
THE EFFECT OF LABOUR TAXATION ON THE EMPLOYMENT LEVEL

*- A SWEDISH STUDY USING AN INSTRUMENTAL VARIABLES
APPROACH*

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ABSTRACT

Over the past decade an increase in labour taxation reforms have been observed across several countries. The main target of these reforms has generally been to encourage labour supply among different groups. In the case of Sweden, an earned income tax credit was introduced in 2007 and reinforced in 2008, 2009, 2010 and 2011 as a measure to deal with the high unemployment level. The relationship between labour taxation and the employment level might thus suffer from bias due to reverse causality.

This paper examines the relationship between the income taxation rate and the employment level in Sweden, using panel data of Sweden's municipalities over the time period 1993-2013. To overcome the endogeneity problems, an Instrumental Variable model has been used where the averaged neighbouring municipalities' tax rates act as an instrument. The results suggest that the income taxation rate has a negative effect on the employment level, where the Instrumental Variable model presents an almost twice as high effect in comparison to the OLS results.

KEY WORDS: Labour taxation, employment level, Swedish municipalities, Instrumental Variable, panel data.

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1. INTRODUCTION

Rising unemployment levels in countries around the world have enforced discussions regarding labour taxation and the role that policies play to curb these rising levels. Labour taxation has not only been a central subject for economic researchers but also a controversial topic for political parties. Estimating the relationship between labour taxation and employment has been on the agenda for several decades (Pencavel, 1986; Blundell & MaCurdy, 1999).

By creating a wedge between the employer's labour cost and the equivalent net pay for the worker, the taxation on labour reduces the amount of labour supplied.

In the past decade several OECD countries have been confronted with these rising unemployment levels and have been forced to implement different policies in order to battle higher unemployment levels. One method that has been frequently turned to is the implementation of an income tax credit.

Examples of this include the Earned Income Tax Credit in the US which first was enacted in 1975 and further expanded in 1986, 1990, 1993, 2001 and 2009 (Hamad & Rehkopf, 2015). In addition to the EITC in the US, several other countries have enforced a similar tax credit, for instance the Working Tax Credit in the UK (Azmat, 2014), Jobbskatteavdraget in Sweden (Regeringens proposition (2006/07:1) and the Working Income Tax Benefit in Canada (Government of Canada, 2015) to name a few.

These countries are clear examples of policy makers adjusting taxation policies on the basis of the prevalent employment situation. As the taxation policies are assumed to respond to the employment level in the country, there is a risk of reverse causality occurring, which would result in biased estimates if not accounted for.

It is of utmost importance to fully understand the relationship between the labour taxation and the labour market and in particular the effect that it has on the employment level. By enhancing the understanding of this relationship, tools can be created for policy makers to improve the effects of policies targeting these certain groups.

The main purpose of this paper is to examine the relationship between the income taxation rate and the employment level in Sweden. By the means of a panel data set of

the Swedish municipalities, this relationship will be estimated using the municipality tax rate, meaning that it is the change in the proportional tax that will be studied. This estimation will be completed using a fixed effects OLS model as well as an Instrumental Variable model. To instrument for the municipality tax, an averaged sum of all the neighbouring municipalities' tax rates will be used.

This study contributes to the existing research that has turned to the use of panel data to shed light on the patterns of employment within Sweden. A great deal of focus within the previous literature has been put on the effects that macroeconomic shocks and labour market institutions have on the employment level. In opposition, this thesis builds on the studies that focus on the effects of fiscal policy. Nonetheless, the largest contribution of this present study is towards the research area of endogeneity within taxation. Bearing in mind that this is a fairly un-researched area, the hopes of developing a method towards a better handling of endogeneity is great.

The paper is structured as follows. Section 2 provides an overview of the theory behind labour taxation and its effect on employment. The subsequent Section 3 offers an overview of the existing literature and empirical studies within the field. The methodology used in this paper is thereafter outlined in Section 4 followed by a description of the data set in Section 5. The empirical results are presented and discussed in Section 6 and Section 7 followed by concluding remarks and suggestions for future studies in Section 8 and Section 9.

2. LABOUR TAXATION AND ENDOGENEITY

2.1 TAX WEDGES AND INCOME TAXATION

According to the OECD definition, a tax wedge is defined as: “the ratio between the amount of taxes paid by an average single worker (a single person at 100% of average earnings) without children and the corresponding total labour cost for the employer. The average tax wedge measures the extent to which tax on labour income discourages employment. This indicator is measured in percentage of labour costs.” (OECD, 2015). Thus the tax wedge includes the personal income tax.

The question of labour taxation and to which extent it affects the employment level has as previously mentioned been a widely discussed topic and as can be seen from the definition of OECD, tax wedges can be viewed as discouraging employment. The negative correlation is thought to emerge as labour taxation reduces the supply of labour which as a result leads to an increase in the unemployment level (Vodopivec, 2005). In the recent decade, several OECD countries have begun a reduction in tax wedges with the purpose of improving the unemployment level as well as encouraging job creation (OECD, 2006).

The taxation of labour is not solely affecting the supply side of the labour market but also the demand side. The demand for labour decreases if the tax results in an increase in labour costs. There are two main causes for this, either if the levied tax falls on the employers and there is no possibility of passing it onto the employed workers, or if the levied tax falls on the employed workers and they have the opportunity of passing it onto their employers in order to keep their real consumption wage (Rutkowski & Walewski, 2007).

Accordingly, the supply of labour decreases if the levied tax falling on the workers results in a lower real consumption wage, as the workers are incapable of counteracting it with proportionately higher wages. In addition, a reduction in labour supply is also expected if the levied tax falls on the employers and they successfully pass it onto the employees through lower wages. Altogether, adding the outcomes of the decrease in labour demand together with the decrease in labour supply the finishing result is a lower employment level.

Labour taxation and its effect on employment is determined by two essential factors, namely the labour market institutions and the individual's preferences, that is, the dominant effect of the income- and substitution effects. In a case of high unemployment and limited work opportunities, the negotiating power of employers becomes higher than usual as well as weaker than usual for employees. This state causes the employees to bear the incidence of the tax. However, in the opposite case with several work vacancies being hard to fill, the negotiating power falls on the employees instead which naturally indicates that the incidence of the tax will be borne by the employers (Rutkowski & Walewski, 2007).

Additional factors that impact the negotiating power of the employers and the employees are the labour market institutions where the presence of for instance trade unions, fixed minimum wages and employment protection legislation raise the negotiating power of employees as well as their possibility of passing the tax incidence onto the employers. Labour costs generally increase as a consequence of labour market institutions, and the employment level pays the price for the maintenance of wages. Classically, a more elastic labor demand results in a smaller effect of a payroll tax on aggregate labour costs and on the other hand a larger effect on wages and employment. Moreover, a more elastic labour supply produces a larger impact on employment and less on wages (Rutkowski & Walewski, 2007).

(Rutkowski & Walewski, 2007) sum up the implications as follows:

Increasing labour taxation can as a temporary disequilibrium cause growth in unemployment up to the point when wages adjust to the decreased demand. On the contrary, a permanent decrease in employment will be produced provided that the negative labour demand is not compensated by an equal positive demand shift, for instance by greater labour productivity and hence a decrease in unit labour cost.

In the short run, provided that the demand and supply of labour is subject to inelasticity, an increase in the labour taxation schedule is expected to have a restricted effect on employment. A greater part of the effect is expected to fall on the wages, and if the incidence falls on the workers or employers is contingent on the elasticity of labor demand and labour supply. However, in the long run a growing tax on labour will have a

larger negative effect on employment as firms discover means to substitute capital for more costly labour.

The largest impact on employment followed by an increase in labour taxation will fall on groups for which the demand for labour is the most elastic. Included in these groups are low-skilled workers, young and older workers as well as women. This impact will be further intensified if the supply of labour in these groups has a high elasticity.

In the instance of labour market regulations and strong trade unions which limit downward pressure on wage modification, the negative impact that payroll taxes have on employment will strengthen.

A further aspect that needs to be taken into account is that a higher tax on labour increases the relative cost of formal employment in regards to informal and untaxed employment. Consequently, there is an expected decrease in formal employment in favor for an increased informal employment. This potential effect is of utmost importance to fiscal policy as an increase in informal employment would imply lower tax revenues.

Last of all, an increase in the taxation of labour shifts consumption from the private sector to the public sector. An effect following this shift is of work opportunities, referring to the movement of private jobs to public. For that reason a common act by governments to encourage work incentives is to shift taxation of labour to consumption taxes (Pestel & Sommer, 2013).

2.2 SWEDISH EARNED INCOME TAX CREDIT

In order to battle high unemployment levels and strengthen labour supply, modern tax policy has turned to the usage of in-work tax subsidies. The most prominent examples being the Earned Income Tax Credit (EITC) in the US as well as the equivalent UK version of the Working Families Tax Credit (WFTC). The Swedish counterpart, Jobbskatteavdraget, was set into action in 2007 with the intention of improving employment. With a purpose of offering enhanced incentives for individuals to move from unemployment to as a minimum, part-time work (Prop. 2006/07:1). These

enhanced work incentives were expected to be reached by the means of decreasing marginal tax rates on labour for low and middle-income earners.

2.3 ENDOGENEITY OF TAXATION

Endogeneity issues are caused when a variable in a regression is determined by other elements in the regression, indicating that there exists a correlation between either the covariate and the error term or the other variables. Reverse causality is one of the most typical causes of endogeneity (Kennedy, 2008).

Within the research area of employment and taxation, the existing macro literature rarely discusses the potential endogeneity issues with the most common determining variables. The taxation schedules and the factors driving alterations within these are frequently associated with further changes in the economy and to identify a causal effect of taxation on employment one need an exogenous variation in the tax rate.

As previously mentioned, the aim of the Swedish EITC was to boost employment, which accordingly is a shared aim for municipalities while altering tax rates. Taxation is often used as an instrument to tackle the incentives of individuals and hence acts as a steering wheel. This is a great indicator of labour taxation being a candidate of suffering from reverse causality. Hence the OLS estimates run a risk of being affected by omitted variables bias and reverse causality. In accordance with this, the potential endogeneity needs to be adjusted for.

A common method of handling endogeneity is by the means of an Instrumental Variables model. This model entails the discovery and use of an instrumental variable instead of the endogenous variable, and hence escapes the problems with reverse causality. This is the path that this paper will follow and the method will be discussed in more detail further ahead.

3. PREVIOUS RESEARCH

To provide an overview of previous research within this field of study this section will present a number of studies made within the area.

Studying the relationship between labour taxation and employment can be done in numerous ways, with the largest difference laying in the choice of variables. One popular method is by using the tax wedge as the chosen labour taxation variable. One of which is the study by (Dolenc & Laporsek, 2010) that examine the effect of the tax wedge on the employment growth in 27 EU member states. Using a panel data set stretching over the period 1999-2008 the authors find that the negative relationship between the tax wedge and employment was confirmed, where a one percentage point increase in the tax wedge reduces the employment growth by around 0.04 percentage points.

Similarly, (Nickell, 2003) chooses to use the tax wedge to study its relationship to employment; however this study focuses on the effect that the tax wedge has on the incentives to work. This paper is also based on a selection of OECD countries. The author finds that a 10 per cent increase in the tax wedge is associated with a two per cent reduction in labour input.

Contrary to the previously mentioned studies, (Mojsoska-Blazevski, 2012) finds that the income tax wedge for the years 1998-2010 does not have a significant effect on the employment rate in Macedonia. As this result is quite unanticipated the author argues that in this case the burden of the taxation might have fallen on the employees in the form of lower wages which discourages labour supply.

Even though there are mixed results across countries, a majority of the studies appear to find a negative relationship between labour taxation and employment as theory predicts, see for example (Faria, 2004; Pissarides, 1998).

In addition to these papers that explore the relationship between labour taxation and its effect on employment, a new supplement has been added within this field and departs from the theory of taxation being endogenous in the labour market framework. Endogeneity of taxation is still a rather unsearched area, though there are a couple of

studies that have proceeded from this theory of endogeneity and have chosen to overcome these issues by the means of an Instrumental Variables model.

One paper in particular has inspired the writing of this current study and is by (Lehmann et al., 2013) and examines the unemployment-reducing effect of tax progressivity. The paper includes a panel of 21 OECD countries over the time range of 1998-2008. Despite that (Lehmann et al., 2013) mainly focus in presenting a larger progressive tax schedule and its raise on the employment rate, they nonetheless discuss and account for the potential endogeneity of taxation. The authors tackle the endogeneity issues by the means of an instrumental variables approach where the tax wedge and tax progressivity are instrumented with a sample of variables including: a measure of the political orientation of the parliament, an index of distrust in civil services as well as a narrative record for the tax components of fiscal consolidation policies. The authors interpret the variation between the OLS estimates and the IV estimates as a confirmation that reverse causality presents an attenuation bias.

In similarity to the previous study, (Duncan & Peter, 2008) have identified the potential endogeneity within the taxation schedule. In contrast to the present study and other studies within the area of taxation and employment, (Duncan & Peter, 2008) examine the reverse causality between the progressivity of income taxation and income inequality. This study is based on a large panel of countries over the period of 1981-2005. Nonetheless, the authors choose to overcome the endogeneity problems with the use of an IV model. To instrument for the countries' tax progressivity schedules the authors use the neighbouring countries' distance-population weighted averages of tax progressivity measures. This paper has also worked as a building block for the present study regarding the choice of instrument and will be discussed in more detail further ahead. Hence, the method of which the authors have used in their paper is of more relevance to this study than their actual topic.

The aim of this study is to not solely build on the existing research within the area of labour taxation and employment but perhaps first and foremost to add to the literature of endogeneity within taxation. By continuing the path of using an IV model to overcome endogeneity, the ambition is to further develop the selection of good instruments and to

enable an additional analysis of whether or not this trail ought to be followed in future studies.

4. ECONOMETRICAL METHOD

4.1 METHOD

To enable an empirical analysis on the effect of labour taxation on the employment level in Sweden, a panel covering 283 of Sweden's 290 municipalities has been collected over a time range of 21 years. This kind of panel data requires a fixed effects estimator for various reasons. The most prominent reason being the need to control for the effects of time-invariant variables affecting the municipalities by using time-invariant effects, in addition to including time fixed effects. Hence, this unobserved heterogeneity can be controlled when it is constant over time and correlated with the independent variables (Williams, 2015).

Furthermore, a panel of this sort is likely to suffer from certain problems concerning the standard errors. (Grassmueck, 2011) claims that the use of aggregate data can result in a state where the residuals do not satisfy the independence assumption. He argues that the residuals are expected to be positively correlated and therefore suggests the use of cluster-correction of the standard errors to solve for this problem. Hence, the models used will have clustered standard errors. A log-linear approach is taken which will result in the following interpretation: a unit change in the tax-variable explaining a percentage change in the employment level.

Two different methods will be used to estimate the causal relationship between labour taxation and the employment level. The first model used is a fixed effects OLS model with no modifications made to account for the potential endogeneity problems. The second model used is a fixed effects Instrumental Variables model, departing from the theory of taxation being endogenous to employment variables. Estimating both an OLS model and an IV model allows for a comparison to be made between the models, where a discussion of the potential size and direction of the bias is enabled.

4.2 SELECTING AN INSTRUMENT

The consistency of the instrumental variable model is immensely reliant on the instruments chosen for estimation and their validity. Hence, the selection of a proper

instrument is crucial and one of the most important parts of the analysis (Veerbeck, 2012).

In this framework there appears to be several potential candidates to instrument the tax rate. (Lehmann et al, 2013) instrument the tax wedge and tax progressivity by using a narrative record for the tax components of fiscal consolidation policies, a measure of the political orientation of the parliament and an index of distrust in civil services. As (Lehmann et al, 2013) have a panel set consisting of a range of OECD countries, some variables included in their study are clearly unsuitable for the present analysis. Nonetheless, a political variable indicating which wing a municipality belongs to could for a few reasons be considered a candidate to instrument the tax rates. However, due to data limitations and the possibility of municipalities forming party–transcendent agreements, this path was not followed.

(Duncan & Peter, 2008) have likewise identified the endogeneity within tax schedules in an alternative context. This study proceeds from the theory of tax competition in which countries compete for the tax base. This is also the theory of which I will progress this study, by developing it to cover municipalities instead of countries and applying it to the present model. Here it is assumed that tax schedules in country X are correlated with tax schedules in the neighbouring country Y. The intuition behind this theory originates in the thought of countries competing for employees by the means of the tax schedule. Seeing as the employment level in country X is not expected to have an autonomous effect on the tax schedule in country Y, the instrument and the other elements of the regression can be assumed to be uncorrelated.

Using this method, the neighbouring municipalities' taxation rates act as instruments to enable an identification of the causal relationship between tax rates on the employment level. If the correlation between the taxation rates of neighbouring municipalities is high enough and the IV model thus has a strong first stage, it would indicate that it is a valid instrument to precede the analysis with (Bascle, 2008).

4.3 OLS MODEL

The OLS model used in this study is presented as equation (1) below:

$$\mathbf{Ln\ emp}_{it} = \alpha_i + \gamma_t + \beta_1 \mathbf{tax}_{it} + \beta_2 \mathbf{X}_{it} + \mathbf{u}_{it} \quad (1)$$

$\mathbf{Ln\ emp}_{it}$ is a logged employment variable, α_i is the unobserved time-invariant individual effect, γ_t is the time fixed effect, the tax variable represents the labour tax of the various municipalities over time, \mathbf{X}_{it} is a vector of control variables described in section 5 along with a further explanation of all the variables.

4.4 INSTRUMENTAL VARIABLES MODEL

To account for the endogeneity in the taxation variable, the use of the neighboring municipalities' taxation schedules will act as instruments. In order to generate this instrumental variable, an average tax rate is calculated for each municipality based on the neighboring municipalities' tax schedules.

The instrumental variable estimation is made up of two equations, namely the first stage and the second stage. Estimating the first stage equation entails regressing the instrumental variable on the endogenous variable and the other control variables. This is done in order to demonstrate the relationship between these variables. For this method to be successful and offer consistent estimates, it is of utmost importance that there exists a strong first stage (Verbeek, 2012). In the context of this study, the average tax rate of the neighboring municipalities must have a strong impact on the endogenous variable, that is, the own municipalities tax rate. In the second stage, the employment level is regressed upon the first stage prediction of the labour taxation rate.

The first stage equation is specified as equation (2) below:

$$\mathbf{Tax}_{it} = \alpha_i + \gamma_t + \beta_1 \mathbf{avg_tax}_{it} + \beta_2 \mathbf{X}_{it} + \mathbf{u}_{it} \quad (2)$$

The second stage equation is specified as equation (3) below:

$$\mathbf{Ln emp}_{it} = \alpha_i + \gamma_t + \beta_1 \mathbf{Predicted tax}_{it} + \beta_2 \mathbf{X}_{it} + u_{it} \quad (3)$$

As the OLS model in this study is assumed to be biased due to reverse causality, it is of interest to discuss in which direction this bias might go. If the OLS model is not able to measure the full effect of labour taxation on the employment level due to endogeneity, then there would be a downward bias on the OLS estimates of β , implying that the OLS results are underestimated compared to the Instrumental Variable models results. However this bias might just as well go in the opposite direction due to other causes and measurement errors resulting in an upward bias and overestimated OLS estimates of β .

5. DATA

5.1 SAMPLE AND DATA

The panel used in this analysis has sampled yearly data ranging from 1993 to 2013, covering 283 of the 290 Swedish municipalities. Data for all the variables included in the panel have been collected from the database Statistics Sweden.

Due to changes to the municipalities in year 1999, some alterations were made to the municipality codes as well as the formation of a new municipality. The municipality Knivsta was dropped from the sample as its existence has only been covering roughly half the time series. A number of municipalities consist of islands which hinder the formation of good instrumental variables in these cases; as a result these municipalities were also dropped from the sample.

The employment level has been chosen as the dependent variable. This variable has been transformed in natural logarithms for the regression analysis as this variable is measured as the amount of employed in the various municipalities. Using a log-linear model is beneficial for several reasons. One of which is for the simplification of the interpretation, as a unit increase of X leads to a β per cent change in Y .

To enable an analysis of the effect of labour taxation on the employment level in municipalities, the variable chosen to represent labour taxation must be chosen with care. As the tax schedules in the municipalities can be calculated in a couple of ways the most important question relates to the inclusion of the county tax. Consequently, in order to distinguish the effects of the municipalities, the selected tax schedule is solely made up from the municipality tax.

Using the logarithm of employment generates a need of controlling for the labour force. As a proxy for the labour force level the total population between the ages 20 to 64, in each municipality has been added.

Other factors that might have an effect on the tax schedule and thus on the employment level are the municipalities' needs for various expenses such as childcare and old-age care. Hence, important variables to control for are the amount of young and old in the

municipalities respectively. The variable for the amount of young is the sum of inhabitants between 0-19 and 65- correspondingly for the old.

An additional variable controlled for is the total municipality expenses. This variable is the sum of the following expenses: political activities, infrastructure, culture, recreational activities, preschool and school expenses, education, geriatric- and handicap care, individual- and family care, certain directed contributions and business expenses. This variable however is not available for the entire time series, so it will only be included in the sub sample regressions.

6. RESULTS

6.1 OLS MODEL

The estimation results from equation 1 are presented in Table 1 below. The entire time-series as well as numerous sub-samples have been estimated and presented in order to enable a wider interpretation of the results. In addition the two left-most columns include the additional control variable of municipality costs.

TABLE 1. OLS RESULTS

Dependent variable: Employment level	1994-2013	2000-2013	2005-2013	2000-2013 With expenses	2005-2013 With expenses
	(a)	(b)	(c)	(d)	(e)
Taxes	0.0044 (5.54e-06)	-0.0085122 (0.00604)	-0.0433558*** (0.0061863)	-0.0011637 (0.006354)	-0.0321641*** (0.0064585)
Young	1.98e-06 (0.00001)	0.000016* (8.30e-06)	0.0000442*** (0.0000104)	0.0000117 (7.69e-06)	0.0000286*** (9.83e-06)
Old	0.0000241*** (5.64e-06)	0.0000174*** (3.06e-06)	0.0000122*** (3.47e-06)	0.0000214*** (4.06e-06)	0.0000257*** (4.89e-06)
Work-age	5.54e-06** (2.31e-06)	-3.70e-06 (3.17e-06)	-0.000016*** (4.51e-06)	-2.29e-06 (3.20e-06)	-0.0000127*** (4.66e-06)
Municipality expenses	-----	-----	-----	-4.82e-07 (2.29e-07)	-1.58e-06*** (2.61e-07)
Adjusted R²	0.4791	0.5663	0.6624	0.5459	0.7350

Coefficients are followed by standard errors in brackets. ***, **, * indicate the significance levels 0.01, 0.05 and 0.1 respectively. The estimates have time and individual fixed effects.

The results for the complete time-series suggest that the labour taxation rate has no significant impact on the employment level. As for the control variables the amount of old residents along with the working-age population level has a significant but rather negligible impact on the employment level. These somewhat bewildering results suggest that the time series is suffering from one or several structural breaks which as a result called for the estimation of the following sub-samples. The results are however not completely unanticipated as the time series covers data from the 1990's during the Swedish crises, which expectedly results in difficulties in measuring labour market outcomes.

The first sub-sample is presented in column b and column d and accounts for the years 2000-2013. Here, the labour taxation rate is found to have a slightly negative impact, though still insignificant. However the adjusted R^2 has risen marginally from the former 0.4791 to 0.5663 and 0.5459 respectively.

The last sub-sample consists of the years 2005-2013 and is presented in column c and column e. In these estimations the labour taxation rate is found to have a negative impact on the employment level with a 0.01 significance level. A one unit increase in the labour taxation rate is therefore associated with a decrease in the employment level with a 4.34 and 3.22 percent correspondingly.

In regards to the control variables, these are found to be highly significant but with an incredibly small effect. The inclusion of the variable of municipality costs raises the adjusted R^2 from 0.6624 (column c) to 0.7350 (column e).

Nonetheless, the OLS estimations are still probably suffering from bias and are thus inconsistent owing to endogeneity and can therefore not be assumed to represent the actual relationships and effects. However the OLS estimations are still of large interest and provide useful comparisons to the upcoming instrumental variables approach.

6.2 FIRST STAGE RESULTS

The results from the first stage estimation, equation (2) is presented in Table 2 below. The assumed endogenous variable, *Taxes*, is here regressed upon the instrumental variable, *AVG_Taxes*.

TABLE 2. FIRST STAGE RESULTS

	Dependent variable: taxes
AVG_Taxes	0.9532*** (0.0105)
Number of observations	5640
F-Statistic	31.52

Coefficient is followed by standard errors in brackets. *** indicates the significance level 0.01.

As can be deduced from Table 2, there is a significant and positive relationship between the average neighboring labour taxation rate and the municipalities own labour taxation rate. To qualify for the use of the IV estimator, one important requirement must be fulfilled, that is, a strong first stage. Therefore the two tax rates must have a strong correlation or else the estimations may suffer from severe bias among other things (Wooldridge, 2009).

To determine whether or not the instrument is strong enough, (Staiger & Stock, 1997) require the F-statistic of the first stage to be above ten. Otherwise, the risk of using a weak instrument is far too great. The result demonstrates that the obtained F-statistic in the first stage has a value of 31.52 which clearly exceeds the milestone of ten. This value suggests that the use of the chosen instrumental variable, *AVG_Taxes*, is satisfactory and can thus be viewed as being a strong instrument.

6.3 SECOND STAGE RESULTS

In TABLE 3 below, the results for the estimations of the second stage Equation 3 can be viewed. Parallel to the OLS model, sub-sample regressions have been made in addition to the complete time series. Columns (d) and (e) represent the equation including the additional control variable of municipality costs.

TABLE 3. SECOND STAGE RESULTS

	1994-2013	2000-2013	2005-2013	2000-2013 With expenses	2005-2013 With expenses
	(a)	(b)	(c)	(d)	(e)
Taxes	0.0032059** (0.0013127)	-0.0171546*** (0.0049312)	-0.0911012*** (0.0087734)	-0.0005503 (0.0077905)	-0.0786773*** (0.0092797)
Young	1.67e-06 (2.11e-06)	0.0000148*** (2.74e-06)	0.0000356*** (5.47e-06)	0.0000117*** (2.79e-06)	0.0000249*** (5.36e-06)
Old	0.0000243*** (1.05e-06)	0.0000179*** (1.26e-06)	9.73e-06*** (2.01e-06)	0.0000214*** (1.52e-06)	0.0000199*** (2.50e-06)
Work-age	5.61e-06*** (7.43e-07)	-3.38e-06*** (1.09e-06)	-0.0000128*** (2.38e-06)	-2.28e-06** (1.11e-06)	-0.0000106*** (2.30e-06)
Municipality costs	-----	-----	-----	-4.91e-07*** (1.34e-07)	-1.16e-06*** (1.61e-07)
Adjusted R²	0.4795	0.5711	0.5237	0.5452	0.6269

Coefficients are followed by standard errors in brackets. ***, **, * indicate the significance levels 0.01, 0.05 and 0.1 respectively. The estimates have time and individual fixed effects.

Similar to the obtained OLS results, columns (a), (b) and column (d) illustrate a slightly positive as well as slightly negative significant effect of the labour taxation rate on the employment level. This result strengthens the suspicion of the time-series suffering from a structural break. The sub-sample in column (c) does now have a taxation coefficient

almost twice the size of the corresponding OLS coefficient. When adding the additional control variable of municipality costs, the taxation coefficient reduces slightly from -0.091 to -0.079. The adjusted R² on the other hand rises from 0.5237 to 0.6269. The preferred instrumental variable specification therefore seems to be the shorter time-series in column (e) resembling the preferred OLS specification. A mutual difference for all sub-samples and regressions is that the OLS model underestimates the correlation between the labour taxation rate and the employment level.

Although the taxation coefficient in specification (d) remain insignificant in the IVmodel, the first two specifications in column (a) and column (b) become significant at the 5 and 1 per cent significance levels compared to the previous insignificant results.

The control variables are found to have very negligible effects on the employment level and are significant at the 1 and 5 per cent significance levels expect for the variable “*young*” in specification (a).

6.4 ROBUSTNESS

6. 4. 1 Unit root

When using panel data models it is important to perform unit root tests to check for the presence of unit roots. If there is such a presence, the data suffers from non-stationarity and can cause difficulties in statistical inference. When performing the unit root tests on this data-set, the test by Harris-Tzavalis is considered the most appropriate as it assumes that the number of panels tend to infinity whereas the number of time periods is fixed (STATA n.d). Consequently , this test is suitable for a data-set with a large amount of panels. In addition to the Harris-Tzavalis unit root test, two more tests have been made to explore the results further and also to be used in the case of uncertainty, namely the Levin, Lin & Chu test and the Fisher ADF test.

The result from the unit root tests can be seen in Table 4 below.

TABLE 4. UNIT ROOT TESTS

Variables	Method	Statistics	Probability	Observations	Stationary
<i>Employment level</i>	Levin, Lin & Chu	-50.5993	0.0000	2538	Yes
	Harris-Tzavalis	-5.4128	0.0000	2538	Yes
	Fisher-ADF	-11.2133	0.0000	2538	Yes
<i>AVG_Taxes</i>	Levin, Lin & Chu	-1.6738	0.0471	2538	Yes
	Harris-Tzavalis	-1.7117	0.0435	2538	Yes
	Fisher-ADF	-2.0184	0.0218	2538	Yes
<i>Taxes</i>	Levin, Lin & Chu	-21.7117	0.0000	2538	Yes
	Harris-Tzavalis	-3.3270	0.0004	2538	Yes
	Fisher-ADF	1.3697	0.9146	2538	No
<i>Old</i>	Levin, Lin & Chu	-44.7280	0.0000	2538	Yes
	Harris-Tzavalis	12.2589	1.0000	2538	No
	Fisher-ADF	-8.3235	0.0000	2538	Yes
<i>Young</i>	Levin, Lin & Chu	-35.5626	0.0000	2538	Yes
	Harris-Tzavalis	0.4359	1.0000	2538	No
	Fisher-ADF	-5.7269	0.0000	2538	Yes
<i>Work-age</i>	Levin, Lin & Chu	-28.9133	0.0000	2538	Yes
	Harris-Tzavalis	7.7410	1.0000	2538	No
	Fisher-ADF	-2.0374	0.0208	2538	Yes
<i>Municipality expenses</i>	Levin, Lin & Chu	-46.4580	0.0000	2538	Yes
	Harris-Tzavalis	-6.5250	0.0000	2538	Yes
	Fisher-ADF	-7.3712	0.0000	2538	Yes

The Harris-Tzavalis tests suggest that the variables “*Old*”, “*Young*” and “*Work-age*” suffer from a unit root and thus are non-stationary. However, the other two tests suggest that these variables are indeed stationary. The Fisher-ADF test displays that the variable “*Taxes*” has a unit root while the Harris-Tzavalis and the Levin, Lin & Chu tests suggest otherwise.

6. 4. 2 Hausman test

To ensure that the fixed effects model is the appropriate model for this study, a Hausman test was performed. The Hausman test has a null hypothesis that the preferred model has random effects and that the alternative hypothesis has fixed effects. When performing this specification test on my data set, a P-value of 0.0000 was obtained, clearly rejecting the null hypothesis of using a random effects model. As a result, the choice of using a fixed effects model is validated by the Hausman specification test.

7. DISCUSSION

7.1 General Discussion

The main theory of income taxation having a negative impact on employment was confirmed in this study, both in the regular OLS model as well as in the Instrumental Variable model.

When using the complete time series the results were surprisingly unexpected. In the OLS model, the income taxation rate did not have a significant effect on the employment level and was even slightly positive. The IV model showed significance at the 5 per cent level; however the results were yet again slightly positive. Clearly, these results were quite unanticipated.

When dividing the sample into smaller time periods the effect started moving in a more intuitional direction. This undoubtedly raised the suspicion of the complete time series suffering from a structural break. Owing to the STATA edition used, no formal structural break test was available to perform. Nonetheless, there are still reasons to believe that a break actually does exist.

One of the reasons is attributable to the financial crisis followed by the housing bubble that Sweden experienced in the early 1990s (Englund, 1999). During this period the unemployment level relatively sky-rocketed in addition to several other financial variables moving in extreme directions (Statistics Sweden, 2005). In a financial situation resembling this state, the employment level is not as susceptible to alterations in the income taxation rate. Nonetheless, as the economy slowly recovered the relationship between income taxation and employment became easier to measure.

This paper chose to use an Instrumental Variables model to estimate the effect that the income taxation rate has on employment and hence dispose of the endogeneity issues. A key part for the Instrumental Variable model to be unbiased and effective is by the use of a strong instrument. With an F-statistic of 31.52 the chosen instrument met this expectation and was therefore seen as a valid instrument to further the analysis with.

The results from the second stage suggest that the impact of income taxation on employment has been massively underestimated compared to the regular OLS model. For the preferred specification in column (e) in both Table 1 and Table 3, the effect

increases from -0.0321641^{***} to -0.0786773^{***} , which is more than twice the size. This increase is aligned with the hypothesis of the OLS model suffering from downward bias due to reverse causality. As policy makers have been targeting high unemployment levels by altering the income taxation rate, regular OLS models are not able to capture the full impact that income taxation has on the employment. These results suggest that measures taken by policymakers actually have a much stronger effect than previously thought.

The use of the Instrumental Variable approach in this framework has displayed that there in fact is potential endogeneity within taxation variables that has to be considered when performing this type of analysis. In the case of Sweden there is a clear reason to believe that the taxation schedule is endogenous after having implemented several income taxation policies with the goal of reducing unemployment.

The IV model seems to be reasonably fitting for the Swedish municipalities but there is no reason to believe that this method is not suitable for other countries as well. Nevertheless the issue with reverse causality might not be completely absent by the use of the instrument in this study. If there for instance exists a correlation between changes in employment levels across municipalities then the issue still remains.

The results of this study are in accordance with the few previous studies made in a similar manner. (Lehmann et al, 2013) also find that the OLS results tend to underestimate the relationship of the effects that labour taxation have on the employment and unemployment.

7.2 IMPLICATIONS FOR POLICYMAKERS

As the results of this study suggest, the estimated effect of the income taxation rate on the employment level has been underestimated when not including measures against the endogeneity problems. The results from the Instrumental Variable model demonstrate that the effect is almost twice the size of the regular OLS results.

These results are of great significance to policymakers as it is essential for them to understand the entire impact that the policy alteration makes. A change in the income taxation rate can now be interpreted and assumed to have a greater effect on the

employment level than previously assumed. This can further be interpreted in two main directions depending on which political belonging one belongs to. Either one infers these results as a confirmation that the remedy towards unemployment is to lower the income taxation rate.

However, probably most important of all is to not forget about the complete picture within policy-making. As we all know, one cannot simply rely on policy-actions only using one instrument to reach one goal. There are several policies working in different directions and targeting different groups at once.

There are also other factors affecting the labour supply of individuals that are not affected by taxes, some of which are individuals' differences in skills, motivation and health (Rosen, 1979).

For that reason, my hopes with this study is to solely build within the already existing field of research and to further understand the complete impact that the income taxation rate has on the employment level in Sweden.

7.3 TIME-LINE CONSIDERATIONS

This paper used a time series of 21 years of annual data which can be considered enough to make this type of analysis; though an increase in the time-series might also result in more robust results. However, as there were suspicions of structural breaks within the entire time series, the reduced time period was almost certainly able to tell more of the story.

7.4 SAMPLE SIZE AND VARIABLES

The sample size was relatively large with a panel of 283 municipalities over the time range of 21 years. The variables that were controlled for were the amount of old, young, work-age people and the municipality expenses. It would have been preferred to control for the political standing of the municipalities. However, due to the lack in data within the chosen time frame this variable was excluded in addition to other reasons.

8. CONCLUSION

This study argues that labour taxation has an employment-reducing effect. To investigate to which extent the size of this effect is, the potential endogeneity of the taxation variables has been taken into account.

The effect of income taxation on the employment level was empirically tested using a panel data of 283 Swedish municipalities over the time period of 1993-2013. This study proposes that the consideration of reverse causality within the taxation framework is of utmost importance and the significance of managing these issues within future research to obtain unbiased results.

This paper chose to cope with the endogeneity issues by the means of an Instrumental Variable model. The theoretical assumption of municipalities competing for workers using the income taxation rate worked as a base for the choice of instrument, where an average tax rate was computed for all the neighbouring municipalities for each municipality. The results suggest that the income taxation rate has a negative significant impact on the employment level. When accounting for the endogeneity in the Instrumental Variable model, the results suggest that the negative impact grows to almost twice the size compared to the regular OLS results, suggesting an immense underestimated effect. These results are in accordance with the theoretical framework as well as the small amount of previous studies within this area.

9. FUTURE RESEARCH

9.1 SUGGESTED IMPROVEMENTS FOR SIMILAR STUDIES

This study proceeded from the theory of the endogeneity of taxation, and acts as an attempt to plot the Swedish labour market and its integration to the financial market. However, the inclusion of other financial variables apart from the income taxation rate has not been considered furthermore in the model. This is of course an issue, as there are additional variables that might be thought of as appropriate to include. One of which is the political standing of the municipalities. Given that the municipalities are independent and self-ruling with different politics, one might expect that whether the municipality is right- or leftwing, there is an effect on the tax schedule which in turn affects employment. Further studies within this area could put added emphasis on this aspect and include some measurement corresponding to the political standing of the municipalities. It is commonly supposed that right-wing politics are in support of lowering taxes in order to stimulate employment.

Relating to the theory of the labour supply of women and young people being more elastic than the average labour supply, a further analysis and sub-sampling of these two groups would be highly interesting to study. This would enable an additional analysis of which groups that are more sensitive to tax reforms. These results can thereafter be used as tools for policymakers who might make these sub-groups targets for future policy actions.

9.2 OTHER AREAS OF STUDY

In the midst of the topic of taxes and the relationship to employment, one might be interested in developing this research area by focusing solely on the effects that tax progressivity have on employment.

This study attempted to build on the existing research concerning the endogeneity of taxation and dealt with the endogeneity problems with the use of an instrumental variables approach. In this case, the neighboring municipalities' tax schedules acted as instruments. Continuing this path would be interesting of several reasons. Firstly, as it still

is a widely un-researched area there are spread opinions regarding the endogeneity at all. In this case it would benefit the existing research with more studies to enable stronger conclusions.

Second, if the endogeneity issues are established within this framework, studies can focus on discovering and launching better instruments. Or on the other hand, future studies can put effort into determining additional ways of dealing with the endogeneity of taxation.

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