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Tax wedge, employment and productivity: micro and macro evidence.

Coordinatore:

Prof. Sergio Destefanis

Relatore:

Prof. Giovanni Pica

Candidato:

Dott. Andrea Festa

Matricola: 8880100035

Tax wedge, employment and productivity:

micro and macro evidence.

Alla mia famiglia,

a Tiziana e a tutti coloro che mi sono stati vicini.

Summary

Chapter 1.

Fiscal policy, employment and productivity. The role of the tax wedge.

Andrea Festa[•]

University of Salerno

Abstract

Fiscal policy has an important role in determining development in modern economies. The tax wedge on labour income may create distortions in the labour market leading to low employment and growth but, at the same time, resources taken from labour taxation can be devoted to welfare financing. These considerations have been widely debated and the aim of this paper is to present an overview on recent literature on this topic.

Keywords: tax wedge, employment, productivity. *JEL classification*: H3.

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1. Introduction

There is a long standing research related to fiscal policy and its impact on economic growth. It is important not only for academic purposes, but also for policy-makers, to obtain an in depth knowledge of the effect of fiscal policies on modern economies.

In recent years endogenous growth theory has brought to light new findings in understanding the sources of economic development. In general, the idea underlying this theory is based on the assumption that growth is a consequence of rational economic decisions.

In particular, at the firm level, enterprises invest on capital and research to gain innovation and profit, individuals increase their level of education to develop human capital and thus to have more job opportunities and high earnings during their working lifetime, governments decide between a wide range of policies to improve economic growth, i.e. encouraging foreign direct investment, enhancing educational opportunities, and so on.

The aggregation and combination of these decisions leads the rate of growth to become a variable that can be affected by fiscal policies as tax wedge on labour income. Moreover, economic theory also suggests that labour market would have in the long-run a tendency to be in equilibrium and unemployment arises when wages are not flexible enough.

The relationship between tax wedge on labour income, employment and growth is easily summarized: the more elastic is the labour supply curve the more is the negative impact of the tax wedge on labour market outcome and then on growth.

Vice versa, by assuming a vertical labour supply curve, an increase of the tax wedge on labour income would result in decreasing real wages without employment consequences. In other words, workers would accept real wages decrease entirely, given the real labour cost borne by firms. Instead, in case of a horizontal, perfectly elastic labour supply, the workers cannot accept any decrease in the real wage and thus an increase of the tax wedge would be fully paid by the firms, with reduction of labour demand and employment rates.

The underlying mechanism is easily synthetized. Workers tend to protect their living standard and firms cannot shift onto net earnings the high labour taxation. Therefore, a high labour taxation measured by tax wedge may lead to a reduced labour demand, increasing unemployment and slow productivity growth, also because workers are less motivated to increase their working effort due to high labour taxes.

Furthermore, high labour taxation can induce workers to reduce their level of education, leading to reductions in human capital accumulation, although it is difficult to disentangle the negative effect of labour taxes on growth and employment from the positive effect on welfare expenditure derived from labour taxes.

In fact, it is well-known that taxation has also positive effects. With the cash-flow generated from taxes, governments can direct some public expenditure to improve productivity, for example trough public education, infrastructures and so on, promoting employment and development.

In this paper I review the debate across this topic, with special regard to the role of the tax wedge on employment and productivity growth by analyzing both

micro and macro empirical papers. By this way it is possible to propose a scenario on tax wedge and its implications on labour market. I also review the methodologies adopted in recent studies, especially the most closer to those adopted in the following chapters.

In chapter 2 I analyze the role of the tax wedge on productivity, the main driver for growth, at the firm level. The recent attention paid from researchers to similar arguments ensures that the impact of the tax wedge on growth is an important issue and it would be important understanding the channels throughout this link may happen.

In chapter 3 I investigate the impact of the tax wedge on Italian regional employment and the special role played by tax relief policy pursued in that country during the past decades.

2. Theoretical framework

Exogenous growth theory gives a little role to fiscal policy in determining growth. The production function has constant returns to scale, rate of saving and labour supply are based on labour and capital as input variables. The theory suggests that economic growth is obtained by accumulation of capital while technical progress is exogenous and saving rates determine the level of income but not the growth.

In other words, different countries sharing same technology and saving rates would converge in the long-run to the same steady-state level of per capita income.

This assumption implies that countries with different level of development and growth convergence in growth rates in the long-run, providing they share similar (technological) characteristics. It is easy to see that this is in contrast with the reality, although some suggest the existence of a conditional convergence within countries.

Moreover, the implied hypothesis of a "deterministic optimism" for the economic world, stating that in the long-run individuals automatically direct the capital in less developed countries because it is more convenient for the investors, has no evidence. In fact, the capital is profitable if in developing countries there is availability of technology, institutions, human resources and entrepreneurship. It is in contrast with the evidence the availability of technology for all countries, developed and developing.

In other words, it is too simplified an economic world in which knowledge is an asset available without cost. It is also unrealistic not to consider the fiscal policy as a key point in determining the growth.

Moreover, exogenous theory implies that in the long-run taxation of capital is inefficient and it should be zero. This means that all taxation should be directed on labour.

Finally, the theory does not explain the determinants of saving rate. Even if saving rate could be made variable, there would be a limited number of rational economic decisions to be taxed.

The unsatisfactory explanation of growth contained in the exogenous growth theory lies in the fact that the theory does not explain how or why technological progress occurs and why there must be decreasing returns to capital.

These lacks have suggested economists to develop endogenous growth models to by-pass the problem of a not explained technology development and, at the same time, to include the taxation as a growth factor. In fact, by removing the limit of decreasing returns to capital in a way that admit individual choices to affect growth, which in turn might lead to a decreasing returns to capital, it is guaranteed a key role to fiscal policy.

Models of endogenous economic growth consider personal choices made by economic agents – as households' utility maximization or firms' profits maximization subject to budget constraint – to collectively determine the growth rate and, because these choices can be influenced by economic policy, it is guaranteed a role to tax policy in affecting growth.

An important characteristic of the endogenous growth theory is that, beyond capital and labour, for the analysis of growth is crucial considering as a growth-driver the productivity. This assumption is at the basis of the work developed in chapter 2.

Several empirical works measure productivity as Total Factor Productivity (TFP). Nevertheless the wide use of TFP as a measure of productivity, there are a number of limitations and criticism in its use, first showed by Abramovitz (1956).

The limitations consist in the fact that TFP is a residual of a fundamental equation of growth potentially incorporating not only technological changes and improvements in productivity, but also a number of possible errors arising from aggregation, incorrect specification of the model, omitted variables. This is the reason why TFP is also considered a "measure of ignorance". Other criticisms arise by denying the possibility of using aggregate measures of capital and the tendency

to equality between the rate of return on capital and marginal productivity. Rymes (1971) suggests that it is misleading to consider true the assumption of capital as a scarce factor of production, proposed by neoclassical theory, instead of a reproducible factor.

However, econometrically TFP is dependent not only from the variable included in the production function (and their possible measurement errors) but also from what variables are used as output and their grossness (Harper & Gullickson, 1999 and Balk 2003).

In particular, TFP calculated on value added is less precise then the TFP calculated on sectoral output, and sectoral output is a measure of TFP less precise then those obtained as gross production. In any case, detailed measures of gross production of firms are rarely available, and then often one has to consider more imprecise productivity measures of TFP.

Despite these well-known limitations, TFP is widely used in empirical analysis and it seems most important than labour or investment as a driver of growth. This is why in chapter 2 I use a measure of TFP to test whether tax wedge on labour income affects productivity (and then the economic growth) at the firm level.

Tax wedge is representable as difference between gross labour income and net wage paid to workers. In particular, it is the difference between what is paid by the firms, named real labour cost (RLC) and the real consumption wage of the worker (RCW). The illustration presented by the European commission (2004) synthesizes the four determinants of the tax wedge. First of all, let us consider the real labour cost as the following equality:

$$RLC = W(1+\tau_f)/P \qquad (1)$$

The real consumption wage (RCW) received by the worker has the following expression:

$$RCW = W(1-\tau_w)(1-t_i)/P(1+t_c) \qquad (2)$$

where W stands for nominal gross wage, P is the GDP deflator, τ_f is the social security contribution rate (SSC) paid by the firm, τ_w is the SSC rate paid by the worker, t_i is the tax rate on labour income and t_c is the consumption rate on goods and services (for simplicity it is assumed to be the same across all types of goods). Simple algebra leads to a reformulation of equation (1) and (2) to extract the following measure of the tax wedge:

$$Tax\ wedge = (1+\tau_f)(1+t_c)/(1-\tau_w)(1-t_i) \qquad (3)$$

or, equivalently:

$$RLC = \lambda * RWC \qquad (4)$$

where $\lambda = (1+\tau_f)(1+t_c)/(1-\tau_w)(1-t_i)$

The equation (3) shows the determinants of the tax wedge. In fact, according to the above definition, an increase of personal income taxes, consumption taxes and social security contributions paid by the firm or by the worker leads to an increase in the tax wedge. It should be noted that some economists do not include in

the determinants of the tax wedge the consumption tax rate, for example Alesina and Perotti (1994), Padoa Schioppa and Kostoris (1992).

To sum up, it could be the case that the increase in labour taxes is shifted onto labour cost, given the real consumption wage, or that the increase affects the real consumption wage, given the labour cost. Still, it could be the case of a mixed effect, both on labour cost and real consumption wage.

In general, it is important to disentangle the substitution and income effect of the tax wedge. The substitution effect is the reduction of employment and/or the number of working hours as the income effect leads the firms simply to shift the labour taxation on workers' net earnings without employment consequences.

Researchers are divided between those suggesting a prevailing substitution effect of the tax wedge, and others proposing a prevalence for the income effect. In the latter case the short-run tax elasticity of labour supply is low and thus there is no significant effect on employment and working hours.

However, according to what showed by Gora *et al.* (2006), there is a way to summarize the link between tax wedge and employment when substitution effect prevails. Figure 1 shows how works this relationship in case of increasing labour taxation.

Figure 1. The effect of the tax wedge on labour market

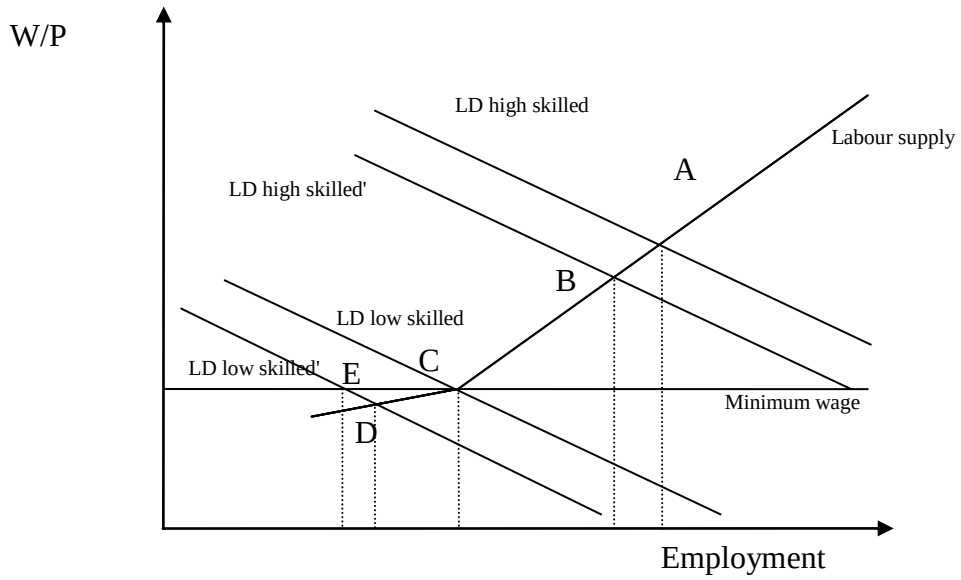

Figure 1 represents a stylized effect of the tax wedge on labour market, it distinguishes the labour demand of high skilled and unskilled workers. It shows that, after a labour taxation increase, the labour demand of high skilled workers shifts from point A to B, with a loss of employment for well-paid workers equal to the difference (A-B).

The situation in the labour market of low skilled workers is slightly different. In absence of a minimum wage legislation, an increase in the tax wedge leads the labour demand of the unskilled workers from point C to D. But if it is present a minimum wage set by the law, the labour demand shifts until point E, with a loss of employment equal to the segment C-E, more pronounced to the previous one (C-D in Figure 1).

It is notable that theoretically this reasoning is applicable only to payroll taxes increase, i.e. labour taxes paid by the firms. Vice versa, any increase in the

labour income taxation paid by the workers would result in a shift onto labour supply. Nevertheless, in the above wage-employment framework the theoretical results remain unchanged.

To summarize, in point D there is less employment reduction then in point E, but a more pronounced cut in the net wage for the remaining workers, while in point E there is more employment loss, due to the existence of a minimum wage legislation, and the workers maintain the same net wage, i.e. they maintain their living standard but with a social cost in terms of unemployment.

On the other hand, an increase in the tax wedge is not only limited to negative effects on employment, but it is also linked to changes in productivity growth rates. The effect of an increase in the tax wedge on productivity growth, assuming a convex relationship between productivity and wages, lies on the assumption that the higher is the productivity of the worker, the higher is the wage earned and vice versa, but with a lower bottom in case of minimum wage legislation. The existence of wage rigidity for unskilled workers (i.e. low productive workers) leads wages not to be affected by changes in the required productivity.

Loosely speaking, after an increase in the tax wedge a worker has two possibilities. On the one hand, he or she increases the level of productivity and maintain the same net wage, i.e. the worker shifts its productivity effort without loss in the net wage. On the other hand, the worker does not increase his or her productivity effort with the result of a decreasing net wage or increasing unemployment. The latter case may happen for several reasons (for example, low skilled workers unable to increase their productivity level or high labour taxes that increase the value of time spent in leisure activities). Obviously, these are academic

situations and in the real economy the effect of a tax wedge increase would be mixed.

Before concluding this section, it is useful to recall that any change needs time, so the overall effect of an increase (or decrease) of the tax wedge could be long-lasting and thus other factors, difficult to disentangle, may play a role.

In any case, a high labour taxation may have an effect on productivity due, for example, to a modification of relative input prices. Therefore a firm experimenting an increase in the tax wedge could react in a manner that differ from the most technological efficient. This may have, at least in the short-run, consequences both on employment and growth, although some studies suggest the possibility of a long-run effect without explicate how long would be the long-run effect.

However, a slow growth may affect the welfare system especially in countries with higher labour taxes and this might lead to a paradox for countries that justify a high labour taxation to finance a sustainable welfare system, especially if their welfare system is not maintainable with slow growth caused by high labour taxation.

Hence, nevertheless in the long-run firms would shift onto net wages high labour taxes without employment effect, this does not ensure that is all the story. In fact, similar considerations have been criticized by several researchers, and a brief overview of this dispute is presented in the next section.

3. Revisiting recent research

Although there is much research on the impact of the tax wedge on employment or growth, there are no previous papers studying its effect on productivity using data at the plant-level. This is one of the motivations for the analysis developed in chapter 2.

In fact, to my knowledge, there are few papers focused on this link. Ding's work is one of these. However, he uses macro data for 28 OECD countries for 1991-2004 (excluding 1992) and considers as measure of productivity the labour productivity. The way Ding H. (2008) measures labour productivity is double; he first considers the growth rate of GDP per hour worked and then the log of value added per hour worked for total manufacturing industry in 1997. Therefore he uses two distinct data sources, OECD Fact Book 2006 for the GDP growth rate per hour worked and O'Mahony and van Ark (2003)'s Manufacturing Productivity and Unit Labor Cost Level Database for the log of value added per hour worked for total manufacturing industry in 1997.

The actual hours worked cannot be correlated with the GDP growth rate per hour worked and with the log of value added per hour worked because these variables have eliminated the time effect and, at the same time, hours worked are correlated to tax wedge. So the actual hours worked seem to be a good instrument in the analysis.

The estimation results show that tax wedge has a negative impact on productivity measured both using as dependent variable the GDP growth rate per hour worked or the log value added per hour worked for total manufacturing industry. More precisely, a tax wedge increase of 1% can lead to a reduction of

productivity of about 0.09. In the model using the growth rate of GDP per hour worked as dependent variable there is no time fixed effect or country fixed effect, and probably this is due to a problem of multicollinearity.

Finally, Ding H. (2008) suggests that, although the tax wedge is a determinant of modern welfare state, especially in Europe, policy-makers should reconsider its social impact because in the long-run can lead to productivity decrease.

Aspal and Vork (2007) analyze a panel of new European member states to check whether labour taxation affects productivity. They use as dependent variable the log of real GDP per worker and, in the robustness check, the GDP per hour worked. On the RHS of their model they use several explanatory variables referred to country labour characteristics.

Despite the presence of a negative correlation between labour taxes and productivity in the fixed effect model, there is a problem of endogeneity with tax wedge. Moreover, the model with the log of real GDP per worker as dependent variable shows inconsistent results, even if they substitute the GDP per worker growth with the GDP per hour growth. This suggests that there exists a problem of specification in the model and thus the results should be taken with caution.

Alesina *et al.* (1999) show, using a simple VAR framework applied to a sample of 18 western OECD including Japan, that an increase in the labour taxation leads to decreasing profits because of high gross wages requested by workers to compensate high labour taxation, which in turn implies decreasing investment and growth rates.

They motivate this finding by considering the production factors, labour and capital, as complements in production and thus a reduction in the employment rate due to high labour taxes leads also to a negative impact on capital accumulation and employment, provided that the income effect due to a lower profits associated to high labour taxation is more pronounced than the positive substitution effect due to the fact that labour becomes more expensive than capital. In fact, an increase in the labour taxation leads to a negative and direct profit impact but also to an indirect decrease in capital accumulation and investment. Alesina *et al.* (1999) suggest that similar mechanism is applicable to an increase of public expenditure with a magnitude more pronounced comparative to the previous ones.

An interesting study on a panel of OECD countries observed from 1956 to 2004 conducted by Ohanian *et al.* (2006) shows that the relationship between tax wedge and productivity is significant. Moreover, including other control variables together with tax wedge can result in increasing efficiency but at the same time to decreasing consistency, because one of more of them could be correlated with tax wedge or other variables, or affected by measurement errors.

Ohanian *et al.* (2006) show that growth models that allow for tax distortions observed in their data capture almost all the average reduction of actual hours worked across countries, although some countries show a too large or too small impact of consumption and labour income taxes on labour supply.

Vartia (2008) analyzes at semi-disaggregated level, instead that at firm level, the impact of taxation on investment and productivity growth and in her main equation uses as dependent variable the TFP growth also controlling for several

variables such as labour intensity, the rate of R&D, entrepreneurship and profitability.

Using a dataset of 13 countries covering the period 1981-2001 she finds a number of results. On the one hand, she shows that both personal and corporate income taxes have a negative effect on productivity growth and this is in line with the view that taxation affects productivity, measured by TFP.

Moreover, she finds that social security contributions have a negative impact on TFP. In particular, the negative impact is more notable when the analysis is restricted to high labour intensity sectors. She suggests that this may happen because of two factors; first, it might be the case that labour taxes can distort factor prices (labour and capital in her specification) leading to slow TFP growth. On the other hand, labour taxes could modify the accumulation of production factors because of the capital-labour ratio modification induced by the tax wedge.

However, she does not distinguish the two possible channels trough this mechanism should work, although the results show that the size of this impact is small. She proposes a two step estimator to encompass the problem suggesting that the empirical results are not in line with the view that the negative effect of labour taxes on TFP is due only to the negative impact on production factors accumulation. She suggests that it is also due to the distortions in factor prices and, consequently, to the distortion of their optimal combination, although this proposition remains without evidence.

Moreover, she finds that countries behind the technological frontier have a more significant growth comparative to those closed to the frontier, although the

growth of the frontier in the leading country appears to bring a positive effect on all countries, but with differences in the magnitude.

An important work that investigate at aggregated level the impact of the tax wedge on variables as employment and/or unemployment rates have been presented by Daveri & Tabellini (2000). The authors show the link between tax wedge and unemployment, suggesting that if labour cost is high, firms will tend to decrease the labour demand (which eventually means increasing unemployment) and to replace labour with capital. In the long run this would lead to a reduction in the marginal product of capital. This reduction would induce firms to invest less and, among other things, would affect productivity growth conducing the system to a new steady-state with the same capital-labour ratio, but with permanent less output per capita, employment and growth.

The authors distinguish between different labour market institutions to ask whether the negative effect of the tax wedge is more significant depending on exogenous considerations. In particular, the authors distinguish three groups of European countries considering their labour institutions. More precisely, they consider that continental Europe is influenced by *decentralized* trade unions, Scandinavian countries are characterized by powerful *centralized* trade unions, while Anglo-Saxon countries have the more flexible labour markets.

These distinctions are relevant if one wishes to measure the potential different impact of labour taxes on unemployment rates. To test this hypothesis the authors use data on 14 countries between 1965 and 1995, then they divide the countries into three subgroups according to the level of collective bargaining and the result is a three-block, one containing the Anglo-Saxons countries, one the

European countries excluding transition and post-socialist economies, and the last group collecting the Nordic countries.

Daveri and Tabellini (2000) find a significant and positive effect of the tax wedge on unemployment and suggest that a high tax wedge is important in exploiting slow growth, investment decrease and rising unemployment in continental Europe in last decades. In particular, growth and investment are negatively affected by unemployment rate, although the impact of labour taxes on unemployment in continental Europe is more significant, but it is not explained whether this correlation is temporary or permanent.

The main conclusion is that the common cause determining slow growth, rising unemployment and decreasing investment is represented by high labour taxes that are mainly related to tax wedge on labour income. One reason for these high labour taxes in continental Europe lies in their pension system and its rising expenditure.

Daveri and Tabellini (2000) suggest to innovate the welfare system in Europe reducing tax wedge and increasing consumption taxes to guarantee the same cash flow for public expenditure. There are two explanations for this proposal. On the one hand, data suggest that distortions due to high labour taxes are more pronounced than those deriving from capital or consumption taxes. On the other hand, capital taxes are not taken into account because its tax base is smaller than the consumption tax base and there is a higher probability to make measurement errors.

Finally, the authors propose that the different unemployment rates registered in Nordic and Continental European countries, although they share a similar level of

labour taxation, are represented by differences in their bargaining system, other than by high public sector employment rates in Nordic countries.

However, these conclusions do not have widely acceptation. In fact, some economists suggest that, at least in the long-run, the tax wedge would pass onto labour itself and thus high labour taxation would be compensated by low real wages without effect on employment. This view is partially supported by other empirical studies (Nickell and Layard, 1999).

Gora *et al.* (2006) study the case of Poland. Their aim is to understand what is the potential effect of the tax wedge on employment, distinguishing between low and high-skilled workers. Using a small panel of data and considering a model with few explanatory variables, they propose a specification including variables as employment and unemployment rates referred to low-skilled and high-skilled workers, other than tax wedge.

The results should be taken with caution due to the lack of data and the small number of explanatory variables included in the model that may lead to a problem of omitted variables. Although these limits, the paper shows that tax wedge has a negative impact on employment, especially with regard to low-skilled workers, the main category affected by labour taxes increase. This finding is not without policy implications. In fact, the low-skilled workers are the category with large labour supply in countries as Poland.

Therefore the authors suggest a fiscal policy oriented to reduce labour taxes especially for low-skilled workers, although in practice the negative effect on employment of an increase in the tax wedge might be more pronounced that the positive effect of a tax wedge decrease in affecting employment.

Kugler & Kugler (2003) investigate the link between payroll taxes and employment or labour supply for the case of Columbia, using a balanced sample of firms with at least 10 employees extracted from the Colombian Manufacturing Survey. Taxation shows significant variation across firms due to differences in taxation between high and low-skilled workers and to the presence of temporary employees with fewer benefits comparative to permanent workers.

In order to control for the omitted variables correlated to tax wedge, Kugler & Kugler (2003) assume that firms systematically overstate or understate the effective tax rate and that any spurious time-varying factor related to taxation is controlled by linear sector-specific or firms-specific trend. The econometric results are similar to those reached by Gora *et al.* (2006) for the case of Poland or by Gruber J. (1997) for Chile.

Once again, labour taxes have a negative effect on employment rates, because an increase of 10% may lead to a reduction in employment of almost 5%. As the Poland case, the negative impact affects more low-skilled than high-skilled workers, and the final result is an increase of unemployment rate especially for low-skilled workers that are more influenced by minimum wage legislation, i.e. they experiment wage "rigidity". The fact that labour taxation negatively affects employment rates, especially for low-paid workers, matters for that country because, as well as Poland, labour supply in Columbia is mainly composed by unskilled or low-skilled workers.

On the same line are the works presented by OECD 2003 and European Commission 2003 that, assuming standard convex aggregate labour demand and supply curves, find that a priority of European countries is to rethink their welfare

system largely financed from labour taxes. In fact, if labour taxation affects negatively employment rates, especially with regard to low-skilled workers, this would bring slow growth in the long-run.

Vork *et al.* (2008) focus on a panel data including eight post socialist European economies observed for the period 1996-2004. Their specification includes several macro variables including measures of labour market outcome as dependent variable (employment/unemployment and labour supply rates for different categories of workers). Explanatory variables are the tax wedge and marginal effective tax rates (METR) that, loosely speaking, compare the state of working and receiving a wage with the state of not working and receiving unemployment benefits, so the more is the marginal effective tax indicator the more is the incentive to not move from unemployment to employment state or to move from temporary work to full work. All countries are considered small transition economies and are thought as sharing a similar social and fiscal history.

They find that the tax wedge has a negative effect on employment and labour supply, especially for low-paid workers and old workers. However, these results suffer from missing data, small number of countries involved in the panel. Moreover, sometimes the results show coefficients with unexpected sign and thus the results should be taken with caution.

The effect of the tax wedge in transition economies is analyzed by Vork *et al.* (2008) and Vodopivec *et al.* (2005). They study a panel of eight post-socialist economies showing a negative impact of the tax wedge on employment; meanwhile, with regard to the developed countries, a similar analysis is carry out by OECD (Employment outlook 2007). In both cases, based on macro data, tax wedge shows

a negative effect on employment although sometimes there are ambiguous results that should be taken with caution.

Coenen G., McAdam P, Straub R. (2008), using a model of two symmetric countries, Euro area and US, investigate the impact of the tax wedge on labour market output. The overall picture is designed to be in line with the New Area-Wide Model developed by the BCE. In their model each country is composed by four rational agents: households, firms, fiscal and monetary authorities distinguishing households on the basis of their ability to access financial markets and firms on the basis of whether they are involved in the production of tradable goods.

The simulations give interesting results. In fact, they confirm that a reduction of the tax wedge in the Euro area may lead to an increase in working hours and output of about 10% in the long-run. This would bring the Euro area close to the US performance, with positive effect in an international perspective of a foreign partners' strengthening other than in an internal effect in terms of household's resource redistribution.

Furthermore, it should be notice that some studies consider the possibility that self-employment allows avoiding taxes and thus, under high levels of tax burden, workers tend to choose opportunities that are inherent in self-employment, as the possibility of under reporting income (Pissarides and Weber, 1989; Baker P. (1993) Kuhn P. and Schuetze H. (2001), Schuetze, H. and D. Bruce (2004).

Cullen and Gordon (2002) suggest that individuals prefer to be successful entrepreneurial companies when personal income is taxed at a higher level than those of legal persons. This may lead to a transition from dependent employment to self-employment or entrepreneurial activities.

Fiorino R. and Padrini F. (2001) construct four quarterly measures of tax rates, focusing on consumption, capital and labour tax rates (which in turn include income tax rate) for several OECD countries to test the tax incidence on labour market output. They find, in line with other studies, that the tax wedge increases especially in continental Europe comparative to Anglo-Saxon countries. They also find a negative impact of taxes on employment but, at the same time, its impact on unemployment is irrelevant, especially with regard to labour taxes. This could be due to a contemporaneous decrease in the labour supply and in the employment rate. Fiorito R. and Padrini F. (2001) conclude suggesting that a cut in the labour taxes may lead to an increase in employment but this would not be enough in continental European countries in reducing significantly unemployment rates.

On the other hand, a study conducted by European commission (2004) tries to bring some lights on the empirical impact of labour taxes on wages and unemployment rate, distinguishing between short and long-run effect. In most papers it is not clear how this relationship can work. It could be the case that this effect appears because of labour supply or labour demand, or it may be the resultant of a dynamic wage formation mechanism.

However, the idea underlying the paper is that labour taxes and their composition play a role in determining wages both in the short and long-run. In other words, the distribution of the tax wedge between employers and employees might modify the wage formation mechanism. There are some aspects investigated in detail like the effect of the level of centralization of wage bargaining on wages or the invariance of incidence proposition (IIP), that is, the fact that changes in the

composition of the tax wedge do not modify the labour taxation or the net wage consumption.

Tax wedge is measured trough the mechanism developed by OECD, based on micro simulations of some stylized individual or families subject to labour taxes, whose income lies between a range centred on the average production worker. Despite this measure is available for six family types of workers, due to the fact that there is strong correlation across countries between the 6 stylized families, they choice the tax wedge for a single worker without children working in the manufacturing sector earning an average wage as an approximation of the population overall tax wedge (OECD, 2003).

According to that, the higher is the tax wedge, the larger is the difference between total RLC and RWC. Because the tax wedge seems to affect real labour cost in both short and long-run, static models are not appropriate to understand how this impact might happen. Therefore it is fitted a dynamic model using a GMM estimator, useful in a sample with many observations and small time period. In the robustness check, where it is used OLS with fixed effect, the results remain unchanged. Due to the fact that the authors' interests lie on the interaction between the bargaining system and the tax wedge, they implement a model in which firms and unions bargain over the wage level, assuming a Cobb-Douglas production function. The starting formula for their analysis the following:

$$W(1+\tau_f) = f(P_c, t_a, \tau_f, \tau_e, t_c \Omega, u, \rho) \qquad (5)$$

where on the LHS there is the real labour cost and on the RHS there is a function in which P_c is the consumer price index, Ω is the labour productivity, t_a and t_c are, respectively, the average income tax and the consumption income tax, τ_f and τ_e the SSCs paid by the firms and by the workers, u the unemployment rate, ρ the gross replacement rate.

To capture the dynamics of the wage formation mechanism, they propose the following specification at the country level:

$$rlc_{it}=\alpha_i+A_1(L)rlc_{it-1}+A_2(L)\rho_{it}+A_3(L)\,\Omega_{it}+A_4(L)u_{it}+A_5(L)lnt_{cit}+A_6(L)ln(1+\rho_{it})+$$

$$+\alpha(L)ln(1+t_{ait})+\beta(L)ln(1+\tau_{fit}+\gamma(L)ln(1+\tau_{eit})+\varepsilon_{it} \qquad (6)$$

where on the LHS there is still the real labour cost (in log) and on the RHS its lag, with i standing for country and t for time. Moreover, the dynamic specification includes as a proxy for consumption tax rate the ratio between consumption and GDP deflator.

Once again the empirical results suggest that tax wedge has in the short-run a negative impact on real labour cost and employment. An increase of 1% in the tax wedge may lead to an increase in the real labour cost of 0.1%. On the other hand, in the long-run tax wedge on labour income does not affect unemployment rate. The determinants of the tax wedge (SSCs and labour taxes on income) show similar results. Hence in the long-run tax wedge is fully shifted onto net wages and does not affect unemployment rate, but in the short-run labour supply of workers relatively

responsive to changes in the net earnings could be strongly affected by rising labour taxes.

The effect limited to the short-run suggests that there is a little role played by real wage resistance. In particular, the results obtained from a sample of 15 EU countries show that a raise in the tax wedge does not lead to a persistent impact on real labour cost and thus on unemployment rates. This means that the ultimate effect should be found in the worker's net earnings (RWC) rather than in the level of employment.

It is notable that it is difficult to quantify how long is the short-run. In practice, this effect could be long-lasting and thus the impact on unemployment rates could be not negligible, but it is difficult to calculate how long can occur over time this negative impact. This suggests that it may be dangerous an undervaluation of the potential long-lasting impact, although in the long-run other factor may play a role.

Moreover, nevertheless the use of three different data set in studying the role of centralization of bargaining systems, the results are imprecise and sometimes with coefficients with unexpected signs and thus the question of whether the centralization of bargaining system is better or worse, and to what extent, comparative to decentralized system with regard the employment performance, remains substantially with no response.

Finally, the analysis of the IIP shows that the invariance holds in the long-run only. An increase in SSC paid by the firms would conduct to an increase in the RLC, with the worker's net earnings unchanged. Vice versa, an increase in the SSC fully on workers or an increase in the consumption tax rate would result in a

reduction of the RWC, with total labour cost unchanged. However, only the impact of SSCs paid by the firms is robust in the overall estimates, while the other estimates should be taken with caution.

To conclude I review the work of Griffith, Redding and Simpson (2006), whose methodology is partially adopted in the analysis conducted in chapter 2, although some peculiarities, as the use of different production functions or different measure of TFP level, distinguish the two works.

Starting from the idea that deregulation, opening of markets, propensity to international trade and investment positively affect economic growth, they suggest that firm's productivity catch-up affects economic growth due to the fact that the leading firms generate positive externalities to non-frontier firms.

In particular, based on a study for the UK case, an economy that benefits from the US multinational firms presence in the national territory, they suggest that foreign-owned firms play a leadership role with regard to productivity growth and domestic firms benefit from this. Hence, they test the hypothesis that in the UK market the presence of US multinational affiliates lead to the growth of domestic firms. Moreover, they test whether domestic firms catch-up to the technological frontier, thanks to the influence of US affiliates, widely recognized as technological frontier firms in the UK.

In their paper they bring some lights on how the distribution of productivity evolves over time showing that productivity catch-up to the technological frontier affects growth. Griffith, Redding and Simpson (2006) propose a model with the following characteristics to measure TFP and its determinants:

$$ln\ A_{it} = lnA_{it-1} + \gamma_i + \lambda ln(A_{Fj}/A_i)_{t-1} + u_{it} \qquad (7)$$

where A_{it} stands for TFP, A_{it-1} its lag, γ_i a firm-specific factor, A_{Fj} is the frontier and u_{it} is the error term. The analysis is conducted at the firm-sector level, so i stands for the generic firm, j stands for sector and t is the time variable. The authors use a rule that discriminates the entry and exit firms based on the tact that productivity does not reach a given threshold A^*_{it}. Therefore the formula captures both persistence and convergence, respectively A_{it-1} and λ, as heterogeneity in innovation is captured with the firm-specific term on the RHS, γ_i. To make the model dynamic, the equation (5) become:

$$\Delta ln\ A_{it} = \gamma_i + \lambda ln(A_{Fj}/A_i)_{t-1} + u_{it} \qquad (8)$$

$$\text{with } u_{it} = T_t + \varepsilon_{it} \qquad (9)$$

where T_t represents time dummies and ε_{it} is the error term. Assuming the long-run homogeneity $(\alpha_2 + \alpha_3)/(1 - \alpha_1)$ the equation (6) is described more carefully by the following Autoregressive Distributed Lag ADL (1,1) specification:

$$ln\ A_{it} = \gamma_i + \alpha_1\ ln\ A_{it-1} + \alpha_2\ ln\ A_{Ft} + \alpha_3\ ln\ A_{Ft-1} + T_t + \varepsilon_{it} \qquad (10)$$

The equation (8) has an error correction mechanism that links the cointegrating relationship between non-frontier and frontier firms as following:

$$\Delta lnA_{it} = \gamma_i + \beta lnA_{Ft} + \lambda ln(A_{Fj}/A_i)_{t-1} + T_t + \varepsilon_{it} \qquad (11)$$

This specification equals equation (6) when $\beta=0$, which in turn implies $\alpha_2=0$ and $\lambda = (1- \alpha_1)$. To obtain reliable TFP estimates, Griffith, Redding and Simpson (2006) use the superlative index number approach that allows a more flexible translog production function:

$$\Delta lnTFP = \Delta lnY - \sum_{z=1\ldots Z} (\tilde{a}^z_{it} * \Delta lnx^z_{it}) \qquad (12)$$

where Y is the production, $\tilde{a}^z_{it}$ is the Divisia share of production ($\tilde{a}^z_{it} = \alpha^z_{it} + \alpha^z_{it-1})/2$, α^z_{it} stands for the share of the factor in production output at time t, Z is the number of production factors with constant return to scale, that is, $\sum_z \tilde{a}^z_{it} = 1$.

Finally, using a panel dataset based on micro data extract from Annual Respondents Database (ARD) collected by the UK Office for National Statistics (ONS), they found evidence and also quantify the contribution of affiliates of US multinationals to UK productivity growth by advancing the frontier and moreover they show that leading firms generate positive externalities to non-frontier establishments.

However, they do not directly measure technology transfer from firms on technological frontier to those behind the frontier; they just show that firms behind the frontier grow faster than those next to the technological frontier.

The overall picture arising from the overview presented in this section brings light on the role of the tax wedge on variables such employment and productivity. Moreover, it ensures that investigating the relationship between tax wedge and

productivity with firm-level data could result in new findings in understanding the channels trough these links may happen.

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Chapter 2.

Tax wedge and productivity. Empirical evidence at the Firm Level.

Andrea Festa[•]

University of Salerno

Abstract

This paper examines the impact of the tax wedge on productivity using firm-level based TFP data for several OECD countries for the period 2000-2008. The identifying assumption is that labour taxation influences firm behaviour and thus its productivity, especially in sectors with relatively higher labour intensity. To address this issue, I estimate the productivity function using the Olley-Pakes approach, which allows to obtain reliable productivity measures by controlling both the simultaneity and the selection bias. Then I apply the differences-in-differences approach, which exploits differential effects of the tax wedge on firms with different labour-intensity. This approach has the advantage that it is possible to control for unobserved factors that, on average, are likely to have the same effect on productivity in all industries. The empirical results suggest that tax wedge has a negative impact on productivity, measured as TFP at the firm level, especially for size small firms than for large ones.

Keywords: tax wedge, TFP, diff-in-diff. *JEL classification*: H2.

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1. Introduction

An important economic issue is represented by fiscal policy and its impact on economic growth. In fact, there is much economic research that studies the effect of labour taxation on several variables as employment or growth. In this paper I use firm-level data to study the link between tax wedge and an important component of economic growth: total factor productivity (TFP) growth.

The reason is that, nevertheless the amount of research on tax wedge and its potential effect on different variables such those listed above, there are no previous papers studying the effect of the tax wedge on productivity at the plant-level.

In particular, previous research suggests the existence of a link between labour taxes and economic growth but does not explain what are the possible *channels* through which this relationship may happen. Some studies have found that an important part of productivity growth is associated with the reallocation of workers from less productive enterprises to more productive ones (Foster, Haltiwanger and Krizan 2001; Scarpetta and Tressel 2002). Additionally, laws that prevent or hinder the reallocation of workers between firms can impede the productivity growth.

The study of the effect of the tax wedge on productivity at disaggregated level allows to obtain several advantages. On the one hand, the measures of TFP are free from aggregation bias, which is particularly important for the role that re-allocation of resources across sectors plays for TFP and firms developments (Arnold and Schwellnus 2008). On the other hand, the use of firm-level data

allows understanding whether the effect of the tax wedge differs between firms with different characteristics.

Tax wedge may influence firm level TFP through various channels. In general, high labour taxation may discourage investment in human capital and employment. Furthermore, high tax wedge may reduce incentives for risk-taking by firms, with negative consequences for productivity (Arnold and Schwellnus 2008).

Tax wedge could have a different effect on firms operating in sectors with higher labour intensity and, on the other hand, it is well-known that different industries, because of their peculiar technological characteristics of production function, need different levels of reallocation of factors. For instance, the textile companies with frequent adjustments in production factors require to modify the workforce depending on the market demand more than firms operating in other sectors.

The reasonable assumption to do is that relatively high labour taxation, measured by the tax wedge on labour income, influences the behaviour of workers and firms and thus productivity, especially in industries where labour taxes are notable. A high tax wedge, by distorting input prices and returns of assets, causes an alteration of the decisions on the supply side, as it may discourage firms from investing, hiring workers and creating job opportunities, leading the system to a lower TFP growth.

Hence the tax wedge, due to certain technological characteristics of sectors, may affect productivity more in certain industries than in others. These

distortions may lead to a reallocation of inputs between firms or sectors that could affect transactional growth.

To sum up, a change in the relative price of factors can lead to less use of either or both, as it may verify inefficient reallocation and therefore low productivity. This biasing effect may be stronger in sectors typically labour intensive.

For these reasons, in the spirit of the methodology illustrated by Rajan & Zingales (1998), I test whether relatively labour dependent industries have a relatively low productivity growth (measured by TFP), in countries with relatively high labour costs (measured by tax wedge).

To this end, I focus the analysis on the potential distortion in the allocation of production factors determined by the tax wedge in different sectors. The novelty of this approach is that, while there is a remarkable research effort in studying the impact of taxation on productivity through channels such as price-input distortions and hence the bias in their allocation, entrepreneurship and the rate of R&D, there are few studies focusing on the impact of the tax wedge directly on productivity, measured by TFP, taking into account data at the firm level.

In this paper the measures of TFP are obtained as residuals of an Olley-Pakes (1996) estimation method that controls for simultaneity and selection biases. This method allows to obtain reliable TFP measures. These TFP measures are then used to build an Error Correction Model (ECM) incorporating the differences-in-differences estimation strategy in order to investigate the impact of the tax wedge on productivity.

The results are easily summarized. Tax wedge has a negative impact on productivity growth measured as first difference of TFP level and these results are consistent also considering subsamples including either size small firms or large ones, although the impact for the small firms is more pronounced.

The basic specification (Table 8) shows that all the coefficients have the expected sign and are significant at 1%, with the exclusion of the specification reported in column 2. In particular, the coefficient of the variable of interest, i.e. the interaction between sector labour intensity and tax wedge is constantly negative and varies between -.0006584 (-.001%) and -.0062585 (-.014%) in the fourth (Table 8, columns 1and 4, respectively).

This differentiation most probably is due to the omission, in the first specification, of the relative TFP variable that is significant in all specifications and it seems to have a role in determining the dynamics of the productivity growth.

With regard to small firms (Table 9, column 4), the coefficient of the interaction between labour intensity and tax wedge reaches the value of -.0082389 (-.018%), while, with regard to large firms (Table 10, column 4), the coefficient takes the value of -.065959 (-.014%).

To my knowledge, these are the first estimations at the plant level in an analysis on the potential impact of the tax wedge on productivity. Furthermore, these estimates are in line with those presented by Arnold & Schwellnus (2008). On the other hand, the results are more reliable comparative to those obtained, with aggregated data, by Ding (2008) because of a problem of multicollinearity in his work.

To sum up, the analysis presented in this work shows that tax wedge negatively affects productivity at the firm level taking into account differentiations in terms of labour dependent sectors. Hence a *channel* through which labour taxation affects economic growth is represented by the relationship between tax wedge and productivity. These results are checked in a number of ways, and the conclusions are presented in the Appendix.

The paper is organized as follows. Section 2 reviews the related literate and gives some light on theoretical background. Section 3 describes data, section 4 shows the methodology as section 5 the empirical specification. Section 6 reports the results. Section 7 concludes.

2. Background and previous research

The analysis of the impact of the tax wedge on productivity at the plant-level has not been sufficiently investigated. Although a complete review of the literature on the effect of labour taxation goes beyond the aim of this paper, it is useful to draw the attention to the main research on this issue both at macro and micro level.

The empirical paper most closer to the present has been developed by Arnold & Schwellnus (2008). In their work, the authors conduct an analysis based on micro data to show that corporate taxes affect productivity and investment. The dataset includes 12 OECD countries, with the exclusion of post-socialist economies, and observations over the period 1998-2004. The data at the plant-level have been drawn from the Amadeus (Bureau van Dijk) dataset.

The identification of the effect of different types of taxes on productivity is obtained from the authors by using the difference-in-difference approach proposed by Rajan and Zingales (1998). They estimate TFP at the firm level via OLS, then they construct an ECM in which productivity growth of firm *i* is positively correlated to increase in the productivity growth of the frontier and with the firm *i*'s distance to the frontier and in which the interaction between relative profitability in sector *s* and corporate tax represent the differences-in-differences strategy.

The results suggest that corporate taxes have a significant negative effect on productivity at the firm level. This effect does not vary across firms of different size or age. Vice versa, it is present a differentiation with regard to young and small firms. Furthermore, firms that are closed to the technological frontier are particularly affected by corporate taxes. With regard to productivity, the negative effect holds both for rising and declining firms.

Griffith, Reddings and Simpson (2006), that adopt a methodology whose spirit is in part considered in the implementation of the estimation strategy presented in this work, especially with regard to the impact of the distance to the frontier on TFP growth, use micro panel dataset to show the potential correlation between a firm's TFP growth and its distance from the technological frontier. They find that productivity catch-up affects productivity growth, suggesting that the leading firms generate positive externalities to non-frontier firms.

An empirical paper, based on aggregate data, has been presented by Ding H (2008). In his work, the author develops a TSLS model in order to study labour productivity, considered an important driver of the total productivity, and the

effect that the tax wedge has on it considering a panel of OECD countries. He uses, as labour productivity variable on the RHS of the main equation of his model, two types of variables: the growth rate of GDP per hour worked and the value added per hour worked for total manufacturing industry drawn from two different sources, OECD Fact Book 2006 and O'Mahony and van Ark's (2003) Manufacturing Productivity and Unit Labor Cost Level Database (CD-ROM).

To control for a potential problem of omitted variables he uses IV estimation technique, while no measures are taken to control for possible sample bias, due to the consideration that the countries involved in the analysis are chosen only on data availability basis. The same reasoning is applied to control for possible simultaneous causality and measurement error. He then controls for possible serial correlation and heterogeneity by using clustered standard errors.

Moreover, he considers the hours worked per worker as an exogenous instrument for the tax wedge because they cannot have any effect on labour productivity other than via the effect of the tax wedge on productivity. Because hours worked per worker are affected by the level of labour taxes (tax wedge) but, at the same time, they have no direct correlation with productivity, they seem a natural instrument in his analysis. In the second stage the regressions are estimated considering a panel data of 28 OECD countries for 1991-2004 (excluding 1992).

The results suggest that a high tax wedge leads to a lower labour productivity measured both using as dependent variable the growth rate of GDP per hour worked or the value added per hour worked for total manufacturing industry. Ding H. (2008) shows that a 1% increase of the tax wedge may lead to about

0.09 percentage decrease in labor productivity. He also shows that is crucial, for the reliability of the estimates, to control for the endogeneity problem, because if one avoids to take into account this issue the estimates would be inconsistent.

However, the estimation results show that a problem of multicollinearity is present in the estimates. In fact, in the regression using as dependent variable the growth rate of GDP per hour worked, the estimates show that there is no country-specific effect in determining labour productivity. The absence of a country-fixed effect can be only explained with the presence of multicollinearity in the specification of the model. In other words, labour taxes measured by the tax wedge seem to capture most part of the labour productivity country effect.

In the second regression, using as dependent variable the value added per hour worked for total manufacturing industry, this problem is not present. Here there is both a country-effect and a year-effect but, after all, if one looks to the magnitude of the coefficients in all regressions, only in a few of those the coefficient of the tax wedge is significant and, when this is the case, it happens thanks to the inclusion of the actual hours worked instrument in the IV regression.

Another potential problem, although a minor one, appears the strong variance of the R-square value, fluctuating between low values to extraordinarily high ones suggesting a potential problem of misspecification of the model. A part from these critics, the paper developed by Ding H. (2008) suggests that, at least in the long-run, higher tax wedge may lead to lower labour productivity growth.

Vartia (2008) analyzes the impact of taxation on investment and productivity at the industry level, using as dependent variable the TFP growth and by

controlling for variables such as labour intensity, the rate of R&D, entrepreneurship and profitability, finding a significant and negative relationship on a semi-aggregated data sample of 13 countries covering the period 1981-2001.

Moreover the author suggests that certain labour taxes that are a part of the tax wedge on labour income, such as social security contributions, have amplified these distortions in labour intensive industries, concluding that tax wedge affects the relative price of factors in a way that differs from the more technologically efficient, leading to a low level of TFP growth.

Furthermore, at macro level, Aspel and Vork (2007) analyze a panel of OECD countries for the years 1970-1999 to exploit the effect of labour institutions and labour taxes on productivity measured as log differenced GDP growth and log differenced TFP growth per hour worked, with TFP data drown from the AMECO database.

The results show that there is a negative impact of labour taxation on productivity, but this effect disappears when hourly productivity is used as RHS variable, suggesting that the tax wedge could affect productivity via its effect on hours worked. Before accepting this finding, one should notice that these estimates may suffer from an uncontrolled and undervalued endogeneity problem. Therefore, the final results should be taken with caution.

3. Data

In this paper I use data from the Amadeus (Bureau van Dijk) dataset which contains detailed firm-level data. This database covers European OECD member countries and I consider micro data for the period 2000-2008 regarding several European countries, with the exclusion of Central and Eastern European countries because they are considered as transition economies with a different economic structure comparative to developed countries.

The data have been cleaned for trivial errors such as observations with negative values for any variable entering the production function and outliers that have been removed by eliminating extreme values before proceeding with the productivity estimates.

The analysis is restricted on firms in the manufacturing and services sectors (Nace 15-93). Sector as recycling, refuse disposal, public administration, education, electricity, health and utilities are excluded from the sample due to the high share of public ownership in some countries.

In the final sample there are 13 sectors (Table 1) and six countries (Table 2), which results in a comprehensive panel dataset that must be divided by 13 sectors, 9 years and 6 countries, with an average number of more than 800 firms per cell (year-sector-country) guarantying the representativeness of the sample. Nominal values are deflated using sector-specific price indices from the OECD Economic Outlook database and STAN database for structural analysis.

With regard to the firm's characteristics, the number of observations by country ranges between 56.916 in Belgium and 534.256 in Italy (Table 2). Data on value added range between 8.016 in Belgium and 18.094 in Netherland, data

on capital between 2.352 in Italy and 7.700 in Germany, data on investment between 383 in Spain and 1811 in Netherland, data on wages between 1.305 in Spain and 8.613 in Germany (average values in Euros).

Labour taxes as percentage of GDP (Table 3) are high in France, Italy and especially in Belgium (22,09%). Vice versa, this percentage is the lowest in UK (14%) suggesting that UK may add interesting variance to the sample, being the tax wedge in that country the lowest and, among other things, very close to that of U.S.

Moreover, labour taxes as percentage of total taxes (Table 4) show that once again the value for UK is the lowest relative to the other countries involved in the final sample. For these reasons using UK as a benchmark country is a good choice in the present analysis. Data referred to tax wedge are drawn from the Eurostat database (Table 6).

By analyzing the TFP measures it is possible to verify (Table 5) that the TFP frontier variable ranges between the average of 3.262469 in Netherland and 5.437021 in Italy, while the TFP at the firm level ranges between 1.551324 in Spain and 1.892959 in Netherland. Furthermore, the relative TFP variable ranges between 3.030976 in Italy and 5.805268 in Netherland.

With regard to the sector analysis (Table 1), data show that coke, refined petroleum, nuclear fuel and wood and wood products are the sectors with the higher and lower average values, respectively. In fact, this is true with regard to data on value added that ranges between 36226.34 and 1642.71, capital (65672.91and 1403.17), employment (7833.73 and 1074.88), with the exclusion

of data on investment that varies between 6339.04 in coke, refined petroleum, nuclear fuel sector and 262.11 in textiles, wearing and leather sector.

Furthermore, TFP frontier variable ranges between the average of 3.529653 in wood and wood products sector and 5.834382 in chemical sector; TFP at the firm level between 1.526428 in wood and wood products sector and 1.933221 in coke, refined petroleum, nuclear fuel sector; relative TFP between 3.00227 in food and beverages sector and 4.804415 in coke, refined petroleum, nuclear fuel sector (Table 6).

4. Methodology

The production function is estimated at the firm-level adopting the Olley-Pakes (1996) estimation approach. It is reasonable to directly estimate the TFP growth at the firm level, without aggregating at the C-S level, if this procedure does not restrict the sample to a highly selected group composed by the surviving firms only reducing the representativeness of the results (Cingano and Schivardi, 2004).

Due to the large comprehensiveness of the final sample, more than 600.000 observations divided by 13 sectors, 9 years and 6 countries, with an average number of more than 800 firms per cell (year-sector-country), the group of surviving firms remains very large also after the Olley-Pakes estimation avoiding the problem of representativeness of the results. Therefore it is possible to run a direct estimation of the coefficient at the firm-level.

Moreover, in the final sample, the restriction to six Western European countries sharing a similar economic structure is another good reason to proceed as above. Nevertheless, in the estimation method I consider also firm fixed-effect and country-year dummies. To my knowledge, this procedure, with regard to the analysis of the impact of the tax wedge on productivity at the plant level, has not yet been proposed.

However, in a separate regression I estimate the production function with OLS at the Country-Sector level in the traditional Solow approach in order to avoid strong assumption about the homogeneity of production technologies across all OECD countries involved in the final sample. The results, available upon request, confirm those obtained with the Olley-Pakes approach presented here.

With regard to the analysis of productivity, I consider a standard Cobb-Douglas production function of the following form:

$$lnY_{icst} = \gamma + \alpha lnL_{icst} + \beta lnK_{icst} + \varepsilon_{icst} \qquad [1]$$

where the subscripts *i* stands for firm, *t* for time, *s* for sector and *c* for country. Any variable entering the above equation is in logs and the dependent variable is the firm's value-added. In the right hand side of the equation [1], L stands for labour input and K stand for capital measured as net capital stock and gross investment is calculated as first differences of net capital stock plus depreciation

in the Amadeus (Bureau van Dijk) data. Firm-level based TFP is measured as residual of equation [1].

The traditional method follows the Solow's assumption that assumes perfect competition in the input factors and a technology with constant return to scale. Since I have plant-level data that allow estimating the coefficient directly, the Solow's assumption are not required.

On the other hand, the direct estimation encounters some econometric problems because the level of productivity, measured as the residual from the estimation of a production function of the form described above, affects both the firm's input choices and the decision to shut down.

In particular, simultaneity and selection bias are important econometric issues of the productivity estimates. The simultaneity problem arises because at least a part of the TFP is observed by the firm at a point in time early enough to enable the entrepreneur to take actions with the consequence that the firm can change the factor input decision once observed its productivity performance. When this is the case, the realisation of the error term influences the choice of factor inputs and therefore the regressors and the error term in equation [1] would be correlated. This implies obtaining biased OLS estimates.

To solve the problem there is a suitable method if it is credible assuming that the part of TFP that influences firm behaviour is a firm-specific attribute invariant over time. In this case it would be enough to include firm dummies into the regression, i.e. a fixed-effect panel regression to obtain consistent estimates of the parameters.

Unfortunately, the fixed-effect estimator uses only the variation across time, which tends to be much lower than the cross-section one. Hence a notable part of the information is left unused and this conducts to weakly identified coefficients. Moreover, the assumption that the part of TFP that influences firm behaviour is invariant over time does not appear to be reasonable in this analysis.

The selection problem arises with firm-level missing values associated to firms dropping out of the sample. The problem is well-known, if the firms are non-random selected the sample may become biased. If one tries to solve the problem by considering only a balanced sub-sample, such choice is likely to bias the estimates of the factor coefficients and does not solve anything.

In particular, if firms with higher capital stock are less likely to drop out of the sample in case of a negative shock in the remaining sample there would be a negative correlation between the realisations of the error term and the capital stocks (Yasar, Raciborski and Poi, 2008). In this case, the estimated capital coefficient will suffer from a downward bias.

An alternative to a fixed-effect regression is the multistep estimation algorithm proposed by Olley & Pakes (1996). This estimator solves both the simultaneity and the selection bias.

The first problem is addressed by using the firm's investment decision as a proxy for unobserved productivity shocks, but there is also a correction for the attrition bias. This correction is achieved by means of a fitted value for the probability of exiting from the sample.

In a first step, the econometrician estimates a probit of a survival indicator variable on a polynomial expression containing capital and investment. In a

second step, the fitted values from this regression are incorporated into the main equation to control for the attrition bias in the second stage together with the simultaneity bias[1].

When one estimates a production function with the Olley-Pakes approach, the use of value added on the left hand side of the equation [1] is another loss of generality. In fact, if there were availability of firm-level based real output data instead of value added, then the estimation would avoid the assumption of additive separability of material inputs implicit in the [1] and it would be less restrictive.

Moreover, the Olley-Pakes method tends to display a higher labour coefficient and a lower one for capital. This could be due to the deviations of the factor markets from the competitive paradigm (Olley and Pakes, 1996). Finally, the capital coefficient is obtained after a semi parametric procedure which results in standard errors based in a bootstrapping exercise with 50 replications.

5. Empirical specification

The main productivity results reported in this section refer to firm level TFP estimated by Olley-Pakes method, with additional robustness checks using different TFP estimates. In the spirit of Griffith *et al.* (2006) I consider that firm-

[1] More details are available in the original work:"The Dynamics of Productivity in the Telecommunications Equipment Industry", Olley, Steven and Ariel Pakes (1996). *Econometrica,* 64, 1263–1297.

levels TFP follows an Autoregressive Distributed Lag ADL(1,1) process of the following form:

$$lnTFP_{icst} = \alpha_1 lnTFP_{icst-1} + \alpha_2 lnTFP_{Fcst} + \alpha_3 lnTFP_{Fcst-1} + \alpha_4 Labint_s * Tax_{ct-1} + \gamma_a + \gamma_s + \gamma_{ct} + \varepsilon_{icst} \quad [2]$$

where on the left hand side TFP_{icst} is the log-TFP level of a non-frontier firm *i*, TFP_{Fcst} is the level of TFP at the technological frontier *F*, $Labint_s$ is the *labour intensity* in sector *s* and Tax_{ct-1} is the tax wedge of country *c* at time *t-1*, γ_a is the firm fixed effect, γ_s and γ_{ct} are, respectively, sector and country-year dummies, while ε_{icst} is the error term.

This specification captures two empirical regularities: convergence and persistence of firm TFP levels over time. In particular, TFP at the technological frontier is calculated as the firm *i* with the highest value of TFP in country *c*, sector *s*, year *t*. In the spirit of Griffith *et al.* (2006) this approach has the advantage that follows the empirical framework and it is simple to use. Most of all, this approach potentially allows for endogenous changes in the technological frontier, because it is possible to see year-to-year that one firm closed to the top TFP firm, first catches up and then overtakes the firm at the frontier.

The interaction between $Labint_s * Tax_{ct-1}$ implements the differences-in-differences strategy. In fact, in the above specification, differences of TFP levels between firms in relatively labour and non-labour intensive sectors in countries with different levels of tax wedge are used for the identification of the tax wedge's effect on TFP.

The measure of $Labint_s$ is obtained as the ratio between labour and capital inputs calculated at sector-level in the Amadeus (Bureau van Dijk) database for the period 2000-2008 considering the United Kingdom as benchmark. To avoid a problem of endogeneity in the analysis, data for the UK are dropped from the final unbalanced sample that is therefore composed by 6 countries and 13 sectors.

Under the assumption of long-run homogeneity: $(\alpha_2 + \alpha_3)(1 - \alpha_1) = 1$ the ADL(1,1) can be rewritten as:

$$\Delta lnTFP_{icst} = \alpha_2 \Delta lnTFP_{Fcst} - (1- \alpha_1)ln(TFP_{Fcst-1}/TFP_{icst-1}) + \lambda(Labint_s*Tax_{ct-1}) + \gamma_a + \gamma_s + \gamma_{ct} + \varepsilon_{icst} \quad [3]$$

suggesting that there is a potential common long-run trend between the productivity level in sector *s* in a "follower country" and the productivity level of the frontier country in the same sector. Furthermore, by maintaining the log-run homogeneity assumption and with simple algebraic manipulations, the ADL(1,1) in [3] can be expressed as the following simple Error Correction Model representation:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s*Tax_{ct-1}) + \gamma_a + \gamma_s + \gamma_{ct} + \varepsilon_{icst} \quad [4]$$

The Error Correction Model represented above has the usual interpretation. Productivity growth of firm *i* of country *c*, sector *s*, at the time *t* is positively correlated with the productivity growth of the frontier firm *F* and with the firm *i*'s distance from the frontier. ECMs are widely used in the contest of non-stationary data because of their link with cointegration concept.

Because ECMs are obtained after first differencing and assuming a correct specification of the long-run cointegration relationship, the final result is an entire removal of any non-stationarity from the data (Henry, 1996).

ECMs are obtained from ADL(1,1) models by simple algebraic transformation and are fully equivalent and suitable for stationary data (DeBoer and Keele, 2008). Therefore it is possible to consider the use of ECMs both in contest of stationary or non-stationary data.

Moreover, the long-run assumption allows the rate of productivity catch-up to depend on relative, rather than absolute, levels of productivity leading the rate of productivity catch-up not to depend on units of measurement for output or factor inputs (Griffith, R., S. Redding and H. Simpson, 2006).

Since in equation [4] TFP_{icst-1} enters both on the left and right hand side, a problem of simultaneity bias arises if, for example, there are measurement errors in TFP_{icst-1}.

To address this issue, it is useful to remember that the panel contains more detailed micro information data on both output and inputs than is typically available in many productivity dataset and therefore the analysis is focused at a very disaggregated level. This approach allows circumventing a number of sources of measurement errors and aggregation biases.

Nevertheless, I address the potential spurious correlation between TFP growth and distance to the technological frontier by instrumenting relative TFP using the t-2 and t-3 lags of the TFP gap term.

In the empirical analysis the effect of the tax wedge is identified through a differences-in-differences estimation strategy. Firms in relatively labour

intensive industries are expected to show relatively slow TFP growth in countries where the tax wedge is high. The identifying assumption is that tax wedge is expected to influence negatively the TFP growth, with a negative effect that is stronger in labour dependent sectors.

A crucial assumption in this method is that, due to technological reasons valid across all countries involved in the sample, differences in sector characteristics are similar across countries. Thanks to this assumption it is possible to define a measure capturing sector technological characteristics that are exogenous to country-specific taxation by using quantitative sector information of a benchmark country.

In this analysis, the benchmark country is represented by United Kingdom. The UK represents a natural benchmark in this regard because labour regulations are very light in comparison with other OECD European countries and similar to those applied in the US. In fact, UK adds interesting variance to the sample, being the tax wedge in that country the lowest (Table 7) comparative to other countries involved in the final sample.

Finally, data from UK are directly drawn from the same main database used to get data of other countries (Amadeus Bureau Van Dijk). This method enables to obtain homogenous measures of labour intensity comparative to those obtainable from other sources, guarantying the data comparability.

6. Results

The analysis of the effect of the tax wedge on productivity is based on the assumption that labour taxes affect economic growth also through their impact on productivity and that, due to technological and organizational sector characteristics valid across all countries, some sectors may be more affected than others by a high tax wedge.

Table 8 shows the effect of the tax wedge on TFP growth at the firm level. Columns (1) and (3) show the specification with country *and* year dummies, while in columns (2) and (4) there is the specification with the interaction between country-year dummies. Notice that the same logic is applicable to the analysis restricted to small and large firms (Table 9 and 10).

In Table 8 the coefficients are significant at 1% and have the expected sign in any specification, with the exception of those listed in column 2 that have the expected sign but are not significant.

The coefficient of the frontier TFP growth variable ranges between .0037443 and .0278774 (Table 8). This means that the leading firms generate positive externalities to non-frontier firms. On the other hand, the coefficient of relative TFP variable ranges between -.4424995 and -.4506993 (Table 8). This means that the more is the distance of the firm *i* to the frontier, the more is the expected productivity growth.

The same reasoning is applicable to the variable of interest, i.e. the interaction between relative labour intensity and the tax wedge, that is negative and significant at 1% level in any specification with the exception of that reported in column 2. It ranges between -.0006584 (-.001%) and -.0062585

(-.014%). This means that a 1% increase of the tax wedge leads to about .001-.014 percentage decrease in the productivity (TFP) at the plant-level.

These results show a possible *channel* through tax wedge has a negative effect on economic growth, that is, through its negative effect on productivity, measured by the TFP at the plant-level.

Frontier and relative TFP variables have, respectively, positive and negative values and are significant at 1% in all estimates, both for large and small firms, according to the theory stating that productivity growth of firm *i* is expected to increase with both productivity growth of the frontier and firm *i*'s distance from the frontier. It is useful to remember that the relative TFP is constructed as the ratio between $TFP_{ics,t-1}/TFP_{Fcs,t-1}$ that denotes the *inverse* of distance to the leader and so it must be negative.

It should be notice that, due to the fact that $TFP_{ics,t-1}$ enters both in the LHS and RHS of the main equation, a potential problem of measurement error arises if one does not control for it. I control for this issue by instrumenting $TFP_{ics,t-1}$ with t-2 and t-3 lags of the TFP relative to the Frontier variable in all specifications. Details of this methodology are discussed in the robustness checks section.

In Table 9 I analyze the effect of the tax wedge on TFP growth for small firms. In columns (1) and (2) small firms are measured as the firms in the bottom percentiles (25%) of the log labour distribution, while in columns (3) and (4) small firms are measured as the firms in the bottom percentiles (25%) of the log capital distribution.

Table 9 shows that all the coefficients have, once again, the expected sign in any specification and are significant at 1%. Here, it is remarkable that the

coefficient of the variable of interest, i.e. the interaction between industry labour intensity and tax wedge has a higher magnitude comparative to that obtained from the analysis restricted to large firms and range between -.0059816 (-.013%) and -.0082517 (-.018%).

There is also evidence of a positive impact of the frontier variable and the relative TFP in affecting productivity in small firms, especially the distance TFP variable that lies between -.5471514 and -.6459739 (Table 9). With regard to the frontier variable, the magnitude of its coefficient lies between .0318575 and .0392633. These impact are more pronounced than those referred to large firms.

Table 10 presents the results for large firms. In columns (1) and (2) large firms are measured as the firms in the top percentiles (75%) of the log labour distribution, while in columns (3) and (4) large firms are measured as the firms in the top percentiles (75%) of the log capital distribution.

Once again, all coefficients have the expected sign and are significant at 1% everywhere. The coefficient of the interaction between industry labour intensity and tax wedge ranges between -.0060385 (-.013%) and -.0065959 (-.014%). Relative TFP lies between -.4112024 and -.4336167, while the coefficient of the frontier variable between .02966 and .0320867.

These findings are consistent with the theory predicting that firms distant to the frontier may growth more than those closed to the frontier and that the frontier may have a positive driving effect on firms behind the frontier.

Even the coefficient of the interaction between labour intensity and tax wedge is significant at 1% everywhere but is more pronounced for small firms than for large ones. In fact, with regard to the small firms, a 1% increase of the

tax wedge leads to about .013-.018 percentage decrease in productivity growth rate. Instead, with regard to the large firms, a 1% increase of the tax wedge leads to about .013-.014 percentage decrease in productivity growth rate.

A possible explanation for this different effect arises considering that differences in labour intensity across sectors may be less pronounced for large firms than for small ones if large firms are relatively less dependent on labour.

Furthermore, Tables 12a, 12b and 12c illustrate the effect of the tax wedge on TFP growth by sector. With the exception of sector 5 – coke, refined petroleum and nuclear fuel – characterized by low data availability, the other sector-specific specifications have the expected sign and are significant. The textile sector shows the higher coefficient of the interaction between labour intensity and tax wedge (-.0016801). Vice versa, sectors 5 and 10, representing machinery, coke, refined petroleum and nuclear fuel, are the only industries where the interaction between labour intensity and tax wedge is not significant (Tables 12a and 12b, respectively).

The frontier variable ranges between .013043 and .057246 (food and textiles, respectively). This range is included in that referred to the main specification (Table 8). On the contrary, in all sector estimates, relative TFP shows values lower than those obtained in Table 8.

The country analysis is reported in Table 13. Once again, the coefficients have the expected sign and are significant everywhere. With regard to the interaction between labour intensity and tax wedge, Italy shows the higher value and Germany the lower (-.0007957 and -.000441, respectively). Frontier variable varies between .0200972 and 0.702112 (Belgium and Netherland, respectively);

that is, a range that includes the coefficients showed in Table 8. Instead, the relative TFP shows values lower than those obtained in the main specification (Table 8).

6.1 Robustness checks

After obtaining reliable TFP estimates through the Olley-Pakes approach, it is necessary to verify the stability condition underlying the Autoregressive Distributed Lag ADL(1,1) process adopted in eq. [2]. It is well-known that, to ensure the reliability of the estimates, $lnTFP_{icst-1}$ and $lnTFP_{Fcst-1}$ of eq. [2] must be stationary. If these variables were not stationary there would be a high probability to obtain spurious estimation results.

Therefore to avoid such problems one needs to control that the variables are stationary and, to this end, Dickey-Fuller and Phillips-Perron unit-root tests, with and without a trend, are performed. The results, available upon request, show that the variables are indeed stationary.

Another issue is that there is firm heterogeneity in TFP levels in equilibrium because the innovation of the frontier firms is probably higher than the innovation of the firms far from the frontier and, on the other hand, any convergence to the frontier takes time. I control for heterogeneity using specifications robust to heteroskedasticity.

However, the main issue with the specifications illustrated above is the contemporaneous presence of TFP_{icst-1} both on the right and left hand side of eq.

[4]. The consequence of this is that any measurement error in TFP_{icst-1} would bring a spurious correlation between TFP growth and distance to the technological frontier (Griffith, R., S. Redding and H. Simpson, 2006).

To address this issue I control for many sources of measurement error in TFP by using detailed micro data found in the Amadeus (Bureau van Dijk) database. Beyond this, I perform IV estimates using the t-2 and t-3 lagged values of the TFP gap term as instruments and the results confirm that the relative TFP variable is important in the estimation methods and thus the error correction mechanism incorporating this variable is a good choice in the empirical analysis.

Hence it would be not a good choice to drop the relative TFP variable from the model because there would be a problem of misspecification and an incorrect specification of the error correction mechanism.

The instruments address the concern that contemporaneous measurement error in TFP_{icst-1} would induce a spurious correlation between ΔTFP_{icst-1} on the left-hand side of equation [4] and $TFP_{icst-1}/TFP_{Fcst-1}$ on the right-hand side of the same equation. Any specification shows that the coefficients of the relative TFP have the expected sign and are significant at 1%.

It should be notice that when one uses instrumental variables is recommended to check the endogeneity of the variable to be instrumented. In this contest I perform the Wu-Hausman and Durbin-Wu-Hausman endogeneity tests and the results (Table 11) show that the null hypothesis of exogeneity of the variable is rejected at 1%. Therefore the IV estimation can be appropriately performed.

A second check is performed to ensure that the instruments are valid, that is, there must exist a correlation with the variable to be instrumented. To this end, a practical rule suggests to regress the variable to be instrumented on instrumental variables in order to check whether there is a high R-squared. In my case the regression shows an R-squared of .5112 suggesting that the instruments have some power and therefore it is reasonable to perform IV estimation together with the error correction mechanism and the differences-in-differences approach.

7. Conclusions

The work presented here gives evidence of a negative effects of the tax wedge on productivity at the firm level. The empirical analysis is based on a large and comprehensive micro dataset of firms extracted from the Amadeus (Bureau van Dijk) database covering several OECD member countries.

I focus the analysis on six European countries sharing a similar economic structure. I find that, based on a differences-in-differences approach, the tax wedge affects productivity both for small and large firms. Moreover, the effect for small firms is more pronounced than for large ones.

In the main specification the coefficient of the variable of interest, i.e. the interaction between tax wedge and sector labour intensity ranges between -.0006584 and -.0062585. This means that a 1% increase of the tax wedge may lead to about .014 percentage decrease in productivity growth rates (Table 8).

With regard to the analysis restricted to the small firms (Table 9), the same coefficient ranges between -.0059816 and -.0082517. In this case a 1% increase of the tax wedge leads to about .013-.018 percentage decrease in productivity growth. On the other hand, the analysis devoted to the large firms (Table 10), shows a coefficient of the variable of interest that varies between -.0060385 and -.0065959. Here a 1% increase of the tax wedge leads to about .013-.014 percentage decrease in productivity growth.

A possible explanation for this different impact could be that small firms are typically more labour dependent than large ones. In particular, this partial reduced effect may be due because differences in labour intensity across sectors could be less pronounced for large firms if large firms have a relatively low level of labour intensity comparative to the small ones.

This paper has presented empirical evidence that reinforces theoretical beliefs that economic growth can be decreased by labour taxes. The underlying implication of this analysis is that policy-makers should reconsider, especially in continental Europe, the welfare systems based on high labour taxation because this might lead to lower productivity growth with negative consequences on economic growth not only in the short-run. A possible solution might be found in a gradual replacement of the tax base towards consumption in a way that could guarantee the same tax revenue without affecting productivity growth.

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Appendix 1: Data used in the econometric analysis

Eurostat definition	Date of extraction	Last update	Years
Tax wedge on labour costs	January 2010	June 2010	2000-2008
Added value	January 2010	June 2010	2000-2008
Wages	January 2010	June 2010	2000-2008
Capital fixed assets	January 2010	June 2010	2000-2008
Depreciation	January 2010	June 2010	2000-2008
Investment	January 2010	June 2010	2000-2008

Note: The sample includes 666.788 observations on all non-frontier firms over the period 2000-2008.

Appendix 2: Descriptive tables

Table 1: Firms' characteristics by sector (average values)

Industry	ISIC Rev. 3 Code	Val. add. *	Cap stock*	Invest. *	Wages *	N. obs
1	15-16	2873.92	3710.08	564.92	1747.26	171655
2	17-19	2171.73	1670.08	262.11	1425.34	133803
3	20	1642.71	1403.17	299.47	1074.88	54879
4	21-22	3251.17	2897.95	434.58	2134.82	130583
5	23	36226.34	65672.91	6339.04	7833.73	3112
6	24	7733.59	9391.48	1127.01	4315.71	60417
7	25	3406.27	3140.49	551.64	2312.06	85591
8	26	2966.78	3583.22	685.27	1787.72	91031
9	27-28	2621.32	1847.88	372.23	1754.03	309142
10	29	3448.72	2035.64	354.65	2498.36	204969
11	30-33	4298.15	2650.82	472.40	3093.37	127210
12	34-35	6230.16	5152.01	784.19	4536.09	52555
13	36-37	2032.50	1571.08	301.37	1323.62	101823

Note: * Values in Euros. Industry classification: 1=Food and beverages; 2=Textiles, wearing app. and leather; 3=Wood and wood products; 4=Paper, printing and publishing; 5=Coke, refined petroleum, nuclear fuel; 6=Chemicals and chemical products; 7=Rubber and plastics; 8=Non-metallic mineral products; 9=Basic metals and fabricated metal; 10=Machinery n.e.c.; 11=Electrical and optical equipment; 12=Transport equipment; 13=Manufacturing, n.e.c.; recycling.

Table 2: Firms' characteristics by countries (average values)

Country	Val. add. *	Cap stock*	Invest. *	Wages *	N. obs
Belgium	8016.69	4667.74	592.15	2717.52	56916
Germany	11086.34	7700.59	1549.70	8613.21	261720
France	3199.82	1956.37	296.67	2244.28	291509
Italy	2308.43	2352.22	458.17	1399.37	534256
Netherland	18094.05	4831.19	1811.15	8300.38	86986
Spain	2213.38	2374.41	383.14	1305.44	295383

Note: *All values are in Euros.

Table 3: Taxes by economic function (% of GDP) in sample countries, year 2007

Country	**Tax on capital as % GDP**	**Tax on consump. as % GDP**	**Tax on labour as % GDP**
Belgium	10.00	11.00	22.09
Germany	7.03	10.07	21.06
Spain	11.02	9.05	16.09
France	10.01	10.09	22.04
Italy	11.08	10.02	21.02
Netherland	7.01	12.02	19.06
UK	11.05	10.08	14.00
EU-15 average	*8.63*	*11.24*	*18.72*

Source: Eurostat database.

Table 4: Taxes by economic function (% of total taxes) in sample countries, year 2007

Country	**Tax on capital as % of total taxes**	**Tax on consumption as % of total taxes**	**Tax on labour as % of total taxes**
Belgium	22.8	25.1	52.2
Germany	18.4	27.0	54.6
Spain	30.3	25.5	45.6
France	23.5	25.2	51.8
Italy	27.4	23.6	49.0
Netherland	18.2	31.4	50.4
UK	31.5	29.8	38.6
EU-15 average	*21.77*	*29.33*	*47.98*

Source: Eurostat database.

Table 5: Descriptive statistics (average values)

Country	TFP_{Fcst}	TFP_{icst}	TFP relative to the frontier
Belgium	4.6624 (1.447382)	1.800156 (.53436)	4.165874 (1.683434)
Germany	4.388847 (1.170816)	1.79454 (.3856469)	4.03255 (1.292361)
France	4.876037 (1.442942)	1.558743 (.3836438)	3.487036 (1.268243)
Italy	5.437021 (.7904124)	1.621955 (.4329144)	3.030976 (.9307067)
Netherland	3.262469 (.6456722)	1.892959 (.4640324)	5.805268 (1.661092)
Spain	4.685608 (1.143849)	1.551324 (.4266234)	3.401256 (1.171483)

Note: The sample includes 666.788 observations on all non-frontier firms over the period 2000-2008. Standard deviations in parenthesis.

Table 6: Descriptive statistics (average values)

Industry	ISIC Rev. 3 Code	TFP_{Fcst}	TFP_{icst}	TFP relative to the frontier
1	15-16	5.289288 (.9562951)	1.611231 (.4832398)	3.00227 (1.046995)
2	17-19	5.038312 (.8953525)	1.570377 (.449277)	3.139306 (1.031158)
3	20	3.529653 (1.022625)	1.526428 (.355436)	4.31753 (1.43665)
4	21-22	4.950517 (1.399719)	1.602276 (.4481372)	3.118016 (1.197419)
5	23	4.088458 (.9560876)	1.933221 (.7249597)	4.804415 (2.1659)
6	24	5.834382 (1.535701)	1.761974 (.5516916)	3.117589 (1.209848)
7	25	3.919157 (.9166733)	1.623683 (.3910058)	4.158329 (1.337686)
8	26	4.759988 (1.221009)	1.650722 (.4491406)	3.387863 (1.227118)
9	27-28	4.948923 (1.241775)	1.584745 (.3585641)	3.190246 (1.014253)
10	29	4.913468 (.9884915)	1.607245 (.3839526)	3.340188 (1.023404)
11	30-33	4.523489 (1.012543)	1.641601 (.4258723)	3.652828 (1.253388)
12	34-35	4.635314 (1.520449)	1.646955 (.4775748)	3.546129 (1.429582)
13	36-37	4.730602 (1.283462)	1.561445 (.4086369)	3.262856 (1.172025)

Note: Industry classification: 1=Food and beverages; 2=Textiles, wearing app. and leather; 3=Wood and wood products; 4=Paper, printing and publishing; 5=Coke, refined petroleum, nuclear fuel; 6=Chemicals and chemical products; 7=Rubber and plastics; 8=Non-metallic mineral products; 9=Basic metals and fabricated metal; 10=Machinery n.e.c.; 11=Electrical and optical equipment; 12=Transport equipment; 13=Manufacturing, n.e.c.; recycling. Standard deviations in parenthesis.

Table 7: Tax wedge on labour cost, years 2000-2008

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU (27 countries)	41	40,5	40,5	40,5	40,4	40,4	41,1	40,9	39,9
EU (25 countries)	41	40,5	40,5	40,5	40,4	40,3	41,1	40,9	39,9
EU (15 countries)	41	40,4	40,5	40,5	40,4	40,3	41,1	40,9	40,8
Belgium	51,3	50,7	50,5	49,6	49	49,3	49,4	50	49,8
Germany	48,6	47,7	48,1	48,8	47,8	48,2	48,4	47,8	46,6
Spain	34,7	35,3	35,7	34,7	35,2	35,5	35,9	35,7	34
France	47,4	47,6	47,4	45	42,4	41,4	45,5	45,4	45,4
Italy	43,5	43,1	43	41,7	41,9	42,2	42,5	42,6	43
Netherlands	42	38,9	39,1	40	40,8	41,7	40,9	40,7	33,6
United Kingdom	*29,1*	*28,6*	*28,7*	*30,3*	*30,5*	*30,5*	*30,6*	*30,7*	*29,7*
United States	*28,3*	*28,2*	*28*	*27,8*	*27,7*	*27,6*	*27,7*	*27,5*	*26,6*

Source: Eurostat database, September 2010

Figure 1. Evolution of TFP

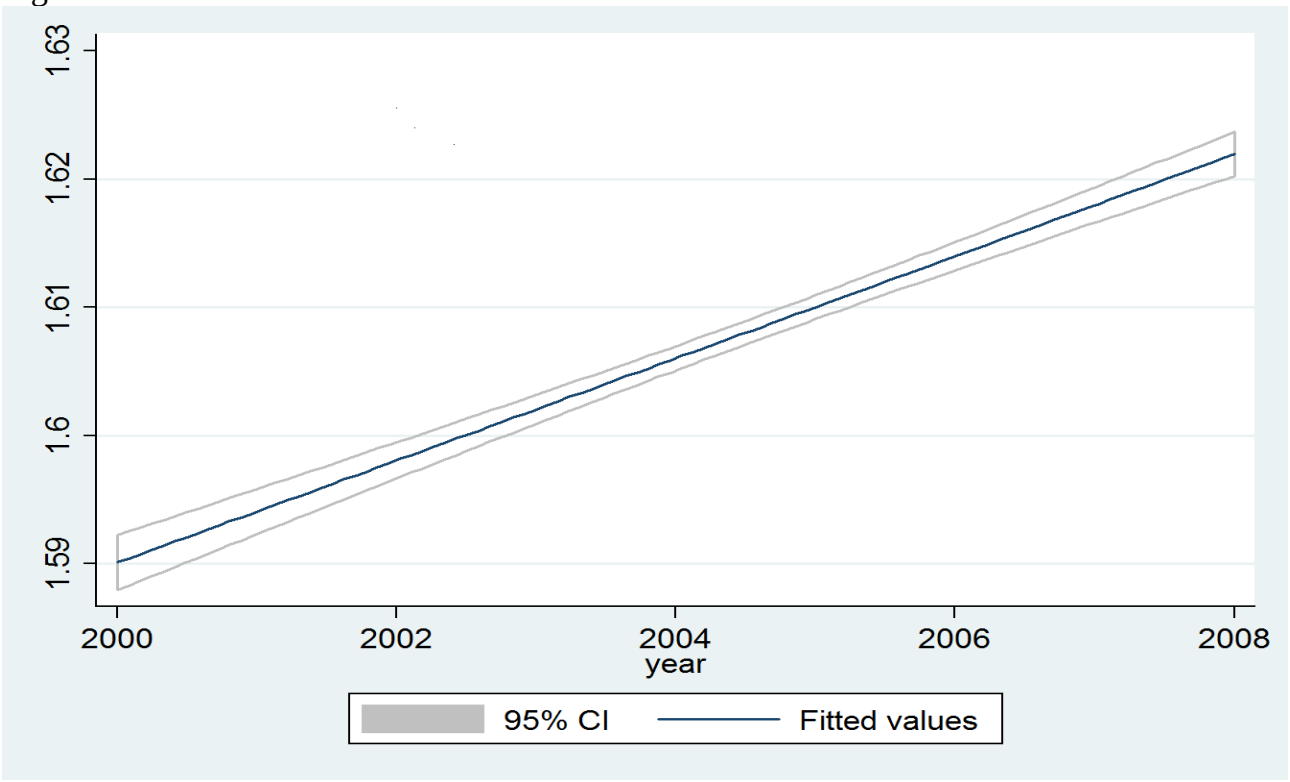


Figure 2. TFP vs. lagged TFP

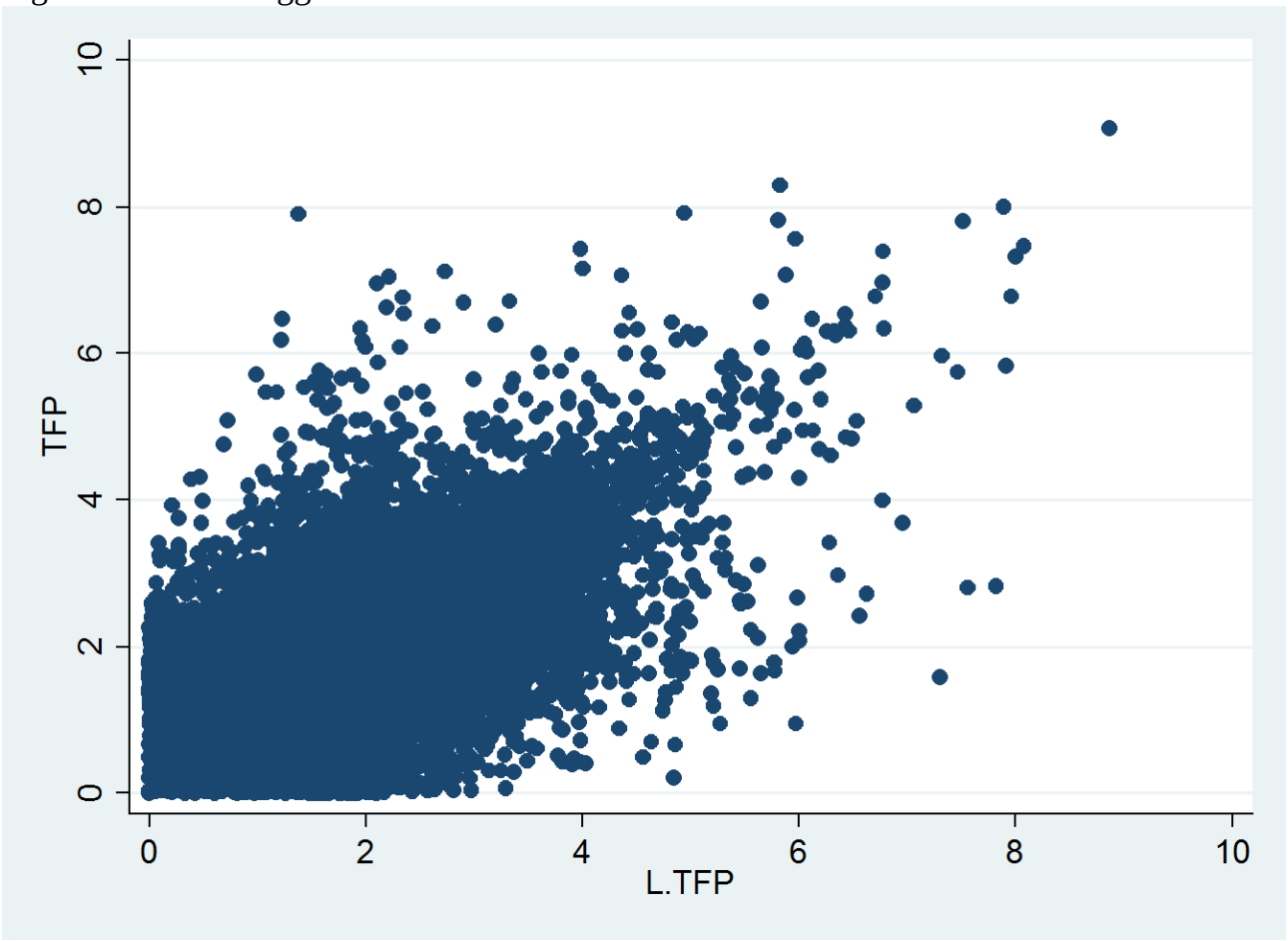


Figure 3. TFP at the technological Frontier vs. lagged Frontier TFP

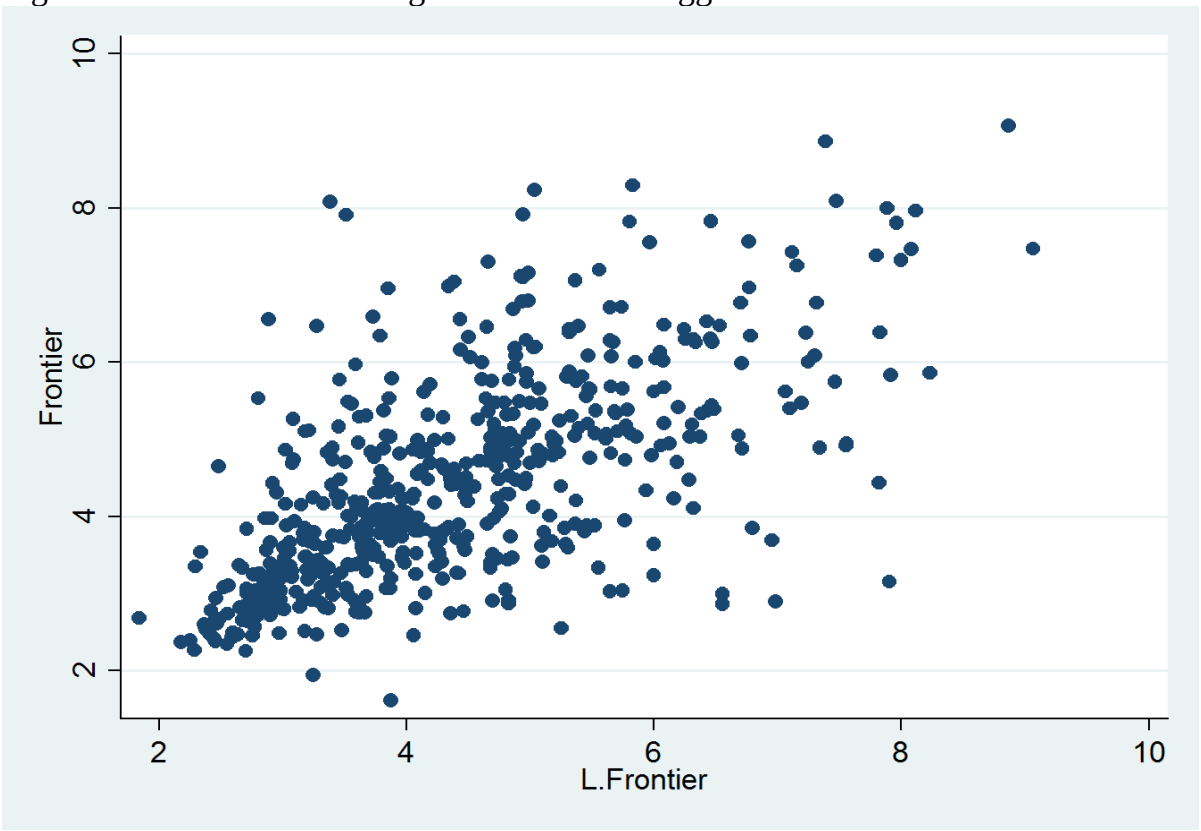
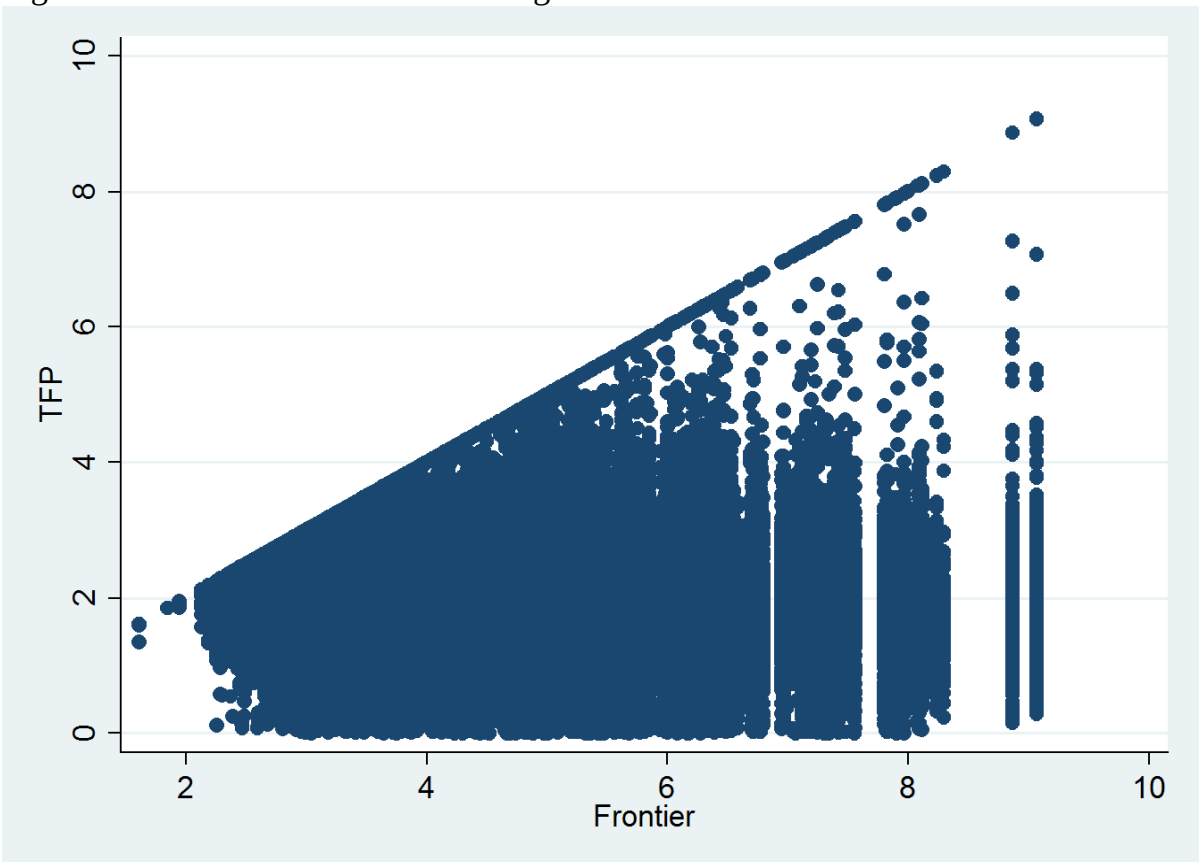


Figure 4. TFP vs. TFP at the technological Frontier



Appendix 3: Econometric results

Table 8: The Effect of the Tax wedge on TFP Growth at the Firm Level

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_s + \gamma_{ct} + \varepsilon_{icst}$$

Dependent variable: TFP growth	(1)	(2)	(3)	(4)
Basic Model				
Frontier TFP growth	.0037443*** (0005318)	.0009816 (.0005849)	0281897 *** (.0010388)	.0278774 *** (.0010489)
TFP relative to the Frontier			-.4424995 *** (.014724)	-.4506993 *** (.0146973)
Labint*Tax	-.0006584*** (.0001767)	-.0002795 (.0001879)	-.006038 *** (.0002592)	-.0062585 *** (.000261)
Country dummies	Yes	No	Yes	No
Year dummies	Yes	No	Yes	No
Country-year dummies	No	Yes	No	Yes
Sector dummies	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Observations	666788	666788	399820	399820
R^2	0.0039	0.0025	0.0661	0.0678

(i) In the estimated empirical model *ΔlnTFP icst* denotes TFP growth in firm *i* , country *c* , sector *s* and year *t* , *(ii)* Δ*lnTFP Fcst* denotes TFP growth in the technological leader firm, *(iii) (TFP ics,t-1 /TFP Fcs,t-1)* denotes the inverse of distance to the leader, *(iv) Labint s *Tax c,t* the interaction between labour intensity and the tax wedge, *(v)* γ *s* and γ *ct* sector and country-year fixed effects, respectively. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.
Models(1 and 3): firm fixed effect; Models (2 and 4) firm fixed effect & country-year dummies. In models 1 and 2 I drop TFP relative to the Frontier variable. In models 3 and 4 I regress IV estimation.

Table 9: The Effect of the Tax wedge on TFP Growth in small firms

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_s + \gamma_{ct} + \varepsilon_{icst}$$

Dependent variable: TFP growth	(1)	(2)	(3)	(4)
Small firms Models				
Frontier TFP growth	.0324632***	.0318575***	.0392633***	.0381664***
	(.0027114)	(.0027399)	(.0025973)	(.0026018)
TFP relative to the Frontier	-.5471514 ***	-.5496237***	-.6435582***	-.6459739***
	(.0379332)	(.0379446)	(.041774)	(.0416227)
Labint*Tax	-.0059816***	-.0060536***	-.0082517***	-.0082389***
	(.0007514)	(.0007609)	(.0006312)	(.0006297)
Country dummies	Yes	No	Yes	No
Year dummies	Yes	No	Yes	No
Country- year dummies	No	Yes	No	Yes
Sector dummies	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Observations	75040	75040	86330	86330
R^2	0.0734	0.0744	0.0920	0.0934

(i) In the estimated empirical model *ΔlnTFP icst* denotes TFP growth in firm *i* , country *c* , sector *s* and year *t* , *(ii)* Δ*lnTFP Fcst* denotes TFP growth in the technological leader firm, *(iii) (TFP ics,t-1 /TFP Fcs,t-1)* denotes the inverse of distance to the leader, *(iv) Labint s *Tax c,t* the interaction between labour intensity and the tax wedge, *(v)* γ *s* and γ *ct* sector and country-year fixed effects, respectively. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors corrected for clustering at the country-sector level in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.
All modelds use IVs estimation. Models (1 – 3): firm fixed effect, country dummies and year dummies; Models (2 – 4) firm fixed effect & country-year dummies. Models 1 - 2 use log-labour variable in defining small firms; models 3 – 4 use log-capital variable in defining small firms.

Table 10: The Effect of the Tax wedge on TFP Growth in large firms

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_s + \gamma_{ct} + \varepsilon_{icst}$$

Dependent variable: TFP growth	(1)	(2)	(3)	(4)
Large firm Models				
Frontier TFP growth	.0297307***	.02966***	.0307552***	.0320867***
	(.0023516)	(.0023862)	(.0025959)	(.0026326)
TFP relative to the Frontier	-.4112024***	-.4199105***	-.4145475***	-.4336167***
	(.0308046)	(.030884)	(.0325253)	(.0326569)
Labint*Tax	-.0062431***	-.00657***	-.0060385***	-.0065959***
	(.0005379)	(.0005434)	(.000623)	(.0006358)
Country dummies	Yes	No	Yes	No
Year dummies	Yes	No	Yes	No
Country-year dummies	No	Yes	No	Yes
Sector dummies	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Observations	104996	104996	103784	103784
R^2	0.0622	0.0648	0.0606	0.0637

(i) In the estimated empirical model $\Delta lnTFP\ icst$ denotes TFP growth in firm *i* , country *c* , sector *s* and year *t* , *(ii)* $\Delta lnTFP\ Fcst$ denotes TFP growth in the technological leader firm, *(iii)* $(TFP\ ics,t\text{-}1\ /TFP\ Fcs,t\text{-}1\ )$ denotes the inverse of distance to the leader, *(iv)* $Labint\ s\ *Tax\ c,t$ the interaction between labour intensity and the tax wedge, *(v)* $\gamma\ s$ and $\gamma\ ct$ sector and country-year fixed effects, respectively. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors corrected for clustering at the country-sector level in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.
All modelds use IVs estimation. Models (1 – 3): firm fixed effect, country dummies and year dummies; Models (2 – 4) firm fixed effect & country-year dummies. Models 1 - 2 use log-labour variable in defining small firms; models 3 – 4 use log-capital variable in defining small firms.

Table 11: Tests on IV estimation method.

Tests of endogeneity of: TFP relative to the frontier

H0: Regressor is exogenous

Wu-Hausman F test	8.95e+03 F(1,399793) P-value = 0.00000
Durbin-Wu-Hausman chi-sq test	8.76e+03 Chi-sq(1) P-value = 0.00000

Table 12a: The Effect of the Tax wedge on TFP Growth by sector

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_{ct} + \varepsilon_{icst}$$

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5
Frontier TFP growth	.013043***	.057246***	.0167327***	.0271775***	.0175188
	(.0035874)	(.0047574)	(.005431)	(.0045866)	(.033937)
TFP relative to the Frontier	-.036479***	-.0615052***	-.0338709***	-.0509631***	-.0021015
	(.0039738)	(.0050856)	(.0062979)	(.0056399)	(.0247736)
Labint*Tax	-.0001635	-.0016801***	-.000165	-.0006399***	-.0002107
	(.0001244)	(.0001845)	(.0001685)	.0001086)	(.0012652)
Country dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Sector dummies	No	No	No	No	No
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	44801	38704	15347	30557	847
R^2	0.0516	0.0810	0.0753	0.0629	0.0253

(i) In the estimated empirical model $\Delta lnTFP\ icst$ denotes TFP growth in firm i , country c , sector s and year t , *(ii)* $\Delta lnTFP\ Fcst$ denotes TFP growth in the technological leader firm, *(iii)* $(TFP\ ics,t-1\ /TFP\ Fcs,t-1\ )$ denotes the inverse of distance to the leader, *(iv)* $Labint\ s\ *Tax_{c,t}$ the interaction between labour intensity and the tax wedge. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors corrected for clustering at the country-sector level in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%. Sectors involved are: (1) Food and beverages; (2) textiles, wearing app. and leather; (3) wood and wood products; (4) paper, printing and publishing; (5) Coke, refined petroleum, nuclear fuel.
All models use IVs estimation with firm fixed effect, country and year dummies.

Table 12b: The Effect of the Tax wedge on TFP Growth by sector

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_{ct} + \varepsilon_{icst}$$

	Sector 6	Sector7	Sector 8	Sector 9	Sector 10
Frontier TFP growth	.0170822***	.0499001***	.015146***	.0259565***	.0137661***
	(.0052736)	(.0068538)	(.0033139)	(.0022436)	(.0040071)
TFP relative to the Frontier	-.0442064***	-.0438362***	-.0677957***	-.0395107***	-.0387071***
	(.0068489)	(.0047256)	(.0053883)	(.0034341)	(.0041351)
Labint*Tax	-.0002249**	-.0013444***	-.0005582***	-.000522***	.0001019
	(.0001354)	(.0002369)	(.0000831)	(.0000616)	(.000141)
Country dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Sector dummies	No	No	No	No	No

Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	18535	23238	25217	81201	52239
R^2	0.0570	0.0820	0.0976	0.0605	0.0668

(i) In the estimated empirical model *ΔlnTFP icst* denotes TFP growth in firm *i* , country *c* , sector *s* and year *t* , *(ii)* Δ*lnTFP Fcst* denotes TFP growth in the technological leader firm, *(iii) (TFP ics,t-1 /TFP Fcs,t-1)* denotes the inverse of distance to the leader, *(iv) Labint s *Tax* $_{c,t}$ the interaction between labour intensity and the tax wedge. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors corrected for clustering at the country-sector level in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%. Sectors involved are: (6) Chemicals and chemical products; (7) Rubber and plastics; (8) Non-metallic mineral products; (9) Basic metals and fabricated metal; (10) Machinery n.e.c.. All models use IVs estimation with firm fixed effect, country and year dummies.

Table 12c: The Effect of the Tax wedge on TFP Growth by sector

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_{ct} + \varepsilon_{icst}$$

	Sector 11	Sector 12	Sector 13
Frontier TFP growth	.0413364***	.039768***	.030622***
	(.0054274)	(.006907)	(.0049661)
TFP relative to the Frontier	-.0490938***	-.0410196***	-.0486087***
	(.004585)	(.0064702)	(.0060017)
Labint*Tax	-.0006424***	-.0008131***	-.0008185***
	(.0001362)	(.0001974)	(.0001624)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Sector dummies	No	No	No
Firm fixed effect	Yes	Yes	Yes
Observations	29379	11892	27863
R^2	0.0798	0.0609	0.0717

(i) In the estimated empirical model *ΔlnTFP icst* denotes TFP growth in firm *i* , country *c* , sector *s* and year *t* , *(ii)* Δ*lnTFP Fcst* denotes TFP growth in the technological leader firm, *(iii) (TFP ics,t-1 /TFP Fcs,t-1)* denotes the inverse of distance to the leader, *(iv) Labint s *Tax* $_{c,t}$ the interaction between labour intensity and the tax wedge. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors corrected for clustering at the country-sector level in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%. Sectors involved are: (11) Electricity, gas and water supply; (12) Construction; (13) Hotels and restaurants.
All models use IVs estimation with firm fixed effect, country and year dummies.

Table 13: The Effect of the Tax wedge on TFP Growth by Country

The estimated equation is:

$$\Delta lnTFP_{icst} = \beta_0 \Delta lnTFP_{Fcst} + \beta_1 ln(TFP_{icst-1}/TFP_{Fcst-1}) + \lambda(Labint_s * Tax_{ct-1}) + \gamma_a + \gamma_{st} + \varepsilon_{icst}$$

	Belgium	Germany	France	Italy	Netherland	Spain
Frontier TFP growth	.0200972	.0243638***	.0302277***	.032054***	.0702112**	.0243461***
	(.0124255)	(.0068248)	(.0020826)	(.0018267)	(.032021)	(.0018316)
TFP relative to the Frontier	-.0293568**	-.0268274***	-.0475957***	-.0515307***	-.0157195	-.0444937***
	(.013486)	(.0070705)	(.0028993)	(.0022023)	(.0131722)	(.0026505)
Labint*Tax	-.0004694**	-.000441***	-.0005161***	-.0007957***	-.0013904	-.000618***
	(.0002814)	(.0001639)	(.0000498)	(.0000561)	(.0009727)	(.0000573)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9896	10521	96569	183360	2240	97234
R^2	0.0518	0.0517	0.0744	0.0718	0.0455	0.0693

(i) In the estimated empirical model $\Delta lnTFP\ icst$ denotes TFP growth in firm *i* , country *c* , sector *s* and year *t* , *(ii)* $\Delta lnTFP\ Fcst$ denotes TFP growth in the technological leader firm, *(iii)* $(TFP\ ics,t-1\ /TFP\ Fcs,t-1\ )$ denotes the inverse of distance to the leader, *(iv)* $Labint\ s\ *Tax_{c,t}$ the interaction between labour intensity and the tax wedge. The estimation sample contains 6 European OECD countries over the period 2000-2008. TFP is the residual of a Cobb-Douglas production function estimated at the firm level. Robust standard errors corrected for clustering at the country-sector level in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.
All models use IVs estimation with firm fixed effect, sector and year dummies.

Chapter 3.

Tax relief and *Fiscalizzazione*. Investigating the impact of the tax wedge on Italian regional employment.

Andrea Festa[•]

University of Salerno

Abstract

The Italian policies of tax relief and Fiscalizzazione are designed to stimulate economic growth and employment, especially in the South. They have been a constant source of debate and attention even in the EU institutions. In this paper I overview the legislative framework, then I empirically investigate what is the impact of the tax wedge on regional employment in order to exploit whether there are differences at the regional level. The empirical evidence shows a negative effect of the tax wedge on regional employment, especially with regard to the northern regions, due to the presence of a more developed decentralized bargaining level that may lead to mechanisms of real wage resistance that protects the private employees' income leading to a negative effect on employment, not only in the short term. Because a labour tax cut in the South may lead to increasing employment, even if less pronounced then the North, it should be positively valuated. The empirical evidence suggests a differentiated effect not only among regions but also among sectors. This might suggests to focus these policies on those regions and sectors where the effect on employment is greater other than to promote the development of a second-level bargaining even in the South to increase the sensitivity of employment to changes in the tax wedge and labour taxation.

Keywords: Tax relief, Fiscalizzazione, employment. *JEL classification*: H2.

[•] I am grateful to prof. S. Destefanis for his suggestions in developing this work. All errors remain mine.

1. Introduction

Tax relief and State-assisted reduction to employers' social security contributions (SSCs) are part of the labour policies and they have been present in Italy since 1968. The motivation underlying these instruments is to be found in the attempts made since World War II, to eliminate any difference in growth rates of southern regions compared with the traditionally more developed northern ones. The aim of these policies is to decrease the tax wedge, viewed as one of the causes of distortions in the labour market and thus a barrier to employment and growth.

Over the years, these policies have been considered capable of reducing the relative price of productive factors contributing to boosting employment, especially in those regions where unemployment is conspicuous, and useful to mitigate the impact of the abolition of wage cages (*gabbie salariali*).

During the years, the policy-makers have added other aims that in turn were perceived as demanding. For example, the promotion of female employment, too low comparative to the male average, or the wage growth's containment during the 70's.

On the other hand, these policies appear not the result of a stable strategy, but rather the result of a huge range of interventions, modifications and extensions of legislation that defy classification and indeed move in the direction of systematic extraordinary measures rather than to a legislative consistency.

In particular, since the 80's there has been a gradual reduction of these measures in order to meet the needs of public expenditure cut and the EU rules

regarding the State aid. During the 90's these rules has been strengthen, leading to the end of these extraordinary interventions in southern Italy.

It should be clear that what goes by the name of tax relief is to be conceptually distinguished from the instrument of the State-assisted reduction of SSCs (here and afterwards abbreviated as *Fiscalizzazione*), as noted by the judgment of the *Corte di Cassazione* (Supreme Court) dated 17 June 1999, No. 6055. In fact, tax relief (*Sgravi contributivi*) and *Fiscalizzazione* are different instruments of economic policy, although they share the same ultimate goal, that is, reducing the tax wedge that in Italy is among the highest compared to other developed countries.

The labour taxation, historically high in Italy, during the 80's has tended to widen due to the combination of several aspects. In fact, until 1981 if the increase in labour taxes, caused by both fiscal drag and the increase in SSCs, were partially offset by the *Fiscalizzazione*, since 1982 this mitigating effect would be significantly affected by the reduction of the *Fiscalizzazione* measures, and the final result was an increase in the tax wedge bringing back the SSCs to levels registered in the first half of the seventies.

First measures of tax relief have been introduced by the art. 18 of D.L. 30 August 1968, No. 918, converted with amendments into the law 25 October 1968, No. 1089.

The original intention was to promote the development of productive activities and to increase the employment and growth rates for enterprises operating in southern Italy.

The main criterion to access these benefits is the territoriality. In fact, tax cuts on labour cost are benefits granted to several enterprises operating in the South and consisting in a partial or total reduction of SSCs due by the firms to Italian Social Security Institution (INPS), with special regard to the contribution of invalidity, old age and survivors.

These measures over time has attracted a growing discontent in the ruling class and in the populations of northern regions, which, rightly or wrongly, impute to the southern ruling class not to take advantage from these benefits systematically financed from resources taken from the national budget and that thus result *de facto* in a indirect intra-regional transfers of resources from the rich North.

On the other hand, *Fiscalizzazione* is a measure which, while operating with a mechanism and finality similar to the tax relief, is to be distinguished because is an instrument of economic policy *without* territorial characterization.

In fact, it is applicable on sector basis, i.e. only firms included in several preferred industries set by the law can obtain the benefit regardless their territoriality.

The relevant legislation on *Fiscalizzazione* dates back to D.L. 7 February 1977, No. 15, converted, with amendments, into the law 7 April 1977, No. 102. The law 8 August 1977, No. 573 extends the application of the law 102/1977 to commercial, hotels and tourism enterprises stating that the firms can benefit from labour tax cut only if they subscribe the labour national collective agreements.

The motivation underlying this work lies in the attempt to overview these fiscal policies and to determine, through empirical estimates, the impact of the

tax wedge on regional employment to understand whether these measures should be implemented with a differentiation on territorial or industrial basis.

This paper is organized as follows. Section 2 develops a review on empirical papers related to the Italian case and its regional differentiations. Sections 3 and 4 give an overview of the legislative framework on tax relief and *Fiscalizzazione*. Section 5 illustrates the available data as section 6 focuses on the estimation methods adopted to investigate the impact of the tax wedge on regional employment. Section 7 reports the results. Section 8 concludes.

2. Previous empirical research

In Italy the introduction of policies of tax relief and *Fiscalizzazione* which, through the reduction of the tax wedge, may lead to an increase in the regional employment rates, has caused much research in order to understated whether these goals have been at least approached.

The different development among regions motivates these policies whose aim is reducing the different rate of regional growth and boosting employment. Policies of tax relief are a benefit granted to firms on regional basis, that is, they are focused especially to southern enterprises.

On the other hand, *Fiscalizzazione* is a benefit restricted to several sectors without regional differentiation until 1980. After this date, *Fiscalizzazione* is more notable in southern regional sectors and thus the differentiations with policies of tax relief becomes nuanced (Table 6).

Nevertheless these benefits the South remains a North-dependent economy which serves as the engine of the country. This depends upon several factors as the gap in the regional and intra-regional GDP, which has not changed much in recent decades (Bodo G. and Sestito P. 1991), the deficit of the balance of payments and the investments on productive activities that in the South has been mainly financed through the intervention of State with resources taken from the North.

It is useful to add that the financing of the deficit not occurs only through extraordinary measures but also via ordinary transfers. Moreover, the substantial increase of these measures in the South has generated a worrying deficit leading to a contradiction between the dual need of supporting development and reducing the southern deficit.

There are many causes underlying to this. In this section I focus on several empirical works developed by Brunello *et al.* (2001), Bodo G. and Sestito P. (1991) that list some of these, such as the dispersal of resources that has frustrated the intention of creating development poles similar to those present in the North-East, environmental factors such as organized crime able to distort public policies, even if difficult to measure, and the inability of the Public Administration to prevent the undue accumulation of extraordinary and ordinary measures (Bodo G. and Sestito P. 1991).

Bodo G. and Sestito P. (1991) propose an econometric model to explain the labor market in both macro-regions (North and South), focusing on several sectors. The limitations associated with the data availability, mainly extracted from the national accounts, induce the authors to operate with few variables as

employment, total and dependent, value added at current and constant prices and labour cost. With regard to the industries, the authors take into account the disaggregation proposed by the Bank of Italy (1986). The sectors thus considered are agriculture, construction, processing industry and market services. The available data on employment are those referred to the number of employed. On the LHS of the model the dependent variable is the (dependent) employment. On the RHS there is its lagged value, the labour cost per unit of work, the value added and a constant.

The model, estimated via OLS, has a trend variable. Since the variables may contain both measurement errors and simultaneity issues, the authors estimate it also through IVs. Finally, the authors present an analysis of cointegration (not reported) confirming the results obtained via OLS and IV.

The results, illustrated in Table 1, show that in the processing industry the labour cost per unit of work affects negatively the dependent variable, as expected. Vice versa, both lagged dependent variable and value added have a positive effect on employment. It should be notice that the results are suitable especially with regard to the northern analysis. In fact, the baseline model estimated via OLS shows that, restricting the analysis to the South in the period 1961-1984, the estimates are unstable, reflecting the strong public involvement in southern regions that may lead to a labour demand not (only) determined by profit maximization process (Bodo G and Sestito P. (1991). However, when the model is estimated until 1979, the dynamic instability disappear (Table 1). Significantly, the results do not change significantly in the IV specification (Table 1) and in the analysis of cointegration. Finally, sectors as constructions

and market services (Table 1) shows not remarkable differences between North and South.

Brunello G, Lupi C. and P. Ordine (2001a) check whether the tax wedge has a role in the wage determination, at least in the short-run, considering the empirical evidence arising from papers based on OECD countries' investigation. These works show that the introduction or an increase in the tax wedge affects the labour cost increasing the unemployment rates (European Commission 2004, Daveri & Tabellini 2000, OECD 2003-2004). Similar results have been reached by Kugler A. & Kugler M. (2003) and J. Gruber (1997) for the cases, respectively, of Colombia and Chile, and by Gora *et al.* (2006) for Poland, with special regard to the effect on the unskilled workers.

Brunello G., Lupi C. and Ordine P. (2001a) investigate the evolution of the Italian unemployment rates between southern and northern regions. The sample under investigation covers the period 1960-1994 in which the main part of the tax relief policies have been applied. The variables included in the model are the gross wages per capita, the unemployment rates, the real value added at factor cost per worker as a measure of productivity, the level of taxation and the real price of imported raw materials. The variables are used in an unrestricted VAR model of the following form:

$$A(B)X_t = \Phi D_t + \varepsilon_t \qquad (1)$$

where $A(B)$ is a polynomial matrix of order k in the lag operator B and $X_t \equiv \{ log(u_t), log(\tau_t), log(\zeta_{ct}), log(PM_{ct}) \}$. U stands for unemployment rate, τ for tax

rate, ζ for social transfers, PM for the real price of the imported materials and energy (Brunello G., Lupi C. and Ordine P. 2001a).

The evidence suggests that the policy of tax relief has not served to reduce the gap in the unemployment rates between North and South. The only appreciable effect seems to be the maintaining of a stable gap between the unemployment rates of these areas.

It is clear that this analysis, including a long period of time, is probably affected by other regional economic and demographic factors, but it should be noted that, when policies of tax relief are not refinanced, there is a significant increase in the differential of the unemployment rates between North and South because the increase in the SSCs.

The results, on the one hand, confirm that the tax wedge does not affect gross wages in the long-run. In particular, in the North the results indicate the existence of real wage resistance against changes in the tax wedge that could affect employment, while in the South an increase in the tax wedge leads to a negative effect on wages without employment consequences.

This difference, still argue the authors, is due to the decentralized bargaining level present in the North that may neutralize the effect of changes in the tax wedge. Vice versa, the lack of second-level bargaining in the less-developed southern regions prevents a full protection of workers' wages.

Obviously, this is not the only cause of the difference between northern and southern unemployment rates. However, because a reduction of the southern tax wedge seems to lead to increasing wages and workers spending power of the depressed areas, it should be positively evaluated as an instrument of

development. Finally, Brunello G., Lupi C., and Ordine P. (2001a) find that policies of *Fiscalizzazione* have a positive effect in the long-run in reducing labour cost, especially in the North.

Brunello G., Lupi C., and Ordine P. (2001b) study the relationship between regional wage determination and unemployment using data covering the period 1960-1994 on unemployment, tax wedge, real price of imported energy and materials and government social transfers per head.

They estimate, for each region *i*, a standard non-stationary VAR of the following form:

$$X_{it} = \mu_i + \Pi_{i,1}X_{i,t-1} + \ldots + \Pi_{i,k}X_{i,t-k} + \varepsilon_{i,t} \qquad (2)$$

where $X_t \equiv \{log(u_t), log(\tau_t), log(\zeta_{ct}), log(PM_{ct})\}$. U stands for unemployment rate, τ for tax wedge, ζ for social transfers, PM for the real price of the imported materials and energy (Brunello G., Lupi C. and Ordine P. 2001b).

The results show that a high tax wedge widen the unemployment rates, especially in the North where is present a real wage resistance (Table 2). Moreover, the relative low wage of the southern workers is not affected by the fact that they work in a context of high unemployment. It depends instead on the unemployment rate prevailing in the North.

To reduce the differential in the unemployment rates between developed and less developed regions, the authors suggest the adoption of a more pronounced decentralized wage bargaining level even in less-developed regions, because a

local labour policy might take into account any difference in terms of regional labour productivity.

Finally Brunello G., Lupi C., Ordine P. and Parisi M.L. (2001) investigate the effect of the tax wedge on regional unemployment in Italy. They use regional data covering the period 1965-1995. Data on unemployment, tax wedge and social transfers are extracted from ISTAT, Svimez and CRENOS. Data on real price of imported energy and materials and real rate of interest are extracted from Bank of Italy.

They estimate for each region *i* a dynamic VAR of the following form:

$$\alpha(L)\mu_{it} = c + x_{it}\beta(L) + v_{it} \qquad (3)$$

where x_{it}= { $log(r_t)$, $log(\tau_t)$, $log(\zeta_{ct})$, $log(PM_{ct})$}, *r* stands for real rate of interest, *PM* for the real price of the imported materials and energy, τ for tax wedge, ζ for social transfers and v_{it} are the residuals (Brunello G., Lupi C., Ordine P. and Parisi M.L. 2001).

The authors find that a cut in the tax wedge may lead to a decrease in the unemployment rate more pronounced in the North (Table 2). In particular, a 10% reduction of the tax wedge in the North could lead to a decrease in the unemployment rate of over 38%, more than three time the 11,4% of the southern regions confirming previous results suggesting that the relationship between tax wedge and unemployment is strongest in the industrialized northern regions than in the South.

The authors suggest an explanation for this to be found in the different labour markets of the two areas. Once again, a key role is attributed to the decentralized bargaining level leading to real wages resistance in the North. In other words, a cut in the tax wedge in the northern regions would be more effective in reducing unemployment rate than in the less-developed regions which eventually are those experimenting higher unemployment rates. This happens because a decentralization obtained by adding local to central bargaining implies an increase in the sensitivity of gross wages to labour taxation.

Hence in this case a labour tax cut is more effective in reducing unemployment (Brunello G., Lupi C., Ordine P., Parisi M., 2001).

Table 1. Labour demand function, regional estimates

Estimated equation: $\alpha(l)_{it} = c + \beta_0(y_{it}) + \beta_1(l_{i-1,t}) + \beta_2(\varphi_{it}) + \beta_3(T_{it}) + \varepsilon_{it}$

OLS – processing industry	North 1961-1984	South 1961-1984	South 1961-1979
C	-0.55 (-0.95)	-1.20 (-1.39)	2.66 (1.27)
Y	0.38 (6.35)	0.11 (1.66)	-0.03 (-0.30)
l_{i-1}	0.66 (8.29)	1.07 (9.00)	0.62 (2.45)
Φ	-0.19 (-2.55)	0.04 (0.62)	0.11 (1.26)
T	-0.000867 (-3.23)	-0.0016 (-5.02)	-0.00109 (-1.26)
IV – processing industry	North 1962-1984	South 1962-1984	South 1961-1979
C	-0.73 (-1.13)	-1.50 (.1.53)	-
Y	0.40 (4.38)	0.12 (1.40)	-
l_{i-1}	0.66 (6.96)	1.11 (8.80)	-
Φ	-0.22 (-1.90)	0.01 (0.13)	-
T	-0.000811 (-2-20)	-0.00103 (-3.89)	-
OLS – construction	North	South	

	1961-1984	1961-1984
C	-1.36 (-1.75)	1.94 (3.88)
Y	0.66 (7.96)	0.31 (3.02)
l_{i-1}	0.47 (5.72)	0.37 (4.18)
Φ	-0.22 (-2.79)	-0.24 (-4.97)
T	-0.00177 (-6.95)	-0.000243 (-1.27)
IV – construction	North 1962-1984	South 1962-1984
C	0.03 (0.02)	2.30 (2.87)
Y	0.61 (5.06)	0.37 (1.75)
l_{i-1}	0.34 (2.53)	0.25 (1.25)
Φ	-0.39 (-2.76)	-0.24 (-2.97)
T	-0.00147 (-4-16)	-0.000521 (-1.73)
OLS – market services	North 1961-1984	South 1961-1984
C	-0.76 (-2.09)	-1.19 (2.85)
Y	0.25 (3.40)	0.38 (4.88)
l_{i-1}	0.82 (14.83)	0.73 (13.07)
Φ	-0.16 (-2.29)	-0.24 (-2.81)
T		
IV – market services	North 1962-1984	South 1962-1984
C	-0.93 (-2.17)	-1.07 (-2.20)
Y	0.26 (3.01)	0.35 (3.91)
l_{i-1}	0.82 (13.72)	0.74 (13.27)
Φ	-0.19 (-2.23)	-0.21 (-2.12)
T		

Note: Results drawn from Bodo G. and Sestito P. (1991). *l* stands for employment, *y* for value added, l_{i-1} for lagged dependent variable, φ for real labour cost per unit of work, *T* is the trend variable, c is the constant and ε_{it} are the residuals. More details are available in the original work. Standard errors in parenthesis.

Table 2. Static long-run regional estimates

Estimated equation: $\alpha(L)u_{it} = c + X_{it}\beta(L) + \nu_{it}$

	T		*T*
Northern Italy		*Southern Italy*	
Piemonte	3.621 (1.048)	Abruzzo	0.626 (0.302)
Lombardia	5.895 (1.677)	Molise	2.161 (0.949)
Trentino	3.724 (1.336)	Campania	
Veneto	2.181 (0.457)	Puglia	
Friuli	3.878 (0.405)	Basilicata	1.879 (0.682)
Liguria	1.942 (0.872)	Calabria	1.779 (0.297)
Emilia-Romagna	2.529 (0.503)	Sicilia	2.756 (0.210)
		Sardegna	2.290 (0.564)

Note: Results drawn from Brunello G., Lupi C., Ordine P. and Parisi M. (2001). X includes the real price of the imported materials and energy, the tax wedge, the unemployment benefits, and the real rate of interest. τ is the tax wedge, ν_{it} are the residuals. More details are available in the original work. Standard errors in parenthesis.

3. Tax relief in southern Italy

Tax relief in the South have been introduced in 1968 to address the challenges coming from the less developed regions following the wage cages (*gabbie salariali*) abolition and to cut the increasing labour costs of the 70's.

The main limitation of these policies is their inability to become stable. Indeed, their peculiarities have been uncertainty because of validity extension without a systematic and clear path, with the result of being perceived as ineffective as well as expensive.

The relevant legislation on tax relief in southern Italy dates back to law 25 October 1968, No.1089 converted, with amendments, into the D.L. 30 August 1968, No. 918. The article 18 establishes that, from 31 August 1968 to 31 December

1973, the enterprises operating in the South with more than thirty-five employees would have benefited from a tax relief of SSCs due to INPS[2]. Specifically, the low establishes the introduction of two *partial* tax relief (*general* and *additional*) on SSCs payable to INPS (Table 5). The enterprises involved are those belonging to industry and handicraft sectors of the South[3].

Tax relief should be calculated on payroll wages subject to SSCs. However, the law 4 August 1971, No. 589 and the law 8 August 8 1972, No. 463 as well as establishing an extension of validity of the tax relief described above, introduce two other types of *partial* tax relief. The first one is named *extra-additional* tax relief, with effect from 1 August 1971 for workers recruited from 1 January 1971 that increase the units already employed in the enterprise net of workers laid-off after 31 December 1971. The second one is named *ulterior* tax relief for workers hired before 1 October 1968 and still employed by the same firms at 1 July 1972.

These provisions have been subsequently incorporated in the art. 59 of the "Consolidated" laws on southern regions (D.P.R. 6 March 1978, No. 218) at the second, fourth, fifth and eighth paragraph.

Beyond these partial measures, the legislature, with the law 2 May 1976, No. 183**,** introduces a *total ten-year* tax relief from SSCs payable by southern firms that operate new hires from 1 July 1976 to 31 December 1980. These new hires should

[2] The less developed regions are identified by the art. 1 of the D.P.R. 30 June 1967, No 1523. They are: Abruzzo, Molise, Campania, Basilicata, Puglia, Sicily, Sardinia and the provinces of Latina and Rieti, the municipalities of the province of Rieti, already included in the former district of Cittaducale, the municipalities around the Tronto river, the municipalities of the province of Rome included in the reclamation area of Latina, the island of Elba, the Island of Giglio and the island of Capraia.

[3] They could not access the benefit if workers were not subject to SSCs for unemployment insurance. However, this constraint has been removed by the Judgment 12 June 1991, No. 261 of the Constitutional Court (*Corte Costituzionale*) repealing the Article 18, paragraph 2 of Law 25 October 1968, No 1089, with regard to the part that exclude from these benefits firms having workers whose wages were not subject to SSCs for unemployment insurance.

increase the net number of units involved within the firms operating in sectors such trades, hotel and B&B, R&D and in others specified by the Interministerial Committee for Economic Planning (CIPE)[4]. Successively, the law 1 March 1986, No. 64, extends its validity until 31 December 1993 (Table 5) and the same terms are established for all *partial* tax relief[5].

Unlike the provisions of the Constitutional Court in case of *partial* tax relief[6], *total ten-year* tax relief (law 183/1976) has confirmed the requirement that the workers' wage should be subject to SSCs against unemployment.

However, in addition to the *total ten-year* tax relief, the legislation introduces a *total annual* tax relief. The relevant legislation dates back to law 151/1993 and subsequent amendments[7].

The measures analyzed – *general*, *additional*, *ulterior* and *extra-additional partial* tax relief; *total ten-year* and *total annual* tax relief – can be added with each other, if they meet all requirements, even in the same firm.

Moreover, to reduce this farraginous system the legislature introduces, with the Ministerial Decree 5 August 1994, a measure that takes into account, among other, the EU indications on tax relief. In fact, this decree replaces any *partial* tax

[4] The industries identified by CIPE in 1977 are: the extractive and manufacturing sectors, data processing industries if handled in the form of a consortium, the production of electricity by burning municipal waste, installation, maintenance and repair industrial equipment, operation of farms fish and shellfish with forcing the cycle of breeding, pig farms in proportion to associated processing plants and storage of meat, pig farms specialized in the recruitment and deployment of individuals and breeding of cattle, pig farms connected to the industrial products, sheep industry.

[5] Eventually, the period of application of the total ten-year tax relief is limited to new hires between 1 July 1976 and 30 November 1991. D.L. 21 January 1992, n. 14 decayed and renewed with $D.L_{(s)}$. No. 237, 293 345, 383 e 442 of 1992 and D.L. No. 12 of 1993. Moreover, Law 151/1993 converting, with amendments, the D.L. 22 March 1993, No. 71.

[6] The Court declared the constitutional illegitimacy of article 18 paragraph 2 of D.L. 918/1968 in excluding from the tax benefit industrial companies if the salaries of its employees were not subjected to SSCs to involuntary unemployment, since not all employers in that sector had such type of compulsory contribution. The Court ordered the refund in ten years of tax relief not enjoyed by these firms, without any legal interests.

[7] Law 245/1993, D.L. 370/1993, Law 14 January 1994, No. 21 converting, with amendments, the D.L. 465/1993.

relief (*general*, *ulterior*, *additional* and *extra-additional*) with a *single* tax relief, from 1 July 1994.

The *single* tax relief is applied to the same regions and firms included in the list of those admitted in the "old" system, but with a difference. Here there is no longer the need to take into account, with regard to the applicability criterion, the labour force for the *ulterior*, *additional* and *extra-additional* tax relief.

Furthermore the law 27 December 1997, No. 449, art. 4 paragraphs 17 and 18, replaces the *single* tax relief, ceased on 30 November 1997, with a *capitation* tax relief on SSCs due to INPS by the employer[8]. The art. 2 also implements a *total annual* tax relief for firms making new recruitments that increase the number of worker units employed on 30 November of the previous year[9]. Successively, the law 23 December 1998, No. 448 replaces it with a *total three-year* tax relief for new hires in 1999, 2000 and 2001 if these assumptions increase the unit employees at 31 December 1998[10]. The measure is protracted with the law 28 December 2001, No. 448 (*Legge Finanziaria 2002*) that represents the end of tax relief in southern Italy (Table 5).

With regard to the incentives for the southern agricultural sector, the policy of tax relief has followed a different path. In fact, the art. 14, law 1 March 1986, No. 64 establishes, for the first time, a *ten-year* tax relief of 70% on SSCs from 1

[8] Applicable to workers who have annual taxable income not exceeding Lit 36 million, or workers hired during the period covered, in place of others, but not in case of layoffs in the 12 months prior to recruitment. Subsequently, the law 23 December 1998 No. 448 (*Legge Finanziaria 1999*), establishes the extension of the *capitation* tax relief until 31 December 2001.

[9] Extensions have been planned by the art. 27, paragraph 1 of D.L. 31 December 1996, n.669, converted, with amendments, into the law 28 February 1997, No. 30 and with the law 27 December 1997, No. 449 (*Legge Finanziaria 1998*), art. 4, paragraph 21

[10] The enterprises can benefit from this *total three-year* tax relief if they offered permanent and full-time contracts, the workers were inscribed as unemployed in the mobility lists or were benefited of the income assistance for 24 months without interruption, it was observed the collective bargaining agreements and it was avoided any reduction of the level of employment during the period facilitated.

January 1987 for new assumptions that increase the existing firm average labour force of the period 1983-1984. The measure have been edited over time (Table 5)[11].

It is also necessary to take into account the UE legislation about the State aids. In fact, this legislation has a key role in determining the reduction and then the abolition of the tax relief in southern Italy. In fact these fiscal benefits were seen incompatible both with common market and free competition[12].

The Commission, while recognizing the eligibility of such benefits in less developed European areas, conditions them on a principle of timing. In particular, it establishes that these benefits would not be extended beyond 31 December 1993. With this decision the Commission pointed its finger at the biggest weakness of these measures, i.e. the continuous extension of validity through the use of reiterated *ad hoc* measures.

Neither the *Fiscalizzazione* remained free from criticism, especially with regard to the systematic tax advantage to enterprises operating in southern regions compared to those operating in the North. Not following the dispositions established by Brussels has brought to infringement proceedings against Italy (see footnote 12).

[11] It should be added that the legislation on tax relief has led to the creation of a serious disputes with many who felt they could add up the benefits described by law 64/1986 and subsequent extensions and amendments, with those of law 67/1988 which reduced the SSCs due to INPS by firms operating in mountain and in disadvantaged agricultural areas. The question was greatly complicated after the ruling of the Supreme Court (*Corte di Cassazione*) of 27 October 2000, No. 14227 that considered summable the above benefits. It was resolved with the law 326/2003 converting, with amendments, the D.L. 269/2003 (Article 44). This law has expressly prohibits the accumulation of the two fiscal benefits. Subsequently, the disposition was saved by the Constitutional Court (*Corte Costituzionale*) with the sentence 7 July 2006, No. 274 and confirmed by the Supreme Court with the sentence 14 August 2008, No. 21692 that ends several years of litigation due to a regulatory framework not linear.

[12] The article 87 of the Treaty establishing the European Community provides the prohibition of State aids which distort competition and free market. However, the second and third paragraph consider some types compatible with the principles and allow the possibility of exceptions in certain cases. With regard to tax relief in southern Italy, the disputes on their compatibility date back at least to the Decision taken by the Commission on 2 March 1988 referred to law 64/1986 which establishes a regime of extraordinary intervention in the Southern Italy through tax relief on SSCs.

4. *Fiscalizzazione*

The State-assisted reduction of SSCs is an instrument of fiscal policy that has been implemented for decades in Italy and it can be dated back to D.L. 706/1964 converted into law 999/1964, which provided a partial reduction of SSCs with effect from 1 September to 31 December 1964. This deadline was then extended by the law 626/1966 until 31 December 1966.

The mechanism underlying the measures of *Fiscalizzazione* and tax relief is similar. Even in this case part of the SSCs is financed by the State[13]. Generally these benefits are accorded on sectorial basis but in some cases they differ according to territorial criterion. In the latter case, the differentiation between *Fiscalizzazione* and tax relief becomes nuanced.

Fiscalizzazione is a measure originally designed to contain labour costs and inflation and to support export-oriented enterprises and sectorial restructuring. Successively, there have been added forms encouraging youth and women employment. In any case, its systematic introduction (Table 6) dates back to D.L. 7 February 1977 No. 15 converted into the law 7 April 1977, No.102[14].

The law 5 August 1978, No. 502 introduces a differentiation on gender basis, with an ulterior reduction for female work. This differentiation, reviewed over time, confirms the purpose of encouraging women's employment[15].

[13] These social charges are often called "undue" because they are borne by enterprises that do not consider them related to the compulsory contributions necessary to ensure the welfare and social services for workers. For example, “undue” SSCs are the contributions that employers pay to INPS for insurance against tuberculosis (TBC), to finance the National Board for the care of orphans of workers (ex Enaoli), for the National Health Service (SSN) and for health insurance for retirees (E. Malfatti, 1994).

[14] Subsequently, the laws 573/1977, 502/ 1978, 92/1979, 33/1980, 416/1981, 267/1982 and 638/1983 as well as extending the validity of the tax benefit also extended it to other sectors.

[15] In particular, the law 33/1980 establishes a reduction of 4% for male and 10% for women workers, whereas the law 45/1986 disposes a reduction of 2.28% for male and 6.30% for women.

An important disposition is the law 28 November 1980, No.782 introducing a differentiation on territorial basis, repeatedly extended[16]. Furthermore, the art. 4 of the law 5 August 1978, No. 502 together with the art. 1 of the law 28 November 1980, No. 782 establish another requirement to access the benefit, that is, the need for the employers to guarantee a wage not less than the minimum set by the national collective agreements (CCNL).

However, the art. 3 D.L. 3 July 1986, No. 328, converted, with amendments, into law 31 July 1986, No. 440 establishes the access to the tax benefit only if workers have a remuneration not less than the minimum set by national *and* local collective agreements. The novelty is represented by removing the reference just to national bargaining, giving a role to local collective bargaining.

In any case, the size of the public debt, which exploded in the 80's, leads the legislator to reduce these benefits. Consequently, since 1982 there has been a progressive reduction that, with the law 29 February 1988 No. 48, was set to a fixed tax rate. This reduction increased the amount of SSCs due by the employer, especially in the metalworking sector. There has been also the equality of the tax benefit regardless of gender, according to the European legislation.

[16] Among others, it should be remembered the law 25 September 1981, N.o 534 converting, with amendments, the D.L. 28 July 1981, No. 395; law 15 January 1982, No.3 converting the D.L. 16 November 1981, No.646; law 21 May 1982, No.267 converting the D.L. 24 March 1982, No. 91; Law 29 November 1982, No.881 converting the D.L. 1 October 1982, No.694; law 25 March 1983, No, 79 converting the D.L. 29 January 1983, No.17; law 22 March 1984, No.30 converting the D.L. 21 January 1984, No. 4; law 4 August 1984, No.430 converting, with amendments, the D.L. 29 June 1984, No. 277; law 6 April 1985, No. 155 converting, with modifications, the D.L. 1 March 1985, No. 44; law 28 February 1986, No.45 converting, with amendments, the D.L. 30 December 1985, No.787; law 29February 1988, No. 48 converting, with amendments, the D.L. 30 December 1987, No. 536.

Furthermore, it should be noted the law 3 August 1990, No.210 converting the D.L. 4 June 1990, No.129, which recognizes even in case of *Fiscalizzazione* a major benefit for enterprises operating in the South[17].

The law 20 March 1991, No. 89 converting the D.L. 19 January 1991, No. 18, is the first attempt to stabilize the *Fiscalizzazione* (Table 6). This law establishes its *permanent* validity in several sectors with regard to compulsory insurance against tuberculosis (1.66%), ENAOLI contribution (0.16%) and support for disease of pensioners (0.20%)[18].

However, the introduction of a regional tax on productive activities (IRAP), changes the framework radically. In fact, the D.Lgs 15 December 1997, No. 446 in order to implement the provisions of art. 3, paragraphs 143 to 149 and 151 of the law 23 December 1996, No. 662, establishes from 1 January 1998, because of the introduction of IRAP, the *abolition* of health insurance for retirees, SSN and TBC contributions. After this, it remained in force only the ex ENAOLI contribution (0.16%) and, for the northern agriculture sector, the TBC (0.01%) and the ex ENAOLI (0.01%) contributions.

However, the law 448/1998 (*Legge Finanziaria 1999*) establishes from 1 January 2000 the complete *abolition* for all the employers of the ex ENAOLI and TBC

[17] In this case, the additional difference was 4.70%. With the law 20 March 1991, No.89 converting the D.L. 19 January 1991, No. 18 it reached 6.20% and then 16.6%.

[18] The D.L. 39/1994, No. 39, decayed and re-proposed with the D.L. 299/1994 converted, with amendments, into the law 451/1994 establishes, from 1 January 1994, the permanent validity also for the further reduction of the health contribution (SSN) that was originally set valid only for the years 1992-1993 by law 151/1993 and applicable only to commercial enterprises with a number of workers between 8 and 15. The permanent reduction of the SSN contribution is fixed instead at 0.4% for construction firms. Subsequently, the law 425/ 1996, with effect from 1 January 1996, reduced the *Fiscalizzazione* for TBC, ex ENAOLI and health insurance retirees of 0.6% for industrial firms operating in the South and those operating in non-agricultural disadvantaged regions, 0.3% for industry and commerce enterprises with more than 15 workers for the health contribution (SSN), which, however, was reduced by 0.1% for commercial enterprises with a workforce of between 8 and 15 as well as for small businesses.

(0.01%) contributions. With the removal of this last two contributions, the policy of *Fiscalizzazione* ends.

5. Data

The empirical analysis uses regional data for the period 1970-2004. Data on value added, SSCs, investment and wages have been extracted from ISTAT regional accounts, data on private employment have been extracted from CRENoS dataset.

Data are also divided at sector-level allowing for more disaggregation. The study is restricted to enterprises in the manufacturing and services sectors (Nace 15-93) with the exception of sectors as recycling, refuse disposal, public administration, education, electricity, health and utilities due to the high share of public ownership. The final sample must be divided by 20 regions, 34 years and 10 sectors and the number of observations by region is 350.

The sample confirms the leadership of Lombardy as economic engine of the country because is the leading region in any descriptive statistic. On the other hand, the less developed region is Molise. However, the reduced size of the region must be taken in account in determining these results.

With regard to private employment (Table 10a and 10b), the data vary between 399.000 average units in Lombardy and 6.700 in Molise. GDP ranges between an average of 117.000 billion in Lombardy and 2.505 in Molise[19]. The same regions are on extreme values with regard to data on investment (1.539 and 32 billion

[19] The analysis does not take into account Valle d'Aosta because of its small size.

respectively), value added (9395.14 and 138.76), income (10.278 and 133), SSCs (40,587 and 32.697.

A more detailed analysis is between macro-regions. Obviously, with regard to the northern ones, the leading region is still Lombardy while the less developed is Umbria. Focusing on southern Italy, and excluding Molise for the same reasons referred to Valle d'Aosta in the northern analysis (see footnote 19), the regions with the extremes average values are Campania and Basilicata.

Tables 10a and 10b show the gap between North and South. Interestingly, if data on southern leading region (Campania in this case) were compared with those of northern ones, this region would settle at the bottom of the list, overtaking only Umbria and Valle d'Aosta limited by geographical and demographical extension.

Furthermore, by analyzing the data on GDP growth (Table 3) it is possible to see that in the period 1980-2004 the growth rates do not vary much between South and North. This suggests that the gap has been kept constant over that period. In particular, since 1995 southern regions have registered growth rates higher than those referred to northern ones, as during the period 1980-1995 there has been an increase in the gap with the northern regions. Similar considerations can be made with regard to GDP growth rate per unit of work (Table 4).

However, the analysis of the evolution of variables such as employment and investment (Graphics 2, and 4) suggests that differences in the period 1970-2004 between North and South have remained constant, despite with regard to the evolution of investment this is true especially from the ‘90 onward. Instead data on value added (Graph 5) shows that regional differences are widened over the period considered.

Obviously, these considerations are not exhaustive, but they reinforce a view supported by others[20] that constant differences in recent decades in terms of GDP per capita, investment or employment cannot authorize saying that southern economy is independent from the North. In other words, public financing of southern trade deficit, also through extraordinary measures, appears to be the key point in maintaining this stable disparity otherwise destined to widen, even in per capita consumption.

At sector-level (Table 11), the data show that an important part of the Italian private employment is attributable to industry in the strict sense (31% of the sample), as well as construction and tourism sectors. Sectors as manufacturing, food and beverages appear to have a role in this contest. Conversely, paper, printing and publishing, with an average of nearly 14,000 units, are the sector with less employed in the sample. The same sectors confirm their characteristics with regard to investment and value added.

6. Methodology

The availability of regional and sectorial data over a large time period (1970-2004), although with exceptions referred to some sectors/variables and, sometimes, years, allows to investigate the effect of the tax wedge, measured by the SSCs borne by employers, on regional employment.

[20] Bodo G. and Sestito P. (1991) and Brunello G., Lupi C., Ordine P. (2001a).

Since the SSCs are the main part of the tax wedge, they seem a natural proxy in the analysis. The relative long time dimension within the available sample suggests that other factors play a role in the study.

Analysis at the regional level might be helpful in understanding whether policies such those described above (tax relief and *Fiscalizzazione*) affects private employment with differences on regional basis. To address this issue I consider a simple dynamic standard model of the following form:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 ln\tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist} \quad (4)$$

where the subscripts *i* stands for region, *s* for sector and *t* for time. Any variable entering the equation is in logs. The dependent variable is the region's private employment. In the RHS of eq. (4), lnl_{ist-1} is the lagged dependent variable, lnw_{ist} is the net wage, $ln\tau_{ist}$ is the proxy for tax wedge per unit of work, lnI_{ist} is the investment, lnA_{ist} is the value-added, γ_a represents the unobserved individual effect, γ_s and γ_t are, respectively, sector and time dummies, ε_{ist} is the disturbance term.

Using panel data in estimating the long-term relationships between regions seems appropriate to identify region-specific effects and to mitigate the problems of missing values and omitted variables. Furthermore, the time dimension of the sample allows to add dynamic elements within the model capturing the persistence of the dependent variable over time and alleviating problems such those regarding the coefficients' distortion in panels with small time dimension[21].

[21] Nickell, S.J., (1981) "Biases in Dynamic Models with Fixed Effects" Econometrica, 49, 1417-1426.

However, Judson & Owen (1999) show that even in panels with large time dimension the problem of distortion may not be negligible, and running simple LSDV estimates could result in biased coefficients. In particular, since many estimation methods are "designed" for panel data with large N and small T, in case of panel data such as those presented here, with a relatively large time dimension and a relatively small individual (regional) dimension, the choice of the estimation method matters.

Furthermore, recent evidence suggests that it is not possible to determine *a priori* the most appropriate estimator, but that the panel size plays a crucial role in determining the choice. In the spirit of Judson & Owen (1999), which in their work compare the performance of different types of estimators for dynamic macro panel data, in the present analysis I estimate equation (1) with GMM estimation methods together with LSDV.

In fact, in their paper the GMM estimators are the class of estimators for dynamic panels showing the best performance. They also seem a desirable choice considering the available variables which may suffer from endogeneity problems.

Despite the Anderson-Hsiao estimator (here and afterwards abbreviated as AH), in their paper reports the best performance as the sample time dimension becomes large, this estimator is compared with other GMM estimators for dynamic models such as the Arellano-Bond estimator (here and afterwards abbreviated as AB) and also with the LSDV estimator robust to heteroschedasticity and autocorrelation in order to verify the robustness of the estimates. The preferred AB estimator is the one-step robust; the two-step estimator is not performed since, as the time dimension becomes large, it requires (redundant) computational complications.

Hence in the analysis I compare several "restricted GMM" estimators, in whose class the AH estimator is considerable as a "fully restricted GMM" estimator, with LSDV. In particular, with regard to panels with large time dimension, these AB one-step robust estimators show better performance than the two-step estimator in terms of lower distortion and less standard deviation. Furthermore, when time dimension becomes large, the two-step estimator seems to impose a tradeoff between the (average) coefficient distortion and the estimates efficiency (Judson & Owen, 1999).

7. Results

This section presents the results of the main regression implemented using the estimators specified above. Table 12 illustrates the estimates of eq. (4) for the baseline model applied to the entire panel dataset.

At a first glance it is possible to see that the coefficients are significant in any regression and have the expected sign. The lagged dependent variable does not show appreciable diversification through the specifications. It varies among .4776304 and .6032451 showing a moderate persistence in the sample.

On the other hand, the net wage has a peak in the AH estimate (-.2509901) while the LSDV estimation shows the lower value (-.1386884). The variable of interest, i.e. the proxy for tax wedge per unit of work, ranges between -.2450796 (AH) and -.1386884 (LSDV).

Investment and value added show similar coefficients in any specification (Table 12). In fact, the coefficient on investment shows a slight impact on the

dependent variable and ranges between .0216069 (LSDV) and .0413697 (AB). Value added also shows a relatively low impact on employment and, among other, its coefficient is significant at 10% in some specifications (Table 12). These coefficients, such as those for investment, show a moderate impact on employment varying from .0133681 (AH) to .0398765 (LSDV).

Interestingly, the AH specification tends to show the highest values regarding the net wages and the tax wage per unit of work. These coefficients show an initial reduction in the AB estimate and a further reduction in the "augmented" AB estimate that controls for the endogeneity of RHS variables of equation (4) by instrumenting themselves with their own lagged values.

However, the LSDV is the specification showing the lowest values with regard to these coefficients and, at the same time, the highest coefficient of the lagged dependent variable (Table 12). This specification seems to validate the suggestions proposed by Judson & Owen (1999) about the fact that, despite a panel's time dimension relatively large, the lagged dependent variable coefficient bias is not negligible.

Furthermore, to address the potential endogeneity of the variable, I estimate eq. (4) by regressing the dependent variable on lagged values of all RHS variables and also by differentiating any variable entering the equation. In both cases any variable is significant and the coefficient of the tax wedge per unit of work falls within the range shown in Table 12 suggesting a certain robustness of the estimates (results available on request).

It is also interesting to proceed with macro regional analysis to investigate any possible regional differentiation. To this end I estimate eq. (4) for North and South,

separately. Once again, the results show significant coefficients of expected sign in any specification (Table 13 and 14). At a first look, these estimates suggest that the lagged dependent variable has an impact relatively higher in the North then in the South.

In particular, in the first case (Table 13) the lagged dependent variable lies between .5402687 and .7498007 (AB and AH estimates, respectively), while in the estimates restricted to southern regions (Table 14) assumes lower values ranging from .2768098 (AH) and .5832285 (LSDV).

It should be noted that the coefficient of the lagged dependent variable in the northern analysis is higher not only comparative to the southern regions but also with regard to the baseline model considering all regions (Table 12). This suggests that the lagged dependent variable is more persistent in northern Italy than in the rest of the country.

The net wage has still a negative impact on employment and takes higher values in the northern analysis. In this case (Table 13) the impact on private employment varies between -.1445557 (LSDV) and -.3053149 (AH). Instead the same coefficient, with regard to the southern analysis (Table 14) takes lower values varying between -.128543 (LSDV) and -.2016601 (AH). Even the tax wedge per unit of work takes significant and negative values in both macro-regional specifications.

Once again, a relatively more pronounced effect is registered in the North. In particular, the coefficient (Table 13) ranges between -.1517861 (LSDV) and -.2887244 (AH). Conversely, with regard to the estimates for the South (Table 14), the coefficient takes relatively lower values ranging between -.1468787 (LSDV) and -.2063439 (AH).

The results are in line with the conclusions proposed by Brunello *et al.* (2001a) about the need to diversify on regional basis policies of tax relief and *Fiscalizzazione*, because they show a more pronounced impact in the North than in the South, achieving a paradoxical effect to that originally envisioned by the legislature.

This is probably due to the presence, in the North, of a more developed decentralized bargaining level that may lead to a mechanism of *real wage resistance* that, if on the one hand preserves the private dependent workers' income from an increase in the tax wedge (Brunello *et al.* 2001a), on the other hand might lead to a negative impact on employment relatively more notable.

Hence, while the tax wedge per unit of work does not appear to influence, at least in the long-run, workers' wages, different speech needs to be done on the impact of the tax wedge on private employment. In fact, the analysis shows that the tax wedge has an effect on employment not only in the short run but also in the long term, confirming some previous insights (Daveri & Tabellini, 2000; European Commission, 2004). Because the analysis uses a relative long time period, it is plausible that other factors play a role and thus it is difficult to quantify *how long* is the long-run in which the tax wedge affects employment before being absorbed by gross wages without real effects.

The analysis also shows that investment and value added do not vary particularly in the regional estimates. Here the average impact on employment is relatively more pronounced in the South. In particular, the coefficient of investment in northern Italy (Table 13) varies from .0176426 (LSDV) to .0256197 (AB). Instead in southern Italy (Table 14) it ranges from .0193026 to .0375545 (both are AB estimates;

however, the first one controls for the endogeneity of the RHS variables and is significant at 5%).

With regard to value added, in northern Italy (Table 13) the coefficient takes values ranging from .0046007 to .0317021 (AH and LSDV specifications, respectively; in the first case, however, the coefficient is not significant). In the analysis restricted to the South, the coefficient ranges between .060248 (AB) and .0229393 (LSDV). These findings may suggest that both investment and value added marginally affect private dependent employment without significant differentiations on regional basis.

Bodo G. and Sestito P. (1991) propose a similar analysis to that presented here. Although not strictly comparable, because of different method and variables used in the two works, it could be useful to compare the results obtained in this study with those reached by them (Table 1). Through this exercise, one can easily check that the results, probably due to more availability of disaggregated data, are more robust and significant then those obtained in their original work, especially for the southern analysis.

However, and more importantly, the coefficient of the lagged dependent variable, both for the North and South, falls within the range showed in their paper (Table1) and the same is true with regard to the coefficient of the tax wedge per unit of work, although in their paper this variable is replaced by the labour cost per unit of work.

The fact that these coefficients lie within the range showed by Bodo G. and Sestito P. (1991) guarantees about the goodness of the estimates presented here even if

it should be noted that the coefficient of value added is significantly lower than that obtained in their paper.

Finally, I estimate eq. (4) considering a sector at a time. This exercise, within the limits set by a lower data availability that suggests caution in interpreting the coefficients, might be useful to understand the presence of a differentiated incidence of the tax wedge at sector-level.

Tables 15a and 15b show the results of the sector-based analysis. Once again, they are significant and have coefficients with the expected sign. Interestingly, in sectors where there is a relevant impact of the tax wedge on employment, the same can be said for the employees' net wage and vice versa. This suggests that these variables, as well as having a generally negative effect on sector's private dependent employment, as expected, are also associated in the sense that they move together.

Tables 15b indicates that the sector where the tax wedge has the most negative impact on private employment is the buildings one (-.6281288), for which there is also the most negative effect of net wages (-.5779638). Conversely (Table 15b), the sector where the impact of the tax wedge is less pronounced is the non-metallic mineral products industry (-.1312489). Here, as said, there is also the absolute lowest impact of net wages (-.1161088).

The estimates on Tables 15a and 15b have been performed via LSDV corrected for autocorrelation and heteroschedasticity. The limited number of data for each sector does not allow to make GMM estimates for several industries. However, the GMM estimates for the remaining sectors (not reported) do not differ significantly from those presented here.

As an alternative way to check the impact of the tax wedge on private regional employment, I apply the differences-in-differences estimation method proposed by Rajan and Zingales (1998). They use differences in the effect of financial openness on sectors within the same country to identify the effect of financial openness on growth.

Transposed to the present contest the hypothesis I test is whether that the tax wedge has a negative impact on regional employment and therefore the (untestable) identifying assumption is that relatively labour dependent sectors *due to exogenous technological conditions of production* should expect lower employment growth in regions with a relatively high tax wedge. Thus eq. (4) becomes:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 lnLabint_s * \tau_{it} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist} \quad (5)$$

where the only difference with eq. (4) is represented by $Labint_s * \tau_{it}$ that denotes the interaction between sector labour intensity and regional tax wedge and implement the differences-in-differences estimation technique. In fact, in the above specification, differences of employment levels between firms in relatively labour and non-labour intensive sectors in regions with different levels of the tax wedge are used for the identification of the effect of the tax wedge on employment. Firms in relatively labour intensive sectors are expected to display relative low employment growth in regions in which the tax wedge is relatively high.

A crucial assumption in this method is that, due to technological reasons valid across all regions involved in the sample, differences in industry characteristics are similar across regions. Thanks to this assumption it is possible to define a measure capturing sector technological characteristics that are exogenous to region-specific

taxation by using quantitative sector information of a benchmark country. It should be noted that the measure of sector labour intensity is that referred to the benchmark country, that is the UK, already used in chapter 2, to which I refer the interested readers.

The results are in line with those obtained in the main specification. Table 16 illustrates the empirical evidence referred to the entire sample. All variables are significant and have coefficients with the expected sign. Moreover, any coefficient moves within the range showed in the main specification (Table 12). The same conclusions are applicable to the analysis devoted to North and South (Table 17 and 18, respectively). This gives a certain degree of confidence in the goodness of the estimates.

Interestingly, the variable of interest, i.e. the interaction between sector labour intensity and tax wedge is significant and has the expected sign everywhere. The variable shows the same characteristics of the tax wedge per unit of work previously used.

In fact, Table 16 shows that the coefficient of this variable varies between -.0379007 (LSDV) and -.0561654 (AH), while in the specification devoted to the North (Table 17) it ranges between -.0438644 (LSDV) and -.0726241 (AH). Instead in the analysis restricted to the South it ranges between -.0330993 (LSDV) and -.044424 (AH). These results confirm the relatively more conspicuous effect of the tax wedge on private employment in the North.

8. Conclusions

The analysis suggests that policies of tax relief and *Fiscalizzazione* may generate different results depending on the development of local labour market institutions. Hence, the impact on regional employment of a reduction of the tax wedge, through policies such tax relief or *Fiscalizzazione*, can be different.

In this paper I find that the tax wedge negatively affects the private regional dependent employment not only in the short term but also in the long-run, although it is difficult to quantify how long is the effect and when any increase/decrease in the tax wedge is fully absorbed by gross wages.

The analysis uses a sample with a large time period, more variables and data disaggregated at the regional and sector level than similar analysis previously proposed (Bodo G. & P. Sestito 1991). This allows for more robust results. Obviously, they are depending upon other factors that probably play a role when the time period is relatively long.

The results – similar to those reached in the differences-in-differences analysis proposed as a robustness check – show that the tax wedge has a relatively higher impact in affecting employment in the more developed regions of northern Italy. This may be due to the decentralized bargaining wage level operating in these regions that tend to preserve real wages affecting regional employment not only in the short-run.

In particular, because in those developed regions it is present a local wage bargaining level, there is more sensitivity of gross real wage to changes in the tax wedge and thus a labour tax cut is more effective in boosting employment than in the South.

On the other hand, labour tax cut might incentive both firms and workers to prefer the regular economy and in the southern region, where the hidden economy is conspicuous, this could be useful in increasing employment.

Furthermore, the analysis shows a differentiated effect among sectors and not only among regions. At a first glance, this might suggests to implement these policies on those regions or sectors where the effect is greater, despite in the first case the interested regions are those where the employment issue is less perceived as demanding than in the South, where instead one should proceed to higher labour tax cuts to obtain the same results in terms of employment growth.

However, because a local labour policy taking into account any difference in terms of regional labour productivity could reduce the employment differentials between North and South, through the increase in the sensitiveness of wages to changes in labour taxes and the incentives to prefer the regular economy, the development of a second-level bargaining in the South should be carefully considered by the policy-makers.

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Appendix 1: Legislation on tax relief and *Fiscalizzazione*

List 1. Legislation on tax relief in southern Italy (1968-2001)

Legge 28 dicembre 2001, n. 448 (Finanziaria 2002). Extension of three-year tax relief in southern Italy (31/12/2004).

L*egge n. 23 dicembre 1998, n. 448 (Finanziaria 1999)*. Extension of pro-capita tax relief and introduction of total three-year tax relief in Southern Italy (31/12/2001).

Legge 27 dicembre 1997, n. 449 - art. 4, co. 17-18. (Finanziaria 1998). Introduction of pro-capita tax relief and extension of total annual tax relief in Southern Italy (31/12/1999).

Legge 28 febbraio 1997, n. 30 di conversione, con modificazioni, del D.L. 31 dicembre 1996, n.669 (Articolo 27, comma 1). Extension of single and total annual tax relief in Southern Italy (30/11/1997).

Decreto interministeriale 5 agosto 1994. Single and total annual tax relief in Southern Italy (30/11/1996).

Legge 14 gennaio 1994, n. 21 di conversione, con modificazioni, del decreto-legge 19 novembre 1993, n.465, Extension of tax relief in southern Italy (30/11/1993).

D.L. 18 gennaio 1994, n. 39. Decayed.

Legge 20 maggio 1993, n.151 di conversione del D.L. 22 marzo 1993, n.71. Extension of tax relief in southern Italy (31/5/1993).

D.L. 20 settembre 1993, n.370. Decayed.

D.L. 20 luglio 1993, n.245. Decayed.

D.L. 18 gennaio 1992, n.12. Decayed.

D.L. 19 novembre 1992, n.442. Decayed.

D.L. 18 settembre 1992, n.383. Decayed.

D.L.21 luglio 1992, n.345. Rejected.

D.L. 20 maggio 1992, n.293. Decayed.

D.L. 20 marzo 1992, n.237. Decayed.

D.L. 21 gennaio 1992, n.14. Decayed.

Legge 19 luglio 1991, n.214. Extension of tax relief in southern Italy (30/11/1991).

Legge 3 agosto 1990, n.210 di conversione del D.L. 4 giugno 1990, n.129. Extension of tax relief in southern Italy and *Fiscalizzazione* (30/11/1990).

Legge 21 marzo 1990, n. 52 di conversione del D.L. 20 gennaio 1990, n.3. Extension of tax relief in southern Italy and *Fiscalizzazione* (31/5/1990).

Legge 20 marzo 1991, n.89 di conversione del D.L. 19 gennaio 1991, n.18. Extension of tax relief in southern Italy and *Fiscalizzazione* (31/5/1991).

D.L. 5 agosto 1989, n. 277. Decayed.

D.L. 29 maggio 1989, n. 196. Decayed.

Legge 7 dicembre 1989, n. 389 di conversione del D.L. 9 ottobre 1989, n.338. Extension of tax relief in southern Italy (30/11/1989).

Legge 28 marzo 1989, n. 110.

Legge 20 maggio 1988, n. 160 di conversione del D.L. 21 marzo 1988, n.86. Extension of tax relief in southern Italy (30/11/1988).

Legge 29 febbraio 1988, n. 48 di conversione, con modificazioni, del decreto-legge 30 dicembre 1987, n. 536 (Art. 1), Extension of tax relief in southern Italy and *Fiscalizzazione* (30/11/1987).

D.L. 29 dicembre 1987, n. 535. Rejected.

D.L. 30 agosto 1987, n.442. Rejected.

D.L. 27 giugno 1987, n. 244. Decayed.

D.L. 28 aprile 1987, n. 156. Decayed.

D.L. 25 febbraio 1987, n. 48. Decayed.

D.L. 22 dicembre 1986, n. 882. Rejected.

D.L. 26 aprile 1986, n. 123. Decayed.

Legge 31 luglio 1986, n.440 di conversione del D.L. 3 luglio 1986, n.328. Extension of tax relief in southern Italy and *Fiscalizzazione* (30/11/1986).

Art. 14, legge 1 marzo 1986, n.64 Legislation on extraordinary measures on Southern Italy.

Legge 28 febbraio 1986, n.45 di conversione in legge, con modificazioni del decreto-legge 30 dicembre 1985, n.787, Extension of tax relief in Southern Italy and *Fiscalizzazione* (31/12/1985).

D.L. 20 febbraio 1986, n. 34. Decayed.

Legge 26 aprile 1985, n.155 di conversione del D.L. 1 marzo 1985, n.44. Extension of tax relief in southern Italy and *Fiscalizzazione* (31/5/1985).

Legge 4 agosto 1984 n.430 di conversione del D.L. 29 giugno 1984, n. 277. Extension of tax relief in southern Italy (30/11/1984).

Legge 27 febbraio 1984 n.18 di conversione del D.L. 29 dicembre 1983, n. 747. Extension of tax relief in southern Italy (30/6/1984).

Legge 30 aprile 1983 n.132. Extension of tax relief in Southern Italy (30/11/1983).

Legge 23 dicembre 1982 n. 941. Extension of tax relief in Southern Italy (28/2/1983).

Legge 12 agosto 1982 n. 546 di conversione del D.L. 30 giugno 1982, n. 389. Extension of tax relief in southern Italy (31/12/1982).

Legge 26 gennaio 1982 n. 13 di conversione del D.L. 26 novembre 1981, n. 679. Extension of tax relief in southern Italy (30/6/1982).

Legge 29 aprile 1981 n. 163 di conversione del D.L. 28 febbraio 1981, n. 36. Extension of tax relief in southern Italy (31/12/1981).

Legge 31 marzo 1979, n. 92 di conversione del D.L. 30 gennaio 1979, n.20. Extension of tax relief in southern Italy. (10 years from the assumption of the worker).

D.P.R. n. 218 del 6 marzo 1978 art 59. (G.U. n. 146 del 29 maggio 1978). Consolidated law on the intervention in southern Italy.

Legge 8 agosto 1972, n. 463 di conversione del D.L. n. 286/1972 Art. 3 bis. "Ulterior" tax relief in southern Italy (30/6/1973).

Legge 4 agosto 1971, n. 590 di conversione, con modificazioni, del decreto-legge 5 luglio 1971, n. 431. Extraordinary measures of tax relief applicable to handicraft, small and medium-sized industrial enterprises (31/12/1980).

Legge 4 agosto 1971, n. 589 di conversione, con modificazioni, del decreto-legge 5 luglio 1971, n. 429. Extension and increase of the tax relief in southern Italy (31/12/1980).

Legge 25 ottobre 1968, n.1089 di conversione del D.L. 30 agosto 1968, n. 918 (Art. 18). Tax relief on southern Italy (31712/1972).

List 2. Legislation on Fiscalizzazione (1968-2000)

L*egge n. 448/1998, Art. 3, co. 5 e 6 (proroga Art. 4, comma 21 della legge 27 dicembre 1997, n. 449). (Finanziaria 1999).* Abolition of TBC and ex-ENAOLI compulsory contributions for the agricultural sector.

D.lgs. del 15 dicembre 1997, n. 446 di attuazione delle deleghe previste dall'art. 3, commi da 143 a 149 e 151 della legge 23 dicembre 1996, n° 662. Abolition of SSN, TBC and ex-ENAOLI compulsory contributions for any employer (with the exception of agricultural sector).

Legge 8 agosto 1996, n. 425 di conversione del D.L. 20 giugno 1996, n. 323. Reduction of Fiscalizzazione (TBC, ex-ENAOLI, retirees health insurance).

Legge 19 luglio 1994 n. 451 di conversione del D.L. 16 maggio 1994, n. 299. Introduction of a *permanent* Fiscalizzazione of SSN contribution.

D.L. 18 gennaio 1994, n. 39. Decayed.

Legge 20 maggio 1993, n. 151 di conversione del D.L. 22 marzo 1993 n. 71. Fiscalizzazione of SSN contribution (years 1992-1993).

D.L. 18 gennaio 1992, n.12.. Decayed.

D.L. 19 novembre 1992, n.442. Decayed.

D.L. 18 settembre 1992, n.383. Decayed.

D.L.21 luglio 1992, n.345. Rejected.

D.L. 20 maggio 1992, n.293. Decayed.

D.L. 20 marzo 1992, n.237. Decayed.

D.L. 21 gennaio 1992, n.14. Decayed.

Legge 20 marzo 1991, n.89 di conversione del D.L. 19 gennaio 1991, n.18. Introduction of a *permanent* Fiscalizzazione (TBC, ex-ENAOLI, retirees' health insurance).

Legge 3 agosto 1990, n.210 di conversione del D.L. 4 giugno 1990, n.129. Extension of Fiscalizzazione (30/11/1990).

Legge 21 marzo 1990, n. 52 di conversione del D.L. 20 gennaio 1990, n.3. Extension of Fiscalizzazione (31/5/1990).

D.L. 5 agosto 1989, n. 279. Decayed.

D.L. 29 maggio 1989, n. 196. Decayed.

Legge 7 dicembre 1989, n. 389 di conversione del D.L. 9 ottobre 1989, n.338. Extension of Fiscalizzazione (30/11/1989).

Legge 29 febbraio 1988, n. 48 di conversione, con modificazioni, del decreto-legge 30 dicembre 1987, n. 536 (Art. 1), Extension of Fiscalizzazione (30/11/1987).

D.L. 30 agosto 1987, n. 442 . Rejected.

D.L. 28 agosto 1987, n. 358. Rejected.

D.L. 27 giugno 1987, n. 244. Decayed.

D.L. 28 aprile 1987, n. 156. Decayed.

D.L. 25 febbraio 1987, n. 48. Decayed.

D.L. 22 dicembre 1986, n. 882. Rejected.

D.L. 26 aprile 1986, n. 123. Decayed.

Legge 31 luglio 1986, n.440 di conversione del D.L. 3 luglio 1986, n.328. Extension of Fiscalizzazione (30/11/1986).

Legge 28 febbraio 1986, n.45 di conversione in legge, con modificazioni del decreto-legge 30 dicembre 1985, n.787, Extension of Fiscalizzazione (31/12/1985).

D.L. 20 novembre 1985, n. 649. Rejected.

D.L. 20 settembre 1985, n. 477. Decayed.

D.L. 22 luglio 1985, n. 356. Decayed.

Legge 26 aprile 1985, n.155 di conversione del D.L. 1 marzo 1985, n.44. Extension of Fiscalizzazione (31/5/1985).

D.L. 22 dicembre 1984, n. 900. Decayed.

Legge 4 agosto 1984, n. 430 di conversione, con modificazioni, del D.L. 29 giugno 1984, n. 277.
Extension of Fiscalizzazione (30/11/1984).

Legge 22 marzo 1984, n.30 di conversione del D.L. 21 gennaio 1984, n.4. Extension of Fiscalizzazione (30/6/1984).

Legge 25 marzo 1983, n.79 di conversione del D.L. 29 gennaio 1983, n.17. Extension of Fiscalizzazione (30/11/1983).

Legge 29 novembre 1982, n.881 di conversione del D.L. 1 ottobre 1982, n.694 Extension of Fiscalizzazione (30/11/1982).

D.L. 2 agosto 1982, n. 492. Decayed.

Legge 21 maggio 1982, n.267 di conversione del D.L. 24 marzo 1982, n.91. Extension of Fiscalizzazione (30/6/1982).

D.L. 23 febbraio 1982, n. 40. Decayed.

Legge 15 gennaio 1982, n.3 di conversione del D.L. 16 novembre 1981, n.646. Extension of Fiscalizzazione (31/12/1981).

Legge 25 settembre 1981, n. 534 di conversione , con modificazioni, del decreto-legge 28 luglio 1981, n. 395, Extension of Fiscalizzazione (31/10/1981).

Legge 28 novembre 1980, n.782. Extension of Fiscalizzazione (30/6/1981).

Legge 29 febbraio 1980, n. 33 di conversione del D.L. 30 dicembre 1979, n.663 – art. 22. Extension of Fiscalizzazione (31/12/1980).

Legge 31 marzo 1979, n. 92 di conversione del D.L. 30 gennaio 1979, n.20 Extension of Fiscalizzazione (30/6/1979).

Legge 5 agosto 1978, n. 502 di conversione, con modificazioni, del decreto-legge 6 luglio 1978, n.353, Extension of Fiscalizzazione and introduction of a gender-based differentiation (31/12/1978).

Legge 22 marzo 1978, n.75 di conversione del D.L. 30 gennaio 1978, n.15. Extension of Fiscalizzazione (31/3/1978).

Legge 8 agosto 1977, n.573 Extension of Fiscalizzazione to new sectors (31/1/1978).

Legge 7 aprile 1977, n.102 di conversione, con modificazioni, del decreto-legge 7 febbraio 1977, n.15, Introduction of *Fiscalizzazione* (31/1/1978).

Legge 626/1966 Extension of the State-assisted reduction of employers' SSCs (31/12/1966).

Legge 21 ottobre 1964, n. 999 di conversione del D.L.31 agosto 1964, n. 706 First introduction of the State-assisted reduction of employers' SSCs (31/12/1964).

Appendix 2: Descriptive tables and figures

Table 3. Regional GDP growth rates (1980-2004)

	GDP			GDP pro-capita		
Regions	*1980-1995*	*1995-2004*	*1980-2004*	*1980-1995*	*1995-2004*	*1980-2004*
Abruzzo	2,1	1,2	1,8	1,8	1,0	1,5
Basilicata	1,8	1,7	1,8	1,8	1,9	1,9
Calabria	2,0	2,0	2,0	2,0	2,3	2,1
Campania	1,5	1,8	1,6	1,1	1,7	1,4
Emilia-Romagna	1,9	1,4	1,7	2,0	0.8	1,5
Friuli-V. G.	2,3	1,2	1,9	2,6	1,1	2,0
Lazio	2,3	1,8	2,1	2,0	1,6	1,9
Liguria	0,8	1,3	1,0	1,4	1,8	1,5
Lombardia	2,3	1,2	1,9	2,3	0,6	1,7
Marche	2,0	1,7	1,9	1,8	1,2	1,6
Molise	1,6	1,5	1,6	1,5	1,8	1,7
Piemonte	1,5	0,9	1,3	1,8	0,8	1,4
Puglia	1,7	1,4	1,6	1,3	1,5	1,4
Sardegna	1,5	1,6	1,5	1,2	1,7	1,4
Sicilia	1,1	1,8	1,4	0,9	2,0	1,3
Toscana	1,8	1,4	1,6	1,9	1,2	1,6
Trentino-Alto Adige	1,8	1,7	1,8	1,5	0,9	1,3
Umbria	1,7	1,6	1,7	1,6	1,1	1,4
Valle D'Aosta	1,5	0,9	1,3	1,1	0,5	0,9
Veneto	2,5	1,5	2,1	2,4	0,8	1,8
Italia	1,9	1,5	1,7	1,8	1,2	1,6
Mezzogiorno	1,5	1,7	1,6	1,3	1,8	1,4
Centro-Nord	2,0	1,4	1,8	2,0	1,0	1,7

Source: Istat, *Conti economici regionali 1980-2004*.

Table 4. Regional growth rates per unit of work (1980-2004)

	GDP per unit of work			Unit of work		
Regions	*1980-1995*	*1995-2004*	*1980-2004*	*1980-1995*	*1995-2004*	*1980-2004*
Abruzzo	1,8	0,8	1,4	0,3	0,4	0,3
Basilicata	2,7	1,2	2,2	-0,9	0,4	-0,4
Calabria	1,7	1,4	1,6	0,3	0,5	0,4
Campania	1,9	1,0	1,5	-0,4	0,9	0,1
Emilia-Romagna	1,7	0,6	1,3	0,3	0,8	0,4
Friuli-V. G.	2,5	0,7	1,8	-0,2	0,6	0,1
Lazio	1,4	0,1	1,0	0,9	1,7	1,2
Liguria	1,6	0,7	1,3	-0,8	0,6	-0,3
Lombardia	1,9	0,2	1,3	0,4	1,0	0,6
Marche	2,1	0,8	1,6	-0,1	1,0	0,3
Molise	2,4	0,8	1,8	-0,8	0,7	-0,3
Piemonte	2,0	0,2	1,3	-0,4	0,7	0,0
Puglia	1,8	1,0	1,5	-0,1	0,5	0,1
Sardegna	1,0	0,8	0,9	0,5	0,8	0,6
Sicilia	1,4	1,0	1,3	-0,3	0,8	0,1
Toscana	1,6	0,6	1,2	0,2	0,8	0,4
Trentino-Alto Adige	1,3	0,6	1,0	0,5	1,1	0,7
Umbria	1,8	0,3	1,2	0,0	1,3	0,5
Valle D'Aosta	1,5	0,1	1,0	-0,1	0,8	0,2
Veneto	1,8	0,6	1,4	0,7	0,9	0,8
Italia	1,8	0,6	1,3	0,1	0,9	0,4
Mezzogiorno	1,7	1,0	1,4	-0,1	0,7	0,2
Centro-Nord	1,8	0,4	1,3	0,3	1,0	0,5

Source: Istat, *Conti economici regionali 1980-2004*.

Table 5 – Tax relief in southern Italy

Law	Measures	Tax benefit[22]	Sectors	Effect
Partial tax relief				
L. 25/19/1968, n. 1089	*General*	8,5%[23] to the employer 1,5%[24] to the employee	Industry and Handicraft	From 1/9/1968 To 30/06/1994
L. 25/10/1968, n. 1089	*Additional*[25]	10%	Industry and Handicraft	From 1/9/1968 To 30/6/1994
L. 4/8/1971, n. 589	*Extra-additional*[26]	10%	Industry and Handicraft	From 1/9/1971 To 30/6/1994
L. 8/8/1972, n. 463	*Ulterior*[27]	10%	Industry and Handicraft	From 1/9/1972 To 30/6/1994
D.M. 5/8/1994	*Single*[28]	14,60% 14% 10,60% 6%	Industry and Handicraft Industry and Handicraft Industry and Handicraft Industry and Handicraft	From 1/7/1994 To 30/11/1994 From 1712/1994 To 30/11/1995 From 1712/1995 To 30/11/1996 From 1/12/1996 To 30/11/1997
L. 27/12/1997, n. 449	*Tax relief per capita*	Lit 1.600.000 Lit 1.400.000[29]	Industry and Handicraft Industry and Handicraft	From 1/12/1997 To 30/11/1998 From 1/12/1998

[22] If not indicated, the percentages are referred to the SSCs borne by the employers only.

[23] The tax relief was set to 6% from 1 June 1993 to 30 December 1994, to 5% from 1 June 1994 to 30 June 1994.

[24] From 1 February 1985 to 31 December 1985 the tax relief was set to 0,75%. From 1 January 1986 this tax relief to employee was abolished (law 22 December 1984, n. 887).

[25] This benefit was applicable to enterprises that hire new workers, increasing the existing work force after 30/9/1968.

[26] This benefit was applicable to enterprises that hire new workers, increasing the existing work force after 31/12/1970.

[27] This benefit was applicable to enterprises which had not laid off workers hired before 1 October 1968.

[28] This tax relief has replaced the previous partial tax relief (general, additional extra-additional and ulterior) and it was applicable to enterprises that hire new workers, increasing the existing work force on 30 November of the previous year. With regard to Abruzzo and Molise, the tax relief of 12% was applicable only from 1/7/1994 to 30/11/1995. The law 30/1997 extended the validity of the *single* tax relief for the period 1 December 1996 – 30 November 1997. The measure was applicable in Campania, Basilicata, Puglia, Calabria, Sicily and Sardinia, with the exclusion of Abruzzo and Molise. The *total annual* tax relief for new employees for the period 1 December 1996 - 30 November 1997 was applicable in the case that the recruitment leads to an increase in the number of units actually occupied on 30 November 1996. The regions benefited were those already listed above plus Abruzzo and Molise. The law 449/1997 established a further extension of the *total annual* tax relief on SSCs due to INPS for new hires in the period 1 December 1997 - 30 November 1998 if the new assumptions increase the number of worker units actually occupied on 30 November 1997, 1 December 1998 – 31 December 1999 if the new assumptions increase the number of worker units actually occupied on 30 November 1998. The workers needed to be unemployed, and the contract of employment should be permanent or at least should have lasted at least 12 months after the end of the period attributable to the benefit. The recipients were again the employer of the Southern regions as well as under the Ministerial Decree 5 August 1994 plus Abruzzo and Molise, and they should not have made layoffs in the 12 months preceding the recruitment itself. The recruitment should not be just a workers replacement.

				To 31/12/1999
		Lit 1.150.000	Industry and Handicraft	From 1/1/2000
				To 31/12/2000
		Lit 1.050.000	Industry and Handicraft	From 1/1/2001
				To 31712/2001
L. 1/3/1986, n.64	*Ten-year tax relief*	70%[30]	Agricolture	From 1/1/1987
				To 31/12/1996
Total tax relief				
L. 2/5/1976, n. 183	*Ten-year tax relief*	Total	Handicraft, Hotels and those indicated by CIPE	From 1/7/1976
				To 30/11/1991
L. 20/5/1993, n. 151	*Annual tax relief*	Total	Handicraft, Hotels and those indicated by Cipe	From 1/12/1991
				To 31/12/1999[31]
L. 23/12/1998, n. 448	*Three-year tax relief*	Total	Private employers and Non-profit Public Administrations	From 1/1/1999
				To 31/12/2004[32]

Note: the law 29/2/2001, n. 448 concludes the legislation relative to tax relief in southern Italy.

[29] This measure was first set to Lit 1.050.000 each. Subsequently, the law 23/1271998, n. 448 increased the benefit to 1.400.000 and extended, with different gradation, the validity of the pro-capita tax relief until 31/12/2001.

[30] The law 29/2/1988, n. 48 reduced the benefit to 60% from 1/1/1987. The Legislative Decree 11/8/1993, n.375 lowered it to 20% from 1 October 1993. Then, the law 29/2/1993, n. 537 it was set to 40% from 1 October 1994, to 30% from 1 October 1995 and to 20% from 1 October 1996.

[31] The annual tax relief implemented by the law 151/1993 was valid until 30/6/1994. Then, the D.M 5/8/1994, the law 28/2/1997 n. 30 and the law 27/12/1997, n. 449 have extended the validity until 31/12/1999. Abruzzo and Molise were excluded from this benefit from 1/12/1994 to 30/11/1996. The benefit was applicable to enterprises that hire new workers, increasing the existing work force. The same principle was established for the total ten-year tax relief.

[32] Abruzzo and Molise were excluded from the benefit from1/1/2000 to 31/12/2001. The benefit was applicable to enterprises that hire new workers, increasing the existing work force at 31/12/1998. The tax relief was extended until 31/12/2004 by the law 28/12/2001, n. 448.

Table 6 – Fiscalizzazione

Law	Measures	Tax benefit[33]	Sectors	Effect
L. 21/10/1964, n. 999	*Solidarity contribution*	0,58%	Manufacturing and mining	From 1/9/1964 To 31/12/1966
	SSC against involuntary unemployment	0.3%	Manufacturing and mining	From 1/9/1964 To 31/12/1966
	SSC against TBC	2%	Manufacturing and mining	From 1/9/1964 To 31/12/1966
	contribution to the pension fund adjustment	0,35%	Manufacturing and mining	From 1/9/1964 To 31/12/1966[34]
L. 7/4/1977, n. 102	*Per capita State- assisted reduction to SSCs (male and female workers)*	Lit 14.000[35]	Manufacturing and mining	From 1/2/1977 To 31/12/1979
		Lit 24.500	Manufacturing and mining	From 1/5/1977 To 31/12/1979
L. 5/8/1978, n. 502	*Per capita State- assisted reduction to SSCs (male workers)*	Lit. 24.500	Manufacturing, mining, trade enterprises export-oriented, hotels, restaurant and similar	From 1/7/1978 To 31/12/1979
	Per capita State- assisted reduction to SSCs (female workers)	Lit. 48.000	Manufacturing, mining, trade enterprises export-oriented, hotels, restaurant and similar	From 1/7/1978 To 31/12/1979
L. 28/2/1980, n. 33[36]	*State-assisted reduction to employers' SSCs in central and northern Italy*	10,64% for male workers 16,64% for female workers	Manufacturing and mining	From 1/1/1980 To 31/1/1982
	State-assisted reduction to employers' SSCs in southern Italy	13,18% for male workers 19,18% for female workers	Manufacturing and mining	From 1/1/1980 To 31/1/1982
L. 21/5/1982, n. 267	*State-assisted reduction to employers' SSCs in central and northern Italy*	9,12% for male workers 14,39% for female workers	Manufacturing and mining	From 1/2/1982 To 30/11/1983
	State-assisted reduction to employers' SSCs in southern Italy	11,66% for male workers 16,93% for female workers	Manufacturing and mining	From 1/2/1982 To 30/11/1983
		3,38% for male workers	Trade[37]	From 1/2/1982

[33] All the following percentages are referred to the SSCs borne by the employers only.
[34] Initially, the deadline was 31/12/1964. Subsequently, the law 626/1966 extended its validity until 31/12/1966.
[35] Pro-capita contributions were monthly.
[36] Together with the law 28/11/1980, n. 782, they implement the tax relief as a percentage on SSCs for disease.

		8,65% for female workers		To 30/11/1983
	State-assisted reduction to employers' SSCs in central and northern Italy (male and female)	2,00%	Agriculture	From 1/2/1982 To 30/11/1983
L. 22/3/1984, n. 30	*State-assisted reduction to employers' SSCs in central and northern Italy*	9,25% for male workers 13,89% for female workers	Manufacturing and mining	From 1/12/1983 To 30/11/1984
	State-assisted reduction to employers' SSCs in southern Italy	11,79% for male workers 16,43% for female workers	Manufacturing and mining	From 1/12/1983 To 30/11/1984
		3,51% for male workers 8,15% for female workers	Trade	From 1/12/1983 To 30/11/1984
	State-assisted reduction to employers' SSCs in central and northern Italy (male and female)	2,00%	Agriculture	From 1/12/1983 To 30/11/1984
	State-assisted reduction to employers' SSCs in Italy	2,00% for male workers 2,60% for female workers	Trade	From 1/12/1983 To 30/11/1984
L. 26/4/1985, n. 155	*State-assisted reduction to employers' SSCs in central and northern Italy*	9,25% for male workers 12,89% for female workers	Manufacturing and mining	From 1/12/1984 To 31/5/1985
	State-assisted reduction to employers' SSCs in southern Italy	11,79% for male workers 15,43% for female workers	Manufacturing and mining	From 1/12/1984 To 31/5/1985
		3,51% for male workers 7,15% for female workers	Trade	From 1/12/1984 To 31/5/1985
	State-assisted reduction to employers' SSCs in central and northern Italy (male and female)	8,3%	Agriculture	From 1/12/1984 To 31/5/1985
	State-assisted reduction to employers' SSCs in Italy	3,32% for male workers 8,65% for female workers	Trade	From 1/12/1984 To 31/5/1985
L. 28/2/1986, n. 45	*State-assisted reduction to employers' SSCs in central and northern Italy*	7,52% for male workers 11,54% for female workers	Manufacturing and mining	From 1/6/1985 To 31/12/1985

[37] Includes firms export-oriented, hotels, restaurant and similar, hydro-thermal firms, plant engineering companies in the metalworking sector, distribution and movie rental enterprises, cinemas, print agencies with national circulation, trucking companies and, with the law 638/1983, the commercial enterprises.

	State-assisted reduction to employers' SSCs in southern Italy	10,06% for male workers 14,08% for female workers	Manufacturing and mining	From 1/6/1985 To 31/12/1985
		2,28% for male workers 6,30% for female workers	Trade	From 1/6/1985 To 31/12/1985
	State-assisted reduction to employers' SSCs in central and northern Italy (male and female)	5,8%	Agriculture	From 1/6/1985 To 31/12/1985
	State-assisted reduction to employers' SSCs in Italy	2,28% for male workers 6,30% for female workers	Trade	From 1/6/1985 To 31/12/1985
L. 31/7/1986, n. 440	*State-assisted reduction to employers' SSCs in central and northern Italy*	6,84% for male workers 9,24% for female workers	Manufacturing and mining	From 1/1/1986 To 31/12/1986
	State-assisted reduction to employers' SSCs in southern Italy	9,38% for male workers 11,78% for female workers	Manufacturing and mining	From 1/1/1986 To 31/12/1986
		1,60% for male workers 4,00% for female workers	Trade	From 1/1/1986 To 31/12/1986
	State-assisted reduction to employers' SSCs in central and northern Italy (male and female)	14,75%	Agriculture	From 1/1/1986 To 31/12/1986
	State-assisted reduction to employers' SSCs in Italy	2,28% for male workers 6,30% for female workers	Trade	From 1/1/1986 To 31/12/1986
L. 28/2/1988, n. 48	*Per capita State- assisted reduction to SSCs in central and northern Italy (male and female[38] workers)*	Lit. 109.000[39]	Manufacturing and mining	From 1/1/1987 To 31/5/1990
	Per capita State- assisted reduction to SSCs in southern Italy (male and female workers)	Lit. 137.000[40]	Manufacturing and mining	From 1/1/1987 To 31/5/1990

In case of assumptions of women with permanent contracts there would be an extension of the tax relief of Lit. 30.000 and, from 1/12/1989 to 30/11/1991, of Lit. 56.000 even for young aged fewer than 29 and new hiring for one year.

Lit. 108.500 from 1/1/1988 to 30/11/1988, and Lit. 55.000 from 1/12/1988 to 31/5/1990 (law 7/12/1989, n. 389 and law 21/3/1990, n. 52).

Lit. 136.500 from 1/1/1988 to 30/11/1988 and Lit. 132.000 from 1/12/1988 to 31/5/1990 (law 7/12/1989, n. 389 and law 21/3/1990, n. 52).

		Lit. 26.000[41]	Trade[42]	From 1/1/1987 To 30/11/1990
	Per capita State-assisted reduction to employers' SSCs in Italy (male and female workers)	Lit. 42.000[43]		From 1/1/1987 To 30/11/1990
	Per capita State-assisted reduction to employers' SSCs in central and northern Italy (male and female workers)	Lit. 133.000[44]	Agriculture	From 1/1/1987 To 30/11/1990
L. 3/8/1990, n.210	*SSC against TBC*	1,66%	Industry	Permanent (from 1/12/1990)
	Ex-ENAOLI	0,16%		Permanent (from 1/12/1990)
	SSN contribution	1,00% in northern Italy 5,50% in southern Italy		Permanent (from 1/12/1990)
L. 20/3/1991, n.89	*Retirees health insurance*	0,20%	Industry	Permanent (from 1/1/1991)
	SSN contribution	2,00% in northern Italy 8,20% in southern Italy		Permanent (from 1/1/1991)
	SSC against TBC	1,66%	Trade	Permanent (from 1/12/1990)
	Ex-ENAOLI	0,16%		Permanent (from 1/12/1990)
	SSN contribution	1,00% in southern Italy		Permanent (from 1/12/1990)
	SSC against TBC	0,11% white collar 1,66% blue collar	Agriculture[45]	Permanent (from 1/12/1990)
	Ex-ENAOLI	0,01% white collar 0,16% blue collar		Permanent (from 1/12/1990)

[41] Lit. 25.500 from 1/1/1988 to 30/11/1988 and Lit. 39.500 from 1/12/1988 to 30/11/1990 (law 7/12/1989, n. 389, law 21/3/1990, n. 52 and law 3/8/ 1990, n.210).
[42] With the exception, from 1/12/1988, of enterprises with less than 16 workers.
[43] Lit. 21.000 from 1/12/1988 to 30/11/1990 (law 7/12/1989, n. 389, law 21/3/1990, n. 52 and law 3/8/ 1990, n.210).
[44] Lit. 85.000 from 1/12/1988 to 30/11/1990 (law 7/12/1989, n. 389, law 21/3/1990, n. 52 and law 3/8/ 1990, n.210).
[45] Applicable only for enterprises operating in the Northern Italy.

	SSN contribution	5,50% white collar 3,80% blue collar		Permanent (from 1/12/1990)
L. 20/5/1993, n.151[46]	*SSN contribution*	3.44% in northern Italy 9,60% in southern Italy	Industry	Permanent (from 1/1/1992)
		1,00% in northern Italy 2,00% in southern Italy	Trade[47]	Permanent (from 1/1/1992)
		0,40%	Construction	Permanent (from 1/1/1992)
L. 8/8/1996, n.425	*SSN contribution*	2,84% in northern Italy 6,84 in southern Italy	Industry and Agriculture[48]	Permanent (from 1/6/1996)
		0,70% in northern Italy 1,70% in southern Italy	Trade	Permanent (from 1/6/1996)
		0.90%	Commercial firms with 8-15 workers, handicrafts, cleaning services, etc)	Permanent (from 1/6/1996)
D.Lgs 15/12/1997, n.446	*Retirees health insurance*	Abolition	All employers	Permanent (from 1/1/1998)
	SSC against TBC	Abolition	Industry and trade	Permanent (from 1/1/1998)
	SSN contribution	Abolition	All employers	Permanent (from 1/1/1998)
L 23/12/1998, n.448	*Ex-ENAOLI*	Abolition	All employers	Permanent (from 1/1/1999)
	SSC against TBC	Abolition	Agriculture	Permanent (from 1/1/1999)

Note: the law 448/1998 concludes the legislation on Fiscalizzazione.

[46] Together with the law 19/7/1994, n. 451.
[47] Applicable also to commercial firms with 8-15 workers, handicrafts, cleaning services, etc.
[48] For the Agriculture, the disposition is applicable only to firms operating in northern Italy.

Table 7 – Amount of tax relief in Southern Italy

General	General&Ulterior	General&Additional	General&Extraadditional	Years
3.7	-	-	-	1968
60.1	-	7.5	-	1969
85.3	-	27.8	-	1970
97.2	-	52.9	3.4	1971
101.5	0.6	56.2	41.9	1972
72.2	73.3	58.1	85.8	1973
66.8	134.7	70.3	174.4	1974
128.2	145.8	105.2	265.1	1975
155.0	127.1	115.3	305.2	1976
191.4	140.0	127.6	446.9	1977
271.2	125.8	160.4	446.0	1978
351.4	137.5	204.6	520.7	1979
372.3	134.9	221.4	585.7	1980
314.7	151.3	161.4	1206.1	1981
547.5	180.7	343.5	1243.2	1982
667.0	234.6	423.5	1310.4	1983
686.8	224.4	427.6	1338.9	1984
662.8	237.0	403.1	1539.7	1985
644.8	242.6	441.6	1783.8	1986
578.2	242.2	370.0	1989.6	1987
382.0	251.6	363.0	2739.3	1988

Source: INPS, Svimez. Since 1989 INPS has not distinguished between various types of *partial* tax relief. Data in billion of Lit.

Table 8 – Total amount of tax relief in Southern Italy and Fiscalizzazione (years 1968-1992)

Total amount of tax relief in Southern Italy	*Fiscalizzazione*	Years
3.7	-	1968
67.6	-	1969
113.1	-	1970
153.5	-	1971
200.2	-	1972
289.4	-	1973
446.2	-	1974
644.3	-	1975
702.6	-	1976
905.9	-	1977
1003.4	-	1978
1214.2	-	1979
1718.4	3000.0	1980
2573.9	5570.2	1981
3440.2	6926.8	1982
3878.3	7977.9	1983
3969.1	9015.9	1984
4099.3	8963.2	1985
4426.0	8173.6	1986
5035.0	7420.0	1987
5794.1	7597.0	1988
6391.0	3782.0	1989
7180.7	2175.0	1990
7870.7	196.9[49]	1991
8317.0	27.6	1992

Source: INPS, Svimez. Data in billion of Lit.

[49] Reduction due to the passage of these contributions into general taxation.

Table 9 – The impact on public expenditure of various types of tax relief in Italy in the period 1998-2005

Pro-capita tax relief L. 449/1997 art.4 par. 17	Total annual and three-year tax relief L. 449/1997 art.4 par. 21 and L. 448/1998	Total ten-year tax relief L.183/1976	General tax relief L. 1089/1968	Tax relief L. 151/1993	Year
275.8	33.5	402.1	109.8	242.2	1998
253.8	156.5	314.7	77.42	226.1	1999
307.644	116.697	216.9	53.71	232.4	2000
259.077	190.326	108.4	-	-	2001
16.725	210.398	-	-	-	2002
-	198.504	-	-	-	2003
-	131.239	-	-	-	2004
26	28.340	-	-	-	2005

Source: INPS. Thousand of Euro. All values before 2002 have been converted into Euro.

Table 10a – Data characteristics by region (average values)

Region	Gdp	Value added	Investment	Income	Employment	SSCs
Northern regions						
Emilia Romagna	49878.94	3906.92	659.96	3984.01	164.12	35825.6
Friuli Venezia Giulia	13150.09	919.23	159.11	1130.6	42.17	33498.63
Lazio	57732.54	2858.80	477.40	4783.49	117.62	36815.86
Liguria	17673.57	1016.46	148.65	1758.8	50.56	33578.89
Lombardia	117094.80	9395.14	1539.1	10278.08	399.79	40587.14
Marche	14450.00	1065.91	176.58	1081.96	55.58	33521.17
Piemonte	50184.40	4030.61	732.99	3747.61	182.26	35811.69
Trentino Alto Adige	12159.94	811.52	148.47	1202.82	31.83	33317.46
Toscana	38846.29	2823.43	452.29	3217.68	134.14	35011.09
Umbria	8015.02	584.76	95.66	614.62	26.12	33061.4
Valle d'Aosta	1621.45	96.67	20.87	138.29	3.82	32639.6
Veneto	50893.74	4062.21	674.68	4216.91	179.81	36051.89

Source: Istat, CRENoS. Monetary values in millions of Euro; employment in thousands of units (annual average).

Table 10b – Data characteristics by region (annual average)

Region	Gdp	Value added	Investment	Income	Employment	SSCs
Southern regions						
Abruzzo	10809.34	719.32	155.4114	764.63	33.46	33240.46
Basilicata	4114.971	226.23	50.98571	226.73	10.99	32825.23
Calabria	12552.29	545.95	128.5543	848.57	31.52	33316.51
Campania	37523.69	1999.89	449.8286	2901.33	108.74	34861.54
Molise	2505.286	138.76	32.13	133.61	6.70	32697.26
Puglia	26813.06	1436.44	272.34	1700.65	77.99	34289.29
Sardgena	12523.29	634.08	121.98	968.93	31.19	33336.09
Sicilia	34315.71	1503.72	286.42	2174.95	82.80	34556.69

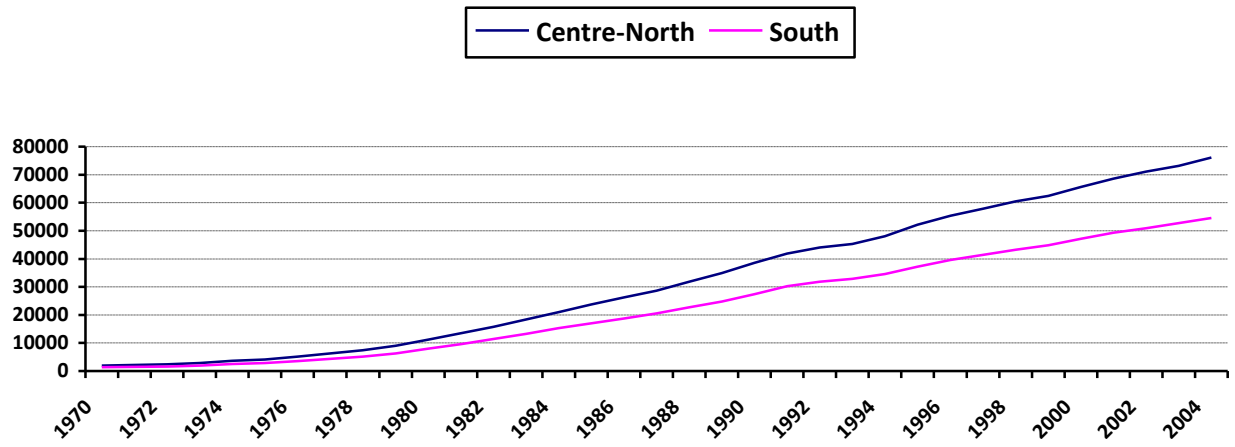
Source: Istat, CRENoS. Monetary values in millions of Euro; employment in thousands of units.

Table 11: Data characteristics by sector (average values)

Industry	ISIC rev. 3 code	Value added	Investment	Employment
Food and beverages	15-16	576.82	117.17	23.09
Textiles, wearing app. and leather	17-19	823.70	111.38	56.69
Wood and wood products	20	652.32	114.70	34.11
Paper, printing and publishing	21-22	356.50	63.63	13.9
Industry in the strict sense	23	6681.71	1363.11	280.58
Non-metallic mineral products	26	355.52	77.95	15.43
Basic metals and fabricated metal	27-28	2337.11	422.83	105.49
Building, Construction	F	1504.11	153.11	82.63
Hotel, B&B	H	4255.73	417.94	210.24
Transport and storage	60-63	1839.92	549.87	63.46

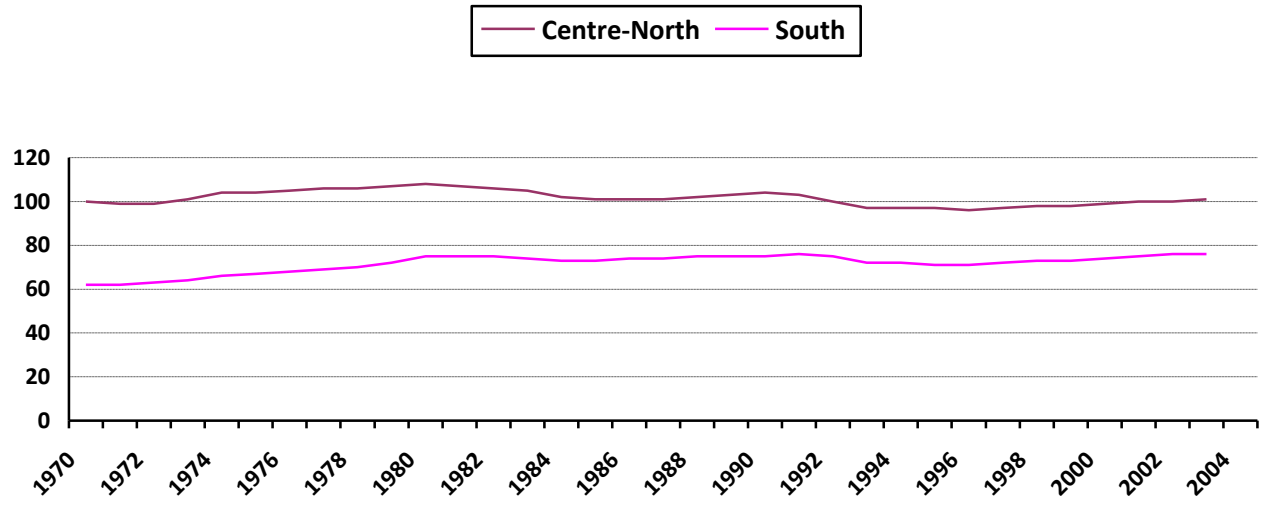
Source: Istat, CRENoS. Monetary values in millions of Euro; employment in thousands of units.

Graph 1: Evolution of GDP by macro-regions (annual average)



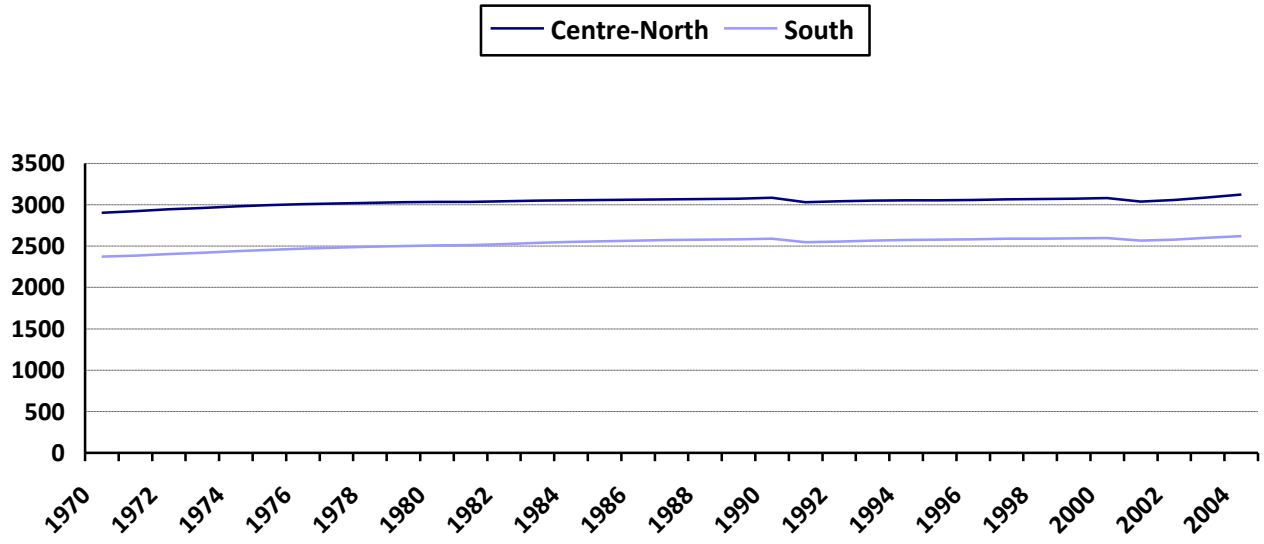
Source: Istat, conti economici regionali. Values in millions of Euro.

Graph 2: Evolution of employment by macro-regions (annual average)



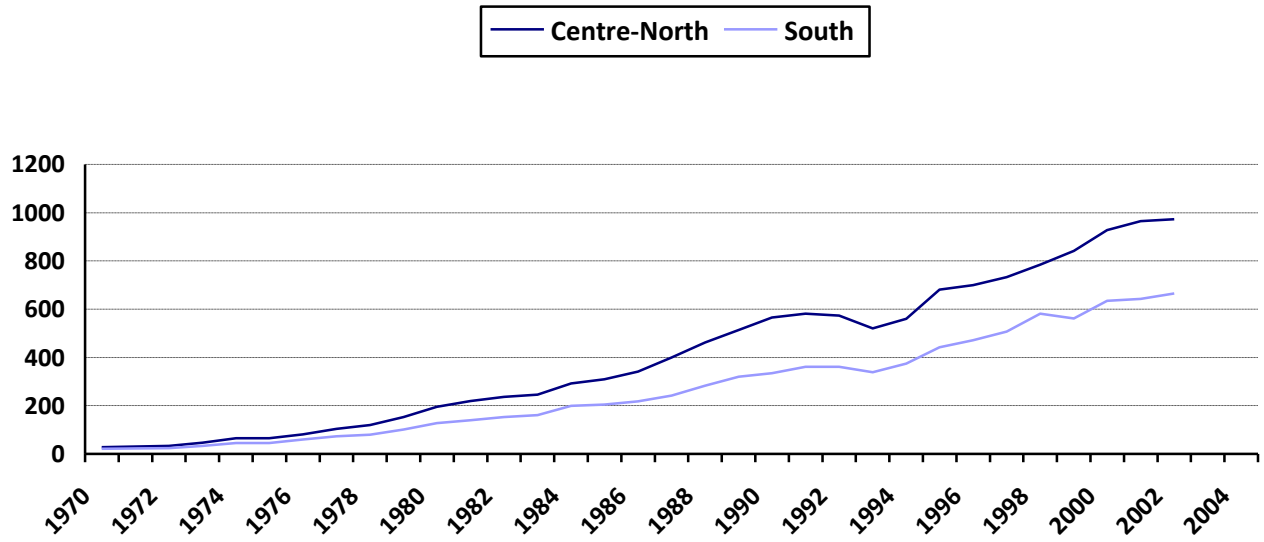
Source: Istat, conti economici regionali, CRENoS. Values in thousands of units.

Graph 3: Evolution of population by macro-regions (annual average)



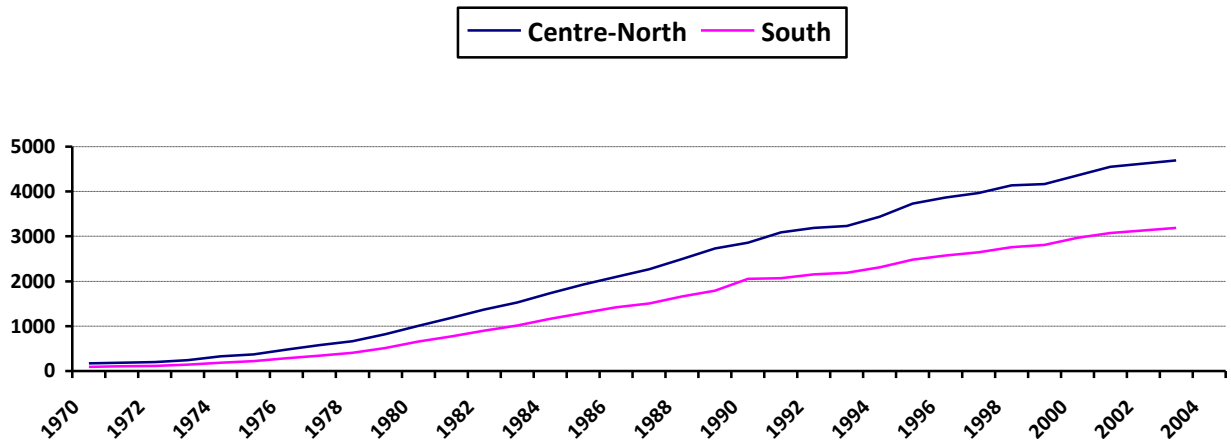
Source: Istat, conti economici regionali, CRENoS. Values in thousands of units.

Graph 4: Evolution of investment by macro-regions (annual average)



Source: Istat, conti economici regionali, CRENoS. Values in millions of Euro.

Graph 5: Evolution of value added by macro-regions (annual average)



Source: CRENoS. Values in millions of Euro.

Appendix 3. Empirical results

Table 12: The effect of the tax wedge on employment in Italy

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 ln\tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist}$$

	(LSDVC)	(AH)	(AB)	(AB augment.)
lnl_{ist-1}	.6032451***	.5283509***	.54121***	.54121***
	(.0361489)	(.1220019)	(.039366)	(.039366)
lnw_{ist}	-.1386884***	-.2509901***	-.1571464***	-.1571464***
	(.0249257)	(.0441744)	(.0292206)	(.0292206)
$ln\tau_{ist}$	-.1492158***	-.2450796***	-.1674442***	-.1674442***
	(.0229378)	(.0402446)	(.0280078)	(.0280078)
lnI_{ist}	.0216069***	.025891***	.0227468***	.0227468***
	(.0068339)	(.0058154)	(.0071379)	(.0071379)
lnA_{ist}	.0398765***	.0133681***	.0335598***	.0335598**
	(.0150865)	(.0072675)	(.0136785)	(.0136785)
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes
Observations	4460	4257	4257	4257
R^2	0.7549	0.2229	n.a	n.a

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $ln\tau_{ist}$ denotes the SSCs pro capita in region *i* , sector *s* and year *t*, *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)*y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 13: The effect of the tax wedge on employment in northern Italy

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 ln\tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist}$$

	(LSDVC)	(AH)	(AB)	(AB augment.)
lnl_{ist-1}	.6195412***	.7498007***	.5402687***	.5665809***
	(.029813)	(.1363205)	(.0341831)	(.0312026)
lnw_{ist}	-.1445557***	-.3053149***	-.1698288***	-.1685548***
	(.0258213)	(.0488495)	(.0294041)	(.022821)
$ln\tau_{ist}$	-.1517861***	-.2887244***	-.1802766***	-.1709921***
	(.0242152)	(.0447718)	(.0277511)	(.0216742)
lnI_{ist}	.0176426***	.0226093***	.0256197***	.0224164***
	(.0036786)	(.0074718)	(.0071009)	(.0067474)
lnA_{ist}	.0317021***	.0046007	.0288047*	.0258621*
	(.0049558)	(.0064127)	(.0147626)	(.0105891)
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes
Observations	2719	2596	2596	2596
R^2	0.7633	n.a	n.a	n.a.

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $ln\tau_{ist}$ denotes the SSCs pro capita in region *i* , sector *s* and year *t*, *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)* y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 14: The effect of the tax wedge on employment in southern Italy

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 ln\tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist}$$

	(LSDVC)	(AH)	(AB)	(AB augment.)
lnl_{ist-1}	.5832285***	.2768098*	.4261765***	.5795197 ***
	(.0749453)	(.1281028)	(.0654859)	(.068881)
lnw_{ist}	-.128543***	-.2016601***	-.1528992***	-.148364***
	(.0446372)	(.0575628)	(.0562244)	(.0493421)
$ln\tau_{ist}$	-.1468787***	-.2063439***	-.1612241***	-.1468787***
	(.0416047)	(.0539381)	(.0530313)	(.0416047)
lnI_{ist}	0279591*	.0323805***	.0375545***	.0193026*
	(.0144092)	(.0088152)	(.0144478)	(.0111608)
lnA_{ist}	.060248***	.0340795***	.0535452***	.0229393*
	(.0204556)	(.0103428)	(.019128)	(.0110353)
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes
Observations	1741	1661	1661	1661
R^2	0.7492	n.a	n.a	n.a

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $ln\tau_{ist}$ denotes the SSCs pro capita in region *i* , sector *s* and year *t*, *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)* y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 15a: The effect of the tax wedge on employment in Italy by sector

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 ln\tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_t + \varepsilon_{ist}$$

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5
lnl_{ist-1}	. .5171353***	.4461503***	.4901107***	.3446555***	.6327091***
	(.0743529)	(.047198)	(.1125617)	(.0585304)	(.070405)
lnw_{ist}	-.2191862***	-.1741679***	-.2534791***	-.4257361***	-.1340855***
	(.0339844)	(.0545707)	(.0348824)	(.0652836)	(.0167384)
$ln\tau_{ist}$	-.2300531***	-.1549108***	-.1836319***	-.4369634***	-.1447134***
	(.0305309)	(.0463847)	(.0113385)	(.0591093)	(.0167598)
lnI_{ist}	.0250464**	.0084473	.0307619***	.0293326***	.0030142
	(.0111437)	(.0276911)	(.0116703)	(.0121144)	(.0150979)
lnA_{ist}	.4091969***	.1918739***	.1960742***	-.0099352	.015336
	(.0641593)	(.0717586)	(.057409)	(.0361318)	(.0119596)
Year dummies	Yes	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	480	440	454	437	427
R^2	0.9186	0.7560	0.8070	0.8307	0.8739

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $ln\tau_{ist}$ denotes the SSCs pro capita in region *i* , sector *s* and year *t*, *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)*y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. Sectors involved are: (1) Food and beverages; (2) textiles, wearing app. and leather; (3) wood and wood products; (4) paper, printing and publishing; (5) Industry in the strict sense. All models are estimated with LSDV robust to heteroschedasticity and autocorrelation. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 15b: The effect of the tax wedge on employment in Italy by sector

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 ln\tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_t + \varepsilon_{ist}$$

	Sector 6	Sector 7	Sector 8	Sector 9	Sector 10
lnl_{ist-1}	.4634531***	.3540506***	.7122192***	.6198129***	.6801916***
	(.056316)	(.040777)	(.0567312)	(.0491498)	(.0691317)
lnw_{ist}	-.1161088***	-.2368494***	-.5779638***	-.1574372**	-.3277892***
	(.0285024)	(.0410783)	(.1439985)	(.0682751)	(.0406183)
$ln\tau_{ist}$	-.1312489***	-.2136382***	-.6281288***	-.1898681***	-.3431837***
	(.032016)	(.0400345)	(.1364533)	(.0729885)	(.0356425)
lnI_{ist}	-.0133106	.0068467	.0251436*	.0152569	-.0044274
	(.0164382)	(.0132858)	(.0122576)	(.0108965)	(.0082901)
lnA_{ist}	-.0054641	.310907***	.021799	.2546464***	.0699747*
	(.0109899)	(.0578825)	(.0239539)	(.0769762)	(.0371342)
Year dummies	Yes	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	391	431	480	460	460
R^2	0.7811	0.8387	0.8235	0.8376	0.8507

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $ln\tau_{ist}$ denotes the SSCs pro capita in region *i* , sector *s* and year *t*, *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)*y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. Sectors involved are: (6) non-metallic mineral products; (7) basic metals and fabricated metal; (8) building, construction; (9) hotel, B&B; (10) transport and storage. All models are estimated with LSDV robust to heteroschedasticity and autocorrelation. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 16: The effect of the tax wedge on employment in Italy. Differences-in-differences estimates

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 lnLabint_s * \tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist}$$

	(LSDVC)	(AH)	(AB)	(AB augment.)
lnl_{ist-1}	.6288735***	.4844615***	.4970443***	.5802007***
	(.0390842)	(.0992925)	(.052398)	(.0441536)
lnw_{ist}	-.1233818***	-.2040697***	-.1485507***	-.1369911***
	(.028432)	(.0387799)	(.0334283)	(.032842)
$lnLabint_s * \tau_{ist}$	-.0379007***	-.0561654***	-.0454535***	-.0413869***
	(.0079563)	(.0109991)	(.009609)	(.009526)
lnI_{ist}	.0213553***	.0303297***	.0447426***	.0222807***
	(.00643)	(.0057483)	(.0075609)	(.0069761)
lnA_{ist}	.0408892***	.0167918**	.0331928*	.0357559**
	(.0152178)	(.0082989)	(.0128359)	(.0143306)
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes
Observations	4460	4257	4257	4257
R^2	0.7433	0.1711	n.a.	n.a.

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $lnLabint_s * \tau_{ist}$ denotes the interaction between sector labour intensity and tax wedge *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)* y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 17: The effect of the tax wedge on employment in northern Italy. Differences-in-differences estimates

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 lnLabint_s * \tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist}$$

	(LSDVC)	(AH)	(AB)
lnl_{ist-1}	.63083***	.6902362***	.5489895***
	(.0313065)	(.1110122)	(.0382991)
lnw_{ist}	-.1447048***	-.2638793***	-.170107***
	(.0232255)	(.0419031)	(.0273491)
$lnLabint_s * \tau_{ist}$	-.0438644***	-.0726241***	-.0526269***
	(.0066113)	(.0126592)	(.0085095)
lnI_{ist}	.0192515***	.0231612***	.0287759***
	(.0063549)	(.007134)	(.0064038)
lnA_{ist}	.0326239*	.0066446	.0287242*
	(.0169218)	(.0070705)	(.0149114)
Year dummies	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes
Observations	2719	2596	2596
R^2	0.7566	n.a.	n.a.

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t, (ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t, (iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t, (iv)* $lnLabint_s * \tau_{ist}$ denotes the interaction between sector labour intensity and tax wedge *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t, (vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t, (vii)*y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.

Table 18: The effect of the tax wedge on employment in southern Italy. Differences-in-differences estimates

The estimated equation is:

$$lnl_{ist} = \beta_0 lnl_{ist-1} + \beta_1 lnw_{ist} + \beta_2 lnLabint_s * \tau_{ist} + \beta_3 lnI_{ist} + \beta_4 lnA_{ist} + \gamma_a + \gamma_s + \gamma_t + \varepsilon_{ist}$$

	(LSDVC)	(AH)	(AB)
lnl_{ist-1}	.6214388***	.2531176**	.4503022***
	(.0748456)	(.1040165)	(.0702223)
lnw_{ist}	-.1049952**	-.1615398***	-.1283123***
	(.0411422)	(.0440565)	(.047736)
$lnLabint_s * \tau_{ist}$	-.0330993***	-.044424***	-.0353039***
	(.0113084)	(.0120112)	(.0126012)
lnI_{ist}	.0221851	.0408935***	.0352499 **
	(.013372)	(.0090676)	(.0136719)
lnA_{ist}	.0597556***	.0397933***	.0601622 ***
	(.0180385)	(.011443)	(.0197932)
Year dummies	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes
Observations	1741	1661	1661
R^2	0.7344	0.3712	n.a.

(i) In the estimated empirical model lnl_{ist} denotes log of employment in region *i* , sector *s* and year *t*, *(ii)* lnl_{ist-1} denotes the log lagged employment in region *i* , sector *s* and year *t*, *(iii)* lnw_{ist} denotes the log of the net wage in region *i* , sector *s* and year *t*, *(iv)* $ln\tau_{ist}$ denotes the SSCs pro capita in region *i* , sector *s* and year *t*, *(v)* lnI_{ist} denotes the log of investment in region *i* , sector *s* and year *t*, *(vi)* lnA_{ist} denotes the log value added in region *i* , sector *s* and year *t*, *(vii)* y_s and γ_t denote sector and year dummies, respectively, while γ_a represents the individual fixed effect. The estimation sample contains 20 regions over the period 1970-2004. Robust standard errors in parentheses. * denotes significant at 10%; ** at 5%; *** at 1%.