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Evaluation of the regionally differentiated social security contribution in Norway

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Preface

[Text]

Oslo, 2 March 2018

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Summary

This report evaluates the scheme of regionally differentiated social security contributions (RDSSC). The Norwegian authorities notified the current scheme for the period 1 July 2014 to 31 December 2020 to EFTA Surveillance Authority (ESA) in 2014. As part of the notification, the Norwegian authorities committed to evaluate the scheme, in accordance with ESA's Regional Aid Guidelines (RAG)

The Ministry of Finance has commissioned Economic Analysis Norway (Samfunnsøkonomisk analyse) and SINTEF Technology and Society to conduct the evaluation.

In line with the objective of the evaluation as stated by the Ministry of Finance and the European Commission Staff Working Document, *Common methodology for State aid evaluations*, the evaluation has tested and analysed whether the RDSSC 1) is aimed at a well-defined objective of common interest, 2) is designed to deliver the objective of common interest, 3) is appropriate and correctly proportioned to achieve these targets and 4) has a distortive impact on competition and trade.

1) Is RDSSC aimed at a well-defined objective of common interest?

RDSSC is the single most comprehensive regional policy measure in Norway and has been part of a broad regional policy since the introduction in 1975. The policy finds legitimacy through broad popular and political support. The objective of RDSSC is to reduce or prevent depopulation in the most sparsely populated regions in Norway by stimulating employment.

The Norwegian economy is characterized by low labour mobility and a national collective wage bargaining system, the latter leading to a relatively high degree of wage equalization for equal work between geographical regions. As a result, wages will not perfectly reflect the scarcity of production factors. In remote areas with small labour markets and/or a one-sided industrial base, this could typically result in higher wages and lower employment than what would have been provided by perfect competition, see ch. 2. Under such circumstances, subsidizing wages to offset the gap between tariff and market wages could offset high labour costs in rural areas.

When the RDSSC was introduced the differentiation of tax rates was justified by a reduction in employment in primary industries in rural areas. Combined with low labour mobility between regions and nationally determined wages, this could create "hidden" unemployment. This may still be the case, but the argumentation for stimulating rural employment has changed over the years. Today the main argument is the importance of stimulating rural employment to avoid depopulation, justified as a compensation for lower productivity in rural areas due to poorer infrastructure, lack of economies of scale, etc.

Whether and to what extent, the objective of preventing or reducing depopulation is achieved through RDSSC, thereby depends on a positive relationship between employment and population. Population and employment are subject to a dynamic adjustment process and are jointly determined. Despite varying evidence from the literature, aggregated studies suggest that stimulating job creation in the eligible regions will contribute to preventing, or reducing, depopulation least populated regions of Norway, see ch. 6.

The objective of RDSSC is politically determined. This contrasts with many other schemes, like e.g. Skatte-FUNN, which was introduced to mitigate a market failure. On the contrary, RDSSC takes on a societal cost in order to achieve a political goal. This does not undermine the legitimacy of RDSSC, although the academic justification is weaker.

Nevertheless, the objective of the scheme of reducing or preventing depopulation in the most sparsely populated regions in Norway is clear and easily understood, is sought accomplished through theoretically convincing means and have broad and long standing political support. We therefore conclude that RDSSC addresses a well-defined objective of common interest.

2) Is the RDSSC designed to deliver the objective of common interest?

The question to be asked here is whether the scheme have direct and/or indirect effects on the beneficiaries, i.e. does it reduce or prevent depopulation in the eligible regions?

Employment may be increased *directly* by RDSSC reducing labor costs, allowing companies to reduce product prices to increase production and gain market shares. RDSSC may also contribute to increased employment *indirectly*, if part of a tax reduction is shifted to workers through higher wages, which in turn leads to increased demand, activity and employment in the economy, see ch. 3.

It is the direct effect that explicitly justifies the choice of RDSSC as a policy instrument. The indirect effect might as well, and maybe more effectively, be achieved by other means, addressing worker or household income directly.

In ch. 5, we utilise detailed micro data to study three large reforms of the scheme that have taken place during our data period 1996-2014:[1]

- In 2000 several municipalities were placed in another zone. We study the municipalities that got a lower payroll tax rate
- The 2004-reform resulted in an increase of the tax rates in zones 2-4. The new rates were applied to the wage costs above a threshold
- The 2007-reform reversed changes in 2004, introduced two new zones and, most importantly, changed the determination of the payroll tax rate from the employees' place of residence to the location of the enterprise.

[1] The sector limitations introduced in 2014 is not assessed due to lack of data after 2014. However, the relevance of this particular assessment is significantly devalued as the sector limitations are removed in 2018.

Overall, find that the direct employment effects are moderate. Moreover, only a modest share of the burden of payroll taxation is shifted on to workers, and a correspondingly large part remains with the employers. This implies that the the indirect income effects also are modest, see ch. 5.

The magnitude of wage shifting varies among zones, indicating that an even smaller share is shifted on to workers in the more rural zones. Furthermore, we find evidence of an asymmetry, as adjustments depends on the sign of the shift: The shift on to workers is lower in the case of an increase in the payroll tax rate than in the case of a decrease, reflecting that it is harder to adjust nominal wages downward than vice versa.

3) Is RDSSC appropriate and correctly proportioned to achieve these targets?

We interpret this as an assessment of whether the objective could be reached in a more effective way by other means. To this end, it is useful to keep in mind what would have happened without the scheme and what alternative schemes are available or feasible.

First, we find RDSSC contributing to reduce or prevent depopulation in the eligible regions. It follows directly from the results discussed above that repealing the regional differentiation of the social security contributions within a tax neutral framework would have resulted in lower employment and settlement in the eligible regions and higher employment and settlement in zone 1.

However, alternative schemes may also achieve similar results. In chapter 7 we saw that RDSSC in monetary terms by far is the most important scheme within the portfolio of rural and regional development policies. Moving all regional support from RDSSC to other schemes would therefore radically change all of them. This rise a serious question about appropriateness. Normally there would be a decreasing return of public schemes. If a scheme increases a lot in size, there is reason to assume that there will be very little effect of “the last million”.

Thus, alternatives to RDSSC should preferably be a mix of other schemes to enhance employment and settlement in the eligible regions. For instance, one could increase capital and innovation support in eligible regions to promote employment. Innovation Norway and the Research Council have several such schemes readily available. Evaluations indicate that such schemes affect employment similarly to RDSSC. However, these schemes are much smaller in scope, and we do not know whether the effects will prevail if they are inflated. This would particularly be the case in Zone 5, where abolishing RDSSC will increase the social security contributions the most and where alternative schemes have to increase relatively much to achieve the same effect. Our assessment is that there is little to gain of reorganizing in this way.

It may also be an alternative to increase income support to households directly as Norway already do in Zone 5, especially in regions where a large share of the tax subsidy is shifted to workers anyway. Increased income support may enhance regional settlement in two ways. First through the same income-employment effect as higher wages trough RDSSC and as an enhanced attractiveness to live in the eligible regions. It is nevertheless difficult to see that income support to households will be more effective than the RDSSC.

Transferring the support to the municipalities directly would enable them to enhance the employment related to their tasks, invest in common goods in the municipality or to enhance small municipal industrial funds where such are in place. Better municipal services or common goods can be factors that help keep or attract labour. However, this would likely shift employment from the commercial sector to the public sector, which in the long run may weaken rural regions' abilities to develop new income opportunities. Nevertheless, this could be a possible alternative to RDSSC as it is today.

Our assessment is that a total (revenue neutral) abolishment of RDSSC clearly would weaken the possibilities of reaching the stated regional policy objectives. The effects would be particularly large in Zone 5. Within an ambitious regional policy, RDSSC appears to be appropriate in combination with other schemes. However, it is interesting to consider whether some municipalities may be better off with a different mix of policy instruments.

4) Does the RDSSC have distortive effects on competition and trade?

The Norwegian RDSSC scheme do have distortive effects. The welfare loss has been estimated in an order of magnitude of 0,25 % of GDP. It may also distort growth patterns between regions somewhat. There is little evidence in the literature that RDSSC schemes have distortive effects on competition. Unfortunately, there are no regionalised time-series data of prices, nor any reliable annual intra-national trade statistics which can be used. Indirect indicators of distortive effects suggest that they are small and may be more due to the presence of specific firms than due to the RDSSC scheme per se. For large sectors of the economy there seems to be no locational advantage of locating outside the zone with the highest social security contribution.

Concluding remarks and central policy implications

We are not able to test the effect of the scheme where the scope is greatest, i.e. in Finnmark. This is due to a lack of variation in the scheme in this area over the evaluation period. It is reasonable to assume that the effects of changes are not linear. A slight change could be expected to have a small or zero effect because risk and costs related to reallocating resources reduce companies' incentives to change behaviour. But, for example, if the payroll tax had suddenly increased from 0 to 14.1 per cent in Finnmark, we would expect substantial effects. Although the scheme costs close to NOK 14 billion in forgone tax revenue, data variation within our data period is limited. Our estimation results reflect that the changes have been relatively limited in our data period, which makes it more difficult to identify effects. In other words, we cannot conclude from our modest estimated effects that the impact of the scheme is small. Our estimates should rather be considered as conservative.

We find effects on both wages and employment, indicating that there are direct as well as indirect effects on employment and population in the eligible areas. There are good reasons to believe that the overall effect of the scheme is significant, especially in the zones with the lowest payroll tax rate. Furthermore, the scope of distortive effects on competition and trad appears to be tolerable.

Based on an extensive empirical review of RDSSC, we recommend the scheme to be continued approximately unchanged. In order to take into account the fact that some municipalities are experiencing challenges not covered by RDSSC, we suggest that the relevant ministries consider giving individual municipalities the freedom to choose whether they will carry on with RDSSC or if they want the same amount of support transferred as a separate free income for the municipality. Such a scheme can, for example, be done as a pilot scheme for a few years to test interest, but with the opportunity to return to previous order later on.

Contents

1 Introduction

Most OECD countries fund social insurance programs, such as retirement, health, disability, and unemployment benefits, with substantial social security contributions on employment earnings (Saez, Matsaganis and Tsakloglou 2012). Social security contributions (payroll taxes) collect about 26 pct. of total tax revenue on average in OECD countries and is the second largest source of tax revenue, after tax on goods and services (OECD 2018).

An employer-paid payroll tax was introduced in Norway in 1967.In 2016 this tax constituted almost 28 pct. of total tax revenues.

A key objective of the Norwegian post-war economic policy has been to achieve full employment for the country as a whole (NOU 1975: 2), and preservation of the distinctive features of the Norwegian settlement patterns has been an explicit objective for Norwegian regional policy since the 1970s (Meld. St. 13 (2012-2013)).

Following a discussion of labour subsidies as a regional policy measure, the payroll tax was regionally differentiated in 1975. The differentiation was in line with economic theory, showing that labour subsidies would be better suited than capital subsidies to stimulate regional employment in an economy with high capital mobility, low labour mobility and a national collective wage bargaining system.

According to theory, lower marginal labour costs in a selected area can lead to higher employment in the same area, partly through the opportunity to increase production and partly because it will be profitable to replace capital with labour in production, to the extent that it is technically possible (NOU 1975: 2).

The payroll tax is lower in rural than in central areas. Today Norway is divided into seven different zones with rates varying from 14.1 pct. in central areas (Zone 1) to 0 pct. in the northern most part of the country (Zone 5).

1.1 Evaluation of the scheme

The scheme with regionally differentiated social security contributions (RDSSC) has undergone several changes since its introduction, both in terms of eligible regions (municipalities) and the difference in tax rates. The Norwegian authorities notified the current scheme for the period 1 July 2014 to 31 December 2020 to EFTA Surveillance Authority (ESA) on 3 June 2014.[2] As part of the notification, the Norwegian authorities committed to evaluate the scheme, in accordance with ESA's Regional Aid Guidelines (RAG).

The Ministry of Finance has commissioned Economic Analysis Norway (Samfunnsøkonomisk analyse AS) and SINTEF Technology and Society to conduct the evaluation. The objective of the evaluation, as stated by the Ministry, is to (1) assess the impact on job opportunities and employment in the eligible regions by differentiated rates in the scheme, and whether and to what extent, the objective of preventing or reducing depopulation is achieved. The evaluation should assess the incentive effect of the implicit aid following reduced rates and to what extent it changes the behaviour of firms (and employees), (2) assess the effects on competition and trade, (3) assess the effects of the new sector limitations, and (4) assess whether the objective could be reached in a more effective and/or less distortive way by other means.

[2] The scheme was notified by letter 13 March 2014 and the notification was completed, after submitting an updated notification, on 3 June 2014.

The evaluation is organised according to the European Commissions' *Common methodology for State aid evaluations* (European Comission 2014). This means that the evaluation is structured around describing the objectives of the scheme to be evaluated, assessing the direct impact of the aid on beneficiaries, assessing the indirect impact of the scheme and assessing the proportionality and appropriateness of the scheme.

1.2 Outline of the report

The following chapter presents the background for regionally differentiated social security contributions in Norway and changes in the scheme over time. Chapter 3 provides a theoretical framework to illustrate how the scheme is intended to work and empirically testable hypotheses.

Chapter 4 describes the data used in our econometric analysis. Chapter 5 presents results on the direct impact of the scheme on beneficiaries (e.g. effect on wages, employment and capital). Chapter 6 presents existing literature on the links between employment and population.

Chapter 7 provides a summary of other (alternative) measures and discusses the proportionality and appropriateness of the RDSSC scheme.

Chapter 8 assesses ripple effects of the scheme. Chapter 9 discusses distortive effects.

We conclude with the main results, their implication and policy recommendations in Chapter 10.

2 Regional Differentiated Social Security Contributions

Social security contributions (through employer-paid payroll tax) have been regionally differentiated in Norway since 1975. The scheme is the most comprehensive regional policy measure in Norway. Prior to the introduction of the regional differentiated payroll tax, regional policy measures were mainly targeted at supporting investments (NOU 1975: 2).

The objective of a regional differentiated payroll tax is to reduce or prevent depopulation in the most sparsely populated regions in Norway by stimulating employment. The scheme is designed to offset employment costs. It is estimated a tax relief of about NOK 13.9 billion for the whole scheme in 2018, of which tax relief to the private sector account for NOK 8.2 billion (Prop. 1 S (2017-2018)).

2.1 Subsidisation of labour rather than capital

In an economy with perfect competition, prices for mobile products and input factors will be equal everywhere, while prices for immobile products and production inputs may vary (e.g. due to differences in demand). However, when wages are largely determined through centralised wage bargaining, equal wages will arise for the same type of work throughout the country. Firms may then pay higher wages – and thus have lower employment – that what they would have if wages were adjusted freely according to local demand conditions (NOU 1975: 2).

The introduction of a regional differentiated payroll tax was based on a series of theoretical studies that discussed the market failures of the regional labour markets, including the disparity between regional demand for labour and nationally determined wages (Hervik and Rye 2010).[3]

Johansen (1965) showed that if the objective is maximising total income, calculation prices providing the optimal solution must be such that common (mobile) resources have the same calculation rates in all regions, while regional (immobile) resources generally have different calculation rates across regions. Considering this, Johansen questioned the subsidisation of common resources, such as capital, rather than labour, which was assumed less mobile (or even immobile). He further specified that the actual wage paid to (equal) workers did not have to be different in different regions to satisfy the optimum requirements, but the firms' calculation cost of labour.

The demand for a production factor (input) normally depends on the price of the product (output) and the relative price ratio between the relevant input factor and all other factors of production. Thus, when the cost of labour changes due to subsidisation, firms' optimal adjustment changes, and in turn the demand for different factors of production and level of production (NOU 1975: 2).[4]

Given the above one could argue that subsidising capital would also lead to increased demand for labour.[5] However, several studies showed that under certain assumptions, subsidisation of labour was preferable to capital subsidies (e.g. Serck-Hanssen (1971)).

Serck-Hanssen (1982) argued that the reason one should subsidise labour and not the use of capital,

[3] For a more comprehensive description of the prelude to the scheme and different theoretical perspectives, we refer the reader to NOU 1975: 2 and Hervik and Rye (2010). Both in Norwegian. An English summary of the latter can be found online ("An empirical and theoretical perspective on regional differentiated payroll taxes in Norway").

[4] Mechanisms leading to these changes is elaborated in Chapter 3.

[5] A reduction in the price of another factor of production will increase employment if labour is complementary (in production) to the factor being subsidised.

when settlement is the objective, is not that it is impossible to achieve this objective by subsidising capital. Increased settlement (or at least reduced depopulation) could be achieved by other means than labour subsidies. It is only more expensive (or equally expensive) to use capital subsidies to achieve an employment target (Serck-Hanssen 1971, 15). He further points out that how much more expensive it will be, depends on how the opportunities for production are in the region.

2.1.1 Labour mobility

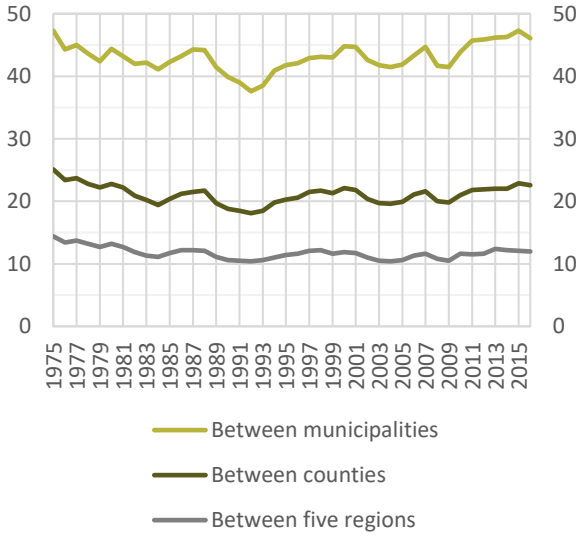
When implementing the regionally differentiated payroll tax, labour was considered immobile between regions. Studying the migration between municipalities, counties and the five regions of Norway, there are few indications that the workers are more mobile today than in 1975 (cf. Figure 2.1). Migration between municipalities per 1,000 mean population has been stable between 40 and 50 the entire period 1975-2016, whereas migration between regions is approximately unchanged, compared to 1975.

However, there are tendencies towards more commuting between municipalities for the last 16 years (cf. Figure 2.2). The share of workers commuting between counties and regions are unchanged during the same period.

The increase in commuting suggest an increase in labour market regions. Better infrastructure (both more and higher quality) enables longer commuting distances, without increasing time spent commuting. Access to interesting work opportunities are a decisive factor when choosing where to live. Easy access to work through commuting increase the available places of residence.

Figure 2.1

Migration per 1,000 mean population. 1975-2016

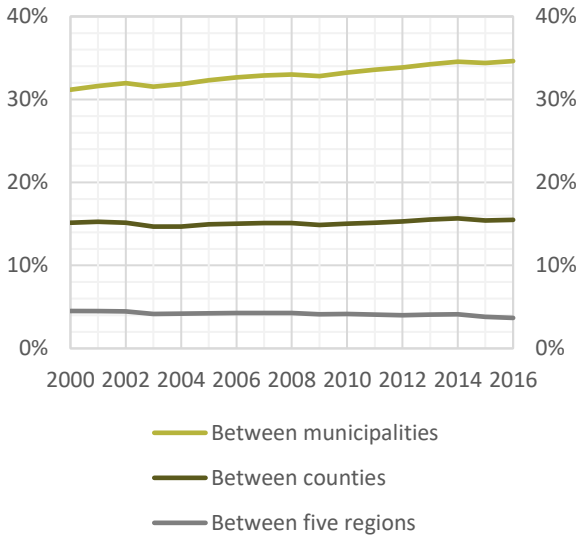


Source: Statistics Norway

Note: Oslo and Akershus is considered as one county. Between five regions: Eastern Norway, Agder-Rogaland, Western Norway, Trøndelag and Northern Norway.

Figure 2.2

Commuting as share of total employment. 2000-2016



Source: Statistics Norway

Note: Oslo and Akershus is considered as one county. Between five regions: Eastern Norway, Agder-Rogaland, Western Norway, Trøndelag and Northern Norway.

2.1.2 Regional unemployment

When the differentiated payroll tax was introduced in 1975, overall unemployment was 2.3 pct.[6] The conception was that full employment was achieved, partly through extensive migration from weakly developed regions to central areas. However, there was a concern that different forms of "hidden" unemployment was present in regions where primary industries had previously been a significant employer, as well as underemployment among specific groups of workers in regions with narrow employment opportunities (NOU 1975: 2).

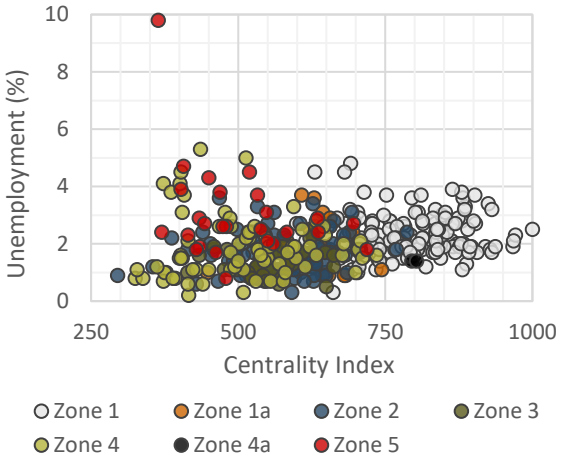
Assuming that immobile labour and nationally determined wages are the cause of regional unemployment, it would be profitable to subsidise labour insofar as this compensates for the difference between the actual wage and the wage that would be derived from a free wage formation in the regional labour market (L. Johansen 1965, NOU 1975: 2).

In 2017 total unemployment was 4.2 pct., but with significant variation across municipalities.[7] It seems that the unemployment rate increases with centrality (cf. Figure 2.3). However, the highest rates of unemployment occur more frequently among the most rural municipalities.

It cannot be ruled out that some share of the disability pensioners should be considered as a form of "hidden" unemployment. Looking at the share of disability pensioners we find little evidence that this is a greater issue in more rural municipalities (cf. Figure 2.4).

Figure 2.3

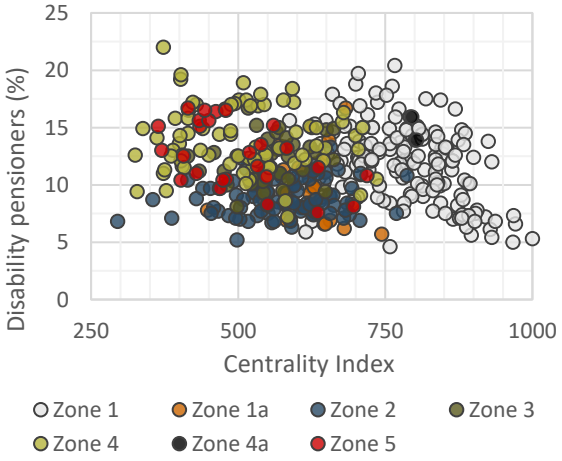
Unemployment[1] and index[2] of centralisation by municipality. November 2017



Source: Statistics Norway
1) Registered unemployed 15-74 years
2) Ranging from 295 (lowest centrality) to 1000 (highest centrality). Oslo is assigned the highest value.

Figure 2.4

Disability pensioners[1] and index[2] of centralisation by municipality. November 2017



Source: Statistics Norway
1) As a percentage of the population 18-67 years
2) Ranging from 295 (lowest centrality) to 1000 (highest centrality). Oslo is assigned the highest value.

[6] Statistics Norway's Labour Force Survey.
[7] The total unemployment rate refers to unemployment in the Labour Force Survey, whereas municipal unemployment refers to registered unemployed. Thus, the average of the unemployment rates in Figure 2.3 is lower than 2.4 pct.

2.2 Administration of the scheme[8]

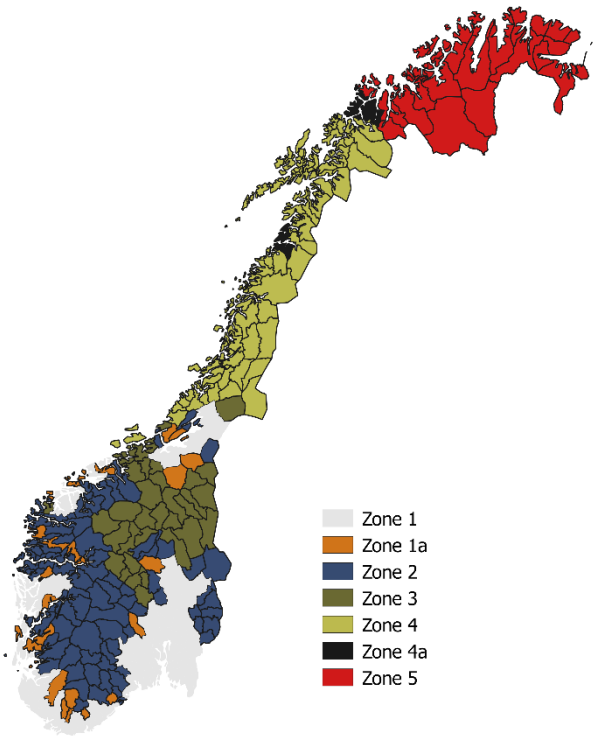
According to Section 23-2 of the National Insurance Act,[9] all employers in Norway have a legal obligation to contribute to the national social security scheme. The contribution is calculated as a share of gross wages paid to the employees. The general rate in Norway is 14.1 pct. The regional (notified) aid constitutes the reductions of the social security contributions below the general rate. The tax rates are determined annually by the Norwegian Parliament. According to paragraph 12 of Section 23-2, the Parliament may adopt regionally differentiated contribution rates, as well as specific provisions for employers within certain sectors.

2.2.1 Eligible recipients

Prior to 2007 the tax rate for each employee was determined by the residence of the employee. After 2007 differentiated payroll taxes implies that the rates vary according to where the firm is located. The employer (firm) is automatically entitled to the reduced rate, i.e. no application is required. If the firm has establishments with different addresses, a reduced tax rate only applies to employees who work within the eligible area. If employees spend half or more of their working time in a tax zone other than the one in which their employer is located, the tax rate is based on the applicable rate in the zone in which the employees spend most of their time.[10]

Figure 2.5

Municipalities by payroll tax zone. 2017



Source: Statistics Norway
Map: ©Kartverket

2.2.2 Sectoral exceptions

Firms operating in the following sectors or activities are not eligible for aid (reduced tax rate) under the scheme:[11]

a. Steel[12]
b. Synthetic fibres[13]
c. Transport[14]
d. Airports[15]

[8] This section is based on EFTA Surveillance Authority decision of 18 June 2014 on regionally differentiated social security contributions 2014- 2020 and mainly describes the scheme as notified for the period 2014-2020. Changes in rates and eligible areas are presented in the next section.
[9] LOV-1997-02-28-19.
[10] From 1 January 2016, it was no longer possible for employers with ambulatory activities to pay a lower rate than the rate applicable to the zone in with the firm had its address.
[11] As of 1 January 2018, firms operating within the transport and energy sector are eligible for reduced tax rates.
[12] As defined in Annex IV of Guidelines on regional State aid for 2014-2020 (p. 43). For the purpose of the evaluation we have defined the steel sector as NACE Rev. 2 group 24.1.
[13] As defined in Annex IV of Guidelines on regional State aid for 2014-2020 (p. 43). For the purpose of the evaluation we have defined the synthetic fibres sector as NACE Rev. 2 groups 13.1, 13.2 and 13.3.
[14] NACE Rev. 2 classes 49.100, 49.200, 49.311, 49.312, 49.391, 49.392, 49.393, 49.410, 50.101, 50.102, 50.109, 50.201, 50.202, 50.203, 50.204, 50.300, 50.400, 51.100, 51.210
[15] See Guideline on regional State aid for 2014-2020 (p. 3).

e. Energy[16]
f. Financial and insurance activities[17]
g. Head office and consultancy activities[18]

Firms with activities both inside and outside the scheme will be eligible for a reduction in the payroll tax for the labour costs strictly related to the eligible activities. However, this requires keeping separate accounts, clearly identifying direct and indirect labour costs and allocating them based on consistently applied and objectively justifiable principles, to demonstrate that the ineligible activities will not benefit from a reduced tax rate.

Firms with outstanding recovery orders and firms in difficulties will not be eligible for aid under the scheme.

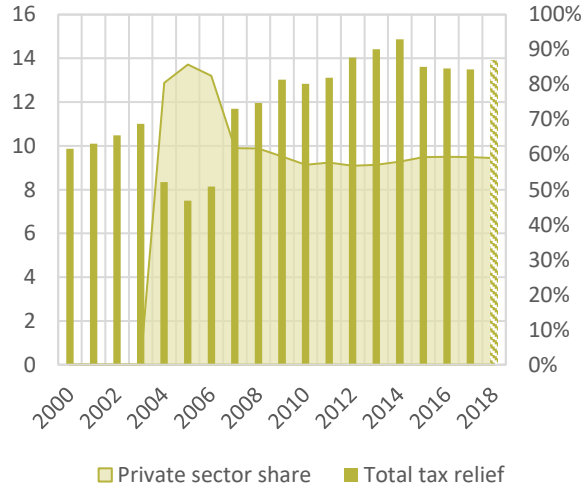
2.2.3 Annual budget

The scheme had a budget of about NOK 13.5 billion in 2017 (estimated loss of tax revenues). Apart from years with restrictions in the scheme (due to ESA regulations), there has been a steady increase in annual budgets (cf. Figure 2.6). Since 2007, private sector has accounted for almost 60 pct. of the estimated forgone tax revenues.

Forgone tax revenues are calculated as the difference between the potential tax revenue if all firms faced a payroll tax rate of 14.1 pct. and what is paid with differentiated rates. Thus, increased wages, and increased employment, is the main explanation for the increase in annual budgets.

Figure 2.6

Estimated loss of revenue (tax relief). NOK billion. Constant 2017 prices. 2000-2018[1,2]



Source: Ministry of Local Government and Modernisation (annual budget proposals)
1) Proposal for 2018
2) Budgets prior to 2004 do not distinguish between loss of revenue from private and public sector

2.3 Changes in the scheme

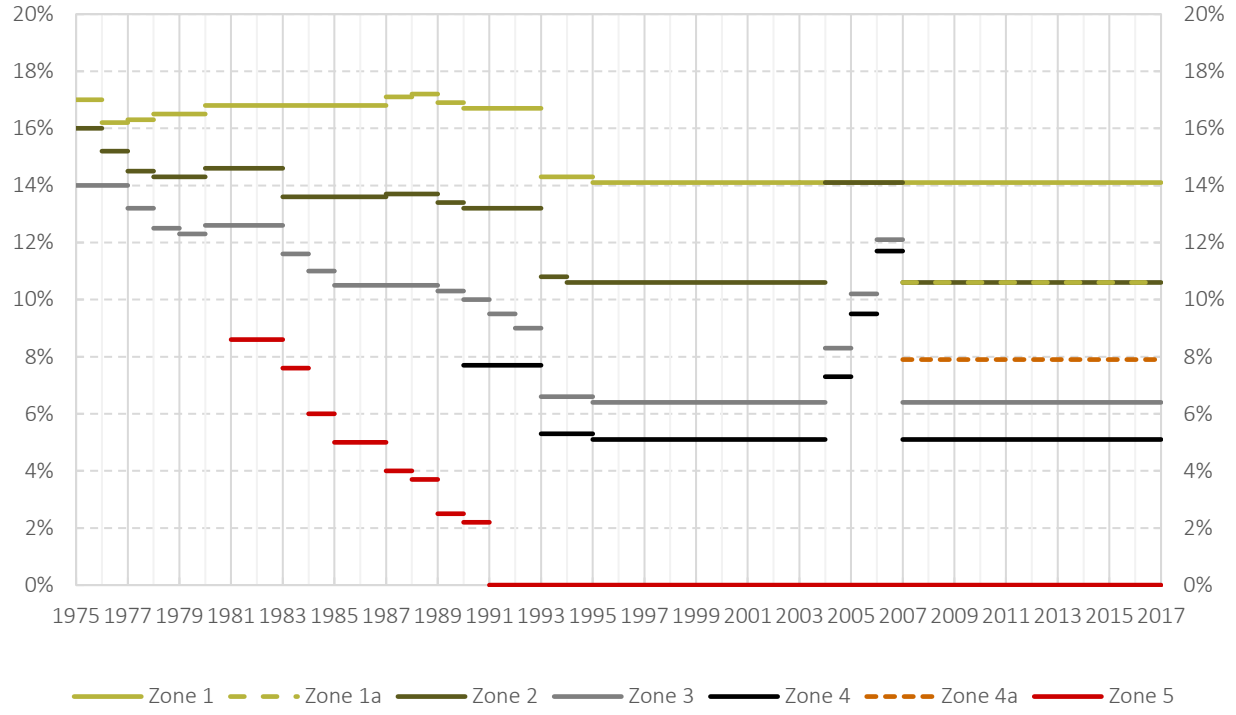
Effective from 1 January 1975, the payroll tax was differentiated in three zones with tax rates varying from 14 pct. in Zone 3, 16 pct. in Zone 2 to 17 pct. in Zone 1. The tax rate per employee was initially dependent on where the employees lived. Thus, firms hiring from different tax zones, faced different costs on potentially equal labour.

A fourth zone (which today is Zone 5) was added to the scheme in 1981, with a tax rate of 8.6 pct. The tax rate was gradually reduced in this zone, and in 1990 another tax zone was added with a tax rate between Zone 3 and (the now) Zone 5 (cf. Figure 2.7). From 1991 the tax rate in Zone 5, also called the “action zone”, has been zero. The action zone

[16] NACE Rev. 2 division 35
[17] NACE Rev. 2 division 64, 65 and 66 (Section K)
[18] Undertakings performing intra-group activities and whose principal activity fall under NACE Rev. 2 classes 70.10 or 70.22

Figure 2.7

Payroll tax rates by tax zone. 1975-2017

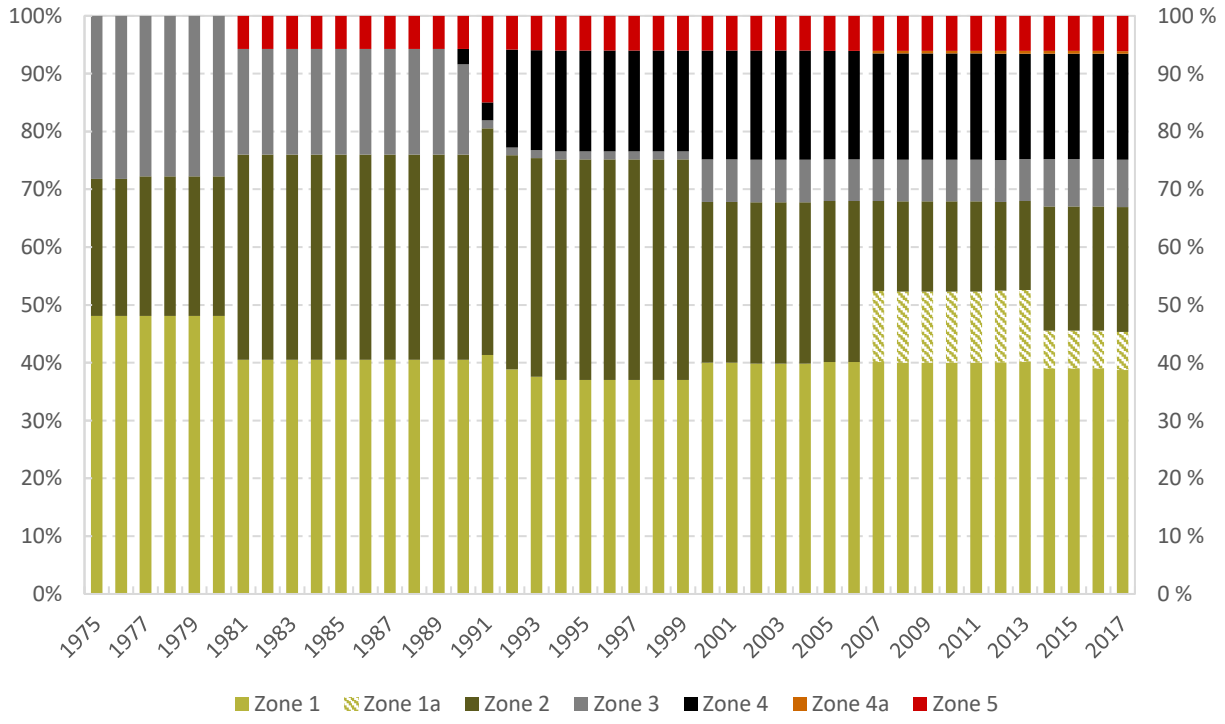


Source: Statistics Norway

Note: Zone 1a was introduced in 2007 with the same tax rate as Zone 2 up to a threshold (see Figure 2.9)

Figure 2.8

Share of municipalities by tax zone. 1975-2017



Source: Statistics Norway

covers all municipalities in the county of Finnmark in addition to seven municipalities in Nord-Troms (i.e. the northernmost part of Norway, marked in read in Figure 2.5).

From 1990-2007 municipalities were divided into five different payroll tax zones.[19]

In 1993, an additional tax was introduced for all employees with earnings exceeding 16 times the basic amount in the National Insurance Scheme (16G).[20] When introduced this tax rate was 10 pct. on the amount above 16G, regardless of tax zone. It was increased to 12.5 pct. in 1998. This scheme lapsed in 2006.

In 1999, the EFTA Court ruled that regional differentiated social security contributions implied illegal state aid. However, later that year, following several changes, ESA approved the Norwegian scheme, partly due to a flexible interpretation of rules for transport support in ESA and Commission's regional aid guidelines. In 2000, the justification of the scheme was changed to supporting firms through reduced payroll taxes to compensate for travel distance in densely populated areas. The scheme was thus considered to be operating aid in accordance with the EEA State aid rules and therefore approved as an indirect transport aid scheme.

Effective form 1 January 2000, further changes in the scheme led to 53 municipalities changing tax zone. In total 39 municipalities faced lower tax rates (most of them moving from Zone 2 to Zone 3), whereas 14 municipalities moved to a zone with higher rates (from Zone 2 to Zone 1).[21]

In 2002 new rates were introduced for employees who were 62 years and older and who were obligated to pay taxes. This was put in place to stimulate employment of workers who might otherwise retire.

The tax rate increased in Zone 2, 3 and 4 for a short period in 2004-2006 due to EEA regulations. However, in 2006 EFTA adopted new Regional Aid Guidelines, which gave greater flexibility to grant state aid in the least populated areas. Hence, payroll taxes were again decreased in the three zones in 2007. In addition, the scheme was extended to seven zones (adding Zone 1a and 4a) and reduced rates for employees 62 years and older ceased to exist.

During the period of increased tax rates between 2004 and 2006, firms in the affected tax zones only faced the higher tax rate on labour cost above a threshold. This still applies for firms in Zone 1a. That is, when labour costs exceed the threshold, the firm faces a higher tax rate on the amount above the threshold. In 2007 the tax-deductible amount was NOK 530 000, which corresponds to following labour cost threshold

$$lcost \geq \frac{530\,000}{0.141 - 0.106} \cong 15.1\ mill.$$

There have been several changes in the labour cost threshold since 2004 (see Figure 2.9).

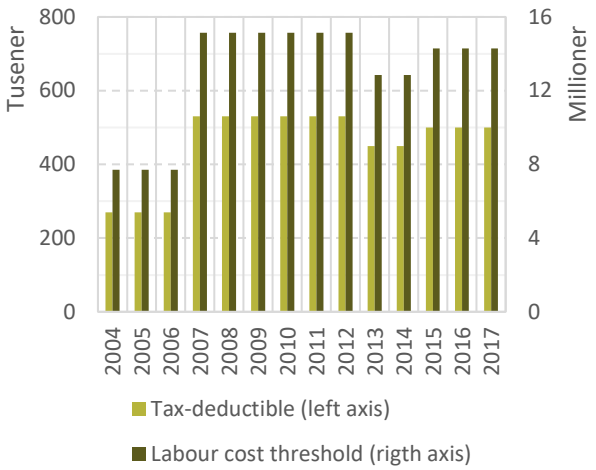
[19] We have omitted to elaborate on a temporary experiment with six tax zones in 1990 and 1991. This has no practical significance for the review of the scheme or the empirical analysis. Norwegian readers are referred to Helde (1998).

[20] Equaled 16 x NOK 37 300 (yearly amount) in 1993.

[21] This reform is used as an identification strategy in one of our empirical approaches and is described in more detail in Chapter 5.

Figure 2.9

Tax-deductible amount and corresponding wage cost threshold. 2004-2017



Source: The Norwegian Tax Administration

From 1 January 2007, the determination of the employees' payroll tax rate changed from their place of residence to the location of the enterprise.

Further changes were made in July 2014, relocating 31 municipalities to zones with reduced tax rates. Furthermore, selected sectors and activities, regardless of municipality, are not eligible for aid under the scheme (EFTA Surveillance Authority 2014). These changes are not part of the current evaluation due to data limitations.

2.4 Seven different tax zones

The seven different tax zones consist of municipalities which vary greatly in both their size and development in central characteristics such as population and employment. The next sections discuss some of the important characteristics of the seven tax zones briefly.

2.4.1 Population growth and density

The main argument for the RDSSC is to stimulate population growth. Municipalities in which does not get any differentiated payroll tax, i.e. zone 1, house 78 pct. of the Norwegian population in 2016, cf. Table 2.1. Slightly less than two pct. of the population lived in zone 5, which has a zero per cent payroll tax rate.

There are not large deviations in population growth between the seven zones. Only zone 3 experience depopulation in the period 2008-2016, while the population growth is more or less stable in zone 2, 4 and 5 during the same period. Not surprisingly, the highest population growth of the seven zones are found in zone 1 with 1.4 pct. annually for the last eight years.

Another characteristic of interest is the population density. As of 2016 the population density is clearly highest in zone 1. This is not sensational in the sense that the municipalities in zone 1 is the most populated by far and include the largest Norwegian cities as of today. Zone 1 have at least ten times more people per square kilometre compared to all other zones, except zone 4a. Zone 4a, however, consist of the two communities Tromsø and Bodø, which have two rather large cities. The two cities contribute the high population density in zone 4a.

The average population density of 14 people per square kilometre is low, which underlines the fact that large parts of Norway is not populated.

Table 2.1
Population growth and -density in the seven different tax zones as of 2016. 2008-2016.

Zone	Share of population 2016	Population density 2016	Annual population growth, 2008-2016
Zone 1	78.4 %	64.9	1.4 %
Zone 1a	2.7 %	6.6	0.8 %
Zone 2	6.6 %	3.9	0.2 %
Zone 3	2.0 %	2.2	-0.1 %
Zone 4	6.1 %	4.2	0.3 %
Zone 4a	2.4 %	31.7	1.4 %
Zone 5	1.8 %	1.4	0.4 %
Norway	100 %	14.2	1.2 %

Source: Statistics Norway
Note: Population density measured as people per square kilometre of land area, including lakes (fresh water area)

2.4.2 Employment and wage growth

Employment[22] are distributed between the seven zones after the same pattern as population described above, cf. Table 2.2. The share of employees in zone 1 are almost identical with the zones' share of the population. Almost eight out of ten jobs are located in zone 1.

The variation in employment growth is somewhat smaller than the variation in population growth as discussed above. Norwegian employment grew by 0.3 pct. annually in the period 2008-2016. The largest employment growth has been in zone 4a, with annual growth rate of one per cent for the last eight years.

Zones 2 and 3 are the only zones with declining employment during the same period, with negative growth annually by -0.5 and -0.7 pct. respectively. The two zones clearly deviate from the other five in respect to employment growth.

Wages seem to be drawn towards the cities and surrounding suburbs. About 84 pct. of wage cost was located in zone 1 in 2016, a significantly higher share than the zones' share of both population and employment. The most central zones relatively high share of wage costs can be explained by the fact that people with high levels of education, and hence high wages, tend to be attracted to cities with urban qualities. These kinds of mechanisms are discussed in more detail later.

The wage growth however, are not deviating for zone 1 compared to the other six zones or the mean Norwegian wage growth for the last eight years. The highest annual wage growth is observed in zone 4a, consisting of Tromsø and Bodø. The two cities' growth may be assumed to have attracted people with high educational levels and high income during the period 2008-2016.

Unemployment rates during the last eight years does not show large variation between the seven different tax zones. None of the seven zones show larger differences than 0.6 percentage points from the national average of 1.9 pct. during the period 2008-2016. The lowest unemployment rate was observed in zone 3, with 1.3 pct. on average for the last eight years.

The unemployment rates do, however, grow at different speed, cf. Table 2.2. Zone 4a and zone 5 have the most positive development with decreasing unemployment rates. This is not what one would expect, as these two zones are expected to struggle the most with declining population and employment.

[22] Employment are measured by place of work, and hence, indicate the existence jobs in the various tax zones.

Among the zones with the fastest growing unemployment rate we find the most centralised zones 1 and 1a. Zone 1, with assumed the most differentiated and growing businesses, show increasing unemployment rates which is significantly higher than more rural zones. However, some of the rise in unemployment rates can be explained by immigration and national migration patterns.

Table 2.2
Employment and wage growth in the seven different tax zones as of 2016. 2008-2016.

Zone	Share of employment 2016	Annual employment growth, 2008-2016	Annual wage growth, 2008-2016	Mean unemployment rate, 2008-2016	Annual growth in unemployment rate, 2008-2016
Zone 1	78.7 %	0.4 %	4.9 %	2.0 %	7.4 %
Zone 1a	2.9 %	0.1 %	7.6 %	1.6 %	8.4 %
Zone 2	6.0 %	-0.5 %	5.0 %	1.6 %	4.5 %
Zone 3	1.8 %	-0.7 %	4.2 %	1.3 %	3.1 %
Zone 4	6.4 %	0.0 %	5.6 %	1.8 %	1.4 %
Zone 4a	2.5 %	1.0 %	7.3 %	1.7 %	-0.6 %
Zone 5	1.7 %	0.0 %	6.3 %	2.3 %	-1.3 %
Norway	100.0 %	0.3 %	5.1 %	1.9 %	6.4 %

Source: Statistics Norway
Note: Employment measured by location of work

2.4.3 Establishments

Jobs can be created by expanding existing firms or establishing new firms. The distribution of establishments in 2016 was highly concentrated in zone 1, cf. Table 2.3. About 84 pct. of establishments in 2016 came in zone 1, in line with the share of wages in zone 1. It seems like the concentration of economic activity in the most central zones are stronger when looking at wages and establishments, than in the case of population.

In addition to their lower share of establishments in tax zones 2, 3, 4, 4a and 5, their growth rates seem to be mostly lower. The exception is zone 4a, which have the highest rate of establishments of all tax zones for the last eight years. This is, however, a tax zone that deviates somewhat from the other zones in the sense that they largely consist of two medium-sized (in a Norwegian context) cities in Tromsø and Bodø.

Table 2.3
Establishments in the seven different tax zones as of 2016. 2008-2016.

Zone	Establishments, 2016	Annual growth in establishments, 2008-2016
Zone 1	83.5 %	3.4 %
Zone 1a	2.2 %	2.2 %
Zone 2	5.0 %	2.1 %
Zone 3	1.4 %	2.6 %
Zone 4	4.6 %	1.5 %
Zone 4a	2.0 %	4.0 %
Zone 5	1.3 %	3.0 %
Norway	100.0 %	3.2 %

Source: Statistics Norway
Note:

3 Theoretical framework

In a free trade economy, prices on tradable products and mobile factors of production will be equal everywhere. Conversely, the prices on non-tradable products and factors of production that are not mobile may wary between different geographical locations. The economy is characterized by optimal allocation of resources, i.e. there will be nothing to gain from reallocating resources within existing production processes, to production of other goods or services or to other regions.

In practice, the mobility of labour is limited, while capital mobility is high, especially in the long run. In Norway, wages are to a large extent determined in centralised wage negotiations. This leads to a relatively high degree of wage equalization for equal work between geographical regions. Thus, wages (and prices of capital) will not perfectly reflect the scarcity of production factors. This may lead to higher wages and lower employment than what is implied by "the free market solution". This could typically be the case in more remote areas with small labour markets and/or a one-sided industrial base.

Demand for labour will in general depend on the profitability of the company, not the overall welfare of the wider society. From the company's point of view, it is profitable to employ labour up to the point where the value added of the last hour worked equals the hourly wage. The company's production volume and composition of labour and capital in the production process depend on the prices on the inputs and on the marginal income (which depends on the properties of the demand curve facing the firm). When the relative prices on the factors of production is changed as a result of a subsidy, the optimal decision for the company is changed, and could thus be changed towards a socially optimal solution.

In theory, the socially optimal solution would be to subsidize labour to the extent that it removes the difference between the national wage and the locally optimal wage, in turn leading to higher employment. This provides a rationale for the authorities to intervene in order to correct factor prices in a direction that leads to a more optimal resource allocation and to reap a socio-economic gain.

A widely used argument against labour subsidization is that it ultimately leads to a lower capital intensity, and therefore lower productivity and welfare losses in the longer term. However, the intention of such subsidies is that subsidization should counteract a market distortion that exists in the first place.

Regionally differentiated payroll tax

The regionally differentiated payroll tax is an interesting case of economic policy. It was guided by standard economic theory in order to stimulate regional employment in the Norwegian economy which is characterized by high capital mobility, low labour mobility and a national collective wage bargaining system. It replaced the older policy of capital subsidies,

As noted, a reduction in payroll taxes changes the relative price of labour (labour becomes relatively cheaper than other factors of production), which is likely to be transferred to higher employment (higher demand for labour). However, the strength of this (direct) effect depends on to what degree the reduction in labour cost is transferred to higher wages.

In the following, we will discuss theoretically how employment and wages may react to a change in the pay roll tax under alternative assumptions. We use a stylized framework suited to illustrate the main mechanisms at work. In Chapter 5, we present a more detailed empirical representation, which also takes account of data availability. Demand and

supply for labour is discussed in Chapter 3.1 and 3.2, respectively. The market solution interacts with the Norwegian system of relatively centralised wage negotiations as explained in Chapter 3.3. We will also consider the time perspective and differentiate between direct and indirect effects in Chapter 3.4. In Chapter 3.5, the main points are summarized in a formal model. Chapter 3.6 derives testable hypotheses based on the theoretical discussions.

3.1 Demand for labour - the company's response to a change in relative factor prices

Standard textbook micro economics, assuming all companies are maximising profits and can employ as many workers as they wish at the going market wage rate, implies that a relative reduction in the price of a factor of production will increase a company's preferred use of this factor. This is easily demonstrated in the case of a firm utilising two inputs (without loss of generality), labour and capital. If the payroll tax is reduced, so is the price of labour, and companies will switch towards a more labour-intensive production process. The effect on capital demand is not so clear cut and is determined by the net effect of a positive output effect and a negative substitution effect.

The *output effect* follows from the reduction in wage costs leading to increased production. This leads to increased use of both labour and capital. The *substitution effect* however, is a bias towards the relatively cheaper factor of production, i.e. companies want to use more labour and less capital. The net effect on capital is thus an empirical question.

Three simplified yet enlightening examples from economic theory are: 1) if an increase in the use of one factor of production leads to a reduction in the use of the other, ceteris paribus, we say that the factors are *alternative*. They have a positive cross-price elasticity, implying that an increase in the price of one good will lead to an increase in demand for the other. 2) In the opposite case, where the two factors of production are *complementary*, i.e. when the factors are mutually dependent in the production process, they have a negative cross price elasticity: an increase in the price of one will lead to a decline in demand for the other. Finally, 3) in the case where price changes on one factor have no impact on the demand for the other, the factors are said to be *independent*.

Additional to the case of complementarity, market imperfections could also lead to increasing capital investments from reduced payroll taxes. If a company wishes to increase production as a result of lower cost and additional labour is not available, increasing labour saving technologies could be an option, through investment in technologies and deepening of capital. Another possibility is that credit restrictions limits a company's investment possibilities, and that a lower payroll tax releases funding for capital investments.

Figure 3.1 provides an illustration. The initial composition of labour and capital of a company is given by X, where the budget constraint (B_1) and the Isoquant (I_1) defines maximum production, provided by the composition of labour and capital given by L_1 and C_1, respectively.[23] A reduction in the pay roll tax implies that the company can employ more labour at a given budget, and the budget constraint shifts to B2. The substitution effect is illustrated by the new slope of the budget constraint. Imagine for a moment that the company would keep production

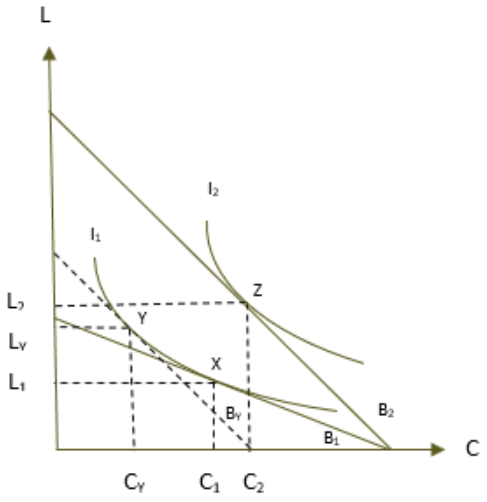
[23] The budget constraint of a company is showing all possible combinations of labour and capital at a given cost – also known as the isocost curve. The isoquant curve is showing all combinations of labour and capital producing a given quantum of output.

constant to the new relative factor prices. This is illustrated by the dotted budget constraint B_Y, having the same slope as B_2, intersecting the same isoquant as before (I_1) but now in Y. In this case we see that labour has increased to L_Y and capital is reduced to C_Y. The output effect follows from the budget constraint moving outwards, increasing both factors of production.

In the example in Figure 3.1, the new composition of labour (L_2) and capital (C_2) after the reduction of the payroll tax is given by the intersection of B2 and I2 in Z. Note that the net effect on capital is positive in this case. This follows if the output effect dominates the substitution effect, which need not be the case.

Figure 3.1

Demand for labour and capital. Income and substitution effects



The effect on labour demand of lower labour costs is always positive. This may also be illustrated by a downward sloping demand curve in a wage/labour diagram, as we return to in Chapter 3.3. In an "opposite" case of increased capital subsides, there would be an analogous unambiguously positive effect on capital and an undecided net effect on labour.

The magnitude of the effects depends on the slope of the budget constraints, i.e. the relative price of labour and capital, the size of the price change and the shape of the isoquant. The latter is determined by how the factors of production are mutually replaceable in the production process.

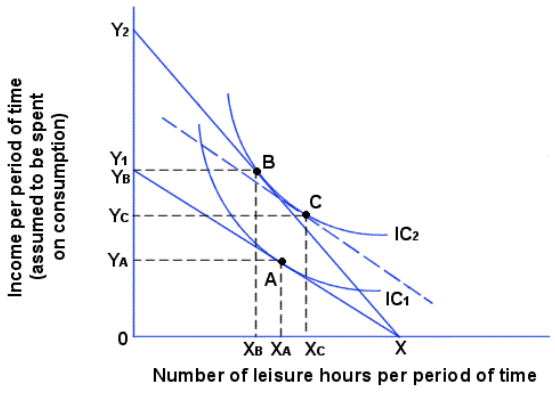
3.2 Supply of labour - the worker's response on consumption vs leisure

In the previous Chapter, we discussed the demand for labour and capital (in partial equilibrium). To illustrate the total effect on a regional labour market of a change in relative factor prices, we need to introduce the supply side. Standard microeconomic theory for the labour market assumes that people are rational and maximize their utility in a trade-off between positive preferences for leisure and income (consumption) resulting from time spent working.

This is illustrated in Figure 3.2, where the line XY_1 represents the initial trade-off, or budget constraint: if every hour is spent on leisure there is no income and, conversely, income is maximized if all hours are spent working. Every additional hour of leisure must be met by an equal reduction in hours worked and a corresponding loss of income. All combinations of leisure and income generating the same level of utility is represented by an indifference curve, where IC_1 defines maximum achievable utility given the budget constraint.

Figure 3.2

Supply of labour. Income and substitution effects



The initial utility maximizing combination of leisure and income is defined by the intersection between the budget constraint XY_1 and the indifference curve IC_1 in A, defining leisure X_A and Income Y_A. If a reduction in the payroll tax is partly passed over to increased wages, income shifts from Y_1 to Y_2, as income increase for a given level of leisure/labour. The indifference curve intersecting the new budget constraint represents a higher level of utility as it facilitates higher levels of consumption and leisure. The move from A to B may be decomposed in two separate effects, an income effect and a substitution effect.

The income effect is illustrated by the shift from A to C. Think of this as an adaptation to a higher level of utility for an unchanged relative cost of leisure. The worker increases consumption and leisure, assuming leisure is a normal good.

The substitution effect is shown by the move along IC_2 from C to B and illustrates that the worker will substitute away from the now relatively more expensive leisure, because of the increased opportunity cost, to an increasing supply of labour.

This means that the effect of a wage cut on labour supply is undetermined from theory. The income and substitution effects pull in opposite directions. Only if the substitution effect is greater than the income effect, labour supply will increase as a response to higher wages, as illustrated in our example in Figure 3.2.

The individual supply curves may, under standard assumptions, be aggregated to a macro supply function. Conditional on that the substitution effect dominates the income effect, the labour supply curve is sloping upward in the wage-labour diagram in Figure 3.3. We now move on to combine the demand and supply curves to study the effect on labour of a change in the pay roll tax.

3.3 Employment and wages

We combine the demand and supply curves from the two previous sections in a labour market model to illustrate how the total effect on employment and wages of a reduction in the pay roll tax may depend on the slopes of the demand and supply curves.
We argued that demand for labour increases when wage costs are reduced. It follows that the demand curves (D) in figure 3.3 are downward sloping. The less sensitive – or inelastic – demand is to a wage change, the steeper the slope of the demand curve.

Demand for workers with high education and skills could be relatively inelastic, assuming it is harder to substitute highly competent labour with low skilled workers and/or machines. First, we focus on supply, and the demand curves are drawn equally steep in the two segments in figure 2 ($D_1 = D_2$), implying that demand responds equally in both segments if wages increase.

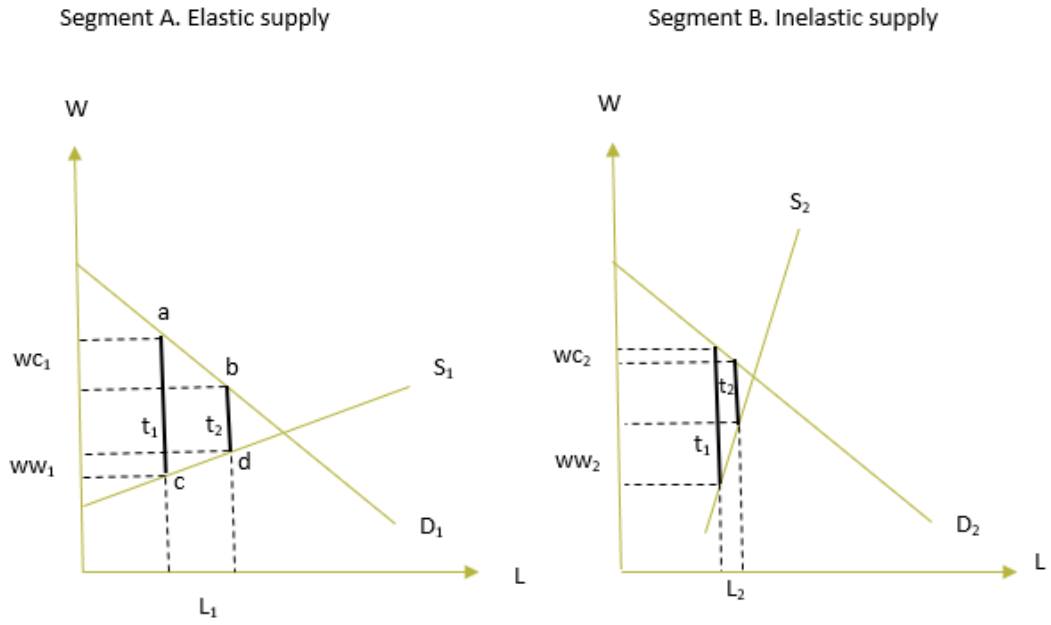
The individual supply curves may, under standard assumptions, be aggregated to a macro supply function, as explained above. Conditional on a positive relationship between the after tax real wage

and labour supply, the labour supply curve is sloping upward. In line with e.g. Hervik and Rye (2005) we split the labour market into two segments with separate supply functions, illustrated by S_1 and S_2 in figure 3.3. In segment 1, supply is relatively elastic, i.e. a wage increase causes a relatively large increase in the supply of labour. In contrast, segment 2 illustrate the case of inelastic supply, where a wage increase leads to a relatively small increase in the supply of labour. An example of a group with a relatively inelastic labour supply, as in segment 2, could be workers with high education and skills, assuming they are more hesitant about moving to sparsely populated areas with less diverse labour markets, networking opportunities, cultural activities and such.[24]

In the hypothetical case of efficient markets except for zero mobility of labour, the supply curve would be vertical. In the opposite case of perfect mobility, supply would increase infinitely after a marginal wage increase and collapse to zero after a marginal reduction, and the supply curve would be horizontal. As explained in Chapter 3.2 the labour supply curve might also be falling, if the substitution effect is smaller than the income effect.

The initial tax wedge is represented by t_1. The tax wedge after a reduction of the pay roll tax is given by t_2. The resulting increase in employment in the two segments are shown by L_1 and L_2, respectively. We see that the magnitude of the employment effect depends on the elasticity of supply and is relatively larger in segment 1 where supply is more elastic. Furthermore, the wage costs of the employer are

Figure 3.3
Supply elasticities



Source: Hervik and Rye (2005)

[24] Stambøl (2000 and 2002) finds that high skilled labour in general is relatively mobile and preferring central areas, but also considering more remote areas when the going gets tough.

reduced by WC and the wage increase received by the employee is given by WW. In both examples in Figure 3.3, the tax reduction is shared between employer and employee. In segment 2, however, where supply is less responsive to wages, most of the tax reduction is converted to higher wage to the employee.[25] The wage cost of the employer is almost unchanged and there is just a tiny increase in employment. Also notice that the deadweight loss is larger in Segment 1, but also the reduction of deadweight loss of the tax reduction, given by *abcd*, is larger.

Off course, the elasticity of demand could also vary, and thus the slope of the demand curve. For instance, one could also assume that the *demand* for high-skilled labour is more inelastic than for low-skilled labour: It is difficult to substitute high-skilled labour against low-skilled labour or capital. This illustrates the importance of the industrial base to the effect of a change in the payroll tax. A steeper demand curve would lead to a lower employment effect and, the increase in the after-tax wage to the employee would be smaller and the reduction in the employer's labour costs would be greater.

To sum up, the model above illustrates effects under the idealized conditions of a free market and predicts a positive effect on employment and wages and reduced deadweight loss of a reduction in the payroll tax. The efficiency of the measure depends on the elasticity of supply, which may vary between different segments of the labour market and regions. In regions (to) where the supply of labour is inelastic, reduced pay roll tax would be a less effective measure to increase employment, and more of the tax reduction is converted to higher wages.

Spillover to wages under wage negotiations

However, the Norwegian labour market differs significantly from the case of perfect competition, which does not fully consider modifications caused by collective wage negotiations. This might be important as close to half of Norwegian workers are organized (see i.e. NOU 1996:9 for a discussion). It is likely that a pay roll tax reduction is more efficient when wage negotiations are centralized, as in Norway (see e.g. Cappelen and Stambøl (2003) and Bennmarker et. al 2008). A region-specific reduction in the pay roll tax will to a lesser extent lead to a region-specific wage increase when wage growth is regulated by nationwide collective agreements. Lower wage costs increase competitiveness and makes it possible to increase production and the use of the relatively less expensive factor of production, i.e. employment. This could help explaining why empirical studies tends to find more employment effects in the Nordic countries and in Norway in particular. Alternatively, the company could utilise the gain in local wage negotiations to attract more high-skilled workers. Empirical studies on a national level tends to find that wages to a large extent are determined by companies' profitability, describing the labour supply as an upward sloping wage curve.

Preliminary summary

The theoretic framework above helps understanding the central mechanisms and indicate the sign of the effects of a reduction in the pay roll tax on wages and employment (and in some cases a ranking of the effects). The composition of industries, the organisation of the labour market and wage formation in the different regions will affect the efficiency of the tax measure. Thus, we cannot say much about the magnitude of the effects based on standard

[25] In the case of a horizontal supply curve, paid wage is not affected and there is a large increase in employment

theoretical considerations. That remains an empirical question. We return to that central point in Chapter 5.

As shown, the slope of the supply curve is ambiguous theoretically, as it depends on the relative strength of the opposing forces of the substitution effect and the income effect.

3.4 Time perspective and direct vs. indirect effects

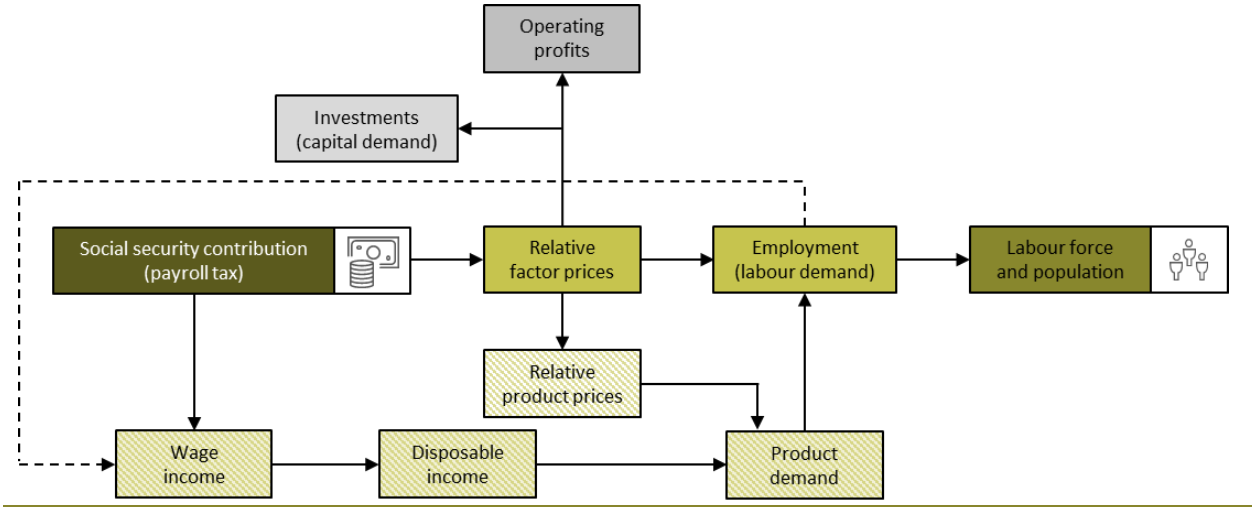
Whether we find that the reduction in payroll taxes leads to a change in relative factor prices (and higher employment) or higher wages is also likely to depend on the time perspective of the evaluation.

Employees' bargaining power may be weak immediately after the policy change (strong effect on the relative price of labour). If so, the effect on employment is likely to be relatively strong in the short run. However, both theory and empirical results on a national level show that, over time, bargained wage increases will counteract the initial effect of a reduced tax rate and one may experience little, or even no, direct effect on employment.

Lack of direct effects on employment does not mean that total (regional) employment cannot increase. Higher disposable income (through higher wages) for those already employed is likely to increase their demand for (locally produced) goods and services.[26] Thus, higher wages may indirectly affect employment (cf. Figure 3.4). If we assume that both capital and workers are mobile, though not instantaneously, relocation of firms (and workers) to municipalities with lower payroll tax may also give a long-term (positive) effect on employment.

There may also be additional positive effects on employment. So far, we have assumed price taking behaviour. Realistically, most industries are characterized by a degree of monopolistic competition. In that case firms will respond to a reduction in factor prices by a certain reduction in product prices, leading to increased demand for their products. According to

Figure 3.4
Effects of a change in payroll taxes (simplified intervention logic)



Source: Economic Analysis Norway

[26] Assuming the number of hours worked stays constant despite higher wages.

economic theory, monopolistically competitive firms normally respond to increases in demand by increasing their demand for employment and other inputs.[27]

If reduced payroll tax leads to higher employment and lower capital intensity than the optimal market solution, a too low capital intensity is associated with lower productivity and this a welfare loss. This will be discussed more thoroughly in Chapter 5 on distortive effects.

3.5 A stylised model

To formalise the line of thought above, it may be useful to consider a stylised model for medium-run employment determination, assuming that employment is determined from demand, i. e. that demand for labour is always accommodated by corresponding supply adjusted for wage effects.[28] For that purpose, we define the following textbook system of equations:

$$N = N\left(\frac{W(1+\tau)}{Q}, D\right), \qquad N_1 \leq 0, \qquad N_2 \geq 0 \qquad (3.1)$$

$$D = D\left(\frac{P}{\overline{P}}, Y\right), \qquad D_1 < 0, \qquad D_2 > 0 \qquad (3.2)$$

$$Y = Y\left(\left(\frac{W}{CPI}\right)\gamma N + T\right), \qquad Y_1 > 0 \qquad (3.3)$$

Equation (3.1) gives the conditional demand for labour in the case of monopolistic competition, where N is employment, W is wage earnings per unit of labour, τ is social contribution taxation rate, Q is the price of variable inputs in production[29] and D is product demand. Given the assumption of monopolistic competition, demand is set equal to output.

The second equation, (3.2), is a product demand function with conventional assumptions about the partial derivatives, where P[30] and $\overline{P}$ is the product price and price on competing products, respectively, and Y is income.

Equation (3.3) is a simple functional relationship for aggregate income in the geographic region we study, where CPI is the consumer price and T is transfers (alternative policy measures). For simplicity, we only consider wage income and transfers. If we apply the framework to a single firm (N is firm employment), total employment is almost unaffected. That is, if only one firm reduces its payroll tax(es) the effect on employment through income is negligible, hence we set $\gamma \cong 0$. Conversely, if the change in taxes apply to all firms (N is regional employment), $\gamma \cong 1$.

Based on this framework the different effects of a reduction in the payroll tax can be expressed compactly as:

$$\frac{\frac{\partial N}{-\partial \tau}}{} = \frac{-N_1\left(\frac{\partial W}{\partial \tau}(1+\tau)+W\right)\frac{1}{Q} - N_2 D_1 \frac{\partial P}{\partial \tau}\frac{1}{P} - N_2 D_2 Y_1 \frac{\gamma N}{CPI}\frac{\partial W}{\partial \tau}}{1 - N_2 D_2 Y_1 \gamma \frac{W}{CPI}}$$

The first term in the numerator represents the effect of relative factor prices on conditional labour demand (direct effect). The effect is negative if $N_1 < 0$

[27] As long as demand is not perfectly inelastic.

[28] As shown in Chapter 3.3, the slope of the supply curve is ambiguous, as it depends on the relative strength of the opposing forces of the substitution effect and the income effect. It is common to assume that the substitution effect dominates, leading to an upward sloping supply curve. However, for the sake of clarity, we simplify the supply side further here in Chapter 3.5. However, this means that supply is not as clean cut as demand, as the income and substitution effects typically pull in opposite directions. If the substitution effect is greater than the income effect, labour supply will increase because of a higher wage.

[29] In this setup we assume that there exist only two inputs of production; labour and another. The number of these may depend on the time horizon of the analysis, e.g. capital being fixed in the short-term analysis but variable in the long-term perspective.

[30] With monopolistic competition P is a function of unit labour costs. For simplicity this equation is left out of the system.

and is largest in absolute value when wage earnings are unaffected, $\frac{\partial W}{\partial \tau} = 0$. As mentioned above, this is perhaps most realistic in the short-term analysis.

If the tax change is transferred to higher wage earnings, then $\frac{\partial W}{-\partial \tau} > 0$. Theoretically, this may be the case if there is collective bargaining and firms and unions have targets for their respective shares of value added in the firms.

The second and third terms represent the indirect effect on employment through the effect on demand. The second term follows from the assumption of monopolistic competition: monopolistic firms adjust their product price ($\frac{\partial P}{\partial \tau} \geq 0$) to changes in labour costs and consumers change their demand to changes in consumer prices.

The third term in the numerator illustrates that demand is increased if a change in payroll taxes is transferred to wage earnings ($\frac{\partial W}{\partial \tau} < 0$). Hence, the more wage earnings are affected, the more the effect through changes in relative factor prices (the first term) is moderated and the effect through changes in demand (the third term) is amplified.
The denominator is always positive. It is less than one if γ is reasonably large, i.e. a reduction in firms' employment has a numerically significant effect on the region's total employment.

With $\frac{\partial P}{\partial \tau} > 0$ (mark-up price setting due to monopolistic competition), $\frac{\partial W}{\partial \tau} < 0$ (changes in the payroll tax affect wage earnings) and $N_1 < 0$ (the direct price derivative of labour demand is negative) all three terms contribute to higher employment.

Even if there are negligible possibilities of substitution, $N_1 \approx 0$ (may be realistic in the short run), there can still be effects on employment stemming from the two channels of increased product demand.

Note that we in the empirical investigations in this report are not able to identify supply of and demand for labour separately, but rather estimate the total effect on employment.

3.6 Hypotheses to be tested

From the theoretical discussions above we derive several hypotheses we wish to test in our empirical investigations in Chapter 5.

We will test whether a change in the payroll tax affects:

- Capital
- Employment, both measured as number of employees and hours worked
- Hourly wage
- Establishment of companies (and exits)
- Value added
- If there are effects, are they symmetric to a rise and a reduction of the payroll tax?

Outside the framework outlined in Chapter 3, we will also investigate other hypotheses, including the relationship between employment on population, the strength of alternative measures and effects on competition and trade.

4 Data

The main data used in our empirical studies below are micro-level data from Statistics Norway. We will elaborate more on the data and variable definitions in final version of the report. Main variables used in our estimations are described in Chapter 5.

Our data comes from several sources, all are micro-level data delivered by Statistics Norway. An overview of these and their characteristics can be found in table 4.1.

Table 4.1 Data sources and characteristics

Source	Person ID	Firm ID	Establishment ID	Years	Notes
The Establishment and Firm Register (Virksomhets- og foretaksregisteret (VoF) in Norwegian) – separately establishment and firm level		x	x	1995-2014	
The Employer-employee Register (Aa-registeret in Norwegian)	x	x	x	1995-2014	
Wage statistics	x	x		1997-2014	Missing firm ID 1997-2002
Matched population, education and income statistics[1)]	x			1993-2015	
Register based employment statistics	x	x		2000-2015	
Firm accounts		x		1993-2015	
Capital statistics from structural statistics		x		1993-2014	Only for industries in manufacturing
Trade statistics		x		2004-2015	

Notes: [1)] Includes Certificates of Pay and Tax deducted (LTO in Norwegian)

5 Empirical evidence

Using different econometric approaches, we find evidence that changes in the payroll tax to some degree are shifted onto workers. This holds for both reductions and increases in payroll taxes, but the degree of the shift is lower in the case of an increase in the payroll tax rate than in the case of a decrease, indicating an asymmetric character of adjustments in these two cases. The magnitude of the shift seems to be sensitive to sample and model specifications, but in general we find that more of the payroll taxation burden remains with the employer. Given that, we further assess how the payroll tax affects firms' decisions with respect to labour demand, capital investments and operating profit. We find an expected effect on firm's demand for labour, but the scope is limited. Our chosen approaches and findings are mostly in line with previous studies of the Norwegian payroll tax.

The person who has the legal obligation to make a tax payment may not be the person whose welfare is reduced by the presence of the tax. That is, the economic incidence may differ from the statutory incidence due to changes in behaviour and consequent changes in equilibrium prices (Fullerton and Metcalf 2002).

There is a general expectation that labour demand is more elastic than labour supply. Thus, the most common assumption in applied incidence studies of payroll taxes is that the incidence is borne by the workers (through decreased wages), regardless of who has the legal obligation to pay the tax (i.e. the statutory incidence). If this is the case, there is little reason to believe that we will find effects on employment precisely because the cost is shifted to the workers, who do not change their behaviour significantly due to their relatively inelastic labour supply.

However, more recent studies find somewhat contradicting results. Saez, et al. (2012) use a reform of payroll taxes in Greece to study long-run tax incidence. They find that the employer-paid payroll tax fully resides with the employer, whereas the employee-paid payroll tax resides with the employee. Thus, their results suggest that employers do not pass on the extra cost of increased employer payroll taxes to the employees.

The statutory incidence of the Norwegian payroll tax is on the employer. Previous studies (e.g. Stokke (2016), Gavrilova, et al. (2017), Johansen and Klette (1997)) find some shifting of the tax incidence on to the workers through decreased wages, but not fully. That is, it seems that the employers do take some of the tax burden, at least in the short run.

In this evaluation we primarily focus on the identification of the differentiated payroll tax rates impact on the wages and employment. We also assess how the payroll tax affects firms' decisions with respect to capital investments and operating profit. Our chosen approaches are mostly in line with previous studies of the Norwegian payroll tax. We also apply some methods that were not used before in the studies of the Norwegian payroll taxation, i.e. the regression kink design.[31]

To identify the causal effects of regional differentiation of payroll tax rates, we must perform a counterfactual analysis, i.e. compare the actual level of any outcome variable with the level that *would* have

[31] This method is most appropriate when any threshold is introduced by the policy and hence is useful when analysing some specific changes in the Norwegian payroll tax system.

been realized in the case of the same payroll tax rate for all regions.

Ideally, the counterfactual outcome level should be determined by a controlled experiment, randomly dividing the population of firms into diverse groups and applying different tax rates to them. The effect of a higher (lower) tax rate could then be measured by the difference in response between the groups with increased (decreased) labour costs and the group with an initial tax rate.

Obviously, this is not possible. Moreover, all employees (firms from 2007) within a given zone are automatically illegible to a corresponding payroll tax rate making it impossible to construct any credible control group. Comparing firms from different zones with each other is also far from the golden standard of randomly selected groups. Introduction of different payroll tax rates and their adjustments over time were primarily intended to stimulate employment in rural areas and areas with high depopulation. In this situation we cannot use, e.g., the employment level in the zone with the highest payroll tax rate (not struggling with depopulation and high unemployment) to infer how much the employment would change in the zones with lower rates in the absence of such a difference in rates.

Our main identification strategy then is to use quasi experimental variation induced by different changes in the policy schedule, the so-called exogenous shocks. Since the introduction of differentiated payroll tax rates in 1975, the policy has been changed many times (jf. Chapter 2.3).

In this evaluation we study three large reforms of the scheme that have taken place during available for us period (i.e. 1996-2014):

- the 2000-reform when several municipalities were placed in another zone. We study here municipalities that got lower payroll tax rate;
- the 2004-reform that resulted in an increase of the tax rates in zones 2-4. The new rates were applied to the wage costs above a threshold;
- the 2007-reform that reversed changes in 2004, introduced two new zones and, most importantly, changed the determination of the employees' payroll tax rate from their place of residence to the location of the enterprise. The latter change then concerned all enterprises that had a mix of employees from different zones.

Further changes have been made in July 2014. Since we have data only until 2014, we are not able to identify any *specific* impact of this recent reform. However, we include this year in our most generalized model that we apply to catch all variations in the payroll tax rate.

Given that we study a complex policy with many specific elements over a long estimation period (1996-2014), we need to consider all other specific changes in the scheme. For example, various industry exemptions were put in place with different timing in accordance with ESA rulings. Firms in these industries then paid the maximum payroll tax rate regardless of municipality. Another example is the introduction of a lower payroll tax rate for employees aged 62 or above in 2003 and withdrawing it already in 2007. We are aware of all these minor changes and handle them either by trimming the data (as in the case of 2000- and 2004-reforms' analysis and partly in the 2007-reform analysis) or by use of a more general model that takes into account all changes (as in the 2007-reform analysis). In each case we go carefully through the process of sample construction and document it in details in the corresponding chapters.

Another critical issue for the identification of the effects is the choice of an appropriate method and construction of a proper control group. The different nature of the reforms described above requires different approaches. In the case of the 2000-reform analysis we use the difference-in-difference method. In the case of the 2004-reform analysis we use two methods, i.e. the difference-in-difference method and regression kink design (RKD). The latter is most appropriate when any threshold is introduced by the policy. Finally, in the case of the 2007-reform, we use fixed-effects (FE) model as the main specification, between-effects (BE) as supplementary model and generalized method of moments (GMM) for the dynamic model specification. Table 5.1 gives an overview of the content of the reforms in our study, the evaluation periods, the applied methods, the scope of the analysis and the main findings.

In the first two cases when we use the difference-in-difference method, we construct the treatment and control groups and test for the validity of the common trend assumption with respect to each response variable (this assumption is satisfied in most of the cases). In the case when we use RKD, we first check whether there is a kink in the response variable (i.e. wage growth) around the kink in the treatment variable (i.e. the amount of payroll tax). We then proceed to testing for the other key assumptions that are crucial for validity of RKD and finding them satisfactory, continue with estimation.

From our main specifications we find that less than 30 % of the burden of payroll taxation is shifted onto workers, and in some specifications almost the whole amount remains with employers. Our results are within the range with recent findings.[32]

The degree of the shift varies among zones indicating less elastic labour demand in the zones with industry structure most oriented on natural resources (most typically for the municipalities in the Northern part of Norway), i.e. more of the tax burden remains with employers there. Furthermore, the degree of the shift onto workers is lower in the case of an increase in the payroll tax rate than in the case of a decrease, indicating an asymmetric character of adjustments in these two cases.

As for the effects on the employment, we get an expected positive result for the employment growth in the case of a decreased payroll tax rate in 2000, and negative labour demand elasticities from the generalized model covering period 2003-2014. These results indicate that the scheme works as intended, however, we cannot estimate any effects for zones, where no changes have had place (i.e. zone 1 and zone 5). Variation in the payroll tax rate is crucial for identification of the effects by our generalized model, hence zones and industries without any change in the tax rate over time are just falling out of the estimation.

An interesting result concerning impact on the capital is a positive impact of lower payroll tax rate on the capital services for the firms in the secondary sector after changes in 2000. It seems that firms in the secondary sector (mainly in manufacturing) spent a part of the tax relief they got on extra investments. However, we need more evidence on the relationship between payroll taxes and capital investments before we make a final conclusion.

[32] While classical economics suggests that most of the long-run economic incidence of the payroll tax resides with employees and this prediction has been confirmed in some empirical studies (i.e. Gruber, 1997, based on the tax reform in Chile), recent contributions by Saez et al. (2012) for Greece and Gavrilova et al. (2015) and Stokke (2016) for Norway demonstrate an opposite result, i.e, that the economic incidence of the payroll tax mostly resides with employers.

One critical issue we have not addressed so far is the impact of differentiated payroll taxation on the population growth in different zones. As mentioned above, introduction of different payroll tax rates and their adjustments over time were primarily intended to stimulate employment in rural areas and areas with high depopulation. While employment is directly influenced by the payroll tax rate through the price on labour, multiple factors can affect the population growth in the regions, i.e. different demographic factors such as birth- and death-rates, immigration and emigration, civil status, etc. All these factors must be taken into account to extract an effect of the payroll taxation. We are not able to do that in the scope of this project, but we provide a specific analysis of the correlation between employment and population in Chapter 6.

Table 5.1
Overview of the empirical results

				Effects			
Changes in the scheme	Time period	Method	The scope*	Wages	Employment	Capital	Value added
2000: In total 53 municipalities changed their zone, of which 34 municipalities in zone 2 changed to zone 3, resulting in a decreased tax rate	1997-2003	Diff-in-diff	All workers and firms located in a selection of municipalities in zone 2 (control group) and 3 (treatment group)	Significantly higher wage growth in treatment group. The degree of tax shifting is about 30 % in the main specification (about 24 % in secondary sector and 37 % in the tertiary sector). The shift rate varies between 18 and 54 % in other specifications	Positive effect on employment growth of the reduced tax rate (both on the extensive and the intensive margins). The effect is driven by firms in the tertiary sector, where the annual employment growth is 2.1 p.p. higher in the treatment group than in the control group. We find weakly significant effect for firms in the secondary sector at the first year of the reform, i.e. in 2000, equal to 3.5 p.p higher growth.	Positive effects in the secondary sector, dominated by manufacturing. The effects are large, but unprecise (large SE's)	Some positive effects, similar to the employment effects, but not very robust
	2000-2006	Diff-in-diff	All firms in zones 2, 3 and 4	Clearly lower wage growth in zone 2. In zones 3 and 4 the result yields only partly, i.e. only firms meeting the highest threshold in 2004	under revision	under revision	under revision
2004: Increase in the tax rate in zones 2-4, yields wage costs above a threshold	2004-2006	RKD	Only firms around threshold in zones 2 and 4	4-17 % of increase in total wage costs is shifted onto workers in zone 2 (0.5-4 % in zone 4)	not applicable (too data-demanding)	not applicable (too data-demanding)	not applicable (too data-demanding)
2004: as above; 2007: withdrawing of 2004-changes, introduction of two new zones and new determination of the employees' payroll tax rate based ont he location of the enterprise; 2014: relocating 31 municipalities to zones with reduced tax rates	2003-2014	FE, BE, GMM	All firms in zones 1a-4	0-54 % of increase in total wage costs is shifted onto workers (0-38 % in BE specification, 0-10 % in GMM specification)	Negative effect on employment growth on the extensive margin with labour demand elasticity equal to -0.6 (when L is measured by number of employees) and to -0.9 (when L is measured by man-hours)	under revision	under revision

* Various industry exemptions in accordance with ESA rulings are excluded in all specifications

5.1 Evaluation of the reform in 2000

In our evaluation of the effects of the regionally differentiated payroll tax rate, we rely on so-called exogenous shocks, or quasi-natural experiments, in order to employ valid research methods and acquire results that satisfy certain methodical standards. One such shock is the change in the scheme that occurred in 2000, analysed by Stokke (2016)[33].

Effective from 1 January 2000 there was a payroll tax reform where 53 municipalities changed tax zone. 32 municipalities switched from zone 2 to zone 3, which meant a reduction in the payroll tax rate, while 14 others changed from zone 2 to zone 1, resulting in an increase in the payroll tax rate. Of the other 7 municipalities that changed payroll tax zone, 6 switched from zone 3 to zone 4 and 1 changed from zone 1 to zone 2.

Table 5.2
Changes in tax zones. 2000

Number of municipalities	Initial zone	New zone	Change in tax rate (percentage points)
32	Zone 2	Zone 3	-4.2
14	Zone 2	Zone 1	3.5
6	Zone 3	Zone 4	-1.3
1	Zone 1	Zone 2	-3.5

Source: Strøm (2002)

In our empirical analysis we direct our attention to municipalities who moved from zone 2 to zone 3. This group is most suited for several reasons. Partly, there is a need for large quantities of data in order to be confident in our results. There is also the issue of the prevalence of "commuter municipalities"[34] among those moved from zone 2 to zone 1. Note that it was the worker's municipality of residence that mattered for the differentiation of payroll tax in this period. This was changed from worker to firm in 2007.

Most workers commuting across tax zones will, in most cases, commute to a zone with a higher tax rate than the tax rate in the zone in which they live. This is because the payroll tax rate is higher in "well-performing municipalities". So, if someone commutes to a municipality where the payroll tax rate is different, it is most likely a well-performing municipality, since it has jobs. This means that the worker's municipality of residence is part of a different labour market, in terms of characteristics, not just geographically, than municipalities that form whole labour markets/economic regions with the same payroll tax rate in all parts of the region. In such (latter) regions, the price of labour input is the same in all parts of the region. As such, comparing or grouping together labour markets with differing payroll tax rates to labour markets with nondifferentiated payroll tax rates, could potentially lead to biased estimates.

We are interested in estimating the effect of a change in the payroll tax rate on wages and employment. The negative shock to labour costs, which occurs the case we will look at in the following, could lead to higher wages since workers will want to partake in the improvement of profitability for the firm. Further, a reduction in labour costs could lead to an increase in employment, since labour input becomes relatively cheaper than it previously was.

5.1.1 Sample construction and restrictions

In our empirical analysis, there are several issues to consider. We are studying an eight-year period and

[33] Currently only available in a working paper version. See http://www-sre.wu.ac.at/ersa/ersaconfs/ersa16/Paper169_HildegunnStokke.pdf

[34] Municipalities where a large part of the workforce is employed in another municipality. In this case, many of the municipalities are neighbors of Bergen.

a policy with many elements, many of which experienced changes during those years.

During our estimation period (1996-2003), several industry exemptions were put in place in accordance with ESA rulings. Firms in these industries paid the maximum payroll tax rate regardless of geographic location. The industries are:

- Production and distribution of electricity
- Extraction of crude oil and natural gas
- Services activities incidental to oil and gas extraction excluding surveying
- Mining of non-ferrous metal ores, except uranium and thorium ores, as well as some firms in mining of chemical and fertilizer materials
- Building and repairing of ships
- Manufacturing of basic iron and steel and of ferro-alloys
- Financial intermediation
- Freight transport by road (firms with more than 50 full-time employees)
- Telecommunications

In addition to excluding the firms in these industries, we also exclude the public and primary sectors. In the case of the primary sector our exclusion is due to the extensive subsidies and the considerable degree of self-employment in these industries. Regarding the public sector, the centralised wage bargaining and national regulation with respect to public sector wages warrants their exclusion from our wage regressions. However, we also exclude them from our subsequent regressions, in order to have a consistent data set.

We exclude high-paid workers and those aged above 56 years due to other changes in the scheme that could potentially affect our identification of the change in the payroll tax rate (see section 2.3 for information about these changes).

In our evaluation of effects, we exclude municipalities in economic regions where more than one payroll tax rate is prevalent. Each economic region constitutes one labour market, meaning there is a great deal of commuting between municipalities in the region, but relatively little commuting out of the region. We exclude individuals working in zones four and five, which is the case for only a small part of our sample.

We choose to estimate effects at the firm level, not the establishment level. This due to better data quality at the firm level and because workers to some extent change employer within the same firm (i.e. change which establishment they work for, within the same firm). In addition, there is the problem of re-organisation of establishments in firms, where divisions are split up or grouped together. Looking at the firm level avoids these issues.

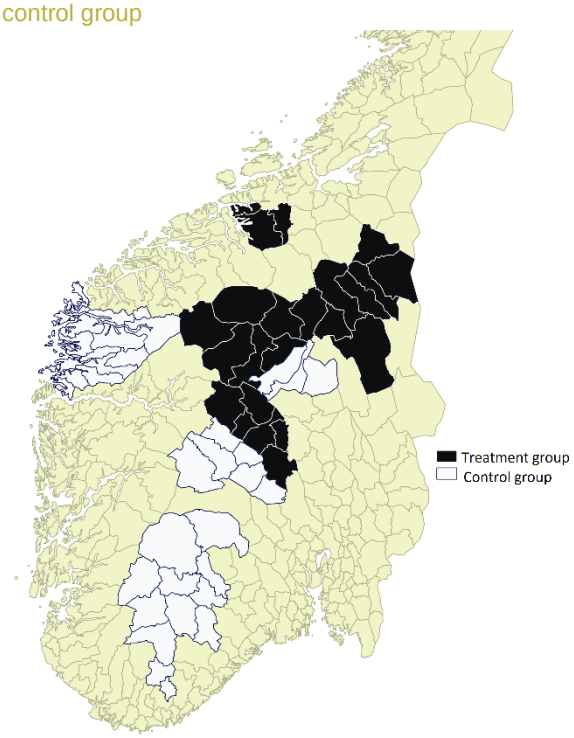
We exclude individuals and firms with missing information on variables included in the regressions, as well as individuals and firms who aren't present both before and after treatment is effectuated or have "holes" in their time series. We further restrict our observations to include only those who are observed for at least three consecutive years. In regressions at the firm level, we only include firms located in the regions of interest.

To avoid skewed results due to outliers in our regressions, we trim our sample by dropping the top and bottom 2 per cent of the distribution of the dependent variable.

We exclude firms who have establishments outside the economic regions that define our treatment and control groups, cf. figure 5.1. In addition, we remove firms with employees from both regions.

The differentiated payroll tax rate lowers labour costs in the regions that are targeted. In the period 1996-2003, this made those residing in the regions relatively cheaper labour, compared to those not residing in the targeted regions. The objective, then, was for these residents to gain employment or remain employed, not for workers commuting from other tax zones to gain employment.

Figure 5.1
Municipalities in the estimation sample by treatment and control group



Source: Economic Analysis Norway
Map: ©Kartverket
Note: Only economic regions where the payroll tax rate is the same for all municipalities are included in the sample.

To study employment effects we have aggregated our individual-level data set to the firm level. This allows us to study employment effects for those residing in the affected regions, since we can count the number of employees in each firm that resides in any given municipality. Our dependant variable is therefore based on employees residing in the treatment and control regions only, not total employment, which could include commuters from other regions. Consequently, we estimate the growth rate in employment for treated and control regions. This way, we examine the "pure employment effect" for those that were targeted by the policy, unclouded by payroll tax zone commuters.

Table 5.2 shows some descriptive statistics for the treatment and control regions. The population in the control regions is almost twice as large as in the treatment regions, although this follows from the larger number of municipalities. Over the period, the population drops marginally more in treatment regions than control regions. Average net immigration and unemployment are also equivalent between the two groups, as both face net outmigration in the pre-reform period (1996-1999) and have an unemployment share of 1.5 pct. In the post-reform period, the share of municipalities on the ROBEK list was much higher in the control regions, suggesting poor economic conditions and/or financial management in municipalities in this group.

Table 5.3
Descriptive statistics from municipal-level data of treatment and control groups

Variable	Treatment group	Control group
No. of municipalities	23	36
Payroll tax zone after 1999	3	2
Percentage point change in tax rate	-4.2	0
Population[1]	72,989	135,213
Population growth[1]	-0.58 %	-0.06 %
Net immigration[1,2]	- 124	- 206
Unemployment[1,3]	1.5 %	1.5 %
Share of mun. on the ROBEK list[4]	22 %	39 %

1) Average over the period 1996-1999.
2) From other parts of Norway.
3) As share of population aged 15-74
4) Indicates either poor financial management of municipal finances or poor economic conditions. Included if on the ROBEK list at some point during 2001-2004. Note that most were taken off the list one year (or less) after inclusion
Sources: Statistics Norway, Economic Analysis Norway and www.government.no

Table 5.4

Descriptive statistics for individual-level data of treatment and control groups. Means over the period 1996-2003

Variable	Treatment group	Control group
Worker-year observations	29,873	48,988
Hourly wage (in 2015-NOK)	165	171
Hourly wage growth (in 2015-NOK)	5.6	5.7
Age composition		
25-34 years old	30.2 %	31.6 %
35-44 years old	36.5 %	35.9 %
45-55 years old	33.3 %	32.5 %
Share of immigrants	1.9 %	3.1 %
Share of female workers	19.4 %	22.3 %
Education composition		
Primary education	22.7 %	23.8 %
Secondary education	68.6 %	70.5 %
Higher education	6.8 %	7.6 %
Industry/sector composition		
Manufacturing	35.8 %	31.9 %
Secondary sector	53.2 %	49.4 %
Tertiary sector	46.7 %	50.6 %
Share of commuters[1]	8.9 %	7.5 %
Worker-year obs. by centrality[2]		
Level 4	30.2 %	23.6 %
Level 5	51.0 %	62.4 %
Level 6	18.8 %	14.0 %

Notes: Statistics are reported using the same adjustments as done prior to estimation.
1) Commuters out of tax zone as share of group.
2) Percentage of group residing in a municipality with the given centrality level.
Source: Economic Analysis Norway

Table 5.5

Descriptive statistics for firm-level data of treatment and control groups. Means over the period 1996-2003

Variable	Treatment group	Control group
Firm-year observations	3,537	8,507
Firm size (reported)	10.2	9.9
Firm size (calculated)[1]	7.5	7.1
Age composition		
25-34 years old	32.9 %	34.9 %
35-44 years old	35.4 %	35.5 %
45-55 years old	31.7 %	29.6 %
Share of immigrants	2.1 %	2.0 %
Share of female workers	36.0 %	35.8 %
Education composition		
Primary education	23.4 %	24.9 %
Secondary education	66.7 %	63.3 %
Higher education	10.0 %	11.8 %
Industry/sector composition		
Manufacturing	28.7 %	23.6 %
Secondary sector	47.3 %	39.4 %
Tertiary sector	52.7 %	60.6 %
Share of commuters[2]	2.6 %	2.7 %
Firm-year obs. by centrality[3]		
Level 4	33.7 %	27.5 %
Level 5	46.7 %	58.6 %
Level 6	19.6 %	14.0 %
Share of full time workers	76.7 %	78.1 %

Notes: Statistics are reported only for firms located in the treatment and control regions.
Statistics are reported using the same adjustments as done prior to estimation
1) Based on observations in employer-employee register for employees residing in the treatment and control regions.
2) Commuters out of tax zone as share of observed workers in individual level dataset.
3) Percentage of group located in a municipality with the given centrality level.
Source: Economic Analysis Norway

In tables 5.3 and 5.4 we show descriptive statistics from our individual and firm level datasets. Differences between the two tables are largely due to the inclusion of part-time workers in the firm level dataset, which most notably affects the share of female workers, and the fact that the firm level data partly includes data based on workers not residing on the treatment and control regions. However, data

on worker characteristics is based on the employees residing in either treated or control regions.

The two groups are fairly comparable at the individual level in terms of the various characteristics, although there is a difference in levels of average hourly wages. The hourly wage is contracted wage divided by contracted hours and therefore does not include overtime and other forms of payment, but it is internally consistent.

At the firm level, the treatment group has more firms in manufacturing than the control group, and relatively more employees in this group as well. This This could be a problem in our efforts to identify a causal effect but will be tested for.

Note that no firms in our estimation sample are located outside the treatment and control regions. The number of employees residing in the regions as a share of the total number of employees in firms is 89 pct.[35]

5.1.2 Econometric strategy

Our regression models follow Stokke's (2016) example, though with some modifications. They are designed for difference-in-differences estimation with OLS, using indicator variables to evaluate the effects of a change in the payroll tax rate on various dependent variables, most notably wage growth and employment growth.

As Stokke notes, the methodological challenge in the study of effects of the payroll tax rate in Norway is that municipalities are not randomly chosen to have a low or high tax rate. Rather, they are picked based on economic and demographic indicators, meaning there are differences in characteristics between those with high and low tax rates. Stokke argues that this can be solved by exploiting the payroll tax reform in 2000 and using the municipalities that remained in zone 2 as controls for those who received treatment, defined as changing zones to zone 3 with a lower payroll tax rate.

Firstly, we estimate the effect of lower payroll taxes on wages. We apply our individual level data set and use the change in log hourly wages as dependant variable. In doing this, we account for unobserved individual level variation in wages. We apply the following equation in our regression:

$$\Delta \ln w_{ijsrt} = a_0 + a_1 T_r + a_2 P_t + a_3 T_r P_t + \overline{X}_{it}\beta + \varphi_r + \rho_t + \mu_s \rho_t + \varepsilon_{ijsrt} \quad (1)$$

where $\Delta \ln w_{ijsrt}$ is the change in log hourly wage from year t-1 to year t for worker i in firm j in industry s located in region r, T_r is a dummy that equals 1 if the labour market region is part of the treatment group facing lower payroll tax rate, and P_t is a dummy that equals 1 in the post reform years (from 2000 onwards). The vector of worker characteristics in year t ($\overline{X}_{it}$), includes dummies for age (5-year intervals), education level (primary, secondary and collage), immigrant status (native, western immigrant, non-western immigrant) and gender. Regional[36] and year fixed effects are represented by φ_r, ρ_t, respectively. Industry times year fixed effects capture industry-specific trends and shocks ($\mu_s \rho_t$). a_0 is a constant, β is a vector of parameters and ε_{ijsrt} is an error term.

[35] 94 pct. if we let our individual data set define the number of employees in firms instead of using the employment variable from accounts.

[36] We use a measure of the municipalities' centrality. The index is measured according to distance to workplaces and service functions such as retail. Controlling for municipality or economic region would be correlated with treatment, thus creating a problem for identification.

We are particularly interested in estimating the parameter a_3, which captures the difference in wage growth between treatment and control regions after the treatment regions change payroll tax zone compared to the pre-treatment period. We also adjust the above specified regression model to allow year-specific treatment effects.

Subsequent to the wage regressions, we look at the effect of lower payroll taxes on employment growth. Here, we use firm-level data aggregated from our individual-level dataset and use the change in log firm size as dependent variable, measured as the number of workers in the firm. Thus, this approach deals with the extensive margin (hired/not hired), as opposed to the intensive margin (part-time/full-time or number of hours).[37] Our regression model is as follows:

$$\Delta \mathrm{lnsize}_{\mathrm{jsrt}} = \mathrm{b}_0 + \mathrm{b}_1 \mathrm{T}_\mathrm{r} + \mathrm{b}_2 \mathrm{P}_\mathrm{t} + b_3 \mathrm{T}_\mathrm{r} \mathrm{P}_\mathrm{t} + \overline{\mathrm{Y}}_{\mathrm{jt}-1} \tau + \varphi_r + \rho_\mathrm{t} + \mu_\mathrm{s} \rho_\mathrm{t} + \epsilon_{\mathrm{jsrt}} \quad (2)$$

where $\Delta \mathrm{lnsize}_{\mathrm{jsrt}}$ is the change in log number of workers from year t-1 to year t for firm j in industry s located in region r, b_0 is a constant, τ is a vector of parameters and ϵ_{jsrt} is an error term. The vector of firm characteristics in year t-1 ($\overline{\mathrm{Y}}_{\mathrm{jt}-1}$) includes workforce composition in terms of age, gender, immigrant status, level of education and contract type.[38] Other explanatory variables are explained in relation to the wage equation above.

Our parameter of interest is b_3, which captures the difference in employment growth between treatment and control regions in the years after the payroll tax cut compared to the pre-reform period. We also adjust the above specified regression model to allow year-specific treatment effects.

The firm level model will be applied with other dependent variables as well, namely the growth rates of number of hours worked by employees residing in the treatment and control regions, capital inputs and value added.

The regressions at firm level will be weighted with the level of the dependent variable to adjust for the fact that a given percentage change of the dependent variable has a different absolute effect on levels according to the size of the level. For example, a percentage change in the number of employees in a firm with 100 employees entails a different change in number of employees compared to what the same percentage change invokes in a firm with 10 employees.

The difference-in-differences method hinges on an assumption of parallel trends, which means that the treatment group would follow the same trend as the control group, in absence of treatment. This is called a counterfactual, since it is only hypothetical and cannot be observed. We cannot test for it empirically, but we can show some descriptive statistics and perform placebo checks in our regressions to investigate the phenomena. In the following, we plot the averages of the dependent variables in the regressions for the two groups.

Figure 5.2 shows the average growth rates in hourly wages in both treatment and control regions, for the years 1997 – 2003. Notably, the wage growth rates in the groups are quite similar and declining in the pre-reform period, although the average growth

[37] We will also use hours worked as the dependent variable to investigate intensive margin effects.

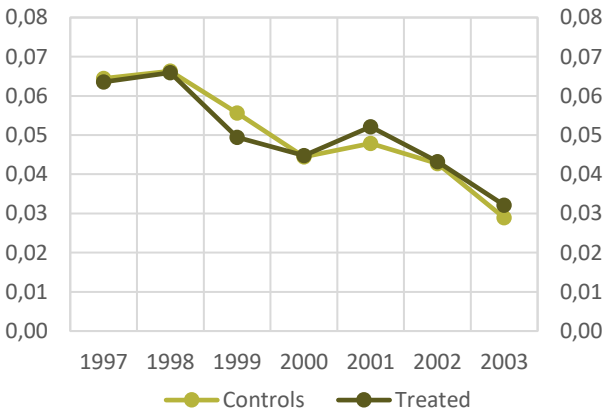
[38] In Stokke (2016) these are included contemporaneously, but since changes in these workforce compositions are due to changes in employment, they should be considered endogenous. We lag these control variables to avoid this.

over this period is slightly higher in the control group. In 2001, the average growth rate is higher in the treatment group than in the control group. However, whether there is a statistically significant difference will be addressed in the regressions.

Figure 5.3 shows the average growth rates in employees residing in treatment and control regions. Employment growth (which we measure as growth in employees residing in either the control or treatment regions) is declining among both groups in the pre-reform period. On average, the two groups have a fairly equal employment growth in the three years 1997-1999; the treatment group's average is 4,2 and the control group's average is 4,5. Post-reform, the average growth rate is higher in employment of workers residing in treated regions.

Figure 5.2

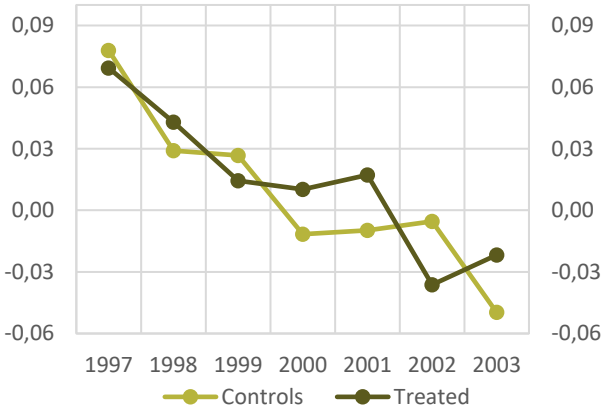
Average annual nominal growth rate of hourly wages in treatment and control groups. 1997-2003



Note: Time series are calculated after making the same adjustments as done prior to estimation (see part 5.1.1)
Source: Economic Analysis Norway

Figure 5.3

Average annual growth rate of employees from treatment and control groups in firms. 1997-2003



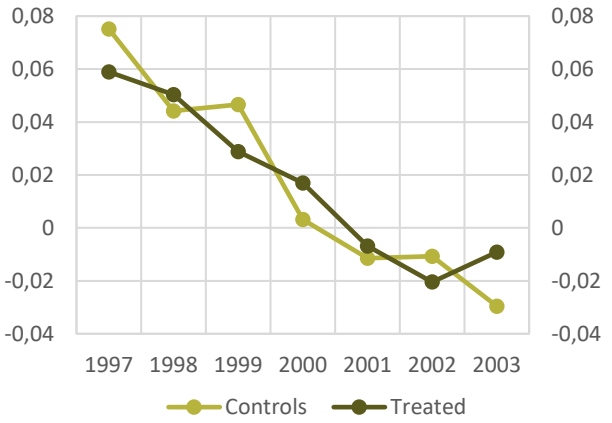
Notes: Time series are calculated after making the same adjustments as done prior to estimation (see part 5.1.1)
Observations are weighted with the number of employees residing in the treatment and control regions
Source: Economic Analysis Norway

Using a variable from the AA-register, which is a self-reported estimate of the number of hours worked for a given employer during the year, we can estimate the effect of a reduction in the payroll tax rate on employment on the intensive margin. We let this variable define an annual number of hours of labour input in firms, again using our individual level dataset to calculate these hours only for workers residing in control and treatment regions.

Figure 5.4 shows the average growth rates in hours worked by employees residing in treatment and control regions. The historical development is similar to that of the average growth rates of the number of employees.

Figure 5.4

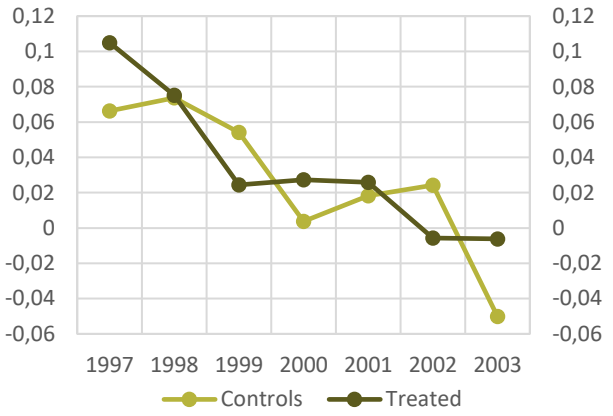
Average annual growth rate of hours worked in firms in the treatment and control groups. 1997-2003



Notes: Time series are calculated after making the same adjustments as done prior to estimation (see part 5.1.1)
Observations are weighted with the number hours worked by employees residing in the treatment and control regions
Source: Economic Analysis Norway

Figure 5.5

Average annual growth rate of value added in firms in the treatment and control groups. 1997-2003



Notes: Time series are calculated after making the same adjustments as done prior to estimation (see part 5.1.1)
Observations are weighted with the level of value added
Source: Economic Analysis Norway

Figure 5.5 shows the average growth rates in value added in firms in the treatment and control regions. Value added in constant prices is defined as operating revenues minus operating expenses plus wage bills.

As the figure shows, the trend does not seem to be similar between groups, meaning we cannot be confident that the common trend assumption holds. We test for this empirically by running a regression for the growth rates of value added pre-reform on treatment, trend and an interaction between treatment and trend. The results show that the trend-treatment interaction is statistically significant at the 10 percent level, meaning we cannot say that the groups have a common trend in pre-reform period. The consequence of this is that the difference-in-difference method is not valid for growth rates of value added. However, we report the results of applying this method in part 5.1.5.

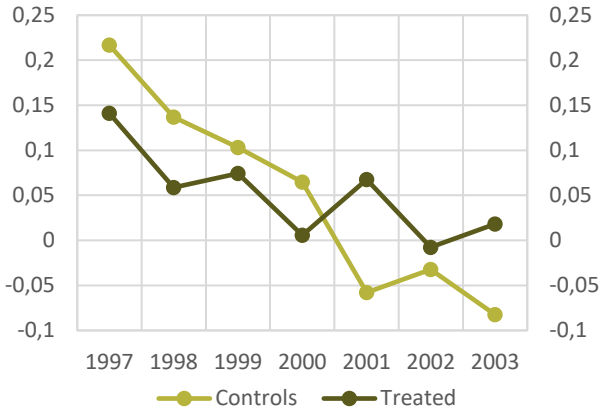
We also investigate the effect of the reduced payroll tax rate on capital. The ideal measure capturing the economic contribution of capital inputs in a production theory context is flow of capital services (see Draca et al., 2007). The variable *K* is a measure of capital services, which are calculated based on the book values of a firm's tangible assets. All assets have been divided into two types: equipments (denoted by the superscript *e*) which include machinery, vehicles, tools, and transport equipments; and buildings and land (denoted by the superscript *b*). Then capital services $K_t = \sum_{j=e,b} (r + \delta_j) K_{jt}$, where the depreciation rates, δ_j, are 20 pct. for equipment and 5 pct. for buildings: see Raknerud et al. (2007). The real rate of return, r, which is calculated from the average real return on 10-year government bonds for the period 1999–2006, is 4.7 pct. (based on the numbers from the Norwegian Central Bank).

Figure 5.6 shows the historical development of the average growth rates of capital services in the treatment and control groups. Note that capital services are stocks within the year, since they are fixed at 1st

of January each year. Changes during the year in the variables defining capital services have an effect on the next year's stock. We conduct the same pre-reform common trend test as we did with value added above and find that the trend is not statistically different pre-reform.

Figure 5.6

Average annual growth rate of capital services in firms in the treatment and control groups. 1997-2003



Notes: Time series are calculated after making the same adjustments as done prior to estimation (see part 5.1.1)
Observations are weighted with the level of capital services
Source: Economic Analysis Norway

All the growth rate plots bear witness of the business cycles that occurred in these years. The Norwegian economy left an upturn in 2001/2002 and entered a downturn, effectuated by the dot-com bubble bursting and worsened by the Norwegian Central Bank's sharp increase in the interest rate, which had a large effect on the exchange rates. The latter had an adverse effect for exports and import competition, which meant worse times for manufacturing. As we saw Table 5.4, the treatment group has relatively more activity in manufacturing, which could potentially be a problem for our identification of a causal effect of the reduction in the payroll tax rate. However, we do not find that the secondary sectors in the two groups have differing trends.

5.1.3 Results from the wage regressions

Using the difference-in-differences approach described in the previous part, we estimate the effects of a reduction in the payroll tax rate on the growth rates of hourly wages. Table 5.5 shows the results of five separate regressions of the impact of the 2000 reform on individual wages for the treatment group, consisting of 23 municipalities moving from Zone 2 to Zone 3, thus facing lower payroll tax rates. The parameters of interest are those estimated for variables that are interactions between post reform years and treatment.

Column (1) shows the regression results when restricting the treatment effect to be an average over the post reform years, 2000-2003. The result means the annual growth rate in hourly wages in the post-reform period is 0.5 percentage points higher in the treatment group than in the control group. The parameter estimate is statistically significant at the 1 percent level and relatively robust to model specifications with clustering at different levels and the log of individual lagged wage levels. The implication of this is a cumulative growth over the post-reform period of 2 percent. The total wage cost reduction on employees in the treatment group is 3.8 percent. [39] This means our average result in column (1) implies that workers received over half of the cost reduction from a lowered payroll tax rate.

[39] Total wage costs is the sum of wage costs and the payroll tax, whereas labour cost is the sum of total wage costs and other personnel costs, where the payroll tax is not applicable. The reduction in the payroll tax rate of 4.2 percentage points can be shown to correspond to a 3.8 percentage points reduction in total wage cost. The initial level of the tax rate was 10.6 percent. (1.106-1.064)/1.106=0.038.

Whereas column (1) reports the average post-reform effect, column (2) reports the year-specific effects. Here, we see that only one post-reform year exhibits a statistically significant differing wage growth between the treatment and control groups, namely 2003. The point estimate in 2003 is 0.007 and only statistically significant at the 10 percent level. There is also an effect in 2001, of the same magnitude, but is not statistically significant. Thus, if we accept the result we find in 2003, the difference in wage growth between the treatment and control groups is 0.7 percentage points over the post-reform period, which constitutes about 18 percent of the reduction in total wage costs following the payroll tax rate reduction, significantly lower than what the estimate in column (1) implied.

When we in column (3) adopt a more flexible model specification that controls for potential common trend violations pre-treatment by including interaction terms between pre-reform years and treatment, the point estimates from column (2) are only marginally changed, but the statistical significance of the 2003-effect does not remain.

Table 5.6

Impact of payroll tax cut on individual wage growth

Column number	(1)	(2)	(3)	(4)	(5)
Dependent variable	Δ ln *w*	Δ ln *w*	Δ ln *w*	Δ ln *w*	Δ ln *w*
Sector/Sample	Full sample	Full sample	Full sample	Secondary	Tertiary
Treatment	-0.002	-0.002	0.000	-0.002	-0.003
	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)
Post 2000	-0.029				
	(0.019)				
Treatment x Post 2000	0.005***				
	(0.002)				
Treatment x 1998			-0.000		
			(0.005)		
Treatment x 1999			-0.004		
			(0.004)		
Treatment x 2000		0.004	0.002	0.007	0.001
		(0.003)	(0.005)	(0.006)	(0.003)
Treatment x 2001		0.007	0.005	0.000	0.014***
		(0.004)	(0.005)	(0.007)	(0.004)
Treatment x 2002		0.004	0.002	0.008	-0.000
		(0.004)	(0.005)	(0.006)	(0.004)
Treatment x 2003		0.007*	0.005	0.009*	0.004
		(0.003)	(0.005)	(0.005)	(0.004)
Observations	63,848	63,848	63,848	32,429	31,419
Obs. treatment	24,186	24,186	24,186	13,306	10,033
Obs. control	39,662	39,662	39,662	19,123	21,386

Notes: Observations are excluded as discussed in part 1. Also included in the regressions are dummies for year, gender, age group, two categories of foreign countries of birth, two levels of education, industry x year and municipal centrality. Regarding columns (4) and (5): The secondary sector is dominated by manufacturing and the tertiary sector is services. Standard errors clustered at firm level in parenthesis, * p<0.1, ** p<0.05, *** p<0.01

Column (4) reports the results of a regression using the same model specification as in column (2), but only for the subsample of workers employed in the secondary sector, dominated by manufacturing. We find statistically significant positive effects in only 2003, where the point estimate indicates a 0.9 percent higher wage increase in the treatment group than in the control group. The effect is stronger than the results in column (2) imply. The parameter estimate for 2003 is statistically significant at the 10 percent level. Thus, the accumulated effect over the post-reform period is an increase in hourly wages for full-time workers in the secondary sector in the treatment group of 0.9 percentage points compared to the same industrial group of workers in the control group.

Column (5) shows the results of same regressions as in columns (2) and (4), but for the subsample of workers employed in the tertiary sector, meaning services. The results show that the effect found in 2001 in the overall sample regression of column (2) comes from services, since no effect is found for the secondary sector this year. Workers in services in the treatment group had a 1.4 percentage points higher hourly wage growth rate in 2001 compared to workers in services in the control group. The effect is statistically significant at the 1 percent level.

It is clear that the effect found in 2003 in column (2) stems from the secondary sector. Indeed, the point estimate is twice as high as in column (2).

The point estimates for both of the subsamples (columns (4) and (5)) are relatively robust to the inclusion of treatment-year interactions for 1998 and 1999 and the log of individual lagged wage levels. However, the statistical significance of the effects in the secondary sector is not as robust as the effect in the tertiary sector.

Overall, using the two subsample point estimates and the sector shares in the treatment group divided by the total wage cost reduction, the degree of tax shifting is about 30 percent.

These results are somewhat in line with Stokke (2016) and Bennmarker et al. (2009), but we find less effect for the secondary sector and an effect in services which is not found in Stokke.

There is a plausible explanation for not finding larger wage effects in the secondary sector than in services, namely the fact that there is a much higher union share in the secondary sector compared to what the case is in services. This means the central wage formation in Norway is relatively more important in the secondary sector, implying less room for wage increases there.

In the above reported regressions, we trim our sample by dropping two percent of the observations on either side of the distribution of our dependent variable. If we instead drop one percent on each side, the variable capturing the treatment effect in 2000 is statistically significant in the regression for the secondary sector. In this case, the degree of tax shifting is 83.33 percent in the secondary sector. If we trim our sample by dropping 3 percent on both sides of the distribution of the dependent variable, the statistically significant effect for the secondary sector is not present in neither 2000 nor 2003. Thus, the degree of tax shifting is quite sensitive with regards to the tails of the distribution of the growth rate of hourly wages. The treatment effect found in 2001 for the tertiary sector is robust to these data considerations.

5.1.4 Results from the employment regressions

Using the difference-in-differences approach described in part 5.1.2, we estimate the effects of a reduction in the payroll tax rate on the growth rates

in firm sizes. The results are displayed in Table 5.6. Only firms located in the treatment and control regions are included.

Results from the regressions on firm size show a positive effect on the employment of workers residing in the treatment regions from the reduction in the payroll tax rate. Column (1) shows regression results when restricting the treatment effect to be an average over the post reform years, 2000-2003. The result indicates the annual growth rate in employees residing in the treatment regions in the post-reform period is 1.8 percentage points higher in the treatment group than in the control group. The parameter estimate is statistically significant at the 10 percent level and relatively robust to model specifications with clustering at different levels and the log of individual lagged wage levels. The result in column (1) has the interpretation that employment growth of workers residing in the treatment regions was 7.2 percent higher than the employment growth of workers residing in the control regions over the post-reform period.

In column (2), we allow the treatment effect to vary over the post-reform period, by using year dummies instead of a step dummy interacted with treatment. Here, we see the effect reported in column (1) stems from the years 2001 and 2003. The point estimates for 2001 and 2003 are, respectively, 0.032 and 0.035 and are both statistically significant at the 5 percent level. These estimates suggest the

Table 5.7 Impact of payroll tax cut on employment growth – firm size

Column number	(1)	(2)	(3)	(4)	(5)
Dependent variable	Δ ln L	Δ ln L	Δ ln L	Δ ln L	Δ ln L
Sector/Sample	Full sample	Full sample	Full sample	Secondary	Tertiary
Treatment	-0.001	-0.001	-0.008	0.011	-0.007
	(0.008)	(0.008)	(0.016)	(0.011)	(0.012)
Post 2000	-0.1***				
	(0.035)				
Treatment x Post 2000	0.018*				
	(0.01)				
Treatment x 1998			0.016		
			(0.012)		
Treatment x 1999			0.004		
			(0.021)		
Treatment x 2000		0.026	0.032	0.034	0.016
		(0.016)	(0.021)	(0.023)	(0.003)
Treatment x 2001		0.032**	0.038*	0.019	0.041*
		(0.016)	(0.021)	(0.023)	(0.004)
Treatment x 2002		-0.023	-0.017	-0.03	-0.019
		(0.016)	(0.021)	(0.02)	(0.023)
Treatment x 2003		0.035**	0.042**	0.009	0.055***
		(0.016)	(0.02)	(0.024)	(0.021)
Observations	10,215	10,215	10,215	3,349	6,866
Obs. treatment	3,006	3,006	3,006	1,115	1,893
Obs. control	7,209	7,209	7,209	2,234	4,973

Notes: Observations are excluded as discussed in part 1. Also included in the regressions are dummies for year, industry x year, lagged shares containing worker characteristics and municipal centrality level. We use weights with the number of employees in the regressions. Regarding columns (4) and (5): The secondary sector is dominated by manufacturing and the tertiary sector is services. Standard errors clustered at firm level in parenthesis, * p<0.1, ** p<0.05, *** p<0.01

employment growth of workers residing in the treatment regions was 6.7 percent higher than the employment growth of workers residing in the control regions over the post-reform period.

In column (3) we include placebo checks for pre-reform years 1998 and 1999. This increases the point estimates but reduces the statistical significance of the 2001 effect in column (2), but only such that it now is significant at the 10 percent level. Thus, the results survive this test and the average positive employment effect across industries holds.

Column (4) reports the results of the same regression as in column (2), but only for the secondary sector, dominated by manufacturing. There are no statistical significant effects to be found here, and all year-effects have their point estimates reduced from column (2), except the effect in 2000, which is higher for the secondary sector.

The column to the right (column (5), reports the same regression only for the tertiary sector, which is services. Here, we find the same statistically significant year-effects found in column (2). It seems the average effect across industries stems from this part of the sample, since the point estimates are higher in column (5) than in column (2) for both 2001 and 2003 and there are no statistically significant effects found in the secondary sector. The point

Table 5.8 Impact of payroll tax cut on employment growth – hours worked

Column number	(1)	(2)	(3)	(4)	(5)
Dependent variable	Δ ln H	Δ ln H	Δ ln H	Δ ln H	Δ ln H
Sector/Sample	Full sample	Full sample	Full sample	Secondary	Tertiary
Treatment	-0.007	-0.007	-0.016	0.008	-0.019
	(0.008)	(0.008)	(0.015)	(0.011)	(0.018)
Post 2000	-0.146**				
	(0.06)				
Treatment x Post 2000	0.016				
	(0.01)				
Treatment x 1998			0.018		
			(0.02)		
Treatment x 1999			0.008		
			(0.02)		
Treatment x 2000		0.02	0.029	0.031	0.01
		(0.014)	(0.019)	(0.022)	(0.019)
Treatment x 2001		0.011	0.019	-0.002	0.022
		(0.014)	(0.018)	(0.021)	(0.02)
Treatment x 2002		0.002	0.011	-0.016	0.017
		(0.014)	(0.018)	(0.021)	(0.019)
Treatment x 2003		0.031**	0.04**	0.016	0.044**
		(0.014)	(0.018)	(0.023)	(0.018)
Observations	10,215	10,215	10,215	3,349	6,866
Obs. treatment	3,006	3,006	3,006	1,115	1,893
Obs. control	7,209	7,209	7,209	2,234	4,973

Notes: Observations are excluded as discussed in part 1. Also included in the regressions are dummies for year, industry x year, lagged shares containing worker characteristics and municipal centrality level. We use weights with the number of hours worked in the regressions. Regarding columns (4) and (5): The secondary sector is dominated by manufacturing and the tertiary sector is services. Standard errors clustered at firm level in parenthesis, * p<0.1, ** p<0.05, *** p<0.01

estimates for 2001 and 2003 are, respectively, 0.041 and 0.055 and they are statistically significant at the 10 and 1 percent levels.

Why is there an employment effect in the tertiary sector and not the secondary sector? The results could stem from an increase in wages in the treatment group, resulting in increased demand for goods and services in the treatment region. We found some tax shifting in terms of wages in part 5.1.3, which gives weight to this argument. However, if we include a lagged level version of our dependent variable in the employment growth regressions, the year effect in 2000 is statistically significant at the 10 percent level for the secondary sector subsample, suggesting an immediate employment effect here. This point estimate for the secondary sector in 2000 indicates a 3,5 percentage points higher employment growth in the treatment group than in the control group.

Using the predicted values from the regressions to calculate counterfactuals, we can summarize the employment effect to be in the region of 282 employees overall, and 185 employees for the tertiary sector. This overall employment effect constitutes about 7 percent of the number of employees in the treatment group of firms in 1999 and the tertiary sector effect is 9 percent of the number of employees in the tertiary sector in the treatment group of firms in 1999.

Using total wage costs and the actual and counterfactual payroll tax rates, we can calculate the what this change in employees cost, in terms of lowered payroll tax. For the overall effect, the cost per extra employee was 572 000 in 2000-NOK. If we only consider the effect in the tertiary sector, the cost was 424 000 in 2000-NOK per extra employee.

The calculated employment effect includes workers who changed workplace from another region to the treatment region in our estimation period, meaning the number above is an over-estimation of the employment effect in a macro sense, but not of the employment effect that is intended with the RDSSC scheme. An increase in the number of employees in the firms in the treatment region probably also involved an increase in population over and above the change in employment, since it is plausible that many families moved closer to the workplace.

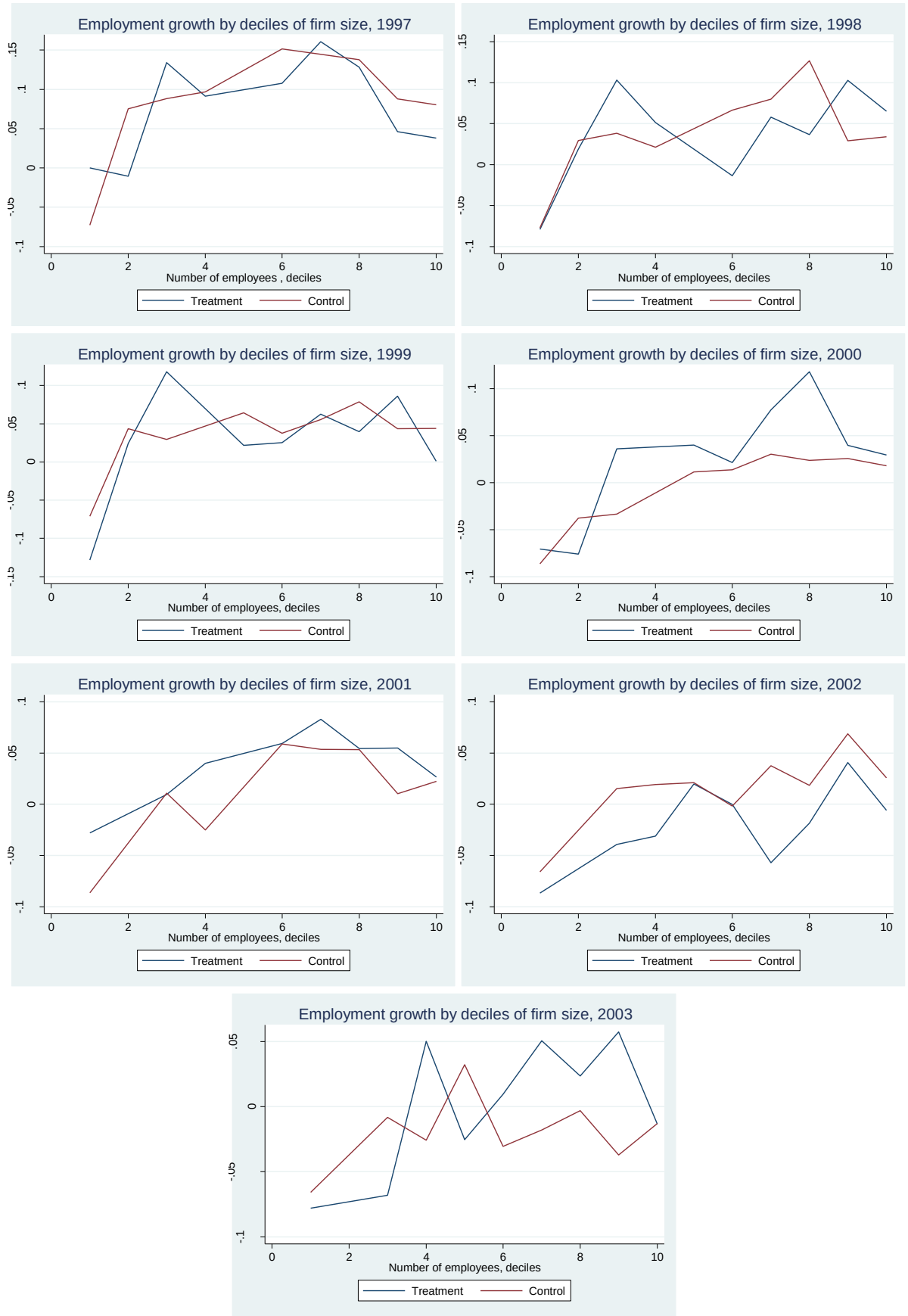
Table 5.7 reports the results from five separate regressions on the growth rates of number hours worked in firms. The model specification is otherwise the same as the previous, where growth rates of firm size is the dependent variable.

In our regressions on growth rates of hours worked we find a positive effect for the full sample in 2003, which stems from services, reported in column (5). The point estimate has the interpretation that the growth in hours worked by workers residing in the treatment regions and working in the tertiary sector grew 4.4 percent more than that of workers residing in control regions and working in services.

This positive and significant effect for firms in the services sector is also found in the regressions using growth rates in firm size as the dependent variable, reported in table 5.6. However, we do not find a statistically significant effect in 2001, as found on the extensive margin.

Figure 5.7 shows average growth rates of employment of workers residing in treatment or control regions in firms, by deciles of employees residing in treatment or control regions. These descriptives show that the growth rates in employment was negative in the lower deciles over the whole period, but also that they were negative almost for all deciles in

Figure 5.7 Average growth rates of employment of workers residing in treatment or control regions in firms, by deciles of employees residing in treatment or control regions. 1997-2003



some later years. Employment growth in the treatment group was negative for almost all deciles in 2002, while the growth rates were negative for almost all deciles inn 2003 among the control group. This is most likely due to the fact that we have not included firms established after 1998 and because there was an economic downturn in Norway after 2001.

5.1.5 Results from value added regressions

As noted in part 5.1.2, it is probable that the common trend assumption is not valid for growth rates of value added. In this part, we report the results from regressions using a difference-in-difference approach for value added. Since the assumption that forms the basis for the difference-in-difference design is most likely violated, the results should be treated with caution, as they are probably invalid, since the research design is flawed.

Table 5.8 shows the results of the OLS-regressions. Only firms located in the treatment and control regions are included. As reported in columns (1), (2) and (3), we find no significant effects across all industries in the post-reform period that would suggest a treatment effect on firms' value added. Column (3) includes a placebo check for the years 1998 and 1999. The coefficient on the treatment-year interaction for 1999 is statistically significant at the 10 percent level, which indicates the common trend

Table 5.9 Impact of payroll tax cut on growth rates of value added

Column number	(1)	(2)	(3)	(4)	(5)
Dependent variable	Δ ln V	Δ ln V	Δ ln V	Δ ln V	Δ ln V
Sector/Sample	Full sample	Full sample	Full sample	Secondary	Tertiary
Treatment	0.004	0.004	0.04	0.043	-0.027***
	(0.015)	(0.015)	(0.035)	(0.027)	(0.012)
Post 2000	-0.213				
	(0.186)				
Treatment x Post 2000	0.008				
	(0.017)				
Treatment x 1998			-0.038		
			(0.042)		
Treatment x 1999			-0.064*		
			(0.036)		
Treatment x 2000		0.02	-0.017	-0.004	0.038*
		(0.024)	(0.039)	(0.042)	(0.023)
Treatment x 2001		0.005	-0.031	0.017	-0.007
		(0.022)	(0.036)	(0.04)	(0.019)
Treatment x 2002		-0.032	-0.069	-0.093*	0.014
		(0.028)	(0.046)	(0.048)	(0.031)
Treatment x 2003		0.04	0.003	0.014	0.049**
		(0.024)	(0.037)	(0.038)	(0.024)
Observations	11,848	11,848	11,848	3,915	7,933
Obs. treatment	3,577	3,577	3,577	1,361	2,221
Obs. control	8,271	8,271	8,271	2,554	5,712

Notes: Observations are excluded as discussed in part 1. Also included in the regressions are dummies for year, industry x year, lagged shares containing worker characteristics and municipal centrality level. We use weights with the level of value added in the regressions. Regarding columns (4) and (5): The secondary sector is dominated by manufacturing and the tertiary sector is services. Standard errors clustered at firm level in parenthesis, * p<0.1, ** p<0.05, *** p<0.01

assumption does not hold for the growth rates in value added.

In column (4) we find only a statistically significant effect in 2002, which is (surprisingly) negative. However, 2002 was a downturn in the Norwegian economy, and it might be that the treatment group is relatively more affected by this than the control group, since we control for common shocks through group common year dummies.

5.1.6 Results from capital regressions

Using the difference-in-differences approach described in part 5.1.2, we estimate the effects of a reduction in the payroll tax rate on the growth rates in firm sizes. Only firms located in the treatment and control regions are included in the sample. The results are displayed in table 5.9.

As opposed to the previous analyses, the treatment occurs in 2001 for capital services, since it is a stock at the start of the year. The growth rate of capital services in 2000 is therefore the difference in log levels between 1st of January 2000 and 1st of January 1999. As before, we do placebo checks to confirm there is no difference in growth rates between groups in 2000.

The overall effect across industries is positive and statistically significant and the placebo checks

Table 5.10 Impact of payroll tax cut on growth rates of capital services

Column number	(1)	(2)	(3)	(4)	(5)
Dependent variable	Δ ln C	Δ ln C	Δ ln C	Δ ln C	Δ ln C
Sector/Sample	Full sample	Full sample	Full sample	Secondary	Tertiary
Treatment	-0.05	-0.05	-0.067	-0.126**	0.017
	(0.039)	(0.039)	(0.151)	(0.062)	(0.04)
Post 2001	-0.582***				
	(0.155)				
Treatment x Post 2001	0.136***				
	(0.053)				
Treatment x 1998			0.022		
			(0.161)		
Treatment x 1999			0.056		
			(0.158)		
Treatment x 2000			-0.006		
			(0.145)		
Treatment x 2001		0.184**	0.202	0.372***	0.031
		(0.083)	(0.186)	(0.135)	(0.078)
Treatment x 2002		0.084*	0.102	0.215***	-0.029
		(0.047)	(0.154)	(0.071)	(0.047)
Treatment x 2003		0.137***	0.154	0.158**	0.120*
		(0.046)	(0.150)	(0.075)	(0.062)
Observations	10,361	10,361	10,361	3,610	6,751
Obs. treatment	3,107	3,107	3,107	1,083	2,024
Obs. control	7,254	7,254	7,254	2,527	4,727

Notes: Observations are excluded as discussed in part 1. Also included in the regressions are dummies for year, industry x year, lagged shares containing worker characteristics and municipal centrality level. We use weights with the level of capital services in the regressions. Regarding columns (4) and (5): The secondary sector is dominated by manufacturing and the tertiary sector is services. Standard errors clustered at firm level in parenthesis, * p<0.1, ** p<0.05, *** p<0.01

accept our assumption of common pre-reform trends. However, when we do placebo checks for two subsamples, the secondary and tertiary sectors, we find significant treatment-year interactions in years in the pre-reform period. The point estimates of these significant variables are on each side of zero, which means our placebo check in column (3) looks fine only because it's the sum of the two. Thus, we cannot conclude on what the treatment effect on capital services is, since the difference-in-difference method in not valid when the pre-reform trends are different among groups. We could attempt a matching procedure to solve this issue, but there are not enough observations in the subsamples.

5.2 Evaluation of the reform in 2004

As mentioned earlier, to identify effects of the regionally differentiated payroll tax rate, we rely on exogenous shocks (changes in the scheme) and on an appropriate methodology to each case. In this section we exploit several changes in the scheme in 2004.

Contrary to the changes in 2000 (studied in the previous section), there was no changes in tax zones in 2004, but municipalities in zones from 2 to 4 got an increase in their payroll tax rate. That happened due to the European Economic Area (EEA) regulations (EFTA Surveillance Authority 2006). While Zone 2 experienced an immediate increase to the general tax rate of 14.1 pct., a step-wise annual increase was implemented in zones 3 and 4 until the reversion of these changes in 2007 (cf. Table 5.11).

In this section we focus on the period 2000-2006, i.e. the period around the change in the scheme in 2004 and between previous change in 2000 and next change in 2007.

At the same time as the tax rate was increased, the government implemented an annual tax deduction of NOK 270,000.[40] That is, firms in the affected tax zones paid the "old" (lower) tax rate until the difference between what they paid and what they would have paid at the "new" (higher) tax rate equalled the deductible amount (see Table 5.12 for an overview of the corresponding wage cost thresholds).

Table 5.11
Overview of tax rate changes in 2004-2006

Year	Zone 2	Zone 3	Zone 4
2004	14.1	8.3	7.3
2005	14.1	10.2	9.5
2006	14.1	12.1	11.7
Before 2004*	10.6	6.4	5.1

* And for wage costs under threshold from 2004

Table 5.12
Overview of threshold for wage costs eligible for low payroll tax rate in 2004-2006, NOK

Year	Zone 2	Zone 3	Zone 4
2004	7,714,286	14,210,526	12,272,727
2005	7,714,286	7,105,263	6,136,364
2006	7,714,286	4,736,842	4,090,909

Note: Threshold is calculated as 270,000/(new tax rate-old tax rate).
Source: Skattedirektoratet, 2014

In the empirical analysis, we direct our attention to all municipalities in zones from 2 to 4 except municipalities that had changed the zone in 2000. The latter group is excluded from the evaluation for the sake of less noise in the estimates. Our estimates in the previous section indicate effects on wages

[40] This deduction amount corresponds to the threshold of 100'000 EUR over three years for the public support allowances by EU Commission.

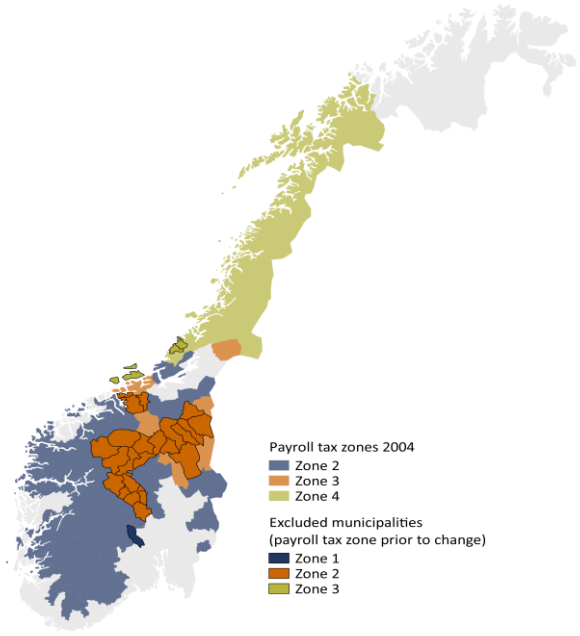
and employment due to decreased tax rates for firms in municipalities that changed tax zone. Thus, one can then hardly believe that firms in these municipalities had the same development in 2000-2003 as firms unaffected by the 2000-reform.

Figure 5.8 shows a map of municipalities in tax zones 2-4 per 2004 and shows how many municipalities are excluded from the evaluation sample (darker area). We can notice that almost all municipalities in zones 2 and 4 are in the evaluation sample and only few in zone 3. In our empirical analysis we provide some results for the zone 3, but they have only an indicative character. We are most confident in our results for zones 2 and 4 and part of the analysis that is highly data-demanding is only conducted for these two zones.

In this chapter we focus on estimating the effects of an increase in the payroll tax on wages and employment. Since labour input suddenly becomes relatively more expensive than it previously was, we expect to observe lower wage growth in the short-run[41] and a reduction in employment (or increase in labour intensity) in the long-run.

One issue to care about is the compensation that was given from the government to the municipalities involved into 2004-reform for the increased payroll tax rate. Firstly, the local governments were fully compensated for increased wage costs by the central government. Then the industries in these municipalities were, to a certain extent, compensated for higher wage costs through local governmental programs financed by the central government. Given that this compensation was not a direct transfer to the firms in question, it does not favour one group of firms against another.[42] Hence, we still can compare treatment and control groups within the same zone.

Figure 5.8
Municipalities in tax zones 2-4. 2004



Note: Municipalities that changed the zone in 2000 are marked with darker colour. These are excluded from the evaluation sample
Source: Economic Analysis Norway

We admit that the compensation on the municipality level could to some extent moderate adjustments by the firms (compared to the case of no any compensation). Our results then should be interpreted as being on the lower boundary. At the same time what municipalities do, is not always optimal from the firm point of view. It can also take time to start to gain from the municipal projects for the firm, while an increase in payroll tax is an immediate shock for the firm. Hence, we believe that in the short-run our estimates are very close to the true effects of payroll tax increase.

[41] It is less probably that the wage level went down given strong labour-unions in Norway and highly centralized wage bargaining. Hence, we expect to observe wage corrections through lower wage growth.

[42] All firms in the given municipality could gain from e.g. better infrastructure or other types of projects that the local government chose to spend these money on.

In this chapter we use two different methods to estimate effects of the increase in the payroll tax rates on wages, i.e. difference-in-differences and regression kink design (RKD). First, we construct the control and treatment groups by splitting the entire population into firms with wage costs under and above the wage costs threshold (cf. Table 5.12). We also check whether the common trend assumption is valid for these groups and find it satisfactory.

The first method covers *all firms* in the treatment and control groups and gives us an indication on the direction of effects. This method is also applied for all three zones. We cannot, however, claim that we find casual effects in this case. Firms in the control group are by definition smaller than firms in the treatment group in terms of their wage costs, and hence, in terms of size measured by employment. We apply then the second method, the so-called Regression Kink Design (RKD), using kinks in the schedule of payroll taxes to pay and study only *the firms that are close enough to the threshold* (and hence are very similar). This quasi-experimental inference gives us casual effects of an increase in the payroll tax rate on wages. Given that RKD is quite data-demanding, the analysis is conducted only for zones 2 and 4.

We find that a smaller part of the increased total wage costs is shifted onto workers, i.e. that most of burden of payroll taxation resides with the employer.[43] The degree of the shift varies in the range 35-50 pct. when we use difference-in-difference. The degree of the shift in the RKD inference varies dependent on the zone being in the range 4-17 pct. for firms in zone 2 and in the range 0-4 pct. for firms in zone 4. This result indicates that labour demand is less elastic in zone 4 (where the industry structure is most oriented on natural resources) and, hence, employers are less flexible to shift the burden on the employees. The degree of the shift in the case of the tax rate increase is also lower than in the case of tax rate decrease studied in the previous chapter (where 18-52 % of the incidence of the tax reduction resided with employees). This result indicates the asymmetric character of adjustments in these two cases.

5.2.1 Sample construction and definition of treatment and control groups

As the evaluation period in this chapter (2000-2006) is partly overlapping with the period studied in the previous chapter (1996-2003), we apply a similar data trimming procedure:

- We exclude firms operating in the sectors or activities that are not eligible for the reduced tax rate under the scheme (see Section 2.2.2);
- We also exclude firms in the public and primary sectors due to the centralised wage bargaining in the former case and to the extensive subsidies and high degree of self-employment in the latter case.
- We exclude employees with earnings exceeding 16 times the basic amount in the National Insurance Scheme (16G) due to the additional payroll tax that was applied for these employees in 1993-2006 (see Section 2.3 for the details);
- From 2003 and onwards, employees aged 62 or above were subject to a lower payroll tax rate to stimulate employment of workers who might otherwise retire. We exclude those aged 56 or above to avoid potential problems regarding

[43] While classical economics suggests that most of the long-run economic incidence of the payroll tax resides with employees and this prediction has been confirmed in some empirical studies (i.e. Gruber, 1997, based on the tax reform in Chile), recent contributions by Saez et al. (2012) for Greece and Stokke (2016) for Norway demonstrate an opposite result, i.e., that the economic incidence of the payroll tax mostly resides with employees. Our results are then in the range with the recent findings.

behavioural effects of this policy both on the employers and employees and to focus on the effects of the main changes of the scheme that yield the majority of workforce.

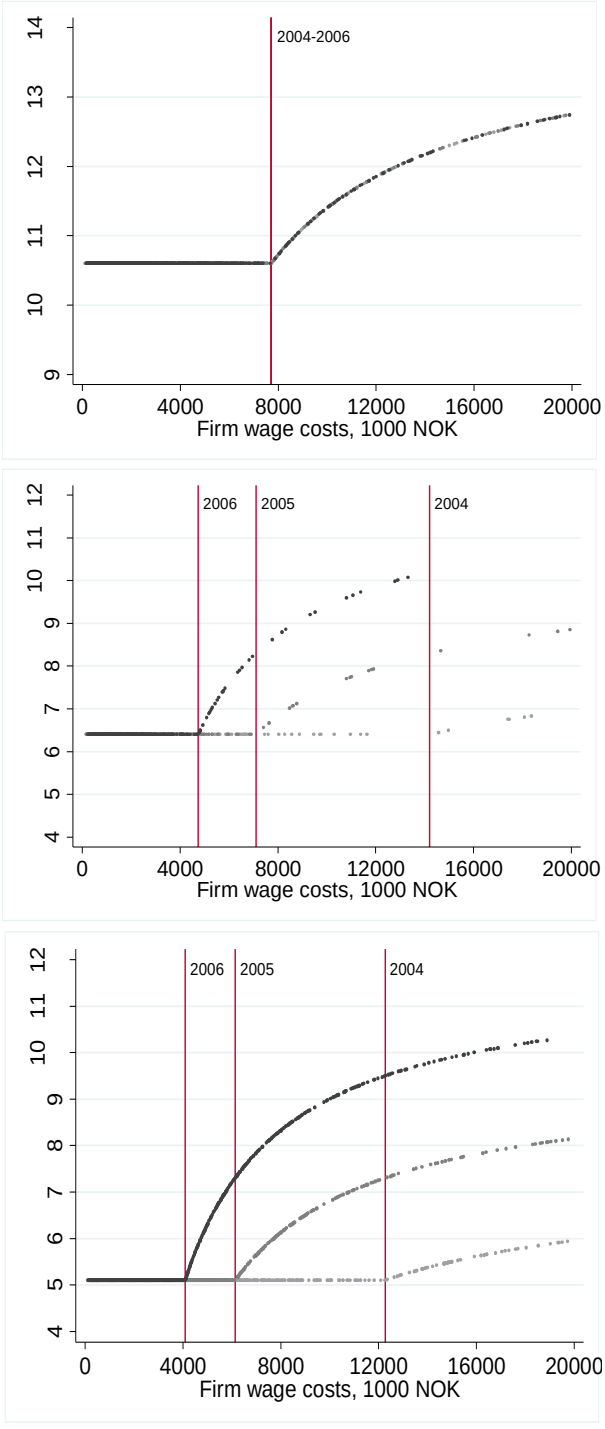
- We exclude individuals and firms with missing information on variables included in the regressions.
- We further restrict our observations to include only those who are observed for at least three consecutive years such as our growth measures cover at least on year before and after treatment in 2004.

In addition, we do some specific adjustments for our evaluation period based on the key features of the 2004-reform. First, as mentioned earlier, we exclude municipalities that changed tax zones in 2000 and, as documented in the previous chapter, had different wage and employment growth in 2000-2003 than the unaffected by 2000-reform municipalities.

Second, we keep only the firms with at least 95 per cent of man-hours performed by employees in the same zone as the firm is located. This step makes us confident with using the thresholds reported in Table 5.12 when dividing firms into treatment and control groups, i.e. those with wage costs above and below the threshold correspondingly. The main reason for doing so is that tax deduction up to NOK 270,000 applies only to employees from zones 2-4, while a range of firms have a mix of employees from different zones. Given that we have information on wage costs and payroll tax paid at the firm and not individual level, we cannot identify which part of the firm wage costs should be compared with the threshold for such firms. Hence, we focus here on the firms that have almost all employees from the same zone and hence apply the same rates for them.

Figure 5.9

Wage costs threshold and effective payroll tax rate by regional payroll tax zone, 2004-2006



The increased payroll tax rates in 2004 resulted in higher labour costs for firms with wage costs above the threshold. The larger the firm was in terms of employees and hence wage costs, the more its total labour costs were affected by the 2004-reform (cf. Figure 5.9). In the period 2004-2006, these adjustments made it also more expensive to employ a new worker for firms with wage costs above the threshold, compared to firms with wage costs under the threshold. For such firms we then expect to observe wage corrections through lower wage growth in the short-run and a reduction in probabilities to employ new workers and even in total employment in the long-run.

We study the effects on wage growth using individual-level data and the effects on employment using firm-level data. In the former analysis we use only full-time employees, while in the latter case all employees are included.

While we use wage costs in nominal prices for comparing them to the threshold and dividing firms into treatment and control groups, in further estimations we measure all monetary variables in 2015 prices, adjusting for inflation using the consumer price index (CPI).

5.2.2 Estimation of effects by difference-in-differences approach

The difference-in-differences method is typically implemented in the literature in a situation with two periods, e.g. one with and one without the policy or one before the policy change and one after. While an immediate increase in the payroll tax rate happened in zone 2 in 2004, the step-wise annual increase was implemented in zones 3 and 4 during 2004-2006 (cf. Table 5.11). That means that we can apply a simple difference-in-differences estimation as in the previous chapter only for firms in zone 2 (where the same policy regime was valid for the whole post 2004-reform period, cf. Figure 5.9).

In the case of zone 3 and 4 where the tax rate had been changed both in 2004, 2005 and 2006, we need to apply a difference-in-differences method with more than one period. We then use the following specification where equation (1) is transformed to a multiple period case:

$$
\begin{aligned}
Y_{it} & \\
&= \gamma^0 \\
&+ \sum_{T \neq 0} \gamma^T G_i^T + \sum_T \tau^T D^T \\
&+ \sum_{T_0} \sum_{T_1 \geq T_0} \alpha^{T_0 T_1} G_i^{T_0} D^{T_1} g_{it} + \sum_j \beta^j X_{it}^j \\
&+ \varepsilon_{it}
\end{aligned}
\qquad (3)
$$

Here, *Y* is the dependent variable by which we want to measure the effect of the policy change (e.g. changes in wage growth or probability to employ a new worker in our case), and X_{it}^j is a range of control variables. *T* is a categorical variable that is equal to 0, 1, 2, 3 given the total number of periods (i.e. 2000-2003, 2004, 2005 and 2006 correspondingly). G^T is an indicator variable for the generation of firms that were treated in period *T>0* (0 remains for the period before the policy change in 2004). D^T is a dummy variable for time period *T*, while g_{it} is a dummy variable that indicates whether firm *i* was treated in period *t*. T_0 represents the period just before the first treatment, and T_1 any other period after this.

The parameters γ, τ, α and β are to be estimated. The γ parameters in the equation (3) correct for differences between treated and untreated firms that already existed before the 2004-change, to the extent that these differences are not reflected in the set of variables *X*. The usage of multiple γ parameters enables us to distinct between different generations of treated firms, i.e. larger firms that were

treated in the start when the threshold for wage cost was very high in zones 3 and 4, and smaller firms that were treated later (the smallest firms that never reached the threshold will have zero value for all *G* variables).

The τ parameters in (3) correct for differences between policy regimes that took place between policy changes. Finally, the α parameters measure the effect of the payroll tax rates changes. Instead of just a single effect, we estimate one effect for each combination of treated firm generation (*G*) and period (*T*). For example, the parameter $\alpha^{1,3}$ would measure the effect of the payroll tax rate increase in 2006 (period 3) on firms in zone 3 and 4 from the first generation of treated firms (the largest firms those wage costs were above the 2004-threshold, cf. Figure 5.9). A similar parameter (effect) is estimated then for every possible combination of period and generation.

To illustrate the potential effects of the 2004-reform, we first present some graphical evidence. Figure 5.10 shows the average growth rates in real hourly wages in both treatment and control firms by zone, for the years 2001-2006. Notably, the wage growth rates in the groups have similar changes in the pre-reform period in all zones, although the average growth over this period is slightly higher for the treated firms in zone 2 and 3. From 2004, the wage growth rates are remarkably lower in the treatment group than in the control group for zones 2 and 3.

For zone 4 we cannot observe any significant change after 2004-reform if we do not consider when the treated firms were treated. If we group treated firms in zone 4 by the period they met a threshold, i.e. first in 2004, 2005 or 2006, we observe some changes for them too (cf. Figure 5.11).

Figure 5.10

Average annual real growth rate of hourly wages in treatment and control groups by regional tax zone. 2001-2006

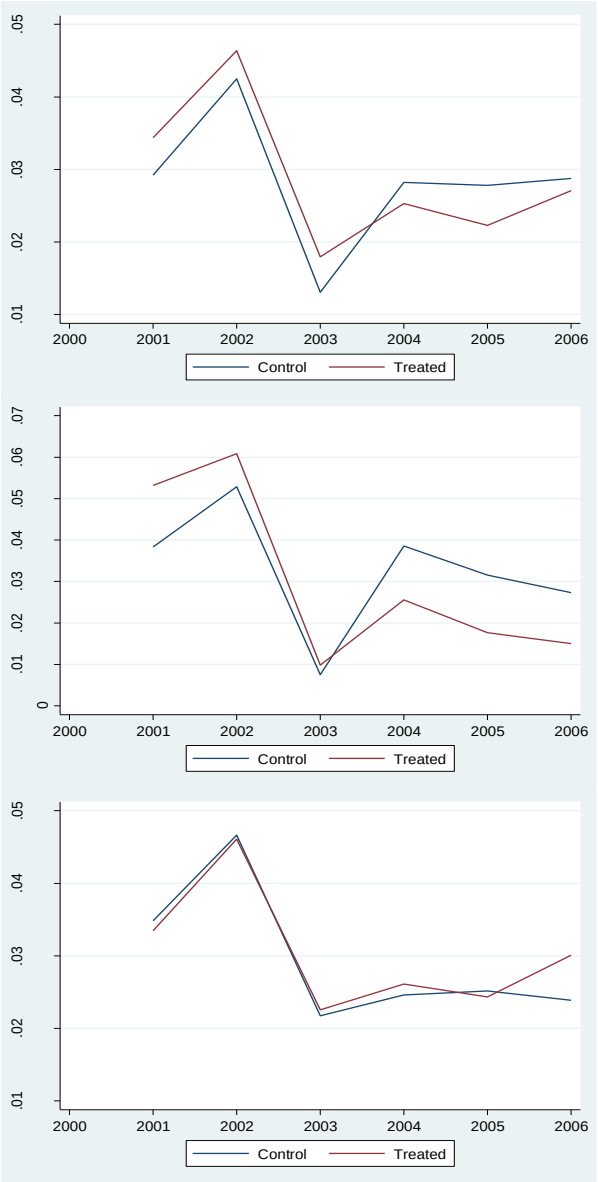


Figure 5.11

Average annual real growth rate of hourly wages in treatment and control groups in Zone 4 by timing of treatment. 2001-2006

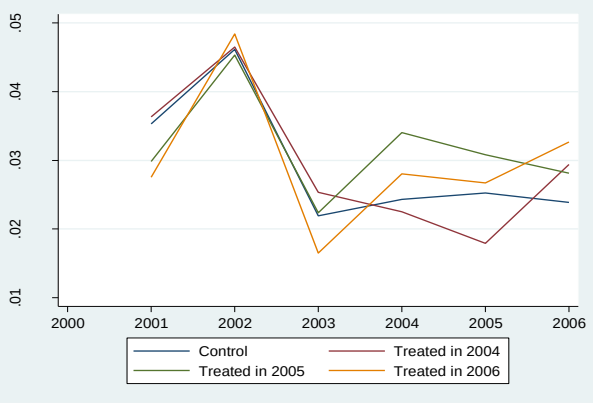


Figure 5.11 shows that while the wage growth rates have similar changes in the pre-reform period for all groups of treated and untreated firms in Zone 4, they behave differently in the post-reform period.[44] The wage growth rates are falling for the firms that were treated in 2004 and in 2005 just after increase of the payroll tax rates, but not for the firms that were treated in 2006. Moreover, firms in all treated groups have higher wage growth rates in 2006 than in the control group possibly implying an anticipation effect on the reversion of 2004-reform that happened in 2007. Whether all these differences are statistically significant we test further in the regressions.

Firstly, we estimate the effect of higher payroll taxes on wages by applying simple difference-in-differences approach similar to the one presented by equation (1):

$$\Delta \ln w_{ijst} = a_0 + a_1 T_j + a_2 P_t + a_3 T_j P_t + \overline{X}_{it}\beta + \overline{X}_{j0}\gamma + \varphi_s + \rho_t + \varepsilon_{ijst} \quad (4)$$

where Δlnw_{ijst} is the change in log hourly wage from year *t-1* to year *t* for worker *i* in firm *j* in industry *s*, T_j is a dummy that equals 1 if the firm *j* is in the treatment group facing higher payroll tax rate (i.e. with wage costs above the threshold) in any of the post-reform years, and P_t is a dummy that equals 1 in the post-reform years (from 2004 onwards).

As in the model (1) the vector of worker characteristics in year t ($\overline{X}_{it}$), includes dummies for age (5-year intervals), education level (primary, secondary and collage), immigrant status (native, western immigrant, non-western immigrant) and gender. In addition, we control for initial firm age $\overline{X}_{j0}$ (i.e. the firm age at the first observation year). Industry and year fixed effects are represented by φ_s, ρ_t, respectively, a_0 is a constant, β and γ are vectors of parameters and ε_{ijst} is an error term.

Table 5.13 presents the results of the regression for all zones involved the 2004-reform and separately for each of the zones 2-4. The parameters of interest are those estimated for variables that are interactions between post reform years and treatment that capture the difference in wage growth between treated and control firms after changes in 2004. Columns (1) show the results when restricting the treatment effect to be an average over the post reform years, 2004-2006. Columns (2) show the results when we adjust the above specified regression model to allow year-specific treatment effects. All standard errors are robust and clustered at the firm level.

Table 5.13 indicates that only firms in zone 2, where the tax rate increased immediately to the highest

[44] Due to too few observations for firms in the zone 3 we do not present the same figure for them.

level and with no further changes in the period 2004-2006, responded sharply by lower wage growth. The average effective payroll tax rate for the treated firms in zone 2 is equal to 12.87 pct. and implies on average about 2 pct. increase in their labour costs after 2004-reform.[45] The interpretation of the results for Zone 2 then is that an average 2.27 percentage point increase in the payroll tax rate generates on average 0.8 percentage point lower wage growth per year during the post-reform years 2004-2006.

Due to several changes in the scheme for zones 3 and 4 (cf. Figure 5.9) and distinct characteristics of the treated firms in different periods regarding both their thresholds, effective payroll tax rates and size of their labour costs, we cannot make any strong conclusions for them based on the model in (4). We move further and estimate generalised difference-in-difference model with multiple treatment groups presented by equation (3). These results are presented in Table 5.14.

Table 5.14 shows that only treated firms of type 1 (i.e. those with wage costs above 2004-threshhold and hence, largest firms with about 35 or more employees) have responded to the increase of payroll taxes in zone 4, while treated firms of type 2 (i.e. those with wage costs above 2005-threshhold and hence, medium firms with about 20-39 employees) have responded in zone 3.[46] However, from Figure 5.9 we can see that there are almost no firms of type 1 in zone 3. In general, there are too few observations in zone 3 to make any strong conclusions and robust calculations. We then proceed with interpretation of the results only for zones 2 and 4.

Interestingly, only firms that initially had wage costs above the threshold responded to the increase of payroll taxes during 2004-2006 in Zone 2. These are in the majority among treated firms in Zone 2 and account for about 90 pct. of observations. For firms that reached the threshold in 2005 or 2006 possibly due to the internal wage or employment growth despite of payroll tax rate increase, we do not find any significant response on wages after treatment either (see the results for firms of type 2 or 3 in Zone 2).

The main interpretation for the firms in zone 2 holds as in the previous model, i.e. an average increase of labour costs by 2 pct. generates on average 0.8 percentage point lower wage growth per year during the post-reform years 2004-2006. However, we find a robust and strong result only for 2006, which is equal to 1 percentage point lower wage growth for employees in the treated firms compared to control group implying 50 pct. tax shifting on employees in Zone 2.

As for the firms in zone 4, the average effective payroll tax rate for the treated firms of type 1 (those with wage costs above NOK 12,272,727 in 2004) is equal to 6.04 pct. in 2004 and implies on average about 0.9 pct. increase in their labour costs from 2003 to 2004.[47] These firm have responded by 0.8 percentage point lower wage growth in 2004 implying almost 90 pct. tax shifting on employees in 2004.

[45] The almost 2.3 percentage point increase in the payroll tax rate from 10.6 pct. to 12.87 pct. corresponds to 2 pct. increase in labour costs: (1.129w-1.106w)/1.106w=0.02.

[46] Given average wage level in 2004, the size of treated firms of type 1 is about 40+ employees in zone 3 and 35+ employees in zone 4. The corresponding numbers for treated firms type 2 are 20-39 employees in zone 3 and 18-34 employees in zone 4.

[47] The almost 1 percentage point increase in the payroll tax rate from 5.1 pct. to 6.04 pct. corresponds to 0.9 pct. increase in labour costs: (1.060w-1.051w)/1.051w=0.009.

Table 5.13

Impact of payroll tax increase on individual wage growth, simple difference-in-difference

	Zones 2-4		Zone 2		Zone 3		Zone 4	
Variables	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Post2004	0.006	0.006	0.021**	0.022**	-0.006	-0.024	-0.003	-0.006
Treatment	0.003***	0.003***	0.004	0.004	0.01	0.01	0.003	0.003
Treatment x Post2004	-0.002		-0.008***		-0.017		0.003*	
Treatment x 2004		-0.001		-0.007*		-0.023		0.003
Treatment x 2005		-0.003		-0.008**		-0.024*		0.001
Treatment x 2006		-0.001		-0.011**		0.003		0.007***
R2	0.033		0.042		0.13		0.04	
No. observations	78147		35392		1289		41466	
No. individuals	17555		7932		284		9339	
No. firms	5114		2311		114		2689	

Table 5.14

Impact of payroll tax increase on individual wage growth, generalised difference-in-difference

Variables	All zones	Zone 2	Zone 3	Zone 4
Post2004	0.008	0.021**	0.092	-0.003
Treated type1	0.003**	0.002	0.055*	0.008***
Treated type2	0.004**	0.001	0.036	0.005**
Treated type3	0.001	-0.002	0.003	0.001
type1 x 2004	-0.006**	-0.006	-0.01	-0.008**
type1 x 2005	-0.008**	-0.008*	-0.019	-0.010**
type1 x 2006	-0.005*	-0.010**	0.061***	0.003
type2 x 2005	0	0.007	-0.051***	0.001
type2 x 2006	-0.003	-0.013	-0.127***	0.004
type3 x 2006	0.006*	0.006	0.018	0.009**
log_emp0	0.001	0.002*	0.023	0.002
log_emp0^2	0	0	-0.007	-0.001**
log_firm_age0	-0.006***	-0.006***	0.007	-0.005***
log_firm_age0^2	0.001***	0.001***	-0.002	0.001***
No. observations	78147	35392	1289	41466
No. individuals	17555	7932	284	9339
No. firms	5114	2311	114	2689
R2	0.033	0.042	0.132	0.04

The average effective payroll tax rate for the treated firms of type 1 is equal to 8.32 pct. in 2005 and implies on average about 2.2 pct. increase in their labour costs from 2004 to 2005. [48] These firm have responded by 1 percentage point lower wage growth in 2005 implying 45 pct. tax shifting on employees in 2005. Finally, the average effective payroll tax rate for the treated firms of type 1 is equal to 10.53 pct. in 2006 and implies on average about 2 pct. increase in their labour costs from 2005 to 2006, but without any tax shifting on employees in 2006. In total treated firms of type 1 in zone 4 (i.e. with 35 or more employees) experienced 5.1 pct. increase in their labour costs during 2004-2006 and had 1.8 percentage point lower wage growth at this period with in total 35 pct. tax shift on employees in 2004-2006.

In the whole, it seems that the largest firms that had got highest increase in their labour costs because of 2004-reform had strongest response too. The main weakness of the presented method, however, is namely that treated and control firms differ by their size. Though they had parallel trends for the wage growth in the pre-reform period, they could differ a lot by the wage bargaining power, employment policy, growth possibilities, etc. that could influence their response. Hence, we cannot claim that the estimated effects are causal and are the results of the 2004-reform only.

To handle this issue, we further apply an extension of the discontinuity approach called the regression kink design (RKD). This method is most appropriate when any threshold introduced by the policy leads to the kinks both in the treatment and in the response variables (as we will show it was in the case of the 2004-reform).

5.2.3 Estimation of effects by regression kink design

In this chapter we use the presence of kinked schedules in the relationship between wage costs and payroll tax paid. These kinked schedules are presented by Figure 5.12. The figure demonstrates that up to the wage costs threshold (illustrated by red line) the firms pay taxes with one rate, while above the threshold they pay taxes with higher rate resulting in the kink in the schedule line. While for the firms in zone 2 it is only one kink, for firms in zones 3 and 4 we observe three kinks given different thresholds and payroll tax rates in 2004, 2005 and 2006.

The basic idea then is to compare units just above the kink point (our treatment group) with units just under the kink point (our control group) and see whether the outcome of interest also exhibits a kink/change of slope in its relation to the running variable at the same point. As in the regression discontinuity design (RDD) this method will retrieve the causal estimates of the policy effects as these two groups are almost identical with respect to the policy (that is not the case in the previous chapter).

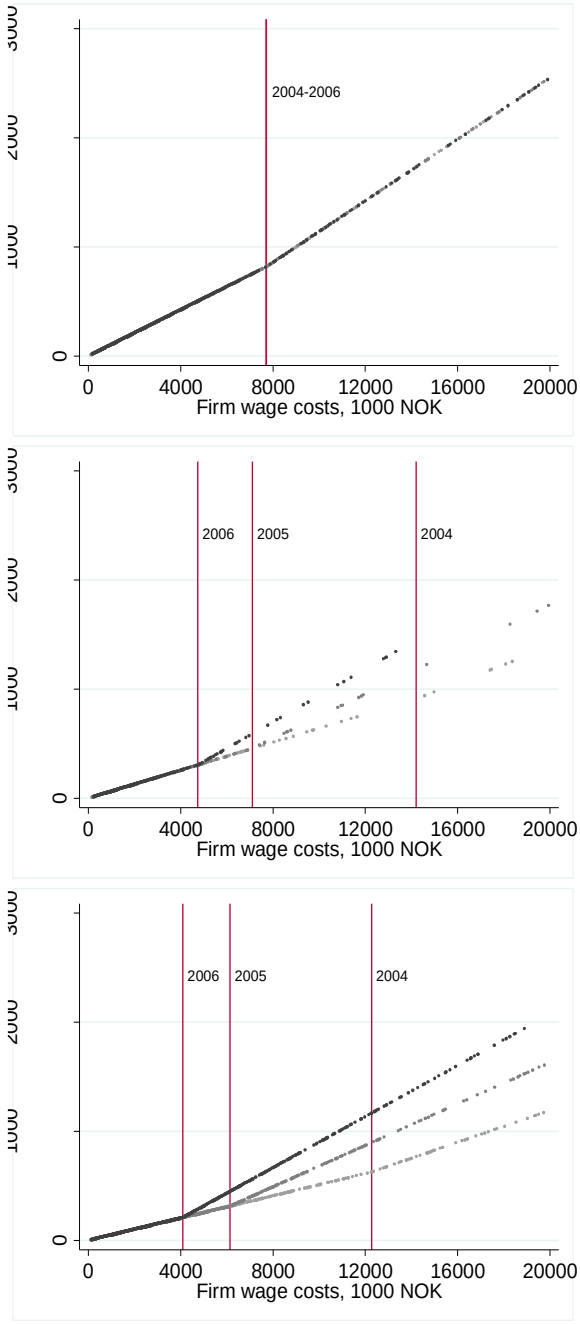
These types of kinks arise in a range of government policies. For example, Simonsen et al. (2015) use kinks in the Danish government's prescription drug reimbursement schedule to investigate how sensitive demand for prescription drugs to the drugs prices is.[49]

[48] The almost 2.3 percentage point increase in the payroll tax rate from 6.04 pct. to 8.32 pct. corresponds to about 2.2 pct. increase in labour costs: (1.083w-1.060w)/1.060w=0.022.

[49] The subsidy in Danmark is based on the total prescription costs the individual has paid during the year – there is 0% subsidy for the first 500 DKK in expenses, then 50% subsidy once you have paid 500 DKK up to you have paid 1200 DKK, then 75% subsidy, and eventually 80% subsidy for expenses above 2800 DKK

Figure 5.12

Kinked schedule of payroll tax amount by regional tax zone. 2004-2006



Another common example is government unemployment insurance payments that are often dependent on the previous earnings, but do not exceed some maximum level and sometimes have also a minimum level. It is possible then to study how long people stay unemployed as a function of the amount of benefit they receive (cf. Landais (2015), who exploits the effects of both benefit level and potential duration on the unemployment spells in the US; or Card et al. (2015), who apply fuzzy RKD approach to study the effect of unemployment insurance benefits on the unemployment duration in Austria).

The main advantage of RKD method is that, in contrast to studies using regional or time variation in payroll taxation, the RK design holds market-level factors constant, such that we identify changes in the actual behavioral response, net of any market level factors that may change over time or across regions. The main disadvantage of this method, however, is that it is highly data demanding since we need to have enough observations around the kinks. Small samples would in general not exhibit enough statistical power to detect any effect in a RD design. That is why we apply it only to the individual data to study the wage growth effects of the payroll taxation in zones 2 and 4.

Formally the schedule of payroll tax amount paid by firm j in year t, S_{jt}, can be presented by the following formula:[50]

$$S_{jt} = \begin{cases} \tau_0 W_{jt} & if\ W_{jt} \le W^* \\ \tau_0 W^* + \tau_1 (W_{jt} - W^*) & if\ W_{jt} > W^* \end{cases}$$

or

[50] This formula is applicable only in our case when we restrict evaluation sample to the firms with employees from the same zone. Firms with employees from various zones applied different payroll tax rates and calculation of the tax amount for them is more complicated. This formula is also valid for all firms with similar restrictions from 2007 when the location of the firm and not employees became a key definition for the tax rate.

$$S_{jt} = \begin{cases} \tau_0 W_{jt} & if\ W_{jt} \leq W^* \\ \tau_1 W_{jt} - (\tau_1 - \tau_0) W^* & if\ W_{jt} > W^* \end{cases}, \quad (5)$$

where *W** is the wage costs threshold, τ_0 is the old payroll tax rate that yields also wage costs under threshold after 2004-reform and τ_1 is a new (higher) payroll tax rate that yields wage costs above threshold. Values for τ_0 and τ_1 are presented in Table 5.11.

We then follow a sharp RK design and estimate the following polynomial regression:

$$\mathrm{E}[y|\mathrm{W} = \mathrm{w}] = \mu_0 + \left[\sum_{p=1}^{P} \gamma_p (w-k)^p + \vartheta_p (w-k)^p \cdot D \right] \quad (6)$$

where |w-k|≤ h with *h* being a bandwidth size. W is the assignment variable (i.e. firm's wage costs) and D = 𝟙 [w ≥ k] is an indicator whether wage costs are above the kink threshold or not. Then ϑ_1 gives us the change in the slope of the conditional expectation function of the outcome given the assignment variable at the kink.

The causal impact of changes in the payroll tax rates can be then found by dividing the change in the slope for the outcome by the change in the slope for the treatment, where the former is estimated by equation (6) and the latter is deterministic and is described by equation (5) (cf. explanation in the Card et al. (2012)):

$$\hat{\alpha} = \frac{\widehat{\vartheta_1}}{\tau_1 - \tau_0} \quad (7)$$

Identification of effects by RKD relies on two assumptions. First, the direct marginal effect of the assignment variable on the outcome should be smooth. Second, density of the unobserved heterogeneity should evolve smoothly with the assignment variable at the kink. This local random assignment condition seems to be credible in the context of payroll taxation as given highly centralized wage bargaining and strong protection of employees in Norway it is hard for firms to perfectly manipulate their ex ante position in the schedule for what they are supposed to cut wages or fire employees. As we mentioned before, we believe that main response by the firms to the 2004-reform happened through adjustments of wage growth rates and not wages. We provide further an empirical evidence in support of the RKD assumptions.

First, we plot the probability density function of the assignment variable to detect potential manipulation of the assignment variable at the kink point. Figure 5.13 shows the number of spells observed in each bin of the firm wage costs normalized by the kink point in zone 2.[51] To test for discontinuity in the relationship between the number of spells and the assignment variable at the kink point we performed McCrary tests as is standard in the RDD literature. The estimate for the log change in height and its bootstrapped standard error are displayed directly on the graph and confirm that we cannot detect a lack of continuity at the kink.

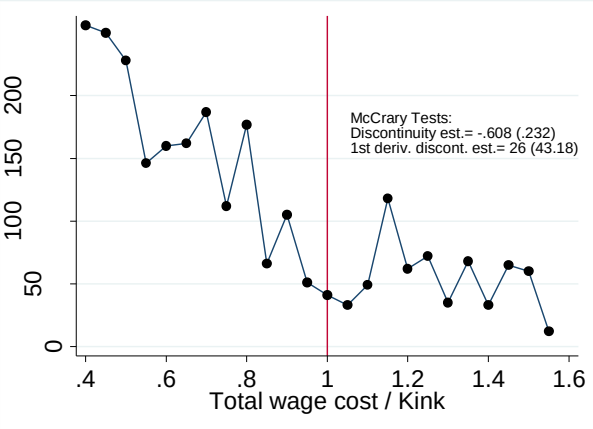
Following Landais (2015), we also extend the spirit of the McCrary test to test the assumption of continuity of the derivative of the p.d.f, as done in Card et al. (2012). This test supports the assumption of a

[51] The choice of the bin size (of 0.2) in our graphical analysis is done using both visual and formal tests of excess smoothing.

continuous derivative of the conditional density at the kink.[52]

Figure 5.13

The probability density function of the assignment variable for the schedule of payroll tax paid. Zone 2



Following discussion in Card et al. (2012) on what is a key testable implication of the smooth density assumption underlying a valid RK design, we test whether the conditional distributions of any pre-determined covariates evolve smoothly with the assignment variable around the kink point. This can be visually tested by plotting the mean values of covariates in each bin of the assignment variable. We have done this test for all individual characteristics, i.e. age, gender, education and immigrant status, and found that all covariates evolved smoothly at the kink point supporting identification assumptions of the RK design.[53]

The next key assumption of a valid RK design is that it is the change in the slope of the response variable. Figure 5.14 displays the relationship between the individual (log) hourly wage growth and the assignment variable normalized at the kink point of the payroll taxes schedule. We can observe a visible change in the slope of this relationship both for zone 2 and zone 4. This provides then supportive evidence for the identification of an effect of payroll tax paid by firms on the individual wage growth in the RK design.

Figure 5.14

Log hourly wage growth by assignment variable normalised at the kink point. Zones 2 and 4, one post-reform period 2004-2006

However, when we split the whole post-reform period 2004-2006 into three sub-periods for

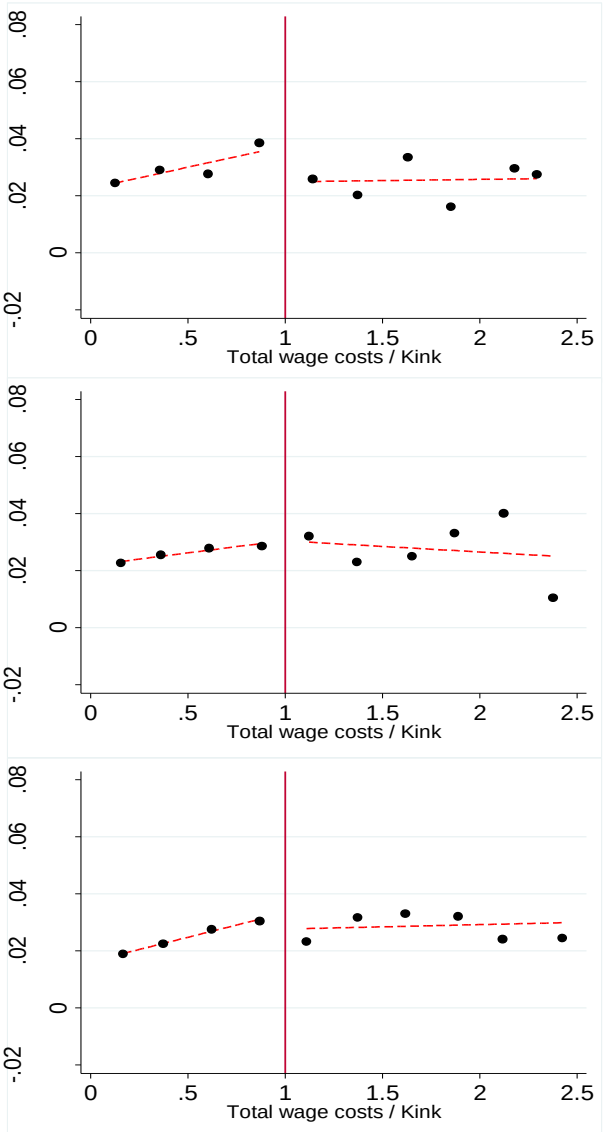
[52] The idea is to regress the number of observations N_i in each bin on polynomials of the average firm wage costs in each bin (centered at the kink) (w – k) and the interaction term (w – k) · 𝟙 [w ≥ k]. The coefficient on the interaction term for the first order polynomial (testing for a change in slope of the p.d.f) reported by Figure 5.13 is insignificant that supports our assumption.

[53] These graphs are not reported here but can be provided in the appendix.

observations in zone 4 and look at the relationship between the individual (log) hourly wage growth and the assignment variable normalized at the specific to each period kink point, the observed changes in the slopes are quite weak. Whether they are significant or not we will test in the regression estimations

Figure 5.15

Log hourly wage growth by assignment variable normalised at the kink point and sub-period. Zone 4, 2004-2006



While Table 5.15 shows the results of RKD estimation of the effects of payroll taxation on wage growth in zone 2 for the whole post 2004-reform period, Table 5.18 shows the corresponding results for the zone 4 in the three sub periods. In each column, that is based on different bandwidth size, we report the weighted average treatment effect $\hat{\alpha}$, calculated as in equation (7), the elasticity of the individual wage growth with respect to the firm labour costs, ε_w, the estimates of the preferred polynomial specification based on the Aikake Information Criterion (AIC) and number of observations (that is naturally increasing with the bandwidth size).

By use of the RKD inference we find that a smaller part of the increased total wage costs is shifted onto workers, i.e. that most of burden of payroll taxation resides with the employer. The degree of the shift varies dependent on the zone being in the range 4-17 pct. for firms in zone 2 and in the range 0.5-4 pct. for firms in zone 4. This result indicates that labour demand is less elastic in zone 4 (where the industry structure is most oriented on natural resources) and, hence, employers are less flexible to shift the burden on the employees. The degree of the shift in the case of the tax rate increase is also lower than in the case of tax rate decrease studied in the previous chapter (where 18-52 % of the incidence of the tax reduction resided with employees). This result indicates the asymmetric character of adjustments in these two cases.

Table 5.15

RKD estimates of the effect of payroll tax rates on wage growth in zone 2, 2004-2006

	(1)	(2)	(3)	(4)	(5)
Bandwith *h*	1000	2000	2500	3000	4000
$\hat{\alpha}$	-0.0189	-0.0056	-0.0098	-0.0045	-0.0013
	(0.0102)	(0.0026)	(0.0078)	(0.0161)	(0.0009)
ε_W	-0.1691	-0.0504	-0.0872	-0.0403	-0.0117
	(0.0908)	(0.0235)	(0.0696)	(0.1435)	(0.0081)
Opt. polyoder	1	1	2	3	1
No. obs	716	1903	2514	3200	4602

Notes: Wage growth is expressed by Δlog(hourly wages). $\hat{\alpha}$ is the RK estimate of the average treatment effect of firm effective payroll tax rate on the outcome. Robust standard errors for the estimates are in parentheses. ε_W is the elasticity of the individual wage growth with respect to the firm labour costs.

Table 5.16

RKD estimates of the effect of payroll tax rates on wage growth in zone 4 by sub period, 2004-2006

Period	(1)	(2)	(3)
Year	2004	2005	2006
Bandwith *h*	6000	4000	1000
$\hat{\alpha}$	-0.0043	-0.0014	-0.0163
	(0.0011)	(0.0007)	(0.0080)
ε_W	-0.0326	-0.0053	-0.0406
	(0.0083)	(0.0025)	(0.0200)
Opt. polyoder	1	1	2
No. obs	1880	1410	905

Notes: Wage growth is expressed by Δlog(hourly wages). $\hat{\alpha}$ is the RK estimate of the average treatment effect of firm effective payroll tax rate on the outcome. Robust standard errors for the estimates are in parentheses. εW is the elasticity of the individual wage growth with respect to the firm labour costs.

5.3 Estimating behavioural responses

A main question in the evaluation is whether reduced payroll tax has a significant effect on the beneficiaries' behaviour, where the desired effect is an increase in employment (assuming this will reduce or prevent depopulation). With the quasi-experimental approaches used in the previous two sections, we find evidence that ….

Our empirical approach in this section follows, to some extent, the line of thought in Johansen and Klette (1997) and Gavrilova, et al. (2015)[54]. These analyses both use a panel of manufacturing plants to study how payroll taxes affect wages and demand for labour. Gavrilova, et al. (2015) exploit the variation in changes of the payroll tax rates for manufacturing sectors in Norway to estimate the incidence of the payroll tax. Johansen and Klette (1997) exploit the regional differentiated payroll tax and a regional subsidy scheme for capital in Norway to study how payroll taxes and investment subsidies affect wages and demand for labour and capital (elasticity of substitution).

Gavrilova, et al. (2015) use a two-stage least squares procedure to estimate the labour demand elasticity, where changes in the payroll tax serves as an instrument for changes in the wage cost rate. Compared to a reduced-form equation where the payroll tax rate is regressed directly on labour demand, this approach distinguishes between whether no labour response is due to a labour demand elasticity of zero or that the tax incidence fully resides with the employees (Gavrilova, et al. 2015, 9).

Though we do not adopt the IV-approach, we do estimate the labour demand elasticity in to steps. Consider the following set of equations

$$N = N(W(1+t), X) \tag{5.1}$$

$$W = F((1+t), Z) \tag{5.2}$$

where W is a measure of real wages per hour, N is employment and labour cost per hour, WC, is defines as $W(1+t)$. X is a measure of product demand, set equal to value added, and Z is other factors typically included in wage bargaining models.

Taking the derivative of N w.r.t. $(1+t)$ we get

$$\frac{\partial N}{\partial (1+t)} = N_1 \left(\frac{\partial W}{\partial (1+t)} (1+t) + W \right) \tag{5.3}$$

which with some rearranging can be put in terms of elasticities

$$\underbrace{\frac{\partial N}{\partial (1+t)} \frac{(1+t)}{N}}_{El_{1+t}N} = \underbrace{N_1 \frac{WC}{N}}_{El_{WC}N \equiv \alpha_1} \left(\underbrace{\frac{\partial W}{\partial (1+t)} \frac{(1+t)}{W}}_{El_{1+t}W \equiv \beta_1} + 1 \right) \tag{5.4}$$

This allows us to first estimate the effect on wages of a change in the payroll tax. As shown in the stylised model in Section 3.5, the effect on labour demand is largest when wages paid to the employees are unaffected, i.e. when $El_{1+t}W = 0$. That is, the tax burden fully resides with the employer.

Given the extreme case where $El_{1+t}W = 0$, or at least $El_{1+t}W \neq 1$, we would expect the employers to change their behaviour, as a response to increased wage costs. Thus, with a β_1 significantly smaller than 1, there is reason to estimate the effect

[54] Working paper currently under revision.

on labour demand from a change in wage cost per hour.[55]

5.3.1 Sample and variable definitions

This part of the evaluation is mainly based on accounting data on firm level. Accounting data contains information on gross wages, payroll tax paid and total wage costs, as well as employment, value added and operating profit. Information on contracted hours is added by aggregating number of hours per worker from individual data. Observing hours worked, we can calculate both wage rate per hour paid to the employees and wage costs (incl. payroll tax) per hour.

When the payroll tax increases this may reduce the wage per worker both because employers may shift their tax burden on to the employees, and because the number of contracted hours may decrease. Thus, without information on hours worked, the estimate on the incidence (tax burden) could be biased (Gavrilova, et al. 2015, 3).

When the payroll tax rate was determined by the residence of the employees, each firm's effective tax rate was a weighted average of all employees' tax rate. We can derive an approximate effective tax rate for each firm from the accounting data.[56] However, we lose a significant number of observations using this variable and the quality of the necessary variables seems to be relatively poor in the first years of the sample.

Using the statutory payroll tax, we have limited our sample to firms with employees solely from the

Table 5.17
Summary statistics. Mean values. 2000-2014

	Mean	Std. Dev.	Min	Max	N
Panel A					
Gross Wage Rate[1]	266.2	105.1	78.0	898.5	633,189
Wage Cost Rate[1]	303.3	127.2	81.2	1,112.6	740,579
Statutory Payroll Tax	0.127	0.032	0	0.141	754,531
Effective Payroll Tax	0.126	0.035	0	0.216	634,659
Employees	9.1	16.8	0	1,636	754,333
Hours	13,304.8	25,405.8	1,294	1,378,093	754,542
Value added[2]	5.27	19,510.0	-9,271.0	5,562,5	732,190
Panel B					
Share of obs. by tax zone:					
Zone 1	79.5 pct.				599,889
Zone 1a[3]	2.5 pct.				18,610
Zone 2	5.8 pct.				43,453
Zone 3	1.9 pct.				14,440
Zone 4	7.0 pct.				53,445
Zone 4a[3]	1.3 pct.				9,658
Zone 5	2.0 pct.				15,047
No. of firms:	133,688				

1) Real wages (adjusted by CPI).
2) NOK million. Constant 2015-prices.
3) Introduced in 2007

[55] Though β_1 is our parameter of interest in the first equation, we also estimate the effect on wage costs per hour directly.

[56] It is an approximation because we are not able to fully split reported labour costs into cost liable to tax and not.

same tax zone as the firm is located to ensure we assign the appropriate tax rate to each firm. By the same reasoning we have dropped firms with several establishments in different tax zones and firms operating in the sectors excluded from the scheme (see Section 2.2.2).[57] We further exclude public and primary sector as in the estimations above (see Section 5.1.1).

We measure all monetary variables in 2015 prices, adjusting for inflation using the consumer price index (CPI).

The main variables included in the estimations are described in Table 5.17. We define the gross wage rate as the ratio between total gross wages to the employees and the sum of contracted hours among all employees at the firm, whereas the wage cost rate is the ration between total wage cost (incl. payroll tax) per hour.

Almost 80 pct. of the observations in the main sample are observations for firms located in Zone 1 (not included in the scheme). Firms in Zone 1 and Zone 5 do not face changes in the statutory payroll tax during the estimation period (see Section 2.3 for changes in tax rates and tax zones). However, they contribute to variation in tax rates across firms (see Section 5.3.3).

The gradual increase in statutory tax rates between 2004-2006 in Zone 2, 3 and 4, and the reversion in 2007 provides us with longitudinal variation. Concentrating on these changes we limit our sample in this part of the evaluation to 2003-2014.

5.3.2 Empirical framework

Our parameter of interest is the elasticity of demand for labour. To estimate the elasticity of labour demand some of the incidence of payroll taxation must reside with the employer (firm), otherwise there is little, or no, reason to expect behavioural responses at firm level. If (some of) the tax burden falls on the employers, through increased wage costs, they may demand less labour. If some of the tax burden falls on the employees, through reduced wages, workers may supply less labour. The total effect depends on how sensitive employers and employees are to changes in prices (demand and supply elasticities as discussed in Chapter 3).

As pointed out by Johansen and Klette (1997), identification of elasticities requires good price data. There are at least two fundamental problems whit existing price data. First, for some factors of production, prices can only be obtained at an aggregate level, and thus may not inhibit sufficient variation. Second, variation in prices across firms or over time may reflect differences in quality or other forms of heterogeneity, e.g. variation in mean hourly wage rates across firms may reveal little information about real cost differences if labour is not homogeneous. However, this difficulty can be overcome by using policy induced variation in factor prices (Johansen and Klette 1997, 5).

To estimate effects on wages of changes in the payroll tax rate, we follow the specification in Johansen and Klette (1997) and estimate the equation

$$\begin{aligned}\ln W_{jmst} = {} & \beta_1 \ln\left(1 + t_{jmst}\right) + \beta_2 \ln VAH_{jmst} \\ & + \beta_3 \ln AWR_{mst} + \alpha_{st} \\ & + \eta_j + \epsilon_{jmst}\end{aligned} \tag{5.5}$$

[57] Some sectoral restrictions are determined based on firm characteristics not available in our data.

where W is the gross wage per hour paid to workers in each firm, and t the payroll tax rate. To control for firm profitability, we include value added per hour, VAH. The alternative wage rate, AWR, is measured as mean wage in other firms in the same municipality and industry. We include time-fixed effects to account for wage and price growth. To control for sectoral shocks, like technological or preference shocks, we include industry-time fixed effects, α_{st}.

The parameter of interest is β_1, the incidence-parameter. We estimate the effect on both wage cost per hour (incl. payroll tax) and the wage per hour paid to the employees (excl. payroll tax). Estimating the effect on the latter, we can derive the elasticity of gross wage rate w.r.t. the payroll tax rate $(1+t)$, i.e. $El_{(1+t)}W$ in equation 5.4:

$$\frac{\partial \ln W}{\partial \ln(1+t)} = \beta_1$$

If firms bear some of the incidence of payroll taxation, we can estimate the labour demand elasticity w.r.t. labour cost with the equation

$$\begin{aligned} \ln N_{jmst} = {} & \alpha_1 \ln(W(1+t))_{jmst} \\ & + \alpha_2 \ln VA_{jmst} + \alpha_{st} + \eta_j \\ & + \epsilon_{jmst} \end{aligned} \qquad (5.6)$$

where N is firm employment and VA is total value added at firm level. Taking the derivative w.r.t. to $(1+t)$ we get

$$\begin{aligned} \frac{\partial \ln N}{\partial \ln(1+t)} &= \alpha_1 \frac{\partial \ln W}{\partial \ln(1+t)} + \alpha_1 \\ &= \alpha_1(\beta_1 + 1) := El_{(1+t)}N \end{aligned}$$

To test the robustness of our estimated demand elasticity we further consider a dynamic model, including lags of the dependent variable (employment)

$$\begin{aligned} \ln N_{jmst} = {} & \alpha_1 \ln WC_{\mathrm{jmst}} + \alpha_2 \ln N_{jmst-1} \\ & + \alpha_3 \ln N_{jmst-2} \\ & + \alpha_4 \ln N_{jmst-3} \\ & + \alpha_5 \ln VA_{jmst} \\ & + \alpha_6 \ln VA_{jmst-1} + \alpha_t \\ & + \epsilon_{jmst} \end{aligned} \qquad (5.7)$$

We apply a GMM estimator to obtain consistent estimates.[58]

5.3.3 Effects of the payroll tax on wages

First, we estimate the model in equation (5.5) on the pooled 2003-2014 cross section (see Table 5.18). Including time dummies, we find a strong and positive relationship between the payroll tax rate and both wages paid to employees and the wage cost per hour. We would expect a positive effect on wage cost, however not greater than 1. We do not expect a positive effect on gross wages to employees. Johansen and Klette (1997) mention three possible reasons for such a result: (i) heterogenous labour combined with higher education/training in central areas (with higher tax rate), (ii) local wage bargaining combined with higher profitability and alternative wages in central areas, (iii) endogenous policy: the payroll tax rate is low in areas with low income/wage levels (Johansen and Klette 1997, 7).

To control for labour heterogeneity across industries, we include interactions with time and industry dummies. This reduces the estimated coefficient somewhat for both wage measures, but it is still greater than 1 and still positive for wages paid to the employees.

[58] As suggested by Arellano and Bond (1991)

Table 5.18
Gross Wage Rate and Wage Costs per Hour. Effects of changes in payroll tax. Pooled OLS. 2003-2014

Panel A				
Log WRH	(1)	(2)	(3)	(4)
Log (1+SPT)	1.514***	1.156***	0.024	-0.369***
	(0.054)	(0.050)	(0.052)	(0.045)
Log AWR			0.443***	0.204***
			(0.013)	(0.009)
Log VAH[1]				0.397***
				(0.010)
Dummies	Year	Year x Industry	Year x Industry	Year x Industry
R-Sq.	0.080	0.190	0.275	0.530
Obs.	590,849	590,846	545,613	408,540
Panel B				
Log WCH	(1)	(2)	(3)	(4)
Log (1+SPT)	2.535***	2.156***	0.879***	0.454***
	(0.060)	(0.056)	(0.055)	(0.046)
Log AWR			0.485***	0.214***
			(0.014)	(0.009)
Log VAH[1]				0.440***
				(0.010)
Dummies	Year	Year x Industry	Year x Industry	Year x Industry
R-Sq.	0.118	0.225	0.314	0.589
Obs.	614,463	614,460	566,837	414,058

* p<0.10, ** p<0.05, *** p<0.01
Note: Estimates are weighted by total number of contracted hours per firm. Clustered standard errors at firm level in parentheses. WRH = Wage Rate per Hour, WCH = Wage Cost per Hour, SPT = Statutory Payroll Tax, AWR = Alternative Wage Rate, VAH = Value Added per Hour. Level of centrality is included as control in model (3) and (4).
1) Instrumented with the lagged value added per hour

We further control for the alternative wage rate and value added per hour. Including both these controls, our results suggest that some of the tax burden is shifted on to workers through reduced wages.

Controlling for other firm specifics, such as share of employees with higher education and share for foreign workers reduces the estimated effect on wages and increases the effect on wage cost. This may imply that we do not sufficiently correct for differences in labour heterogeneity and the endogeneity of the payroll tax rate (Johansen and Klette 1997).

Table 5.19
Gross Wage Rate and Wage Costs per Hour. Effects of changes in payroll tax. Pooled OLS, fixed effects and between effects. 2003-2014

Panel A			
Log WRH	Fixed Effects	Between Effects	Pooled OLS
Log (1+SPT)	-0.054	-0.495***	-0.369***
	(0.123)	(0.035)	(0.045)
Log AWR	0.011**	0.237***	0.204***
	(0.005)	(0.006)	(0.009)
Log VAH[1]	0.448***	0.377***	0.397***
	(0.019)	(0.002)	(0.010)
Dummies	Year x Industry	Year x Industry	Year x Industry
R-Sq.	0.113	0.488	0.530
Obs.	392,970	408,540	408,540
No. of groups	66,757	82,327	-
Panel B			
Log WCH	Fixed Effects	Between Effects	Pooled OLS
Log (1+SPT)	0.484***	0.335***	0.454***
	(0.123)	(0.036)	(0.046)
Log AWR	0.008**	0.241***	0.214***
	(0.004)	(0.006)	(0.009)
Log VAH[1]	0.466***	0.403***	0.440***
	(0.015)	(0.002)	(0.010)
Dummies	Year x Industry	Year x Industry	Year x Industry
R-Sq.	0.227	0.527	0.589
Obs.	398,341	414,058	414,058
No. of groups	67,165	82,882	-

* p<0.10, ** p<0.05, *** p<0.01
Note: Estimates are weighted by total number of contracted hours per firm. Clustered standard errors at firm level in parentheses. WRH = Wage Rate per Hour, WCH = Wage Cost per Hour, SPT = Statutory Payroll Tax, AWR = Alternative Wage Rate, VAH = Value Added per Hour. Level of centrality is included as control in model (3) and (4).
1) Instrumented with the lagged value added per hour

Next, we estimate the wage regression in (5.5) with fixed effects, exploiting any longitudinal variation in the data. We also report the results from estimating the same specification using between variation

(between effects). Comparing results from the pooled OLS, fixed effects and between effects it is apparent that our results, at least on wages paid to employees, are sensitive to estimation method. Further, it seems that the significant effect on wages paid to employees in the pooled OLS stems from the between variation in the data.

The estimated effect of wage costs per hour seems to be relatively robust to method of estimation. Assuming the tax incidence must sum up to 1 by definition, we would interpret an estimated effect on wage cost per hour significantly different from 1, as evidence of some shifting of tax burden on to the employees. Estimating the effect on wage cost per hour using GMM with included lagged dependent variable, we get a point estimate of 0.905 and not significantly different from 1. However, the Hansen p-value implies that this estimate is unreliable.

Using fixed effects, the results are solely driven by firms located in Zone 1a to Zone 4, due to lack of variation in the statutory tax rate in Zone 1 and Zone 5.

The presence of significant effects on gross wages when exploiting cross section variation in data and lack of effects only using longitudinal variations may be interpreted as support of zero effect on wages in short-term analysis (see Section 3.5). Changes in tax rates for firms in Zone 2-3 in the period 2004-2006 were small in magnitude and only temporary, whereas tax rates vary from 0 to 14.1 pct. across firms in the sample and throughout the entire estimation period.

5.3.4 Effects of wage costs on employment

Regardless of specification and method, we find that some, or most, of the incidence of payroll taxation resides with the employers (firms). Thus, in this section we proceed to the next step in the framework presented above and estimate the elasticity for labour demand. We measure labour demand at firm level as number of employees and total number of contracted hours per firm.

Estimating the conditional demand of labour using fixed effects we find an elasticity of labour demand of -0.652 when number of employees is the dependent variable and -0.950 estimating the effect on number of hours.

Table 5.20
Elasticity of labour demand. Fixed effects and between effects. 2003-2014

	Log N FE	Log N BE	Log HRS FE	Log HRS BE
Log WCH	-0.652***	-0.976***	-0.950***	-0.986***
	(0.005)	(0.006)	(0.005)	(0.005)
Log VA[1]	0.829***	0.864***	0.936***	0.887***
	(0.008)	(0.002)	(0.008)	(0.001)
Dummies	Year x Industry	Year x Industry	Year x Industry	Year x Industry
R-Sq.				
Obs.	431,833	447,758	431,835	447,761
No. of groups	71,511	87,436	71,511	87,437

* p<0.10, ** p<0.05, *** p<0.01

Note: Clustered standard errors at firm level in parentheses. WCH = Wage Cost per Hour, VA = Value Added, N = Number of employees, HRS = Contracted Hours

1) Instrumented with the lagged value added

Using wage cost per hour as our independent variable of interest, we do no longer lack longitudinal variation in Zone 1 and 5. However, we also report the results from estimations exploiting the cross-sectional variation with between effects. The estimated elasticity increases somewhat when estimating the effect on number of employees but almost unchanged when using number of hours as the dependent variable.

Table 5.21
Elasticity of labour demand. GMM. 2003-2014

	Log N	Log HRS
Log WCH	-0.389***	-0.350***
	(0.066)	(0.064)
Log VA_t	0.037	0.210***
	(0.066)	(0.025)
Log VA_{t-1}	0.100***	0.066***
	(0.016)	(0.015)
Log N_{t-1}	0.602***	
	(0.023)	
Log N_{t-2}	0.030***	
	(0.004)	
Log N_{t-3}	0.014***	
	(0.003)	
Log HRS_{t-1}		0.518***
		(0.034)
Log HRS_{t-2}		-0.009**
		(0.004)
Log HRS_{t-3}		0.021***
		(0.003)
Dummies	Year	Year
Obs.	220,268	220,383
No. of groups	50,153	50,162
Hansen p-value	0.130	0.008
No. of instruments	38	38
AR (1)	0.00	0.00
AR (2)	0.00	0.00
AR (3)	0.01	0.756

* p<0.10, ** p<0.05, *** p<0.01

Note: Robust standard errors at firm level in parentheses. The GMM estimates are all two step. WCH = Wage Cost per Hour, VA = Value Added, N = Number of employees, HRS = Contracted Hours. Estimated using xtabond2 (Roodman 2009)

Including lagged employment and estimating the demand elasticity using a GMM estimator, it seems that we should rely more on the specification with number of employees as our dependent variable.

The coefficient estimates from the specification with number of employees as the dependent variable suggest a long-run elasticity of -1.102.[59]

5.3.5 Effects of the payroll tax on labour demand

Considering the payroll tax, t, is a rate, we convert $El_{(1+t)}N$ to a semi-elasticity. That is, with some re-writing of the expression derived above, we get

$$\frac{\Delta N}{N} = \alpha_1(\beta_1 + 1)\frac{1}{(1+t)}\Delta t$$

With this expression we can calculate the percentage change in labour from a one percentage point change in the payroll tax rate in each tax zone.

Table 5.22
Effects on labour demand from a one percentage point *reduction* in the tax rate

Tax zone	Mean tax rate[1]	Fixed Effects[2]	Between Effects
Zone 1	0.141		
Zone 1a	0.107	0.589	
Zone 2	0.106	0.560	
Zone 3	0.065	0.612	
Zone 4	0.052	0.620	
Zone 4a	0.079	0.604	
Zone 5	0.000		

1) Inserted as initial value for the payroll tax rate

2) Assuming the tax incidence fully resides with the employer as our estimated effect on gross wages is insignificantly different from zero (i.e. $\beta_1 = 0$). The point estimate on the labour demand elasticity used here is -0.652 (see Table 5.15).

…

[59] -0.389/(1-0.602-0.030-0.014)

6 The dynamics of regional population growth

The question of whether people follow jobs, or jobs follow people have been widely discussed within regional science for the last fifty years. The direction of causality has important policy implications.

A wide range of studies have analysed the interdependent processes of population and employment growth. Studies suggest that population and employment are subject to a dynamic adjustment process and are jointly determined. However, the empirical results are ambiguous.

Aggregate studies support the hypothesis that people follow jobs. Evidence is found in both the US as well as the Nordic countries when looking across subgroups of people and jobs. However, the literature has produced mixed evidence of the direction of causality for subgroups of people. The main lesson is that there is a strong bidirectional causality between jobs and population growth for subgroups. The results vary between educational level, time periods, countries and types of jobs.

Despite varying evidence from the literature, aggregated studies suggest that stimulating job creation in the least populated regions of Norway will contribute to reducing, or preventing, depopulation in the eligible regions.

6.1 The RDSSC stimulate population growth through employment

The objective of the regionally differentiated social security contributions (RDSSC) is to reduce or prevent depopulation in the most sparsely populated regions in Norway by stimulating employment. By stimulating the demand for employment through reduced rate of social security contributions (payroll tax) there is an underlying assumption that it will affect employment, and in turn stimulate population growth in the region.

Discussions and empirical evidence in the previous chapters show that RDCCS to a certain extent contributes to higher employment in reduced tax zones than would otherwise have been the case.

Considering that the schemes goal is to stimulate population in the least populated parts of Norway, clarifying the potential effects of employment growth on population growth is key. This brings us directly into one of the most fundamental discussions within regional science the last fifty or so years. The question of whether people follow jobs, or jobs follow people? In the case of the former, we can say that RDSSC reduce or prevent depopulation in the most sparsely populated regions of Norway. In the case of the latter, there is a more ambiguous rationale for the scheme, and alternative measures may turn out to be more effective.

Chapter 5 studied and discussed the effect the scheme has on employment. The pitfalls and considerable challenges in estimating these effects are discussed in detail. While employment is directly influenced by the payroll tax rate through the price on labour, multiple factors can affect the population growth in the regions, i.e. different demographic factors such as birth- and death-rates, immigration and emigration, civil status, etc. All these factors must be taken into account to extract an effect of the payroll taxation. We are not able to do that in the scope of this project, but the following sections discuss the literature on regional population growth in more detail.

6.2 Urbanization, productivity and regional development

Urbanization (population growth in cities and their surrounding suburbs) and productivity (both employment per se and output per worker) are closely linked. The Productivity Commission discuss these

mechanisms in a Norwegian context in NOU 2015:1, *«Productivity – Underpinning Growth and Welfate».* The following paragraphs are inspired by the discussion presented by the Productivity Commission.

The underlying processes of urbanization is key in understanding the existence and emergence of cities and other densely populated urban areas as well as understanding population growth in less populated areas. The process of urbanization in Norway diverges somewhat from our neighbouring countries during the 20th century, cf. Figure 6.1. Norway lags the share of population in urban settlements and has the lowest share today compared to the other Nordic countries.

Nevertheless, almost nine out of ten Norwegians now live in urban settlements. Almost all Norwegian population growth since 1966 has come in our medium or large urban settlements. About 70 per cent of the population growth can be contributed to the four largest towns (Oslo, Bergen, Stavanger/Sandnes and Trondheim). Their share of population growth is higher than their share of the employment growth.

The urbanization process can best be understood by discussing agglomeration effects, which is also fundamental to understand why cities exist (Duranton og Puga 2013). The emergence and growth of cities can be explained by density and variation of types of people facilitate learning and collaboration (Glaeser, Kallal, et al. 1992). Collaboration and learning stimulate innovation, knowledge spill-over and the acquiring of knowledge, and hence gives cities and large urban settlements economies of scale through larger markets, more suppliers of goods and services and a wider range of services and infrastructure for their population. Access to amenities and public goods increase as more people can share investments. Finding a suitable business partner or hiring the right employee is easier when you have access to a large labour-market. A large labour-region will also reduce the risk of not finding a suitable job as an employee (Puga 2010).

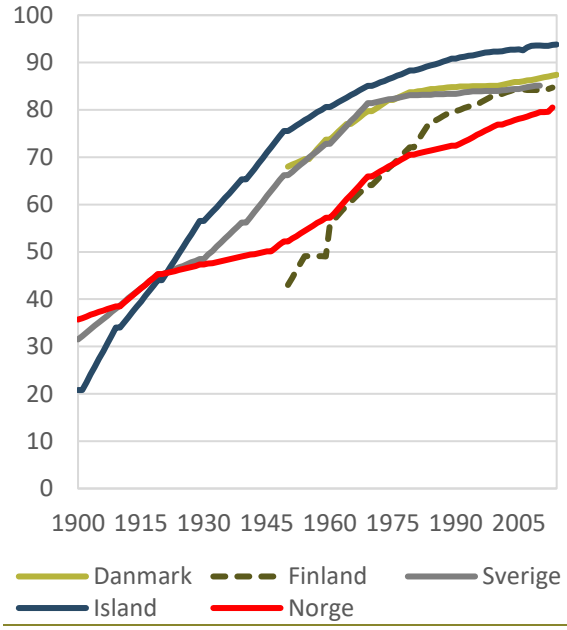
Technological change, higher quality infrastructure and communications facilitate increasing specialization within the traditional industries (NOU 2015: 1 2015). This leads to a concentration of headquarters and other administrative functions in cities, whereas production is located in areas where land is less expensive and access to natural resources are better.

Location of the administrative functions within cities leads to increased demand for supporting services such as accounting, legal advisors, marketing and other consultancy services, which in turn leads to a higher density of people with higher education.

The literature suggests a strong correlation between educational level, wage level and population growth. People with high levels of education usually have high income, which in turn indicates high productivity, at least in the private sector (NOU 2015: 1 2015). High density of people with high educational levels leads to high productivity and wage levels in (large) cities (Rattsø 2014).

Figure 6.1

Percentage of the population in Nordic countries living in densely populated areas. Percentage share, 1900-2014



Source: Statistics Norway, Statistics Iceland, Statistics Sweden, Statistics Finland and UN

Two main explanations for the high density of people with high educational level in cities are usually given. On the one hand people with high education value the amenities and services provided in the cities. Knowledge-based jobs will need to follow. On the other hand, knowledge-based firms seek opportunities in larger cities due to the existence of a large labour-pool as well as the existence of the same type of businesses. People with high educational levels want to move to these cities to seek interesting work opportunities (Rattsø 2014).

The correlation between highly educated people and urbanization (migration) have led to regional scientists argue that in order to facilitate regional growth, you need to attract people with high educational levels. This group of people generally have higher income than those with low educational levels, which implies that their demand for local goods and services are generally higher **Ugyldig kilde er angitt.**.

There are, however, reasons to believe that these empirical results in a lesser degree apply to Norway than the US. Several cities are in real competition of people and jobs in the US. This is not the case in Norway, which only have one large city (Oslo, ref. (NOU 2015: 1 2015)).

Regions with many and high-quality amenities show the highest rates of population growth (Duranton og Puga 2013). Glaeser et. al. (2000) find that city growth is stimulated by geographical factors such as the number of sunny days, localization near the coastline and by a range of available goods and services such as restaurants, culture and schools as well as low crime rates.

Results from Shapiro **Ugyldig kilde er angitt.** support the importance of amenities, and that people with high levels of education stimulate growth in demand for consumer services, which in turn makes a region attractive for potential migrants.

There is a positive effect on population growth by increasing the quality of municipal services such as schools, kindergartens and cultural activities. Investments in infrastructure, housing development and beautiful and functional public spaces are shown to affect the attractiveness of a region (Isdahl 2012).

Short distances trough effective infrastructure to work and other daily services minimize time used on transportation both by adults and children. One strategy for regional development are presented by Glaeser et. al. (2000) and Glaeser and Saiz (2003) is to attract people with high levels of education through the development of safe living

environments in cities with effective means of transportation.

The importance of amenities and infrastructure as well as municipal services are clearly some of several potential ways to stimulate population growth. However, there are no unambiguous answer to whether the effect on population growth is strongest by stimulating amenities and other municipal services to attract people with high education, or if the same effects can be obtained through pinpointed measures to facilitate jobs per se, or knowledge-based jobs more specifically.

All the mechanisms discussed above explanation why urban regions in general growth faster than rural regions.

Citites and urban settlements are also growing in part on the expense of the most rural parts of Norway, as in other countries. However, Norwegian regional policy aims to slow this development by implementing various measures to stimulate population growth in their least populated areas. RDSSC is one example of measures aimed at stimulating population growth or reduce depopulation. Regional policy may be the main reason why Norway has a lower share of its population located in urban settlements compared to the other Nordic countries, and especially Sweden. In this case one can argue that the weaker urbanisation process in Norway than other Nordic countries in itself indicate an effect of regional policy measures such as RDSSC.

Norwegian regional policy consists of a wide range of measures, some of which stimulate attractiveness of the least populated regions and some which stimulate job growth. One example is RDSSC. Stimulating migration to the least populated areas of Norway through regional employment growth assumes that job growth in turn attracts more people. The causality is however debated. Below we highlight important results from this debate in regional science.

6.3 Regional growth: A question about demand or supply

Regional science and urban researchers have for the last fifty years been discussing the fundamental causes of regional growth processes. One central question relates to whether people follow jobs, or jobs follow people. This is a chicken-or-egg question, i.e., which one comes first, demand or supply of labour? Does population growth stimulate the growth of employment (jobs), or does employment growth in a region attract people and hence population growth?

In the context of this evaluation of RDSSC, does the creation of jobs in the least populated regions of Norway make net migration more attractive to these regions, or are the population growth (or depopulation) determined by other non-economic factors such as regional amenities or social networks?

Early studies of this question are the works of Borts and Stein (1964), Lowry (1966) and Muth (1971). Since then a wide range of studies have been conducted. A meta-analysis of studies using regional and dynamic adjustment models, as presented by Carlino and Mills (1987), are given in Hoogstra et. al. (2005) and a quality review of the literature can be found in Bollinger and Ihlanfeldt (2001) and Sohn and Hewings (2000). The literature has produced mixed results.

The traditional view is that people follow jobs. People move to regions where they have access to income through interesting work opportunities. Theories supporting demand-driven employment argue that employment is exogenously determined and

consequently determines population growth and migration. Population follow jobs as the region become more economically attractive, i.e., people migrate to regions where job opportunities exist. Regions which can generate employment growth will become more attractive to more people.

In the case of Norway, one can assume that increased employment in the least populated regions will prevent, at least some, people from migrating to more urban regions. The actual, or more realistic, effect of stimulating employment is not necessarily increased population, but reduced depopulation.

The early literature on demand-driven theories was based on export-based theory of regional growth, which states that differential rates of population growth are induced by differential growth in job opportunities or actual employment (Tervo 2017).

Access to job opportunities are also a key finding when studying motives among Norwegians to move or to not move (Sørlie, Aure and Langset, Hvorfor flytte? Hvorfor blir boende? Bo- og flyttemotiver de første årene på 2000-tallet 2012). However, a wide range of arguments is part of the individual decisions about moving or staying, and the individual preferences change over the life-span. Other preferences and considerations are decisive after securing the work-situation. When access to interesting work opportunities exist for the individual itself, and possible partner, other factors such as access to family and friends or other urban or rural amenities will become decisive in the decision on moving or staying.

This result supports the people follow jobs argument. However, it illustrates how complex the relationship between population and employment growth is. In addition to the beforementioned arguments, societal trends such as urbanization and personal preferences play key roles in the migration processes.

Although the arguments supporting the people follow jobs hypothesis are solid, there is a growing literature which support the opposite, i.e., jobs follow people. Borts and Stein (1964) was one of the early advocates stressing the importance of labour supply in stimulating population growth. Supply-driven growth gained traction in the field of regional science following Richard Florida's book "*The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*" from 2004.

An increasing amount of research suggests that amenities, entertainment and lifestyle considerations are important elements of the ability for cities to attract people and firms (Florida 2002, Glaeser, Kolko and Saiz, Consumer City 2000, Lloyd, Digital bohemia: New media enterprises in Chicago's Wicker Park 2001, Lloyd and Clark, The city as an entertainment machine 2001, Florida, The rise of the creative class and how it's transforming leisure, community and everyday life 2002).

Increased population growth makes the region more attractive to firms. The increased attractiveness to firms can be split in two: firstly, the growing region represents an increasing pool of potential workers, and especially specialists with higher education. Secondly, a growing population represents a market for firms, and especially firms which supply services to the population such as wholesale, services and construction. There may also be a multiplier working in the way that growth in knowledge-based companies give larger marked for services of different kind.

There are also reasons to believe that population and employment are subject to a dynamic adjustment process and are jointly determined

(Carruthers og Mulligan 2008). When regions experience population growth, income will most likely rise and in turn increase demand for local goods and services. The increased demand will affect production, and hence demand for employees. This circular causation is also a main finding in many studies both at the aggregate and more detailed level as we will discuss in more detail below.

The answer to the direction of causation, and to the relative magnitudes of the bidirectional causation, will have important policy implications.

In the case when people follow jobs, policies should target the demand for labour, i.e., the creation of jobs. The RDSSC is relevant in this case, as it stimulates employment.

When jobs follow people, policies should target people through stimulating investments in regional amenities or direct economic aid to households such as reduced income tax, higher tax deduction, child allowances or other individual benefits.

In a situation where causality runs both ways, the relative magnitudes of the feedback become important in the design of efficient policies and mix of policy instruments. The real issue is which effect is stronger, and not which way the causality runs (Massey 1990).

6.4 Mixed evidence from the literature

Since the early works of Borts and Stein (1964), Lowry (1966) and Muth (1971), studies using regional adjustment models has become the go-to research design after the work presented in Carlino and Mills (1987).

A wide range of studies have analysed the interdependent processes of population and employment growth. Studies suggest that population and employment are subject to a dynamic adjustment process and are jointly determined, however, the empirical results have produced mixed and rather unclear conclusions (de Graaf, van Oort og Florax 2012, Hoogstra, Florax and van Dijk 2005, Carruthers og Mulligan 2008)).
A meta-analysis of empirical results support that jobs follow people, even though the findings in the literature show large variation and there is no clear answer to the direction of causality (Hoogstra, Florax and van Dijk 2005). The following sections will discuss the varying results in more detail.

6.4.1 Aggregate results suggest that people follow jobs

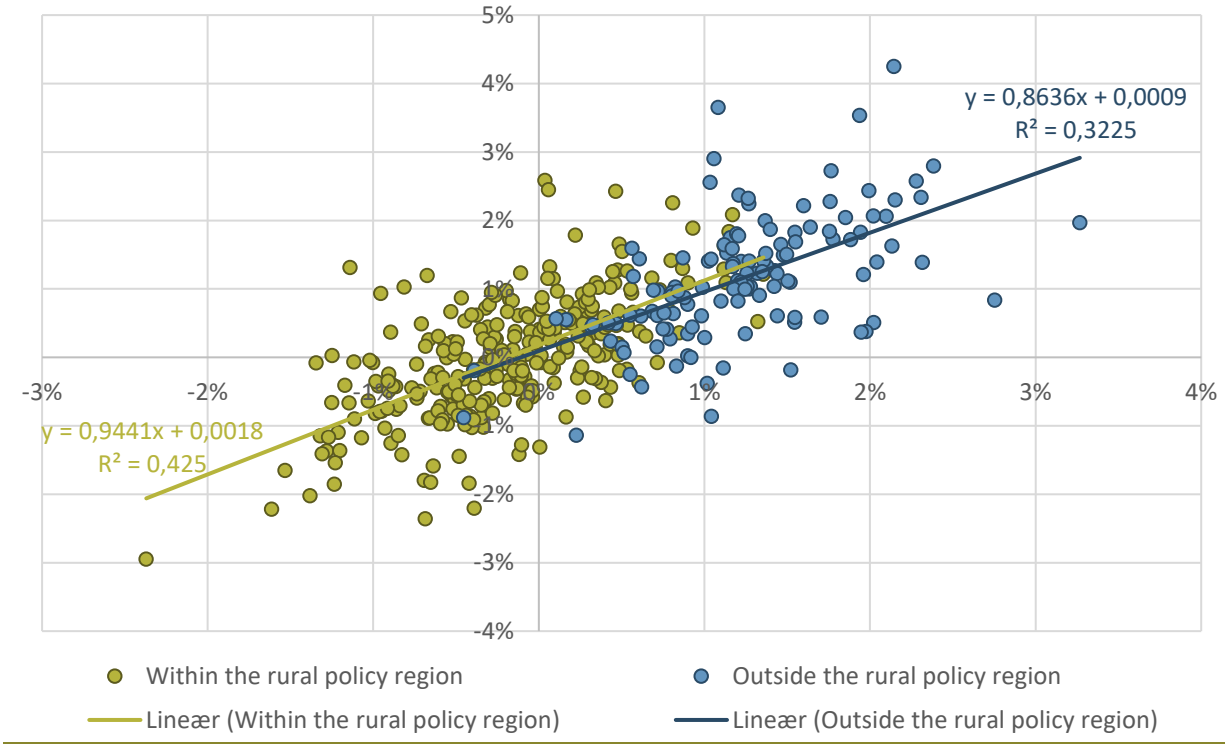
Aggregate studies of the relationship between population and employment growth support the hypothesis that *people follow jobs*. Evidence is found both in studies of the US and the Nordic countries when looking across subgroups of people and jobs (Østbye, et al. 2017, Tervo 2017, Mulligan, Vias og Glavac 1999). Studies of Norwegians' arguments in their decisions to move or not to move supports the hypothesis that access to relevant and interesting jobs is a decisive factor (Sørlie, Aure and Langset, Hvorfor flytte? Hvorfor blir boende? Bo- og flyttemotiver de første årene på 2000-tallet 2012).

Looking in to data of population growth and employment in Norwegian municipalities show that there is positive correlation between growth in population and employment in Norwegian counties the last 16 years, as shown in **Feil! Fant ikke referansekilden.**. Municipalities with positive population also experience positive employment growth. This is the case for all municipalities, inside and outside the rural policy region. The regional policy region consists of the municipalities with particular challenges regarding population and employment growth, and hence are eligible for various rural policy measures.

However, the statistical correlation is not that high at 0.42 (0.32) within (outside) the rural policy region, which implies that about one third of the variation in employment is explained by population growth and vice versa. There are, however, not possible to identify a causal direction with such correlation co-efficients. The relationship is not particularly strong either, as we would expect a correlation coefficient close to one.

Figure 6.2

Population (y-axis) and employment (x-axis). Annual growth rates, 2000-2016. Employed persons by place of work

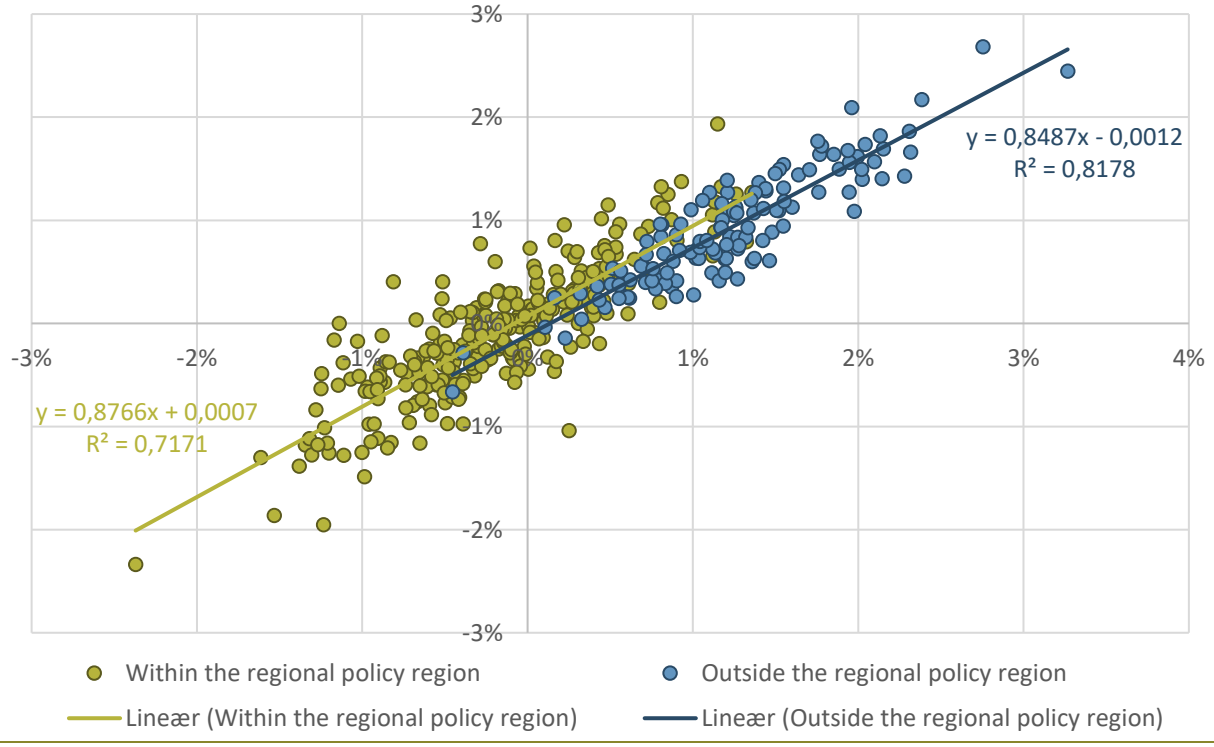


Source: Statistics Norway

Note: The rural policy region

Figure 6.3

Population (y-axis) and employment (x-axis). Annual growth rates, 2000-2016. Employed persons by place of residence



Source: Statistics Norway

The low correlation coefficient between population growth and employment measured by place of residence can in part be explained by commuting. When allowing commuting between municipalities, by studying employment by place of work, the correlation coefficient is significantly higher. The correlation between population growth and employment growth is 0.88 (0.85) within (outside) the rural policy region as shown in Figure 6.3.

Access to interesting work opportunities is an important part in the decision about moving or not moving. However, access to interesting work opportunities are not restricted to the county administrative borders.

Correlations such as the ones shown above does not contribute to answering the question of whether jobs follow people or people follow jobs. It does, however, underline the importance of job opportunities for migration and regional development.

Population and employment groups are also strongly correlated, supporting the hypothesis that people follow job opportunities. Adding the results from studies of Norwegians' arguments for moving and not moving, there are even more evidence in aggregated studies supporting the hypothesis that people follow jobs.

6.4.2 Ambiguous results in detailed research

The literature cannot conclude about the direction of causality when it comes to subgroups with different kinds of education or skills. As presented and discussed by the likes of Moretti (2010), generating jobs in local economies attract additional jobs through increased demand for local goods and services. The multiplicative effect by one additional job will depend on the types of job and the educational, and hence income, of the created jobs. This will affect the total effect of measures such as RDSSC depending on which industries increase their demand and what kinds of people they demand. It can also explain the varying results produced in the literature about the direction of causality in the question of whether jobs follow people or people follow jobs. Using aggregate data in such studies might conceal the existence of different patterns among subgroups (jobs or people) (Østbye, et al. 2017).

Recent evidence based on data for the Nordic countries support the hypothesis that people follow jobs at an aggregate level (Østbye, et al. 2017, Sörensson 2012). Tervo (2016) and Østbye et. al. (2017) find no reverse causality, but Sörensson (2012) does.

Tervo (2016) and Østbye et. al. (2017) studies more detailed data, differentiating between educational level, time-periods (just Tervo, 2016) and industry (just Østbye et. al., 2012). Both studies suggest that jobs follow highly educated people.

The study of Finland by Tervo (2016) also finds temporal variations during the study period of 1990-2010 due to economic fluctuations. People did not follow jobs, nor did jobs follow people during the deep recession in the early 1990s (Tervo, 2016). Furthermore, the study suggests that the regional growth in the city regions of Finland were supply driven, which is in line with the theories presented by such as Glaeser et. al. (2000).

Following the results from Finland, the author suggest that major city centres offer amenities that particularly attract highly educated people. Jobs follow highly educated people, while less educated people follow jobs. Ultimately, population and employment growth drive one another (Tervo, 2016). As suggested by the author himself, his result is in line with other studies of complex regional growth processes, and that they may take different forms in difference

economic environments. Rather than a clear answer to the question of whether people follow jobs, or jobs follow people, Tervo (2016) stresses the fact that the answer may be multifaceted and dependent on time period and the development level of the economy. Hence, policy recommendations are troublesome.

Østbye et. al. (2017) supports the findings in Tervo (2016), even though they add another dimension by allowing between-sector dynamics in addition to highly and less educated people. The study divides the economy into two sectors in line with Florida (2002), i.e., creative class jobs and other jobs.[60] Highly educated people are assumed to have creative class jobs, less educated people are assumed to have other jobs. In the three Nordic countries of Norway, Finland and Sweden, data suggest that there is a development towards lower (higher) equilibrium density of highly educated people in regions with low (high) density of other jobs (Østbye et. al., 2017).

The results suggest that people and jobs relocate in response to property prices. Evidence also suggest that there is a strong bidirectional causality between jobs in the two sectors. Creative class jobs (typically found in wholesale, health sector and education) follow other jobs (typically industry), and vice versa (Østbye et. al., 2017). The authors launch the hypothesis that land-intensive 'main jobs' (traditional industry) does not follow creative class jobs.

Furthermore, Østbye et. al. (2017), stresses the importance of the endogenous processes in which will reinforce the initial stimulus through local demand for goods and services between firms and consumption from increased income to the population. Depending on the industry composition in the regions in which receives the initial stimulus, the endogenous processes will create additional demand and employment as suggested by Moretti (2010). One additional employee in export-oriented industries will have a larger effect on local demand for goods and services than one additional employee in local services because of his or hers assumed higher income.

Studies of the Nordic countries allowing for between-sector and -people dynamics points towards a strong bidirectional causality between people and employment growth. Still, these studies indicate that job creation in non-service industries may be followed by jobs in services, which again may start an endogenous job-people-job processes.

6.5 Complex results call for complex policy measures

Evidence from aggregate studies support the hypothesis that people follow jobs. The hypothesis is also supported in studies of Norwegians' decisions about moving or not moving. Hence, there are reasons to believe that stimulating job creation in the least populated regions of Norway will reduce depopulation in these regions.

Ambiguous evidence follows from detailed studies of the relationship between population and employment growth. The results vary between educational level, time periods, countries and types of jobs. The endogenous processes between population and employment growth is therefore not fully understood.

[60] Creative class jobs are defined by occupational nomenclature (ISCO-codes), and include the likes of physicists, mathematicians, statisticians, architects, engineers, nursing and midwifery professionals and so on. See an example of how creative class jobs are defined in Boschma and Fritsch (2009) and Østbye et. al. (2017).

The complex relationships, and the fact that the two determinants are mutually dependent, calls for multiple measures targeted towards various reasons for depopulation in rural regions. The RDSSC, which is a broad and industry-neutral measure, fits the aggregate results, but may have little effect on population development in areas where depopulation is due to few or weak amenities.

7 Alternative measures

Norwegian rural and regional policy covers a wide range of direct and indirect measures. RDSSC is by far one of the largest measures (followed by the municipal funding).

In this section we have discussed various alternative measures. The aim is to not lay out a plan for a phase-out of the RGCCS-scheme, but to discuss what alternative schemes can be used to achieve the same aim as RGCCS. We also discuss if it is reasonable to assume that the cost effectiveness of alternative instruments are the same or better than the RGCCS, given that they shall reach the same aim.

Both capital subsidies, research aid and infrastructure investments are important measures within the Norwegian economic development policy. Economic theory and empirical studies however show that the measures effects on rural employment (and habitation) is highly uncertain and possible even negative.

Such measures are more administrative burdensome, and we must assume a declining marginal return of such measures if the best projects are realized first.

Replacing RDSSC-funds with capital subsidies, research aid or transport infrastructure projects in rural areas does not stand out as suitable alternatives.

If the primary goal is to ensure rural employment (and habitation) transfering all RDSSC funds to municipal authorities, increasing public employment and spending in rural areas seem like an effective alternative.

7.1 Alternative measures to the RDSSC may produce similar effects

The previous chapters find some positive effects on employment of the regionally differentiated social security contributions (RDSSC). Such positive effects may be regarded as reduced depopulation in zones with differentiated payroll tax compared to a situation where there is no differentiation.

The scheme does seem to have the intended effect on employment, at least in parts of the economy, and the literature supports the hypothesis that job creation will stimulate population growth (chapter 6)

We discuss, in theory, alternative measures relevant to reach the same goal as the RDSSC – reduced depopulation in the least populated regions of Norway. The discussion will consider measures which reach the population-goal more effectively or in less distortive ways.

The following sections will present an alternative future where the RDSSC-funding as it is of 2016 is channelled through alternative measures. We will not go into detail about how such an exchange can be carried out, but solely focus on a future where the funding is moved to the alternative measures.

7.2 The single largest rural policy measure

Preservation of the existing settlement pattern has been an explicit objective for Norwegian rural and regional policy (in the following just rural policy) since the 1970s. The Report to the Storting (white paper) on urban sustainability and strength is published annually (see Meld. St. 18 (2017) for the latest version). The aim of the rural policy has gradually shifted from preserving the existing settlement pattern towards “(a)ll citizens in Norway are to have equal living conditions, wherever they live” (Meld.

St. 18 (2016-2017) 2017). The RDSSC was designed under the former objectives of the rural policy.

The rural policy includes direct measures in addition to a strong commitment to equitable public infrastructure and services (OECD 2008).

Direct measures cover both subsidies and financial support for firms, business networks, individuals and local communities as well as non-economic measures such as the localisation of state and government jobs throughout the country. Indirect industry regulations and environmental regulations, such as the regulations of the petroleum sector, fishery and agriculture, affect rural and regional development as well.

Before assessing alternative measures to the RDSSC it is useful to compare the monetary size of the RDSSC with other related economic measures.

The rural policy is divided into two parts: the "narrow" and the "wide". The term "narrow" rural policy[61] covers measures administrated by the Ministry of Local Government and Modernisation[62] aimed at preserving the existing settlement pattern. In the national budget for 2018 these measures totalled 1,4 billion NOK.

Most of the funds are allocated to the county-level. Counties fund regional industry development measures through the likes of Innovation Norway and SIVA (introduced below) or by funding municipal industrial funds. In addition, counties fund local development projects where municipalities apply with relevant projects.

The term "wide" rural policy[63] covers other rural policy measures. These policies cover policies administrated by various ministries with the aim to compensate for rural disadvantages. The measures can be categorized as fiscal measures (such as the RDSSC scheme), industry measures (such as grants for production of agricultural products, grants to the forestry industry), infrastructure (grants for providing internet, transport and road safety measures) and other measures (covering support for culture, environment and upbringing).

In the fiscal budget for 2018, measures defined under the wide rural policy are estimated to a total of 41 billion Norwegian kroner (Ministry of Local Government and Modernisation, 2018). However, the amount does not cover national measures with rural and regional implications, such as investments in, or grants for, infrastructure, education, defence, health, research and innovation or labour market.

Another important group of measures in the wide regional policy is those governed by public funding agencies such as Innovation Norway (IN), The Research Council of Norway (RCN), Siva and GIEK. Their objective is to secure firms' access to innovation and research measures. This applies to firms in general, and firms in the least populated parts of Norway especially. IN, RCN, Siva and GIEK constitute a central part of the implementation of Norwegian research and innovation policy in all parts of the country.

The various measured governed by Innovation Norway includes advisory services, network services, loans and grants as well as local development measures. Some measures are national and

[61] In Norwegian: «den smale distriktspolitikken»
[62] The Ministry is responsible for housing policy, the Planning and Building Act, local government finances and local administration, ICT Policy and Public-Sector Reform, rural and regional policy, the conduct of elections, government employer policy, Sami and minority affairs and national mapping and geodata policy.
[63] In Norwegian: "den brede distriktspolitikken"

industry-neutral, whereas others are geographically differentiated and industry specific. Most measures target companies, whereas other target business networks and local communities.

Innovation Norway fund innovation projects based on applications. IN's total budget for 2016 was about 3,7 billion kroner and 6,7 billion kroner including loans. About 3,5 billion kroner was transferred to the agriculture and fishery sector, one billion kroner to rural measures and the remaining measures to other sectors and areas.

The Research Council of Norway (RCN) finance basic and applied research, but also infrastructure for research and development. RCN administrate approximately 9 billion kroner a year, which corresponds to about one quarter of all research and development funding in Norway.[64] Support from RCN is generally not geographically differentiated except regional research funds (RFF). Some programs are open for all disciplines, whereas other programs target specific disciplines or industries, and hence, will be more important for some regions than others.

Siva stimulate innovation by building, owning and developing infrastructure for industry, start-ups and research environments. Their investments and activities are geographically differentiated.

The Norwegian Export Credit Guarantee Agency, GIEK, supports Norwegian exporters by issuing guarantees on behalf of the Norwegian state. The aid is nation-wide, however, more frequently used by companies within certain industries (and thus regions).

In addition to the measures administrated by the above-mentioned enterprises, an important measure administrated by the Ministry of Finance is SkatteFUNN (SKF). SkatteFUNN is a tax deduction scheme established with the objective to stimulate R&D investment in Norwegian firms. SkatteFUNN applies to all firm sizes, all industries and all types of business entities, irrespective of geographic location.[65]

Municipalities and firms can in some extraordinary readjustment processes be eligible for funds directly from the national or local government.

In monetary terms, the RDSSC is by far the most important measure within the rural policy. The schemes costs, i.e. the tax loss, are estimated to 13,9 billion kroner. The costs of the RDSSC are pictured as the red column in Figure 7.1.[66] Hence, the cost of RDSSC is equal to the RCN and SkatteFUNN's combined budgets, and four times greater than the budget of Innovation Norway.[67]

There are some individual measures compensating individuals living in the so-called "action zone" in Finnmark and northern Troms county.[68] The most important policy instruments in the action zone, in addition to exemption from social security contributions, are write-down of student loans, exemption from electricity tax on consumption, reduced income tax, higher income tax deduction and increased

[64] Total funding for rnd is estimated to 35,1 billion NOK in 2017. 25 percent is allocated through the RCN, 40 percent through the university sector, 10 percent through international rnd programs and the remaining 25 percent through various other research institutions and rnd measures. NIFU (statistikkbanken, 2017).

[65] However, the scheme differentiates somewhat between SMEs and large firms. Large firms have the opportunity, through SkatteFUNN, to receive a tax deduction of up to 18 percent on costs associated with R&D projects, whereas SME is entitled to a tax deduction of up to 20 percent on their costs.

[66] Figure 7.1 illustrate how large the RDSSC are compared to other relevant measures that are part of the Norwegian rural policy. It cannot, however, be used to summarise all measures in rural policy, since there is some degree of overlapping between the budgets of the wide and narrow rural policy, and the other agencies' budgets. As a comparison Figure 7.1 illustrates the size of the RDSSC rather clear.

[67] The budget of Innovation Norway totals 3.7 billion kroner excluding loans.

[68] The action zone include all municipalities in Finnmark county, and seven municipalities in the northern part of Troms county.

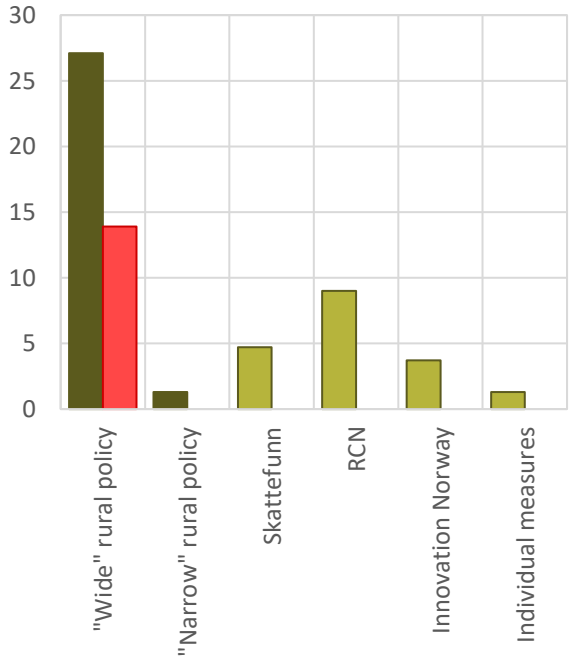
family allowance. In 2018 this individual measure is estimated to about NOK 1.3 billion, not including the RDSSC-benefit.

Norway have a large municipal sector based on the principle of equal welfare services and equalising income system. This implies that the funding of municipalities plays a decisive role in maintaining the existing settlement pattern.

We will discuss the various types of measures in the following chapters. When discussing alternative measures, it is useful to keep in mind the monetary size of the RDSSC-scheme compared to other funds. As an experimental thought, we can ask ourselves if transferring all funds from RDSSC to one or more of the other measures would be more effective in maintaining settlement patters. If the answer is “no”, the RDSSC is the most effective measure.

Figure 7.1

Rural and regional policy and important research and innovation measures. Billion Norwegian kroner. 2016.



Source: Statistics Norway, National Budget, NIFU, Innovation Norway

7.3 Alternative measures can affect employment and population growth

The various economic measures described above aim to preserve the current settlement pattern – or at least contribute to maintaining the main features of the settlement pattern. Even if the main objective to all the rural measures is equal, they are built on different assumptions about how one best can contribute to reach its goal.

The following sections will briefly discuss how alternative measures can implemented and have a similar effect on employment and population growth as the RDSSC.

7.3.1 Measures to change factor prices

Chapter 3 presented the theoretical justification of RDSSC. The objective RDSSC is to reduce or prevent depopulation in the most sparsely populated regions in Norway by stimulating employment. By lowering the cost of labour, the aim is to stimulate a substitution effect that will replace some capital with labour (substitution effect) and increase production.

Increased production, higher profit (due to lower costs) or partly wage increases will have an income effect which in turn stimulate local consumption.[69]

Other measures that contributes to reduced price of (important) input factor(s) will in theory have similar positive cost reducing effect, possibly followed by an increased use of input factors, including labour. Subsidising investments in research and capital, power and transportation cost subsidies are some examples of cost-reducing alternatives to RDSSC.[70]

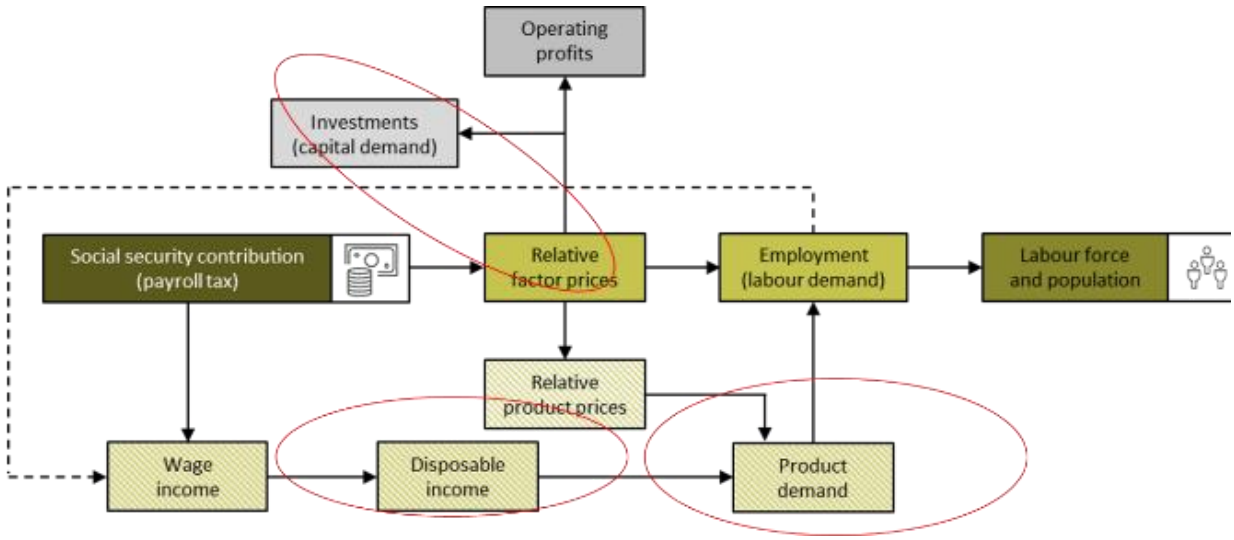
However, as chapter 3 discuss, economic theory predicts that a relative reduction in factor-prices will increase a firm's preferred use of this factor (substitution-effect). Capital subsidies allows for an adjustment in their input mix in favour of capital if capital and labour are substitutes, whereas labour subsidies such as RDSSC allows for a substitution of labour for capital.

We assume that capital subsidies have a negative substitution-effect on employment in the following. But in a case where production increase as a consequence of decreased product price, employment may rise if production expand sufficiently.

Similar theoretical arguments can be made for transport and research subsidies, but with different effects on employment. On a firm level, research subsidies lower the cost of research (and with time possible increase productivity). It is reasonable to assume that research and labour are complementary factors. A research subsidy will therefore lead to an increase in employment of researchers, and in the long run also other personnel if the extra research contributes to enhanced production.

Figure 7.2

Effects of a change in payroll taxes (simplified outline)



Source: SØA

[69] The theoretical framework is elaborated in Chapter 3.

[70] Low electric prices have for long given Norwegian industry a comparative advantage. Interconnected electricity markets and international regulations have reduced this comparative advantage with time.

Direct transport subsidies or transport infrastructure investments can in theory also lower the total operating cost of firms by lowering transport time and transport cost[71]. As before, the positive cost reducing-effect will in theory lead to increase in all factors including labour. It there is no substitution or complementarity between transport and labour, such a measure will have no further effect on employment.

Feil! Fant ikke referansekilden.show a stylized model which summarize the firm effects. For simplicity, the illustration is based on a firm using labour, capital, research and transport as input factors in equal portion. The various factor subsidies will have similar cost reducing effect and thus rise in demand for labour (as well as other input factors). However, labour demand will also depend on the substitution effect in which labour demand will be somewhat higher in case of labour subsidy and research subsidy (but only researchers).

Figure 7.3

Assumed firm-level effect measured to change in factor prices.

Source: SØA

Extending the simple analysis in which the firm not only rely on capital, labour, research and transport, but also on land, suggests that change in factor will lead to changes in industry mix.

Assuming that land is a limited, labour subsidies allows relative labour-intensive firms to out-bid capital intensive firms for land, whereas capital subsidies allow relatively capital-intensive firm to outbid their relatively labour-intensive firms. Economic theory thus suggest that capital subsidies can lead to a negative effect on regional employment with time (Lind and Serch-Hanssen, 1972, Patrick C., 2016.).

A potential "fear" of RDSSC alongside this reasoning, is that labour subsidies will lead to a unilateral industry mix consisting of labour-intensive firm (in stagnation) which in the long run will lower the productivity in rural areas than would otherwise have been the case. This "fear" was seen as not relevant when implementing RDSSC as rural areas have and must have a large amount of labour intensive firms to support local markets (agriculture, public sector, construction, services etc) (NOU: 1975: 2).

7.3.2 Measures to grow disposable income

Our empirical tests also indicate that RDSSC lead to an increase in wages and owner income and thus household's disposable income within target regions. Higher disposable income can increase savings, investment and consumption. The enhanced regional consumption will enhance the regional employment through regional production of the consumption goods (typically services)

[71] Such cost reductions are reflected in reduced lead times, improved safety, improved visual quality associated with transport systems (tourist roads, landscaping), reduced barrier effects, reduced operating costs for the means of transport, and by reducing noise and other contamination (effektutvalget, 2003)

The income effect of RDSSC on regional consumption can also be reached by a variety of alternative means.

Firstly, individual measures such as reduced income tax, higher tax deduction, child allowances or other individual benefits will raise disposable household income. Such measures are already used within the "action zone" in Northern Norway and can easily be extended to the entire RDSSC-zone.
Higher disposable income can however also lead to an increase in consumption of other goods and services, depending on the consumption pattern of the individuals. There is in other words no guarantee of what degree that such measures increase regional consumption and associated local employment.

Secondly, higher regional consumption can also be stimulated by subsidizing selected goods or services. Lower price will normally lead to an increase in demand for that good. For subsidy to have a direct impact on rural employment, the subsidy should be on goods and services produced in rural areas.

Product subsidies are however, rarely geographically differentiated, except from within the "action zone" in Northern Norway which have an exemption from electricity tax. The cost and effect of a product subsidy depends on the characteristics of demand and supply.[72] For price elastic goods i.e. a reduction in price will result in a relatively large percentage rise in demand of that good (and reduced demand for substitutes). For low elastic goods, however, a subsidy only leads to a small change in demand.

As in the case of individual oriented measures, product subsidies will also increase disposable income.

In addition to the consumption effects of income transfers to households such transfers will undoubtedly be regarded as positive for those receiving the benefit, and thus the incentive to live within the Action zone. The relevant question is if the measures affects the decision on where to work or live and hence the labour supply in rural areas. The measures were introduced to increase the incentive to live and work in the Action Zone.

In opposite to the RDSSC, the aim is not to generate labour demand, but labour supply. Income transfers to households therefor address a problem when forms are restricted by shortages of labour, not a problem when cost of labour are too high.

As presented in chapter 3, theory suggest that as wages increase, work becomes relatively more profitable than leisure (substitution effect). However, with higher wages, the individuals can maintain a decent standard of living through less work (income effect). A wage increase can thus lead to a growth, but also decline in labour supply.
Studies indicate that income transfers actually stabilize population and ease recruitment (Pedersen and Andersen (2001)[73] and Angell et al (2012).

The individual measures do however have some other interesting features. The measures apply to all households independent on employment status and history of habitation. Thus, the individual measures target a "wider" part of the population than the pay roll tax deduction. It is therefore relatively costly.

[72] Initial endowment, elasticities ex. Consumer choice theory

[73] Pedersen, P. og M. Andersen (2001): Langtidseffekter av person- og bedriftsrettede tiltak i Finnmark og Nord-Troms. Norut Samfunnsforskning as. Rapport 3/2001.

A mix of individual measures can however be used to target specific parts of the population. Some measure applies to those with children and those with higher education. Tax deduction is relevant to all with income, whereas those with higher income benefit most from lower tax rates.

Thirdly, increase in public consumption can also lead to an increase in public employment and public demand from local firms. The actual effects in terms of number of new jobs, depend on a variety of factors such as the availability of labour. In areas with available resources such a measure can be relatively effective in creating new jobs. The down side, is however, that it primarily fosters public sector activities and not commercial activities.

The magnitude of the employment effects on such measures will depend on a variety of factors such as local labour market, competitiveness of local firms, individual preferences, wage formation amongst others. Magnitude of firm effect must be tested empirically.

7.3.3 Measure to increase local attractiveness

Higher disposable income (caused by individual measures or DAGA) makes one region more attractive compared to another region (all thing equal).

A part of the discussion on regional development have focus on what attributes makes a region attractive for inhabitants and population. Historically both “narrow” funds and regional activities have been used to make local communities more attractive for its inhabitants and business. In theory, funding for local attractiveness measure can thus represent an alternative to RDSSC.

The theory of attractiveness (Vareide, 2013) defines three different attractiveness dimensions: attractiveness for businesses, visits and settlements. Attention is drawn to unique characteristics at one place and distinguished from structural conditions. The structural conditions are related to the size of the place, whether it is part of a larger labour market and growth in adjacent areas. The structural conditions are difficult to affect locally, but conditions of attractiveness can be affected locally and foster growth.

Vareide (2013) defined such conditions as buildings and land, amenities (urban goods, services, services), reputation and urban identity and culture.

Another part of the academic discussion on regional growth has focused on what is most important for a region's development - more people or businesses (see, for example, Florida, (2004, 2010), Storper and Scott (2009), and Buch et al. (2013).

International theory and empirical evidence show that in the longer term, there is a very strong correlation between where people reside and income opportunities. [74]

Damvad and Bygdeforskning (2015) argue that one must take size of labour market and relocation patterns into consideration, arguing that job opportunities is the key determinants when choosing in which labour market regions to reside, but family relationships and the community's benefits are emphasized far more when choosing in which community *within* a certain labour market region to reside.

Samfunnsøkonomisk analyse (2016) did and empirical study on development funds from a sample of

[74] Se Michael Storper (2011): *Why do regions develop and change? The challenge for geography and economics.* Journal of Economic Geography 11.2 (2011): 333-346. Michael Storper (2013): *Keys to the City*. Princeton University Press.

projects from 2006-2014 and found no statistically significant relationships between the use of development funds and population development.

The absence of effects can be explained partly by the design of the instrument. The funds are distributed to many small projects and it takes long time from implementation of the projects until changes in terms of results and effects occur, making it difficult to identify in available data. It seems as if the funds are too small to be captured in population data at municipal level. Or that the municipals are not able to prioritize the most effective projects in terms of their ability to affect population growth.

At the same time, the absence of effects may also be because the measure does not affect people's decision on where to live. Both of which, suggests that the funds allocated in this way do not have an impact on population growth.

The findings suggest that measures to increase local attractiveness, would not affect population growth as such, but habitation pattern and satisfaction within the existing community.

7.3.4 Unambiguous, and possible negative effect on job-creation of capital subsidies

Recent evaluations of national measures for research and innovation suggests higher employment, profitability and value creation in firms with aid than for firms with no aid.[75] However, the measures effects on ensuring rural habitation and employment is not investigated (because it is not central goals).

Innovation Norway which incorporates the former "The State District Bank and Development Fund"[76] and has a special role in offering loans and grants to firms in rural areas. In 2016 a total of 900 million NOK where allocated to companies under within the "regional assignment"[77]. Funding is based on a selection basis, with innovation being a key criterion.[78]

Cappelen et.al (2015) compare[79] development in value added in firm with rural loans and grants with similar firms with no support. The comparison shows that firms with rural loan and grant on average have 5,7 percent higher value added than similar companies without loan and grants. This scheme effect is at the same level as for companies with national loans and grants.
Similarily shows Capelen et.al (2015) that on average does companies with rural loans and grants have about 5,8 percent higher growth in employees than companies without such loans and grants.[80]

Interestingly, national loan and grants trough IN led to increased productivity to higher value added, which seems to offset the employment effects of increased sales. This seems not to be the case of rural loans and grants, which have no significant productivity effects. One possible explanation is that capital marked restrict firms in rural areas to achieve productivity in line with comparable firms in non-rural areas.

[75] SSB (2016); Samfunnsøkonomisk analyse (2018): Evaluation of Skattefunn Norwegian Research Council (2017); Evaluation of BIA

[76] Statens nærings- og distriktsutviklingsfond var selv resultat av mange tidligere fusjoner, der særlig Industribanken, Utbyggingsfondet for Nord-Norge og Distriktenes utbyggingsfond var sentrale forløperinstitusjoner.

[77] The most important measures within this assignment is loan and grants to start-ups (totalling to about 38 percent of support within the rural zone), to companies older than 3 years (52 percent of total support to rural zones) and other measures (totalling to about 10 percent of funding to rural zones) (Innovation Norway, annual report 2016).

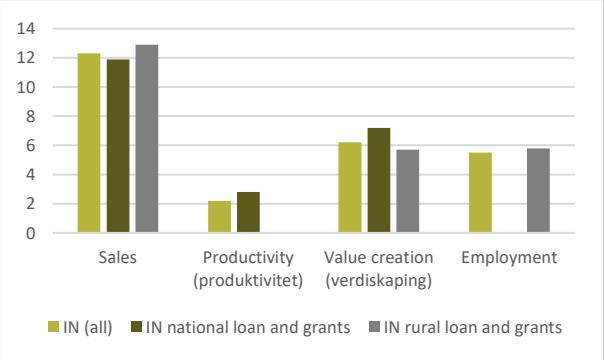
[78] (Innovation level is however, lower for rural project than for national projects).

[79] Ådne Cappelen, Erik Fjærli, Diana Iancu and Arvid Rakneru (2015) «Effect on firm performance of support from Innovation Norway». RaknerudSSB–rapport 2015/35

[80] The level varies between the different programs and is 1,8 percent for business development grants (distriktsrettet bedriftsutviklingstilskudd) and 6,7 percent for rural start-up grants (distriktsrettet etablererstipend),

Figure 7-4

Output from firms with loans and grants from Innovation Norway compared to firms with no support, 2016



Source: Innovation Norway annual report, 2016

Assessment of employment is based on the location of company (i.e. where the company is registered), and not to where people work or live for that sake. Thus, we do not know the number of job created within the rural areas. Further, the assessment is based on an investigation of the employment effect for the companies with aid, not for the region as such.

Although capital subsidies are widely used, there are little empirical studies on the effects on population). The few international studies on the topic, does however find that capital subsidies lead to no or even reduced demand for labour in line with economic theory (Patrick C., 2016.)

For example, have Patrick C. (2016) empirically investigated the use of capital subsidies in America and found results in line with economic theory. Patrick C. (2016) use the Incentive Environment Index constructed from state provisions that limit and structure state aid and a county panel. The results indicate that increasing capital subsidy tolls is associated with capital-labour substitution, decreased employment density and changes in local industry mix. Patrice (2016) find that capital subsidies induce more capital in both rural and urban areas. The effect on capital increase is higher in urban areas than rural areas. Employment effect is however negative in both.

7.3.5 Empirical studies reveal a complex relationship between transport infrastructure and regional growth

The National Transport Plan[81] includes major infrastructure investment for the coming decades and includes projects in the areas covered by the RGSSC-measure. Investments decisions are based on profitability, but also on other issues such as regional development (Effektutvalget, 2003).

Investment in transport infrastructure is also often launched as a measure for rural and regional development. But it is likely that changing all RGSSC -funding to infrastructure investment in rural areas beyond what is part of the NTP will increase employment and habitation further?

Firstly, one argument in favour of infrastructure investments in rural areas is that it leads to employment during planning, building and operation phase. This is a temporary effect we do not discuss further in this context.

Secondly, improved infrastructure gives regions improved accessibility and lower transportation costs, which allows for industry and inhabitants to remain in the region..

[81] National Transport Plan (2018-2029), Meld. St. 33 (2016–2017) lay out the government's transport policy. was presented on April 5, 2017. Numerous subsidiaries are responsible for implementation. "A transport system that is safe, promotes value creation and contributes to conversion to the low-emission community".

Transport economics[82] also predicts a link between investment in transport infrastructure and productivity. Better infrastructure can give businesses access to larger supply and goods market and thus allow for increased exploitation of internal economies of scale for example from usage of larger production and storage units and or more just-in-time organization. Increased efficiency and profitability of the business sector can stimulate business investment in private capital and productivity (Aschauer, 1989).

Thirdly, agglomeration theory[83] expects that reduced travel time between cities or towns creates larger housing and labor market regions. Commuting, and thereby a larger labor market, allow for more specialization and better match between supply and demand for expertise. Geographic density also simplify communication thus stimulates knowledge sharing[84], learning and innovation.

Empirical studies point to methodological challenges of measuring the effects on productivity of regions. Case studies reveals that some infrastructure projects have such effects, whereas others have not. Menon (2013[85])

With regards to habitation and population growth, the effects are even more ambiguous. Lian et al (2010)[86] investigated the ripple effects of major road investments in Norway during the period 1993-2005. The study is based on a statistical analysis of 102 major road projects. Data show that population growth is mainly determined by the degree of centrality. Higher growth in more central region supporting agglomeration theory and findings in other empirical studies such as Engebretsen og Gjerdåker (2012)[87]. However, the data used in Lian et al (2010) support that road investment has a small additional effect on population growth[88] (but data does not reveal any effect on employment, income levels, commuting or industrial growth).

Another study Aarhaug et al. (2017)[89] finds that the effect in terms of population growth varies with the size of the labor market. The greatest effect of transport infrastructure project is seen in small regions (defined as labor markets of less than 5000 inhabitants) for which the infrastructure project increases the region (labor market) beyond a critical size (estimated to be around 10 000 inhabitants). If the infrastructure project increase the labor market sufficiently to increase variation in services and thus attractiveness, population can grow. For larger labor market, infrastructure project can have large benefits in terms of utility for many (and thus better results in a cost-benefit analysis). Such project will however, have small effect on population.

Studies on infrastructure and regional development suggest that if the objective is to maintain or increase population in rural areas, it is more important to invest in infrastructure, which increases the size

82 Se for example Aarhaug, J., Hanssen, W. and Engebretsen, Ø. (2014) Næringslivets nytte av samferdselsinvesteringer. Oslo, TØI-report 1328/2014. Aschauer 1989, Gjerdåker and Lian (2008).

83 Se for example Produktivitetskommisjonens first report (NOU 2015:1), Duranton, G. og Puga, D. (2004): Micro-foundations of urban agglomeration economies. I Handbook of regional and urban economics, 4, 2063-2117, Melo, P. C., Graham, D., & Noland, R. (2009). A meta-analysis of estimates of urban agglomeration economies. Regional Science and Urban Economics (39), ss. 332-342, Menon publikasjon nr. 15/2015 Utfyllende samfunnsøkonomisk analyse av E39 Søgne - Ålgård samt Heggedal, T-R., Moen, E.R. og Riis, C. (2014): Samfunnsøkonomiske virkninger av fergefri E39 Stavanger- Bergen. CREAM Publikasjon NO. 2-2014. Menon (2014),

84 Menon (2014) discuss sharing of risk, advantages of individual spesialisation sharing of advantages of variety and sharing of udividable goods.

85 Menon (2013): transport infrastructure and productivity

86 Jon Inge Lian and Joachim Rønnevik, TØI report 1065/2010

87 Engebretsen, Ø. og Gjerdåker, A. (2012): Potensial for regionforstørring. TØI-rapport 1208/2102.

88 An investment of € 125 million would only increase population size of nearby municipalities by 1 pct. over the whole period 1990-2008.

89 Transportation Research Procedia, Volume 26, 2017, Pages 187-195, https://doi.org/10.1016/j.trpro.2017.07.019. The study is based on register data on population, industry, commuting, road infrastructure, access to services of general interests (SGI) and the latest Norwegian travel survey.

of small regions with growth potential rather than increasing the size in already large regions. This results however differ from those usually reached by using cost benefit analyses, typically giving higher priority to infrastructure projects in the largest regions (Aarhaug et al., 2017). Studies[90] suggest that the worse condition on the current transport network, the greater the opportunities for such investments to create positive effects. It is especially beneficial if a central bottleneck disappears. Further, the region in question must have a clear development potential, including with a reserve pool of well-qualified labor, and an expansive business community with "entrepreneurial spirit" and a well-developed industrial and political environment that can help trigger the growth potential that may exist.

Both Norwegian[91] and international[92] empirical studies suggest that the relationship between transport infrastructure and regional development is more complex than theory suggests. The findings reveal that transport infrastructure investment alone is no guarantee for rural habitation and development, men potential cost and benefits must be based on case-by-case-evaluation.

7.3.6 Research measure depend on existence of research community

Although most RnD measures administrated by the RCN are national, the Council also have measures targeting certain regions. Research in North (Forskningsløft I Nord) is one such program. The program was established in 2009 as a measure to increase RnD competence, RnD activity and RnD cooperation between research community and industry in the northern region of Norway. As of 2017, the program has ceased and the projects in now a part of the larger program FORREGION which also has a regional focus (thus in the entire country). This program is just started, and an evaluation is currently in its early beginning.

Experience from its predecessor VRI and program Strategic University Colleges projects (SHP) targeting regional university colleges, indicate that regional activities are important tools to mobilise and qualify for research activities and programs. Regional RnD programs seem suited to boost local research activities and thus employment of researchers in already existing research communities. Wider effects on local economy are rarely investigated, mainly because they not possible to track and or expected to be very small.

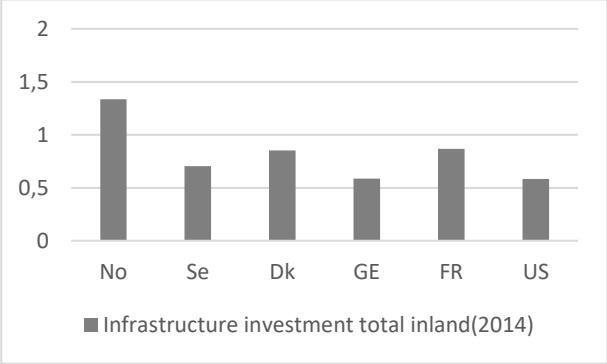
7.3.7 Declining marginal benefit of alternative industry measures

Norway has a wide range of measures for research and innovation, both nationally and geographically differentiated.

Norway also have an extensive transportation infrastructure network and is investing more in transport infrastructure than many other OECD countries (measured in total inland investment as a share of GDP), see figure XX:

[90] (Rietveld and Bruinsma 1998, resited in TØI, 2010):
[91] (Aarhaug, 2017, Menon, 2014).
[92]

Figure 7-5 Infrastructure investment measured in total inland investment as a share of GDP



Source: OECD

We cannot rule out positive effects also in terms of employment for specific projects, even if economic theory and empirical studies suggest unambiguous or even negative effect on rural employment.

Capital and RnD funding is granted on a selection basis, and it seems plausible to assume marginal diminishing return on both capital subsides and research assuming that "best" projects are realized first.

A significant rise in available funds will either mean funding project with significant lower score on criteria for market failures, innovation, research quality or cost benefit. Score on innovation is for example lower for rural loans and grants, compared to projects with national loans and grants.

Unconditioned capital subsidies will most likely not be in accordance with international agreements regarding company aid.

Rural areas are dominated by public sector and labour intensive- small firms. Generous availability will at least not in the short run foster more eligible (capital intensive) firms. Economic theory and empirical evidence suggest generous subsidies cannot create companies, business cluster or innovation alone (Samfunnsøkonomisk analyse, 2017). The drive for entrepreneurship or innovation must come from the actors themselves (see Baumol, 2002).

7.3.8 RDSSC-scheme is most efficient

RDSSC-scheme, but also Skattefunn are right-based measures with relatively low administration cost. Most research and innovation measures are however based on selection basis. Selection process and administrative burden varies for different measures.

Infrastructure investment decision is also based on selection basis; however, the selection is partly based on professional and political decision-making procedure, including a variety of stakeholders. It is difficult to believe that transfering all RGCCS-funding to infrastructure investment ensure rural areas priorities in future investment decisions unless the funds are allocated to a "rural investment fund".

Nonetheless, administrating measures and activities, selecting applications and control public spending does involve significant amount of resources.

The RDSSC-scheme has other administrative advantages compared to industry measures.

Firstly, it can relatively easy be adjusted to different zones according to perceived disadvantages of different regions. Such mechanical targeting is more difficult (or costly) for industry measures.

Secondly, the pay roll tax is linked to usage of labour and habitation of the employees. Capital subsidies is however, linked to the firm based on the location of the company as the time of application. Although it is possible to make funding contingent upon local activity, it is difficult (or costly) to ensure that activities will remain local in foreseeable future. Without such a condition, a region with substantial access to

available (cheap) capital will be very attractive to capital-intensive firms with employment elsewhere.

Thirdly, a subsidy applying to all firms minimize unproductive rent-seeking activities.

7.3.9 Other measures can however be relevant to meet local challenges

RDSSC is a measure aimed at increasing demand for labour. The measure was introduced at time of which many rural areas suffered loss of large industry plant followed by an increase in labour supply. Many rural areas still suffer under such a challenge. The “narrow” and “wide” rural and regional policy covers a great number of measures aimed a meeting various local challenges.

Rural area in Norway however, vary greatly in size, industry mix, labour market and growth potential.

We recommend careful monitoring of population development and perceived challenges (for example using the “rural barometer”) and need for specific measures.

The measures should be given as a long-term funding of a certain size, thus allowing for municipalities to fund individual measures or industry measures as they see fit.

According to Angell (2012) the tax cuts, student loan write-downs and additional child benefits are measures that make people settle and stay in Finnmark and North Troms, and that the person-oriented instruments have also made it easier to recruit new employees to the entire Action Zone, but most important for the central municipalities.

The measures are relatively easy to implement and administrate, and the mix of measures can be scaled up or down and they can be directed towards all individuals or parts of the population given local challenges. A shift towards a combination of both reduced pay roll tax and individual measure also for other areas with similar challenges (and growth potential) could prove effective.

However, is important to emphasize that large parts of the firms in the RGCCS-zone are struggling with low profitability and that a possible change in direction of lower pay roll tax and more individual measures must be made gradually. Similarly, experience also show that for individual measures to be effective, they must be known to the population in wide and of sufficient magnitude to affect decision making of the individuals. Such measures should thus apply for a long period of time.

8 Ripple effects

8.1 Introduction

The econometric estimations are revealing possible total effects of the scheme by means of so-called exogenous shocks, related to changes in the scheme. The objective of the ripple effects analysis is to decompose the total effect into direct and different types of indirect ripple effects. The effects are simulated by use of exogenous production shocks in a fixed-price model with very little behaviour modelled (PANDA). This was judged as an important property in an alternative analysis where it could be important to avoid predefined behaviour by the model (cf. conclusions in the pre-study).

As the analysis carried out by using difference-in-difference methodology results in revealing total effects, the contribution from the ripple effect analysis is limited to decomposition of the total effects into different components of ripple effects. Of special interest is the possibility to illustrate spillover effects (inter-regional effects) by using a multiregional input-output model.

Initially there was also interest in analysing population effects through the population model I PANDA. This part is however left out due to limitations in the model and what we can expect in additional insight. The population and labour parts of the model will give feedback corrections to the economic model due to changes in commuting and population. These effects will always have a dampening effect on the economic effects through welfare transfers etc. in the region were the economy is shocked. In this respect we would need a multiregional model to reveal interregional migration and commuting effects, but this is not yet implemented as part of the multiregional PANDA-model.

8.2 Decomposition of ripple effects

Ripple effects in this context are additional effects in industries and households both inside and outside the treatment area, created by industries covered by the RDSSC scheme. Effects are simulated through a production shock in a specific region within the scheme area, and ripple effects are calculated for different regional delimitations in the country. The analysis carried out is a calculation of gross ripple effects. This implies that we do not consider production or employment resource limitations, neither consider alternative labour and capital use in other regions. There are reasons to assume local mismatch between labour supply and demand at the regional level, and perhaps special valid for beneficial regions within the RDSSC scheme. We do however calculate gross ripple effects in the rest of the country as well, and the presumptions mentioned above are therefore important.

Calculated components are:

- Direct effects,
- Indirect and induced effects inside the actual RDSSC region
- Spillover effects (indirect and induced) to other regions of the country
- Feedback effects in the scheme area from other regions.

Indirect effects are business-to-business effects through intermediate deliveries in the production. Induced effects are effects generated through changes in household income and capital returns due to both direct and indirect effects. In this analysis we have limited the induced effects to changes in private consumption due to changes in household income.

The ripple effects are calculated as different kinds of demand-driven effects in fixed-price single and multi-regional input-output (I-O) models in PANDA.

Even if the multiregional input-output model is quite simple the ambition has been to shed light on the possible spillover effects between treatment regions, control regions and other regions. The multiregional model has no direct links between the regions, as the interaction between regions are handled by an extra national region or pool for interregional trade. Any trade between regions in the model thus passes to and from this common pool. One reason for keeping the model simple in this way, is the possibility for flexibility in the selection of number and delimitation of regions.

Ripple effects are calculated for the same municipalities and industries as the analysis in the econometric estimations for 2000. These are related to areas and industries which have experienced changes in the RDSSC level (moved from one tax zone to another).

8.3 Data – Trade coefficients

All data are statistics and parameters estimated in PANDA.

A crucial parameter when calculating regional ripple effects is the estimation of regional trade and regional trade patterns. The coefficients are here expressed as the division of trade between industries in each region (intra-regional trade) on one hand and trade between industries in the regions and a common national trade pool on the other (multiregional trade). The latter may also be named interregional trade even if this term is usually limited to trade specified directly between regions and not via a common pool.

Estimation of regional trade coefficients is usually a challenge, and this is no exception in this case. These are not usually recorded or observed and must be estimated by means of different estimation methods. Several methods are reported and tested in the literature (the gravity function, the Round and Flegg methods, location quotients etc.).

Ripple effects are in general dependent on the level of trade coefficients estimated in the I-O model. The level of the (intra-)regional trade coefficients is dependent on several factors, but rather important is the industry and demand structure in the region on the one hand, and the level of the regional production and supply in each industry compared to the national level on the other. The size of the actual region will therefore be important to the level of the intra-regional trade coefficient and ripple effects. Since the national levels of the trade coefficients are given (=1), the value of the aggregate interregional trade coefficients can be calculated asa residual as soon as we have estimated the intra-regional trade coefficient.

The kind of trade parameter which is normally estimated in regional I-O models is the so-called self-sufficiency ratio, which gives the region's own supply of each product as a ratio of either total or domestic demand for this product. This is often referred to as the regional purchase coefficient - RPC. In PANDA, the output RPC coefficients for deliveries of all kind of use are given as ratios of total domestic (national) demand for each specific product, estimated for each industry and region.

For intermediate deliveries an input RPC coefficient reflecting the sum of regionally delivered inputs in each industry as a part of total domestic input in this industry. The elements in the domestic intermediate table for each county are then justified by use of a

so-called RAS routine to fulfil the regional RPC values in each direction.

The estimation is done by first estimating RPC values for counties outside the model based on different sources, such as (vendor surveys, purchasers ledgers, commodity flow surveys) and synthetic methods (mainly use of FLEGG estimators), In the last step the elements in the county tables are justified by use a RAS-routine.

These pre-estimated RPC values for counties are used as benchmark values when estimating the actual RPC values in the model.

When data for the chosen region(s) are pre-processed in PANDA, the trade coefficients are estimated in two alternative ways, depending of the size and composition of the region:

- For regions less than a county estimation of regional intermediate element values is based on direct (down)justifying of county values by comparing the demand for and supply of this specific product in the region compared to that in the county. RPC values are thereafter deducted.

- For regions consisting of more than one county or parts of two or more counties the estimation of RPC values is based on a general function weighting the influence of regional production as a share of national production together with regional demand for the single product as part of the national demand for the same product.

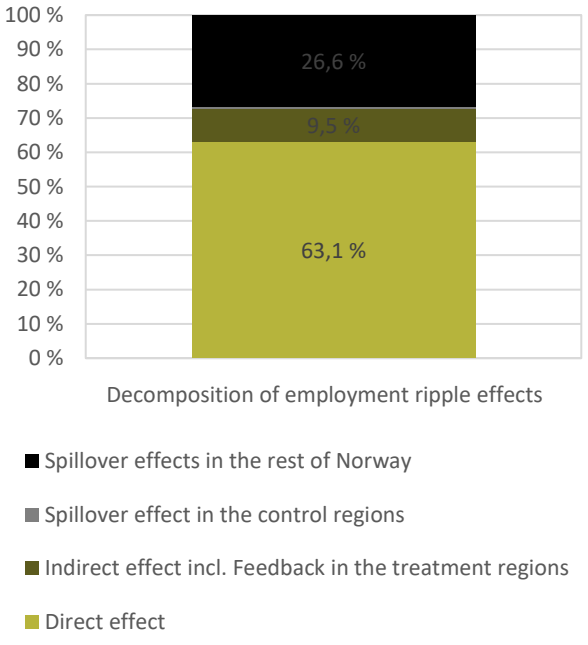
These two estimation methods are calibrated to give the same values when the region is a county.

8.4 Ripple effects decomposed

We have calculated different ripple effects simulated by a production shock in eligible industries in 23 municipalities where the tax zone was changed from zone 2 to zone 3 in 2000. In addition to the region consisting of these municipalities we have included the control region used in the econometric analysis, while the rest of the country is divided in ten regions in the model.

Figure 8.1

Ripple effects on employment from industries in municipalities that moved from Zone 2 to 3 in 2000



Source: SINTEF

The municipalities are located in four different counties, and form five municipality groups. These are here merged together into one region, but we have also made model runs with these five regions instead of the aggregate region. The result from de disaggregated runs did not differ much from the aggregate runs, and we have used the aggregate region in the runs presented here

The direct effect is calculated to 63,1 % of total effect. Ripple effects inside the RDSSC region (both indirect and induced and included feedback) are calculated to 9,5%. The spillover effects in the Control region is calculated to less than 1 %, while the spillover effects in the rest of the country is 26,6 %.

All effects appear through production and income changes and changes in the utilization of intermediate and private consumption products.

More calculations are planned (related to value added and wage changes), but these could not be made in time for the schedule of this draft due to problems with stabilising the multiregional model.

8.5 Conclusions

The total indirect and induced ripple effect (national effect) is 37,1 pct. of the direct effect in this calculation. This do not seem to be very high but will be verified by additional model runs with alternative regional delimitations.

One interesting question is how large the spillover effects to the control region is expected to be. These calculations indicate small effects (less than 1 % of the total effect) and give as such little bias through trade from the RDSSC region to the control region.

9 Distortive effects

9.1 Introduction

Distortive effects of the RDSSC scheme can be classified in to two types of distortion. The first type of distortion is allocative distortion. A regionally differentiated social contribution scheme may lead firms (and people) to locate in less productive regions. For Norway the distortive effect of the regional variation in the social security contribution scheme has been estimated to give a deadweight loss of 0.22 pct. of GDP (Rattsø, Stokke 2017). This is of the same magnitude of order as what is found for the dispersion of tax rates between the US states. For the estimation of the US values a spatial CGE model with monopolistic competition was used (Fajgenbum et al. 2015). The allocative distortion is however something which is wanted and any (non lumpsum) tax would introduce such allocative distortions. The question when it comes to allocative distortions is if society is willing to forego approximately 0.25 % of the gross domestic product in order to maintain the RDSSC scheme.

The second way in which the RDSSC scheme may be distortive is in the way it distorts competition between firms. Either between nations or between regions within a nation. Differentiated taxes exist within the states of the Australia, EU and the US. The employer paid social security schemes differs substantially in design, from a lump sum tax in Denmark to a broad (tax deductible) payment in France that may reach 45 % of the salary, to a percentage-based scheme with payment caps in Germany.[93] Spatial variations in tax rates are therefore not uncommon, but the special situation in Norway is that the tax rates varies within the country. The question is then if the RDSSC scheme distorts competition within the nation or between Norway and other nations.

9.2 International Trade and the RDSSC scheme

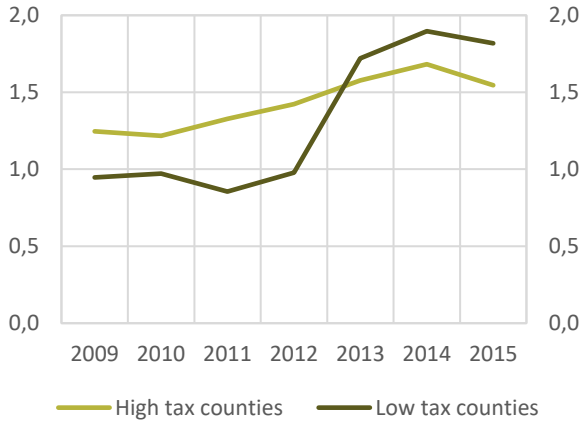
The literature has not had a focus on how differentiated labour taxes (or social security contributions) have had an impact on competitiveness. Instead the literature (such as Caju, Rycx and Tojerow 2011) have focused on how international trade has had an impact on wages. The consensus seems to be that increased exports increase wages, increased imports (competition from increased export) decrease wages and that the causality goes from trade to wage formation (not that trade is determined by wages). Now, if the RDSSC scheme confers a permanent competitive advantage to the regions receiving the lowest taxes then that would materialize itself in the form of either a faster growth of exports or a slower growth of imports than what is observed in the regions with a higher tax.

Export data are available at the county level, while the RDSSC scheme may make the social security contribution vary between the municipalities in one region. However, some counties (Østfold, Akershus, Oslo, Vestfold) consist of only municipalities with the highest tax and the municipalities in the three northernmost counties (Nordland, Troms, Finnmark) pays no, or a low, tax. A comparison of the growth rates of export of industrial goods (relative to GDP) could be used as an indicator of a sustained competitive position.

We use export of chemicals (but exclude raw materials and fuels) relative to the regions GDP in industry as an indicator. Using data from 2009 to 2015 gives the following picture:

[93] Data tajeb from the KPMG online database of tax rates.

Figure 9.1
Export value relative to GDP. 2009-2015



Source: SINTEF

The jump from 2012 to 2013 is due to a 40 pct. drop in GDP in the three northernmost counties with the lowest tax (the GDP measurements underwent a revision in 2013). There are no obvious differences in trend.

Ideally here we should also have had data for imports according to industry and region. However, due to the geography of Norway most imports are registered in the south and are not easy to trace so that regionalized statistics for imports are not produced. An even more fine-grained estimation of distortion of competition is obtained if we look at the impact on domestic competition.

9.3 Measuring domestic distortion of competition

Little has been done when it comes to measuring distortion of competition due to differentiated payroll tax schemes. Most of the literature has found that a reduction in payroll taxes are to a large extent shifted to employees in the form of higher wages, and one of the earliest studies (Gruber 1997) found a full shifting of a tax reduction to wages. In the literature any effects on prices (and competition) are therefore assumed to be small and has not been examined. There is therefore no set methodology on how to measure to what extent a differentiated payroll tax has an impact on competition and any reasoning has therefore to be done based on analogy with the methods used in competition and antitrust analysis.[94]

The first step would be to examine (through correlation or cointegration of prices) whether different firms are operating in the same market. That is, are the prices for different goods and services correlated between the different zones in the RDSSC scheme. If they are not the markets are separate and there is no reason to assume that the tax has any impact on the competition.

However, if the firms in the different RDSSC zones are operating in the same markets then the extent of distortion of competition would have to be measured either by to what extent the taxes gives a price advantage (a sustained and significant non-transitory decrease in prices), or to what extent trade is diverted (in the form of increased sales from regions with a more favourable tax rate).

Unfortunately, there are no regionalised time-series data of prices, nor any reliable annual intra-national trade statistics which can be used. In other words, it becomes necessary to rely on more indirect and imprecise measures.

Profit seems like one measure which could be used to measure any distortive effects of the RDSSC scheme. However, the degree of shift to employees

[94] For a textbook exposition, see Davis, Garcés (2010)

in the form of higher wages may be variable between industries and regions so value added VA is a better measure to use.

Now, value added is essentially pq-rh where p is the price of output, q quantity sold, r the price of input and h the quantity of input. Any cost advantage in the form of lower taxes that give rise to increased profits (or value added) should now show up as an increase in the ratio of value added to sales S, i.e. in the form of a higher (1-rh/pq) ratio. Note that this is a very indirect measure that must be interpreted with some caution since there are no actual price data or trade data which could be used to corroborate any price or trade advantages due to operating in a region with lower social security contribution

9.4 Detection strategy

Our strategy for detecting any distortions of competition are as follows. First, we look at aggregate value added and sales from an industry in a municipality. The ratio of value added to sales would then correspond to a weighted sum (with sales as weights) of all the firms in that industry in the municipality.

The advantage of looking at the aggregated value is that differences between the firms in the municipality is removed from the analysis. We are only interested in the competitive position of a municipality, not of the firms per se. Second, we identify which zones that have a significantly larger or smaller ratio of value added to sales by running the following regression:

$$\frac{VA_{i,t}}{S_{i,t}} = a_0 + a_1 D_{1A} + a_2 D_2 + ..$$

Her D_{1A} is a dummy for zone 1A, D_2 a dummy for zone 2 and so on, in addition dummies are added for municipality I (to remove any variation within the zone), time t (to remove any variation over time) and over industry (2-digit NACE, note that even at this aggregated level some industries are absent in some municipalities). Running this regression on an unmodified dataset (where employee count for each industry is one or more and sales larger than 0) for the years 2007-14 gives that only the dummy for zone 3 is significant, and then with a negative sign (N = 87271, adj-R^2 = 0,02073). However, the specification is extremely sensitive to outliers. Removing VA/S ratios that are outliers (in the sense of being 1,5IQR away from the median value) gives the following results:

	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	0.8277293	0.0477867	17.321	< 2e-16
Zone_1A	0.0199897	0.0168877	1.184	0.236542
Zone_2	0.0283262	0.0235308	1.204	0.228674
Zone_3	0.0405426	0.0171165	2.369	0.017857
Zone_4	0.0294538	0.0169665	1.736	0.082568
Zone_4A	0.0124548	0.0125648	0.991	0.321568
Zone_5	-0.0022757	0.0137187	-0.166	0.868251

Here N= 86372, adj-R^2=0,4687. However, if look at a sample where VA/S is constrained to be above 0 and below 1 (N = 80957) the Zone_4 dummy becomes insignificant and the estimate of the Zone_3 dummy drops to 0.0296 (and retains significance with Pr(>|t|) = 0.017857).

Interpretation of these kind of regressions are fraught with difficulties. Since the VA/S ratios are by nature non-normal the t-values and significance values should be taken not to literally.

More interesting is the variation due to reduction of the sample size. Zone 3 is a small zone with, in 2014, only 0.6 % of the total sales of goods and services in Norway. A few firms in this zone with highly positive or negative results could drive the results of the regression.

In short, the result indicates that there may be few general competitive distortions due to the RDSSC scheme. However, that does not imply that no firm is using the reduced social security contribution in order to gain competitive advantage, but the results indicate that on average the reduced social security contribution does not spill over into distorting competition. However, as noted earlier only actual price data or trade data can be used, in a case by case basis, in order to corroborate any price or trade advantages due to operating in a region with lower social security contribution.

9.5 Location and the extent of the market

The discussion about to what extent the RDSSC scheme is distortive brings us to the question about why companies choose to locate their business in a certain region. A municipality in a zone with the highest social security contribution may be an attractive location for one industry, while another municipality is less attractive even with a low social security contribution payment.

Using VA/S measure used in 9.4 and using the average VA/S of companies in Zone 1 as a benchmark one can run regressions industry by industry and with dummies for only time and municipalities outside Zone 1 in order to detect if there are some municipalities where there is a gain for the industry to be outside Zone 1. For some industries there are no such effect:

- manufacture of coke and petroleum products
- manufacture of fabricated metal products (except machinery and equipment)
- manufacture of furniture
- repair and installation of machinery and equipment
- water supply, sewerage, waste management and remediation activities (NACE 36-39)
- civil engineering
- specialized construction activities
- wholesale and retail trade and repair of motor vehicles and motorcycles
- retail trade, except of motor vehicles and motorcycles
- other retail sale of new goods in specialized stores
- land transport and transport via pipelines
- postal and courier activities
- accommodation
- food and beverage service activities
- telecommunications
- computer programming, consultancy and related activities
- real estate activities
- other professional, scientific and technical activities
- security and investigation activities
- public administration and defense, compulsory social security
- human health activities
- residential care activities
- social work activities without accommodation
- sports activities and amusement and recreation activities
- activities of membership organizations
- and other personal service activities.

There are, in other words, rather large sectors of the economy that do not seem to profit from locating outside the zone with the highest social security contribution rate. It is notable that several of the industries are industries in the service sector with a demand for relatively low skilled workers, industries where a lower payroll tax may lead to increased demand for labour (Stokke 2016).

On the other hand, there are also several industries where there are benefits (at least measured by the VA/S ratio) to be located in a municipality not having

to pay the highest social security contribution. Construction of buildings is one of them. However, the results may be due to local markets with less competition. Manufacture of machinery and equipment n.e.c another. In this industry the firms outside zone 1 are often small, highly specialized and have very limited competition in general (both domestically and internationally) since their products often are niche products. In short, the competitive advantage of locating outside the zone with highest social security contribution is difficult to interpret without a detailed study of the extent of the market for each individual firm.

9.6 Conclusion

On a final note it should be noted that the RDSSC scheme may give rise to dynamic effects. Lowering the price of labour gives a shift towards more labour-intensive technology. If, in addition, demand for labour is primarily directed towards lower educated labour (as in Stokke 2016) we may end up in a situation where a having lower social security contribution rates in a region, in the long run, dampens growth by giving lower incentives for acquisition of human and physical capital.

The RDSSC scheme of Norway have obviously a distortive effect, as any tax have. It may distort growth patterns between regions. There is little evidence in the literature that a RDSSC scheme has a distortive effect on competition. Indirect indicators of distortive effects indicate that they are small and may be more due to the presence of specific firms than due to the RDSSC scheme per se.[95]

For large sectors of the economy there seems to be no locational advantage of locating outside the zone with the highest social security contribution. In sum, there may be effects, but they are hardly detectable and must be resolved on a case by case basis where price and (geographical) market share data are utilized in order to ascertain the degree of competition.

The conclusion is not surprising giving the findings in the literature. Most conclude that the causality runs from competition to wage formation (costs), not the other way around. A meta-analysis of the literature (Melguizo, González-Páramo, 2013) concludes that: "In the long run, workers bear between two thirds of the tax burden in Continental and Anglo-Saxon economies, and nearly 90 % in the Nordic economies.". The differentiated tax regime does not give rise to a sustained competitive advantage, and the wage formation mechanism that prevails in the Nordic countries reduces any competitive advantage even further.

[95] Although one can speculate if the RDSSC scheme acted as an incentive for the firms to choose a particular location.

10 Concluding remarks and recommendations

The main objective of this evaluation has been to assess to what extent the Norwegian scheme of regionally differentiated social security contributions (RDSSC) has had a positive contribution to regional employment and population in eligible regions.

The evaluation has been carried out according to the Guidelines on State Aid (European Commission 2014). In line with these guidelines and the objective of the evaluation as stated by the Ministry of Finance, the evaluation has tested and analyzed several data sets to assess whether RDSSC:

- Is aimed at a well-defined objective of common interest
- Is designed to deliver the objective of common interest, i.e. assessing the direct and indirect impact of the scheme on beneficiaries
- Use of resources are proportional and appropriate for achieving the objective
- Distort competition and trade

In this chapter we summarize our findings and provide our recommendations for how RDSSC – in combination with other regional policy instruments – can contribute to stable settlement patterns in eligible regions.

10.1 The objective is well-defined

Since the introduction in 1975, RDSSC has been part of a broad regional policy to preservation of the distinctive features of the Norwegian settlement patterns. The policy has very wide political support and may in this way be said to be of common interest. The political support for stable settlement patterns is also supported by economic theory, cf. chapter 3

The specific aim of RDSSC has been to increase employment in eligible regions. The reasoning for supporting employment is based on the assumptions that enhanced regional employment also increases the settlement in the same region.

Several studies support the assumption that regions with employment increase also experience growth in population numbers. However, the direction of causality is not clear. Do people follow jobs, or do jobs follow people? In chapter 6 we discuss this further. Although there is varying evidence from the literature, aggregated studies suggest that stimulating job creation in the least populated regions of Norway will contribute to reducing, or preventing, depopulation.

When the RDSSC was introduced the differentiation of tax rates was justified by a situation with strong reduction in employment in primary industries in rural areas. This situation combined with low labour mobility between regions and nationally determined wages could create “hidden” unemployment, cf. chapter 2. This may still be the case, but the argumentation for stimulating rural employment has changed over the years. Today it is much more important to stimulate rural employment to avoid depopulation.

There may still be lack of labour mobility between regions in the short run and migration data support this (cf. chapter 2). But in the long run (through generations) agglomeration forces create urban amenities rural firms have to compensate one way or another to attract workers, cf. chapter 6.

Two potential developments can undermine the political objective of stable settlement patterns:

- Due to weak access to urban amenities rural regions may not attract sufficient labour although there are work opportunities

- Depolulation may slowly reach a level that reduce the attractiveness and productivity for the remaining firms.

The latter may be the result both of reduced economies of scale for local services and increased transaction costs through longer distance between partners and customers.

Avoiding depopulation appears today as the most urgent argument for stimulating employment in rural regions, as is the aim of RDSSC.

RDSSC brings the calculation price of labour below market wages. In this way RDSSC may both help rural firms to compete for labour in the long run and/or to expand production through lower cost. In both cases will rural employment be larger than would otherwise have been the case.

Overall, the objective of the scheme of reducing or preventing depopulation in the most sparsely populated regions in Norway is clear and easily understood, is sought accomplished through theoretically convincing means and have broad and long standing political support. We therefore conclude that RDSSC addresses a well-defined objective of common interest.

10.2 Empirical analysis shows that RDSSC increases employment in eligible regions

The basic idea behind RDSSC has been that the scheme should increase employment in sparsely populated regions. This can be done directly by RDSSC reducing the company's labour costs. The assumption is that reduced labour costs allow enterprises to reduce their product price, gain market share and increase production. It is this direct effect that explicitly justifies the choice of RDSSC as a policy instrument.

However, RDSSC may also contribute to increased employment when affected enterprises do not reduced their product prices. This may e.g. be the case for enterprises that sell their products in small local markets (local services), or are effectively restricted by access to other input factors (such as natural resource-limited companies). Nevertheless, the enterprise revenue will increase as a result of cost reductions. Overtime, it is reasonable that wage bargaining helps to spread this income increase between employees (wages) and owners (profit). When income increases for employees and owners living in eligible regions, demand for all consumer goods will increase, typically household-based services produced in the region. Through higher local production of consumer goods income transfer via RDSSC will also contribute to increased regional production.

In chapter 5 we have tested if it is possible to identify significant direct and indirect employment effects in detailed employment and firm data. We have also tested the degree of wage increases as a result of RDSSC.

To be able to test the effects we have had to utilise the variation of the RDSSC scheme over the last decades. We have studied three large reforms during period 1996-2013:

- the 2000-reform when several municipalities were placed in another zone. We study here municipalities that got lower payroll tax rate;
- the 2004-reform that resulted in an increase of the tax rates in zones 2-4. The new rates were applied to the wage costs above a threshold;
- the 2007-reform that reversed changes in 2004, introduced two new zones and, most importantly, changed the determination of

the employees' payroll tax rate from their place of residence to the location of the enterprise.

Data from all the reforms confirm that there are both significant direct and indirect effects on employment in in eligible regions. We find that the direct employment effects are small. Moreover, only a modest share of the burden of payroll taxation is shifted on to workers, and a correspondingly large part remains with the employers. This implies that the indirect income effects also are modest

An obvious interpretation of the results above is that a repeal of RDSSC as a policy instrument will result in increased centralization. The employment in the country as a whole will probably be almost unchanged, but over time businesses will reduce their investment and production in the (now) eligible regions and expand elsewhere. Based on our data it is reasonable to assume that RDSSC contribute to between 2 and 5 percent higher employment in the eligible regions than would otherwise have been the case.

In the interpretation of the size of the identified effects, it is important to take into account that we have not been able to test the effect of the scheme where the scope is greatest, as in Finnmark and the northern areas of Troms. It is reasonable to assume that the effect of changes is not linear. A slight change could be expected to have a small or zero effect because risk and conversion costs stops companies from changing behaviour if the tax change is too small. But, for example, if the payroll tax had suddenly increased from 0 to 14.1 per cent in Finnmark, we would expect big effects. Although the scheme is close to NOK 14 billion, data variation within our data period is limited. Our estimation results reflect that the change has been relatively limited in our data period, which makes it more difficult to identify effects.

Taking this into account, it reasonable to assume that the effects are significantly greater in Zone 5 than in the other zones

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10.3 Alternatives to RDSSC are costlier and less appropriate

RDSSC appears to increase employment in eligible regions. Based on our data the public cost of every extra employee is calculated to almost NOK 800 000 NOK (2017-NOK) for a sample of municipalities which moved from zone 2 to 3 in year 2000. The calculation does not have to be transferable to all zones but illustrates a realistic scope. In total support and the RDSSC has similar scope as the Norwegian agricultural policy support (14 billion NOK).

However, we want to point out that the implicit support increases over time as a result of the scheme design. Because the social security contribution is calculated on basis on employer-paid payroll tax, the difference between high and low tax rates will grow in monetary terms in line with general wag increasing.

To assess the proportionality and appropriateness of the scheme, it is useful to keep in mind 1) what would have happened without the scheme and 2) what alternative schemes are available.

Repealing the regional differentiation of the social security contributions within a tax neutral framework would obviously have resulted in lower employment and settlement in the low-rate zones and higher employment and settlement in zone 1. This follows directly from the results discussed above. It is also worth noting that the results of a tax neutral change will not necessary give the same employment

increase in Zone 1 as the decline in the zones with a reduced rate. This follows from our empirical tests that show that tax increases and tax reductions do not seem symmetrical on employment

It seems obvious that a tax neutral repealing of the regional differentiation of the social security contributions is no alternative when there is a need for schemes which contributes to positive population development (or reduce depopulation) in rural areas.

However, it cannot be ruled out that alternative schemes can achieve equal results with less effort.

In chapter 7 we saw that RDSSC in monetary terms by far is the most important scheme within the rural and regional development policy mix. Moving all implicit regional support from RDSSC to other schemes will radically change all other schemes. This rise a serious question about appropriateness.

Normally there will be a decreasing effect of public instruments seeking to influence the behavior of individuals and businesses, cf. discussion in chapter 7. Especially if one scheme multiplies in size, there is reason to assume that there will be very little effect of “the last million”. Alternatives to RDSSC should preferably be a mix of other schemes to enhance employment and settlement in the eligible regions.

An alternative to RDSSC can be to increase capital and innovation support in eligible regions to promote employment. Norway have several such schemes within Innovation Norway and the Research Council. Evaluations indicate that such schemes increase employment almost at the same level as RDSSC, cf. Chapter 7. However, these schemes are much smaller in scope than RDSSC and we do not know whether the effects will last if all the implicit support through RDSSC is transferred to such schemes. In particular, this will be the case in Zone 5, where abolishing RDSSC will increase the social security contributions the most and where alternative schemes have to increase relatively much to achieve the same effect. Our assessment is that there is little gain in such a reorganization.

It may also be an alternative to increase income support to households as Norway already do in Zone 5. Increased income support may enhance regional settlement in two ways. First through the same income-employment effect as higher wages trough RDSSC and as an enhanced attractiveness to live in the eligible regions. It is nevertheless difficult to see that income support to households in itself will be more effective than the implicit increase of income that follows from RDSSC. A significant increase in regional income transfers to households may also go to both “needy and non-needy”, which may be difficult to defend based on fairness.

Regional employment can also be enhanced by moving the implicit support to companies through RDSSC to eligible municipalities themselves. Municipalities are the main provider of care services, primary education and local community development. Transferring the support to the municipalities themselves will enable them to enhance the employment related to their tasks, invest in common goods in the municipality or to enhance small municipal industrial funds where such are in place. This may be a realistic alternative to RDSSC as it is today.

If enhanced employment is the only objective the cost of one municipal employee may cost almost the same as the implicit cost of one extra employee through RDSSC. One public employee costs

approx. NOK 700 000[96], compare to may be NOK 800 000 in RDSSC. As long as the cost of one extra employee in the municipally sector costs almost the same as one extra employee through RDCCS, moving regional support from RDCCS to the municipalities could be an appropriate alternative to local employment challenges. However, such a move will also shift employment from the commercial sector to the public sector, which in the long run may weaken rural regions' abilities to develop new income opportunities.

Strengthening municipal finances can be an interesting alternative in municipalities with untapped income opportunities and where the challenge is to attract residents. Better municipal services or common goods can be factors that help keeping or attract labour. In such municipalities higher state funding could be an alternative to RDSSC.

Our assessment is that a total abolishing of RDSSC clearly will weaken the possibilities of reaching regional policy objectives. The effects of abolishing the scheme will clearly be largest in Zone 5. We do not assess that there is any complete alternative to RDSSC. Within an ambitious regional policy RDSSC appears to be an appropriate instrument alongside other schemes aiming at balancing the settlement pattern.

However, it may be necessary to consider whether some municipalities may be better off with a different mix of policy instruments.

10.4 No detectable effects on competition and trade

I chapter 9 we discussed if the RDSSC scheme distorted competition and trade. The RDSSC scheme may be distortive if it distorts competition between firms, nationally or internationally.

Our empirical results indicate that all the positive employment effect of the RDSSC in the eligible regions comes as a shift of employment from non- eligible regions. Our interpretation of this is that the potential marked distortion primary occurs as a distorting competition within the nation.

In chapter 9 we try to detect any distortive effect through testing if the ratio of value added to sales are significantly larger in the RDSSC zones. We do not find evidence for this and there probably are few general competitive distortions due to the RDSSC scheme. However, that does not imply that no firm is using the reduced social security contribution in order to gain competitive advantage, but the results indicate that on average the reduced social security contribution does not spill over into distorting competition.

We neither find locational advantage of locating outside the zone with the highest social security contribution. In sum, there may be effects, but they are hardly detectable and must be resolved on a case by case basis where price and (geographical) market share data are utilized in order to ascertain the degree of competition.

Our conclusion is that RDSSC hardly distort competition and trade i general. There may be undetectable distortions nationally, but unlikely internationally.

[96] Based on man-years expenses in the Norwegian municipal sector. 2016. Statistics Norway

10.5 Recommendations

Based on an extensive empirical review of RDSSC, we recommend the scheme to be continued approximately unchanged.

RDSSC is, however, so general in its design that the scheme is not suitable for compensating municipalities where the real obstacle to positive population development is not a lack of job opportunities, but lack of social benefits (amenities). Such a situation may apply to both small municipalities with long distances to larger centres and municipalities with such a low population density that it is demanding to develop local service businesses. Such municipalities are at risk of depopulation even if there are local income opportunities. Strengthening the finances of such municipalities can, in principle, help to increase the population and also the customer base for some local services (through consumption of municipality employee).

Shifting support from companies to municipalities may also be an alternative for municipalities with real commuting opportunities for municipalities in zone 1. This will apply to municipalities in zones 1a and 2, zones with so small tax differences in tax rates to zone 1 that the effects of RDSSC on the company behaviour are limited. For such municipalities may more financial transfers enhance municipal service production or the development of common goods, which again could be important for population growth.

In order to take into account the fact that some municipalities are experiencing challenges not covered by RDSSC, we suggest that the relevant ministries consider giving individual municipalities the freedom to choose whether they will carry on with RDSSC or if they want the same amount of support transferred as a separate free income for the municipality. Such a scheme can, for example, be done as a pilot scheme for a few years to test interest, but with the opportunity to return to previous order later.

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