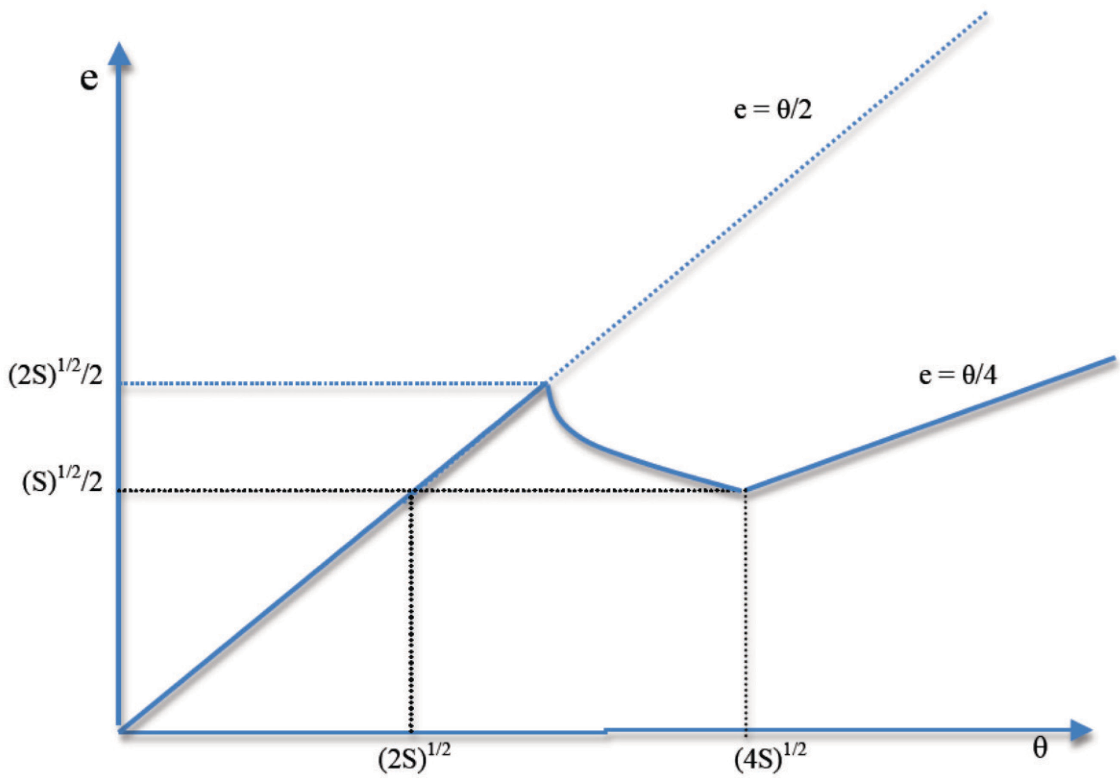


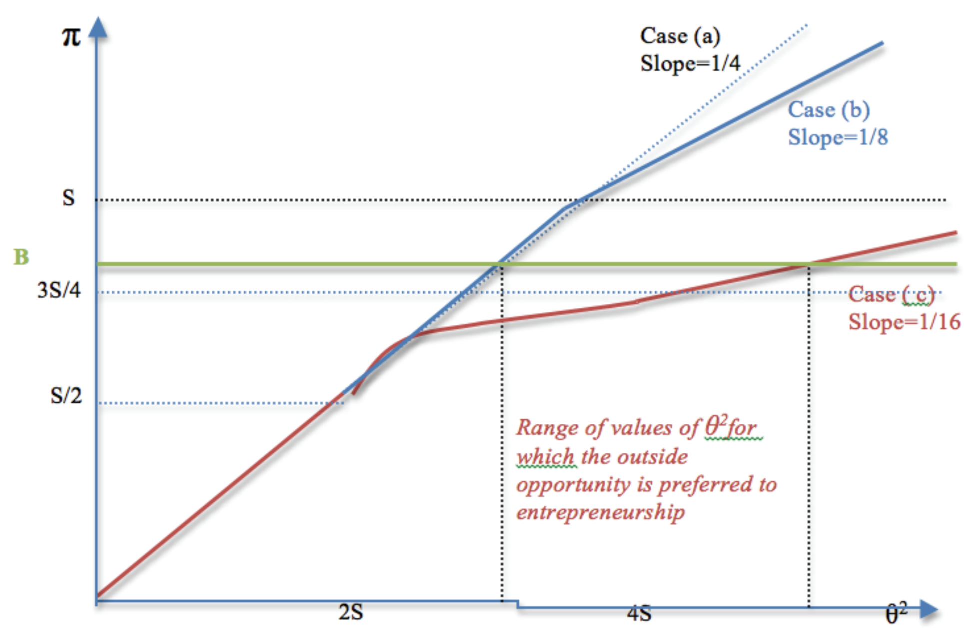
Figure 4 is another way to illustrate the impact of progressive taxation on the level of effort chosen by the entrepreneur (keeping the assumption of a 50% income tax rate for income above a threshold *S*). There is an absolute reduction of effort when mid-range opportunities are considered. If for "top opportunities", the reduction in effort is less an important, level of effort remains below its growth-maximizing level.

Figure 4: Evolution of effort when cost of effort is not deductible (τ=1/2)



We are now in a position to better understand the effect of taxation on the quality of entrepreneurship. It is indeed often underlined that taxation may have a negative impact on the number of nascent enterprises. This, as a matter of fact, can be illustrated in Figure 5 where we have plotted the outside opportunity revenue (B) as well as profits derived from entrepreneurship in three different contexts: (a) no tax, (b) taxed with all efforts deductible and (c) taxed without the possibility to deduce effort-related costs. Clearly, there exists a range of opportunity for which a decision maker who would have entered entrepreneurial activity in contexts (a) and (b) will not seize the opportunity in context (c). But, and this is an often neglected point, even when entering entrepreneurship, and regardless of whether we are in context (b) or (c), progressive taxation will reduce the impact of entrepreneurship on growth. To put it differently, if taxation does not always reduce the amount of entrepreneurship, it does have a negative impact on wealth creation due to a significant reduction of effort.[13]

Figure 5: Impact of various tax schemes on self-employment and effort



It is precisely the purpose of the next section to explore whether we can empirically confirm an impact of taxation (tax burden) on the level of entrepreneurial effort, that is, on the quality of entrepreneurship. Needless to say, there are many parameters besides taxation that can impact the choice of the level of effort undertaken by the entrepreneur if only because there might be motivations others than profit at work (for instance, the prestige from and respect for developing a large size company).

[13] Although we consider here a progressive scheme with only two tax brackets, the logic easily extend to the case of many brackets. Once should then expect after each change of bracket, first, a drop in the absolute level of effort followed by an increase in the level of effort as θ increases but at a lower pace than in the previous bracket. Hence, the better the opportunity, the larger the gap between actual level of effort (that is, the level optimal from the point of view of the taxed entrepreneur) and the growth-maximizing level (understood as the level optimal for the individual in absence of taxation) will be.

3. An empirical test of the link between taxation and quality of entrepreneurship

The above model illustrates the way in which the entrepreneur's effort is a primary contributor to the quality of entrepreneurship. In fact, we consider effort as an indicator of the quality of entrepreneurial activity. Thus, one way to test the prediction of our theoretical model is to empirically analyze the impact of taxation on effort using data on small and medium enterprises. This is the main purpose of this section.

3.1 Data and methodology

In the empirical analysis, we focus on data from a large group of small and medium-sized enterprises (SMEs) in the Lombardy region in Italy.[14] Focusing on a specific region (province) helps reduce the significant heterogeneity that can result from examining data from various countries or regions from the same country.

Our proxy for entrepreneur's effort is the firm's return on assets (ROA). Ideally, we would have liked to use hours worked (by the entrepreneur) as a measure of entrepreneurial effort but due to unavailability of data on this variable, we resort to use of ROA which generally represents management's success in using the firm's assets to generate earnings. It is calculated as the ratio of net income to average total assets. Studies that have used total hours worked by the entrepreneur as a measure of entrepreneurial effort have found that effort (number of hours worked) has a positive effect on firm's performance of the firm. This is also supported by existing theoretical model. For example, Bitler et al. (2005) develop a principal-agent model in an entrepreneurial setting and show that "effort

[14] The source of data used in the empirical analysis is the Italian company business information (firm level) database *analisi informatizzata delle aziende* (Aida) which is produced by Bureau van Dijk. Details on how to access the database can be found at *www.bvdinfo.com*.

increases with ownership; and effort increases firm performance."

We use the ratio of taxes multiplied by 100 to profit/losses before taxes as an indicator of taxation. We refer to this variable as average tax rate. We use (in log form) on the right-hand-side of the equations both the level (avtax) and the square (avtax squared) form of taxation. In addition, we control for the firm's revenues from sales and services (revenues), number of employees in the firm (numemp), average wage (avwage), defined as the ratio of wages and salaries to the number of employees in the firm, and the effect of time. The data cover the period 2001-2010 and the panel is somewhat unbalanced as not all firms have data for each of these years. We include firms that have only up to 500 employees for at least 6 of the 10 years considered here.

The methodology consists of performing ordinary-least squares (OLS) and fixed-effects estimations, as well as Arellano-Bond generalized method of moments (GMM) estimation (Arellano and Bond, 1991). We first undertake a pooled-data OLS. However, given that these are panel data and there is need to control for fixed effects we also perform fixed-effects estimations using the following equation.

$$y_{it} = \beta x_{it} + \alpha_i + \mu_{it} \tag{1}$$

Where y_{it} is ROA in firm i at time t, α and β are parameters to be estimated, x_{it} is a vector of explanatory (RHS) variables, α_i is firm-specific effects, and μ_{it} is the error term. In addition, given that the performance of firms may influence the average tax rate (mainly through its effect on expected profits and losses) there is a potential endogeneity problem which warrants use of estimators that would take endogeneity into account. We opt for the Arellano-Bond dynamic generalized method of moments (A-B GMM) mainly due to the difficulty in finding appropriate instruments for an instrumental variable estimation.

The A-B GMM estimator eliminates unobserved individual specific effects by first-differencing equation (1) and after adding the lagged dependent variable on the right-hand side (RHS) we get the following equation

$$y_{it} - y_{it\text{-}1} = \lambda(y_{it\text{-}1} - y_{it\text{-}2}) + (x_{it} - x_{it\text{-}1})'\beta + (\varepsilon_{it} - \varepsilon_{it\text{-}1}) \qquad (2)$$

Clearly, the term $(y_{it\text{-}1} - y_{it\text{-}2})$ in equation (3) is correlated with the error term $(\varepsilon_{it} - \varepsilon_{it\text{-}1})$. In addition, the potential explanatory variables contained in vector x may be endogenous variables. This requires that we use instruments to control for the endogeneity problem. The A-B GMM uses appropriately lagged levels of the differenced RHS variables as instruments. We test for second-order autocorrelation and overidentifying restrictions (Sargan test) to assess the validity of the instruments and all reported estimates pass both tests.

3.1 Empirical results

Table 1 presents pairwise correlations between relevant variables. We note that the correlation between ROA and the other variables is rather weak. Its correlation with average tax rate is negative but quite low (-0.13). The only coefficients of correlations that exceed 0.5 are between assets and revenues (0.68) and assets and number of employees (0.60). The association between average taxes and ROA seems to be, as Figure 6 suggests, non-monotonic. The data are humped in the middle, with a somewhat flat association to the left and to the right of the hump.

Table 1

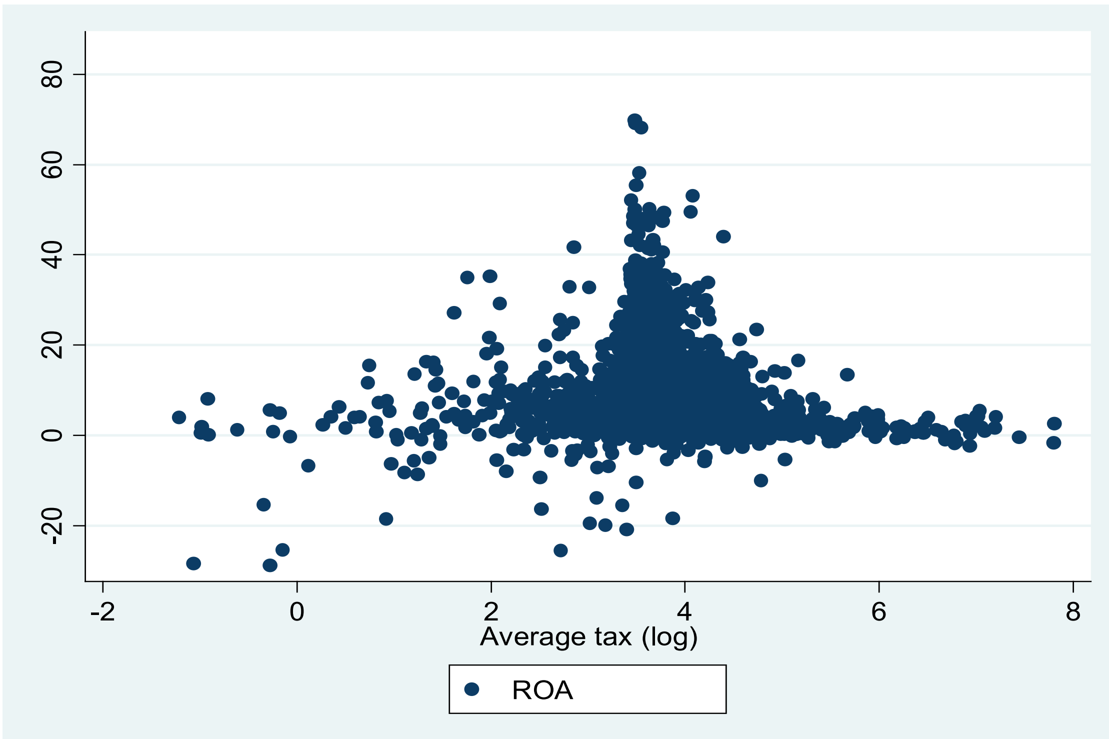
Tax variables – correlation (p values are in parentheses)

	ROA	average tax	profit before taxes	number of employees	assets	revenues
average tax	-0.131					
	(0.00)					
profit before taxes	0.292	-0.178				
	(0.00)	(0.00)				
number of employees	-0.041	0.029	0.079			
	(0.00)	(0.10)	(0.00)			
total assets	-0.069	-0.162	0.149	0.601		
	(0.00)	(0.00)	(0.00)	(0.00)		
revenues	0.004	-0.085	0.22	0.484	0.685	
	(0.76)	(0.00)	(0.00)	(0.00)	(0.00)	
average wage	-0.008	-0.006	0.032	-0.006	0.232	0.156

	(0.55)	(0.72)	(0.02)	(0.64)	(0.00)	(0.00)

See information on source of data and variable description in the text (section 3.1).

Figure 6: ROA (%) and average tax



Source: Authors' calculations based on raw data from AIDA database (Bureau van Dijk, 2012).

Table 2 shows the results from the three types of estimations. The pooled-data OLS estimates indicate that the lagged value of ROA has a significant correlation with its contemporary value, suggesting some persistence in the ROA levels However, the average tax burden seems to have no significant effect while its square form has a negative effect, suggesting that low level of taxation may not affect ROA while higher tax rates would have a negative impact on effort (proxied by ROA). We also find that revenues from sales and services have a positive impact while the effect of time is negative.

The next set of results is obtained using the fixed-effects estimator. We find that the effect of taxes (in level) is positive and statistically significant while the impact of avtax squared remains negative, suggesting the presence of an inverted-U relationship between taxation and entrepreneurial effort (proxied by ROA). We also find that revenues from sales and services have consistently positive effect while time has a negative impact. In addition, there is evidence of a negative impact of the number of employees on ROA.

Discussing the results from pooled-data OLS and fixed-effects estimations we have used the terms effects and impact rather loosely, as these relationship could be purely correlations not true effects. Given that taxes and wages and salaries may very well be influenced by entrepreneurial effort (ROA), some causality may be running from ROA to taxes and wages which would create an endogeneity problem. We thus estimate the same equations using the A-B GMM technique, as noted earlier.

The A-B GMM estimates shown in the last three columns confirm the main results. Indeed, we find that taxation initially has a positive effect on the quality of entrepreneurial activity but this effect becomes negative at higher average tax rates (inverted U effect). Again, the impact of revenues is statistically significant and positive while the effect of the time of employees is negative and significant. There is some weak evidence that average wage has negative effect (significant at the 10-perecent level). The effect of time could also be interpreted as the age of the firm. In general, newer small and medium-sized businesses tend to experience more dynamism and managerial effort on the part of the entrepreneurs/owners.

The empirical results support the prediction of the model we present in this paper. The results provide evidence that beyond a certain level, higher taxes would result in lower effort on the part of the entrepreneur, thus lowering the quality of entrepreneurial activity and reducing firm's performance. Using the results in the last column, the turning point in the relationship between taxation and the quality of entrepreneurship occurs at a tax rate of approximately 33.9%. This implies that average tax rates greater than 33.9% would lead to significant decline in entrepreneurial effort and lower the quality of entrepreneurship.

Table 2
Effects of taxes and other variables on ROA
Tax rate = (taxes)/(profits and losses before taxes)

	OLS (with robust standard errors)			Fixed effects			A-B GMM[a]		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
lagged ROA	0.592*** (0.06)	0.591*** (0.07)	0.593*** (0.07)	0.206*** (0.01)	0.205*** (0.02)	0.206*** (0.02)	0.095*** (0.03)	0.116*** (0.02)	0.097*** (0.02)
avtax	1.557 (1.09)	1.519 (1.09)	1.514 (1.10)	2.321*** (0.49)	2.183*** (0.49)	2.014*** (0.49)	7.224*** (2.38)	4.771** (2.38)	5.012*** (1.938)
avtax squared	-0.307** (0.14)	-0.305** (0.14)	-0.299** (0.14)	-0.393*** (0.06)	-0.384*** (0.06)	-0.366*** (0.06)	-1.06*** (0.31)	-0.755** (0.31)	-0.711*** (0.31)
number of employees	-0.0002 (0.0003)	-0.0002 (0.0003)	-0.0001 (0.0004)	-0.003* (0.001)	-0.002 (0.002)	-0.003** (0.001)	-0.003 (0.002)	-0.001 (0.002)	-0.003 (0.002)
revenues	0.119 (0.17)	0.153 (0.17)	0.363** (0.15)	1.074*** (0.27)	1.697*** (0.29)	2.518*** (0.32)	1.830*** (0.37)	2.993*** (0.37)	3.587*** (0.45)
Time		-0.111* (0.05)	-0.112** (0.05)		-0.311*** (0.05)	-0.348*** (0.06)		-0.443*** (0.07)	-0.418*** (0.07)
avwage			-0.002 (0.002)			-0.003 (0.002)			-0.025* (0.01)
No. of obs.	3071	3071	3025	3071	3071	3025	2174	2174	2145
F stat (p value)	23.77 (0.00)	24.13 (0.00)	20.78 (0.00)	51.98 (0.00)	47.77 (0.00)	45.38 (0.00)			
R-sq (OLS)	0.43	0.44	0.44						
R-sq: within between overall				0.10 0.33 0.33	0.11 0.28 0.29	0.12 0.23 0.26			
Wald Chi2 (p value)							48.04 (0.00)	90.05 (0.00)	98.80 (0.00)

See information on source of data and variable description in section 3.
Robust standard errors are in parentheses.
* indicates significance at 0.10 ** indicates significance at 0.05 and *** indicates significance at 0.01.
[a] The variables average tax and its squared form, as well as the variable average wage, are treated as endogenous.

4. Summary and discussion

In this paper, we develop a simple theoretical model that studies the interaction between progressive taxation (an increase in the average tax rate), effort and wealth creation through entrepreneurial activity. We show how progressive taxation, while not affecting the behavior of entrepreneurs with less profitable profit opportunities, can exert a significant influence on entrepreneurs who have more profitable opportunities, causing them to waste part of the opportunity by choosing to lower their effort in order to reduce the tax burden they may face. Hence progressive taxation can have a negative effect on the quality of entrepreneurship through its adverse impact on effort.

We subject one of the model's predictions to empirical testing using a large set of Italian firm data from the region of Lombardy and find that the empirical evidence, from fixed-effects and Arellano-Bond dynamic model estimations, provides strong support to these predictions. The empirical results show that, beyond a certain average tax level, a higher average tax (indicator of tax progressivity) causes entrepreneurial effort to fall, implying an inverted-U relationship between progressive taxation and entrepreneurial effort. We find that the critical level of average taxes—a level at which the effect of higher taxes on entrepreneurial effort changes from being positive to being negative—is at an average rate of about 33.9%. Based on the 2013 Italian income tax rates for individuals, shown on the website of the *Agenzia delle Entrate* (the Italian revenue agency), the turning point occurs at a taxable income of approximately 75,015 euros (see appendix B for 2013 tax rates on individual income in Italy). [15]

Overall, the theoretical and empirical results point to a potential adverse effect of progressive taxation on the quality of entrepreneurship through a negative impact on

[15] Ideally, we would have liked to have data on the evolution of firm's market value to be able to explore whether progressivity places a "cap" on the profitability of the SME. At some point the entrepreneur stops looking for innovation by reducing effort. However, we were not able to get market value for the SMEs for which we have data on other relevant variable (due to their unavailability).

entrepreneur's effort. To the extent that innovation depends on good quality entrepreneurship, these findings also suggest that progressive taxation can have a negative influence on innovation. This would be consistent with studies that have identified a negative influence of progressive taxation on innovation (see, for example, Keuschnigg and Nielsen, 2000).

An important corollary of the theoretical and empirical results we obtain in this paper is that even when progressive taxation is found to have a positive effect or have no effect on the quantity of entrepreneurship (Bruce and Deskins, 2012; Bacher and Brülhart, 2010) it can still exert a significant negative impact on the quality of entrepreneurship thereby causing entrepreneurial activity to have little or no effect on growth.

Also, our work provides insight into the growth of businesses. In particular, it suggests that, besides the difficulty of raising capital, the relative lack of mid-sized company in countries could be explained by the fact that taxation is high and progressive.[16] Actually the two effects naturally reinforce each other: in order to grow, a small business needs at some point to raise capital and this requires effort. If effort is not "tax deductible" and tax rates are high, the entrepreneur will not push for an increase in the size of her business.

The possibility that progressive taxation generates entrepreneurship of poor quality has been recently studied by Asoni and Sanandaji (2013)[17]. They develop a model where, at the

[16] The lack of mid-sized enterprises in France—a country where companies and individuals are heavily taxed—was recently noted in The Economist. They wrote: "It is the second gap in corporate France that is both more striking and more worrying: the absence of mid-sized companies like Germany's *Mittelstand* firms, which form the backbone of the German economy. According to one estimate, France has just over 4,000 medium-sized enterprises, proportionately only half as many as Germany and Britain. And the average French company, with just 14 employees, is a lot smaller than the average German one, which has 41." The Economist, November 17th 2012, last downloaded August 31 2014 at: http://www.economist.com/news/special-report/21566236-france-needs-more-start-ups-and-mittelstand-firms-lack-enterprise

[17] Gentry and Hubbard (2005) also examined whether tax progressivity discourages innovative entrepreneurs but failed to derive strong evidence to support this hypothesis. Also, the empirical results obtained in Harju and Kosonen (2012) imply that lower taxation results in a rise in firm turnover in Finland. The authors interpret firm turnover as an increase in 'effort exerted by their owners'.

beginning of each period, each employee decides (on the basis of the opportunities available to him/her) to become self-employed or remain an employee. The decision of the employee, therefore, depends on: (i) the value of the ideas that he/she has (and that are randomly distributed), (ii) the likelihood to get a better idea in the future, (iii) what he/she earns as an employee and, of course, and (iv) the tax structure. Asoni and Sanandaji show that a progressive tax will drive more employees towards self-employment (higher quantity), but at the expense of quality. That is, they become self-employed even if their idea for a business is not very profitable. The intuition is that progressivity makes it more costly to wait for an excellent idea to start a business. Put differently, the individual prefers to jump at the first opportunity available, even if not very profitable. The authors rightly underline the difficulty of tracing back the effects of taxation.

However, while Asoni and Sanandaji's study examines the same main issues as our present work, ours makes a novel contribution to the theoretical and empirical literature in that we focus on the interaction between progressive taxation and entrepreneur's effort and use the latter as a proxy for entrepreneurial quality.

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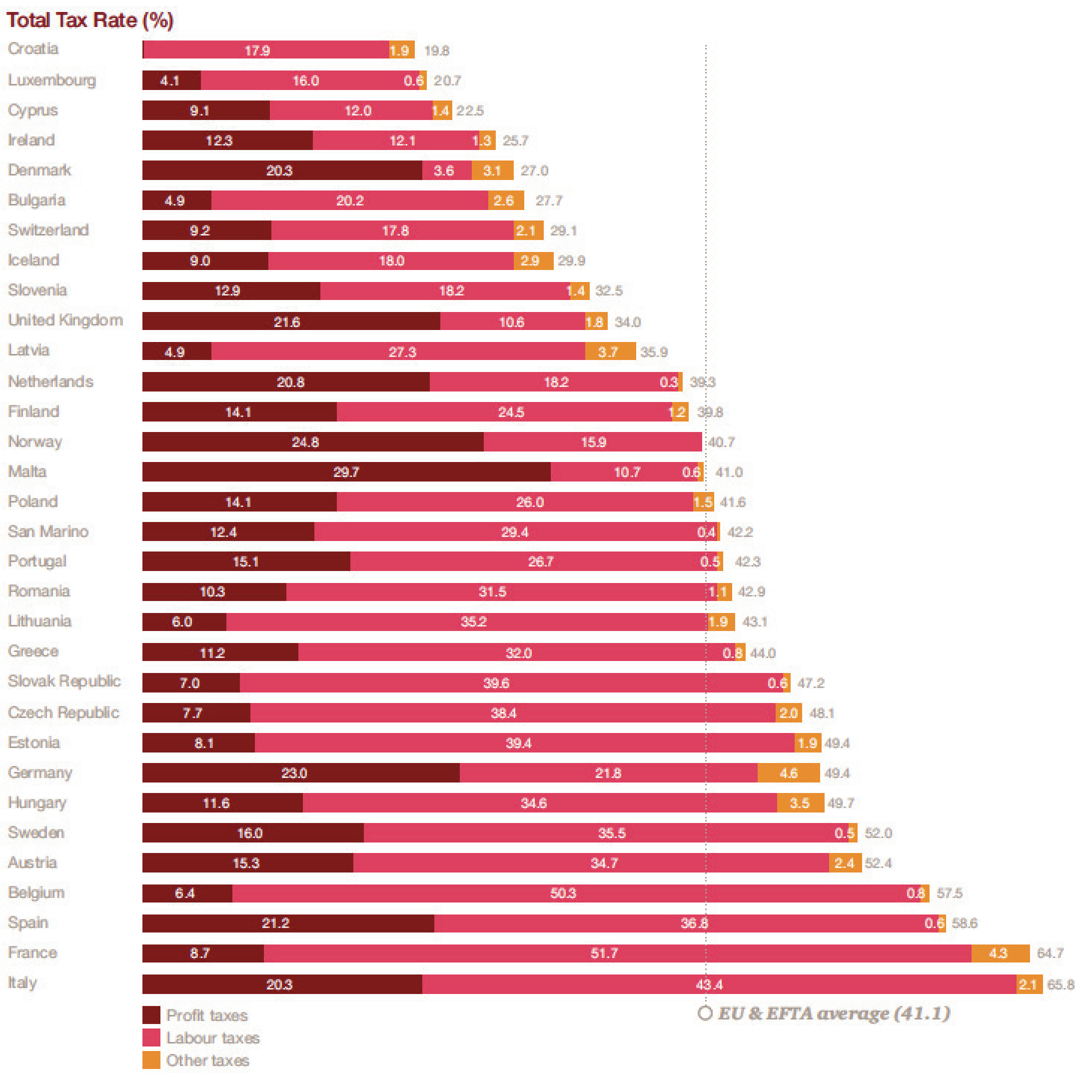
Annex A:



PricewaterhouseCoopers Paying-taxes 2014 (page 156)

Appendix B

Table for calculating Irpef

Taxable Income	**Rate**	**IRPEF (Gross)**
up to 15,000 euros	23%	23% of income
more than 15,000 and up to 28,000 euros	27%	3,450 + 27% on the part exceeding 15,000 euros
more than 28,000 and up to 55,000 euros	38%	6,960 + 38% on the part exceeding 28,000 euros
more than 55,000 and up to 75,000 euros	41%	17,220 + 41% on the part exceeding 55,000 euros
more than 75,000 euros	43%	25,420 + 43% on the part exceeding 75,000 euros

Source: www1.agenziaentrate.gov.it/inglese/italian_taxation/income_tax.htm#Rates and income brackets