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Regional Risk Sharing Among Swedish Municipalities

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Abstract: We use panel data to analyse long-run and short-run risk sharing among Swedish municipalities in terms of municipal-level personal incomes during the period 2000-2018 and local government finances during 2005-2018. We find that long-run redistribution of personal incomes amounts to 44 percent and short-run stabilisation to 39 percent. In terms of municipal finances, we find a degree of risk sharing between 70 and 100 percent, depending on the definition of municipal disposable income. Moreover, the degree of risk sharing of personal incomes has decreased during the period, while risk sharing of municipal finances has remained stable. Further, the degree of risk sharing is decomposed into various components, and we find that risk sharing of personal incomes is mainly driven by benefits systems, while local government risk sharing is driven primarily by the income equalisation system. We further separate municipalities into four groups, and find that both the total degree of risk sharing and its main components vary significantly between large cities and other types of municipalities. In conclusion, we find that the degree of regional risk sharing in Sweden is high compared to previous studies of other countries.

Keywords: risk sharing, regional redistribution and stabilization, fiscal equalisation, local government

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1 Introduction

In the last thirty years, regional inequality in Sweden has increased significantly, as income has become increasingly concentrated in large cities and their surrounding areas (Nordin, 2020). Migration of human capital from rural areas to these more densely populated cities have further exacerbated inequality between regions—not only in terms of economic outcomes, but also in terms of social attitudes and political preferences (Keuschnigg et al., 2019). For instance, opinion polls show large differences in social attitudes and electoral support between cities and rural areas. In general, rural areas seem to exhibit lower trust in institutions and are more dissatisfied with the country's general situation. Furthermore, these areas are also generally more positive towards increased regional redistribution (Oscarsson, 2017).

The increasing regional divergences are also apparent in the changes of demographic compositions, which is likely to have consequences for regional financing and to pose significant challenges for the more sparsely populated regions. In Sweden, the dependency ratio—the ratio of total population to working-age population—was virtually constant for large cities between 1974 and 2017, while in increased significantly in rural areas (Mörk et al., 2019).

This demographic shift could impose serious strain on municipal budgets in the future, as more sparsely populated municipalities will have to finance an aging population, while their traditional economies have also experienced a decline. The problems associated with these shifts have also been acknowledged by the Swedish government. An official report concludes that the public sector will be increasingly burdened in the future and that municipalities will face challenges in regard to municipal finances, access to human capital, and provision of municipal services, and that these problems are likely to be especially severe for smaller and more rural municipalities (SOU 2020:8).

The question of how to approach this issue and mitigate the consequences of divides between wealthier and poorer municipalities is also frequently debated in Swedish media. For example, in an interview with one of Sweden's largest newspapers, former prime minister Göran Persson recently expressed his disapproval of the current system, which he stated has led to the municipalities with the highest tax rates also providing the lowest quality of service (Strandberg and Turesson, 2021). Further, recent changes to parts of the municipal equalisation system provoked much debate and criticism from those regions who are—or would become—net payers, such as Stockholm decrying the payments as punitary (Svenonius, 2019), while the government argued that changes in the system are necessary to maintain an equal standard of living across the country (Prop. 2019/20:11).

In light of these discussions, the manner in which countries approach these interregional differences is an important topic of study. This paper analyses these differences using the concept of risk sharing—in this paper defined as the relationship between personal income and

disposable income, as in e.g. Bayoumi and Masson (1995) and Mélitz and Zumer (2002). In the case of full risk sharing, there would be no relationship between personal income and disposable income relative to the national level, while these would be perfectly correlated in the absence of risk sharing. Risk sharing is analysed both in regard to the long run relationship—termed *redistribution*—using a cross-sectional analysis, and in terms of short-run changes—*stabilisation*—using within-unit variation. Further, the same analysis is applied to local government finances, where the municipal tax base substitutes for personal income in the definition of risk sharing. The analysis is also performed for different types of Swedish municipalities, in order to determine whether there are heterogeneous levels of risk sharing between these groups.

As in e.g. Asdrubali et al. (1996) and Mélitz and Zumer (2002), the total degree of risk sharing is decomposed into several components in order to determine the different channels of risk sharing. Additionally, as an extension, this paper also explores whether the degree of risk sharing has varied over time by analysing several subperiods, and the analysis of stabilisation is extended by varying the length of what is considered short-run.

The contribution of this paper is twofold. First, to the best of our knowledge, the only similar analysis performed using Swedish data is by Andersson (2004, 2008), who used data covering a period from the 1980s to 2001, and only focused on stabilisation. Since then, there have been several changes to the Swedish tax, benefits, and grants systems, in addition to structural and demographic changes in the Swedish economy. Thus, this paper contributes by analysing risk sharing using more recent data, as well as quantifying the degree of redistribution. Further, Andersson (2004) only considers the effect of direct activities by the central government, while large parts of the Swedish systems of risk sharing are undertaken by the municipalities. Second, this paper also analyses the degree of risk sharing with regard to local government finances, which to our knowledge has not been previously done in a Swedish context.

The rest of this paper is structured as follows. Section 2 reviews previous literature on the subject, and section 3 describes the Swedish institutional environment. In section 4, the data is described, and descriptive statistics are provided. The empirical strategy is presented in section 5, followed by estimation results in section 6. Finally, section 7 contains a concluding discussion.

2 Literature Review

The topic of risk sharing has been studied and developed by a number of previous authors, with papers such as Cochrane (1991), Mace (1991), and Townsend (1994) having particular importance in establishing the theory. These papers study risk sharing among households, in

the context of consumption insurance—that is, how consumption varies with income. For example, if consumption for a specific household is not affected by its income, that would imply full risk sharing, while a perfect relationship would imply no risk sharing.

Other papers, which are more closely related to this paper, study risk sharing among regions within countries instead of households. Sala-i-Martin and Sachs (1991) test risk sharing of regional incomes through federal programs in the US, and find that a one dollar decrease in per capita regional personal income leads to a change in regional disposable income of about 0.6 dollars during the period between 1970 and 1988. Bayoumi and Masson (1995) similarly analyse regional risk sharing via federal, or transnational for the European Community (EC), programs in the US, Canada, and the EC from the late 60s to the late 80s and attempt to separate long-term fiscal flows from regional business cycles, where the former is termed redistribution and the latter stabilisation. Specifically, redistribution concerns the long-run relationship between personal income and disposable income, and stabilisation concerns the change in disposable income resulting from a change in personal income. They find that the redistribution effect is 22% and the stabilisation effect is 31% in the United States, while it is 39% and 17% respectively in Canada. They also analyse the stabilisation of national per capita income for EC states relative to the EC average, where there is no fiscal mechanism, and find that the degree of stabilisation is in the range of the estimates for Canada and the US.

Asdrubali et al. (1996) also study the amount of risk sharing within the United States by analysing the impact of changes in gross state product on state disposable income and state consumption, and decompose the effect into additional channels so as to determine the extent of risk sharing from capital markets and credit markets, as well as federal systems. They also study the differential degrees of risk sharing and channels for states with high degrees of agriculture, manufacturing and mineral extraction, and find that manufacturing states do not seem to differ from other states, while those more reliant on agriculture and mineral extraction have higher total smoothing. In total, they find a degree of risk sharing in terms of stabilisation of about 75% on aggregate, when including capital and credit market smoothing. This higher degree of smoothing compared to previous findings can in large part be attributed to credit market smoothing, which is an attempt by the authors to capture the difference in disposable income and consumption, and measures the effect of savings and loans. They also perform the analysis using a larger differencing interval in their first differences specification to capture longer-term effects, and find that credit market smoothing decreases rapidly after the first year, while smoothing from the government grows larger over time. Sørensen and Yosha (1998) use a similar method to analyse stabilisation of GDP between various OECD and EC countries, and find a degree of smoothing at about 40%, which is decreasing as the differencing interval is increased.

Mélitz and Zumer (2002) attempt to reconcile the heterogeneous results of previous re-

sults in the literature and perform a series of tests for Canada, France, the UK, and the US. They find that while there are differences between countries, differences in previous estimates for regional stabilisation within the same country can mainly be attributed to accounting choices, with those papers using personal income generally yielding higher estimates compared to those studying gross regional products. They further argue that the definition of transfers should be related to the choice between using personal income or gross regional product. Specifically, they argue that personal income estimates should include transfers to individuals, while gross product estimates should include all transfers affecting local production, thereby including grants to local governments. Following these definitions, the authors find that regional stabilisation of personal income through the central government in the US, France, and the UK amounts to close to 20%, but only somewhat above 10% for Canada. With the use of gross regional product, where data is only available for the US and Canada, they find that the estimate for regional stabilisation is lower for the US and higher for Canada, at slightly more than 10% and 15% respectively.

Kalemli-Ozcan et al. (2003) estimate the degree of risk sharing in a number of countries and find estimates of stabilisation of personal incomes between approximately 25% and 75%. They also extend the analysis to study whether higher levels of risk sharing affects the level of industrial specialisation within regions, since theoretically this should lead to higher exposure to risk, and find that higher risk sharing is associated with a higher degree of specialisation. Borge and Matsen (2004) analyse risk sharing among Norwegian regions. Specifically, their analysis follows Asdrubali et al. (1996) closely. However, they also attempt to study the potential risk sharing effect from public employment. They find that public employment absorbs approximately one quarter of private sector shocks, and that the total degree of risk sharing is over 80 percent. Andersson (2004) studies risk sharing among Swedish municipalities and finds a stabilisation effect through the central government fiscal system of about 10%, using personal income between 1983 and 2001. Andersson (2008) instead studies the stabilisation effect using gross regional product and finds a smoothing effect of about 20% during the period 1985-2001.

Hepp and von Hagen (2013) study interstate risk sharing in Germany, using the same method as Asdrubali et al. (1996) and find that around 80% of variances in gross state product in post-unification Germany are smoothed across states, of which around 11% is by the government. They also find significant regional differences between post-unification West and East Germany, and that the contribution to risk sharing by the governmental sector for West German states has decreased from about 54% to 17% in the period after unification. Feld et al. (2018) analyse regional risk sharing based on Swiss data and total gross cantonal income—meaning all income earned by individuals and companies. They find a total redistributive effect of around 20%, while their estimate for stabilisation is slightly below 10%.

There have also been a few papers attempting to quantify the degree of risk sharing in terms of local government finances. Smart (2002) analyses redistribution of local government finances among Canadian provinces and finds a total degree of redistribution at around 45%, and full risk sharing when including only provinces which are receiving equalisation grants. Smart (2004) further studies Canadian provinces, this time in terms of stabilisation of local government finances, and finds a total degree of stabilisation slightly more than 40% after controlling for differences in tax rates. Hepp and von Hagen (2011) study both redistribution and stabilisation among German states in terms of local government finances. They find that the degree of redistribution is somewhat below 80% for unified Germany, and that the degree of stabilisation is around 20%.

3 Institutional Background

3.1 Local Government

Sweden is divided into 21 regions and 290 municipalities[1], which have extensive powers according to the principle of local self-government—a part of the Swedish constitution. The local governments have several mandatory responsibilities laid down by law. For example, municipalities have responsibilities including education and care for the elderly and the disabled, while the main responsibilities of regions are to provide healthcare and public transport. Beyond the mandatory responsibilities, local governments are allowed to undertake a vast range of voluntary activities—following the principle of local self-government—such as investments in culture, tourism, and economic development. In order to finance their operations, local governments have the constitutional right to levy flat-rate income taxes on their populations, which account for a vast majority of their incomes, with most of the remaining incomes coming from various state grants and a fiscal equalisation system.

In aggregate, the municipalities, which are the units of analysis in this paper, receive about two thirds of their income from direct income taxes. General government grants add a further 14%, for a rough total of about 80% in income from general grants and taxes. Most of the remaining fifth comes from various fees—often capped by law—and targeted government grants. Thus, the only significant method for municipalities to directly raise their income is by adjusting the local tax rate. With regard to expenditures, almost three quarters are attributable to education and care for the elderly and those with disabilities, with a further 7% spent on transfers and other categories related to social care. Thus, about 80% of municipal expenditure is on various social services, most of which is mandatory expenditure, with the remaining fifth spread between infrastructure, culture and other areas, including both mandatory and

[1] In one case, Gotland, the region and the municipality are combined into one entity.

voluntary ones. However, there is significant heterogeneity between the municipalities.

Since 2000, municipalities are required to maintain balanced budgets, and any budget deficits are by law required to be remedied within three years time. A further requirement is that municipalities should have their economies in good order (*God ekonomisk hushållning*), which is usually interpreted as having a net income of 2% of taxes, equalisation payments and general government grants (Swedish Association of Local Authorities and Regions, 2005).

Due to the fact that municipalities have various different preconditions which may affect their ability to provide adequate services to their population, there are a number of mechanisms in place which attempt to equalise these differences, with the goal of eliminating all sources of different levels of service provision and local tax rates besides those caused by differences in efficiency and local ambition levels (Riksrevisionen, 2019). The two major ways this is done is through an income equalisation system and a cost equalisation system. The income equalisation system is designed to compensate for differences in tax power[2] between municipalities, where the municipalities which have a tax power above 115% of the average national level have to pay a fee equal to 85% of the municipal tax income they received from tax power above that threshold[3]. Similarly, municipalities with a tax power below the same threshold receive grants equal to 95% of the extra municipal tax income they would have gotten, were they to have had a tax power equal to 115% of the average national tax power. The fact that the threshold is set to above than the national average as well as the asymmetric compensation rates means that the government injects funds into the system, in contrast to the cost equalisation system, which is funded by the municipalities themselves. In this system, the government calculates an expected structural cost for providing certain mandatory services for each municipality, for example based on demographic differences. Municipalities with lower calculated structural costs than the average are required to pay a fee corresponding to the difference, while municipalities with higher structural costs receive grants.

Furthermore, there are also three other, more minor components. The first is the structural grant. This is a grant given to mostly—but not exclusively—rural, northern municipalities to compensate for parts of the cost equalisation being removed by a reform in 2005. The second is the transitional grant, which is a temporary grant provided to municipalities in conjunction with reforms of the system in order to smooth any losses and mitigate distributional effects. There is also an adjustment grant—or fee—which is divided equally among the municipalities by population, to compensate for differences between total equalisation and the amount set aside for equalisation in the national budget. If the amount allocated in the budget exceeds total equalisation, all municipalities receive an equal per capita grant, and all pay

[2] Tax power is defined as the total taxable personal income in a municipality, divided by the population. Tax power is calculated based on personal earnings two years prior.

[3] Based on a standard tax rate (county tax) for the entire region, rather than the municipality's own tax rate, such that the municipalities cannot affect their level of compensation or fee themselves.

a fee if the reverse is true. This adjustment grant is sometimes also used to inject additional money into municipal budgets by purposefully allocating a larger amount than necessary.

The equalisation system has undergone several reforms during this period. The largest one took place in 2005, when the entire system was reformed, resulting in the base for the current system. One of the main changes to the income equalisation system was that the threshold was raised from 100% to the current level, shifting financing from the municipalities to the state, since additional financing now had to be injected to the system. This was done in order to create a more unified system, as previously, a separate system of population-dependent general grants was financed by the state, which was abolished by this change. The second major change was that the fee paid for exceeding the threshold was lowered from 95% to 85%, meaning that those municipalities which were still net contributors had to pay less. These changes especially benefited wealthier urban and suburban municipalities. The cost equalisation mainly saw minor changes in this reform, though the models for calculating structural costs were updated and certain models were removed or added. As mentioned above, the structural grant was implemented in this reform, to compensate for changes in the cost equalisation. The models for the cost equalisation system were also updated in two reforms in 2008 and 2014 respectively. A major part of the reform in 2008 was the addition of a model compensating for differences in wage levels between municipalities, which mainly benefited the larger cities. In 2014, there were several minor adjustments for different components, which mainly benefited rural and manufacturing municipalities (Statskontoret, 2017).

In 2014, there was also a change in the income equalisation, whereby municipalities with a tax power above the threshold only had to pay a fee of 60% for tax power between 115% and 125% of the national level, instead of 85%, in order to improve municipal incentives for increasing the tax power level. For the tax power exceeding 125% of the national average, the compensation rate was still 85%. This change was reversed in 2016.

3.2 Individual

The main components of taxation of personal income in Sweden are the municipal and regional income taxes, as well as the government income tax. As mentioned previously, the municipalities have discretion to choose their own tax rates and the rate will thus vary. As an indication of the size, the average municipal tax rate in 2018 was equal to 21.60%, with a standard deviation of more than one percentage point. Including regional income taxes, the average rate in 2018 was 32.93%. Income is also taxed by the government when it exceeds a certain threshold—at present SEK 523 200 per year—at which point the state tax rate is 20%. During the period analysed there was also a second threshold, at which income was taxed by an additional 5%, which has since been abolished. Capital gains are taxed at a nominal rate of

30%, but there are several exceptions to this, depending on the source of capital gains, which may lower the effective tax rate. Furthermore, capital losses are in general deductible.

During the period of study, in 2007, an earned income tax credit (EITC, *jobbskatteavdrag*) was introduced, lowering the effective municipal tax rates (though paid by the national government). This credit has since been expanded several times, and significantly reduces municipal taxes for low- to medium-income earners, since the size of the deduction only increases up to a certain threshold. In later periods, the size of the deduction has not only been increasing up to a threshold, but also decreasing thereafter. Furthermore, the ROT (*Reparation, Ombyggnad och Tillbyggnad*) and RUT (*Rengöring, Underhåll och Tvätt*) deductions were introduced during the study period, which are deductions on income taxes due to certain services being purchased. ROT mostly covers repairs, conversions, and extensions of personal residences, while RUT covers cleaning, maintenance, and laundry, though RUT has also been extended to cover additional services related to a variety of different household chores.

4 Data

Mainly using data from Statistics Sweden, we construct a dataset covering all 290 Swedish municipalities, with most variables for personal income covering the period from 2000 to 2018. We use variables from 2005 until 2018 for municipal finances, due to the large changes in the compensation systems in 2004. We further exclude the municipalities of Gotland and Knivsta. The former is excluded due to institutional differences, as Gotland is a combined municipality and region, while the latter is excluded due to being formed during the period. The remaining municipalities are divided into groups by type. This division follows the 1993 division by *Svenska kommunförbundet*, which divided municipalities into nine groups. We aggregate these groups into four categories. First, large cities are combined with their suburbs. Second, three different types of medium-sized towns are combined into one. Third, rural municipalities are combined with municipalities with low population densities and with small towns. Finally, manufacturing municipalities are maintained as a separate group and not combined with any other.

Data used in this paper include general demographic data, as well as data on personal incomes, taxation, and municipal finances. The general demographic data is collected from Statistics Sweden. Data on municipal expenditure is retrieved from Kolada—a database created by the Swedish Association of Local Authorities and Regions (SKR), in collaboration with the government. Municipal expenditure is expressed as net expenditure, which includes income from fees and targeted government grants that are associated with the specific activity. Revenues and grants are based on the income statements for each municipality, compiled by Statistics Sweden. Municipal tax rates and grants specific to the fiscal equalisation system are

also collected from Statistics Sweden.

Data on the municipal property fee is collected from SKR. On the municipal income statements, the property fee is included in income from general government grants. Thus, in order to separate the property fee from the other general grants, we deduct the fee from the total.

Data on disposable income and its components is collected from Statistics Sweden, following the European System of National and Regional Accounts (ESA) 2010. Employee compensation includes wages, social fees paid by the employer, and non-monetary compensation. We further include household income from unincorporated enterprises in this category. Capital income and expenses include dividends, interest and similar transactions, but not realised profits from sales of stocks and other financial assets. Benefits include both taxable and non-taxable benefits, and include benefits from all levels of government. Our data does not allow for any further disaggregation of the benefits included. Taxes include tax reductions, but do not include consumption taxes. Social fees only include fees deemed to be directly related to the employee, and thus do not include the entire employer contribution (*arbetsgivaravgift*), but only the part of the contribution related to pensions, which is about a third of the total contribution. They also include other social fees paid by the employer according to collective bargaining agreements with the unions, which vary by industry.

We also collect data on education outcomes from the Swedish National Agency for Education. which includes information about average merit rating[4] for 9th grade students and proportion of students reaching minimum requirements, for each school with at least 15 pupils in 9th grade and where there is adequate information on socio-economic factors. The data contains both actual outcomes for each school, and model-based outcomes from the SALSA model, which is a model aiming to output expected outcomes based on the socio-economic background of the pupils. It takes into account parental education levels, the gender distribution of pupils, and the proportion of students of non-Swedish background. The difference between the actual outcome and the model based outcome, the residual, is therefore intended to better capture the performance of schools. A residual greater than zero would mean that a school performs better than expected given socio-economic factors, while a negative residual would imply that the school is underperforming. Since the data is on a school-unit level, we aggregate it to the municipal level, weighting the schools by number of 9th grade pupils and calculating the average.

[4] Each final grade gives a corresponding number of merit points between 10 and 20. In total, the points are based on 16 subjects (17 if the pupil has chosen to study extra languages, from 2015 onward). Thus, the maximum possible merit points are equal to 20*16 = 320 prior to 2015 and 340 thereafter.

4.1 Municipal Trends

In order to analyse the heterogeneity between different municipalities, they are divided into four main categories: Large cities and suburbs, medium-sized towns, manufacturing-dependent municipalities, and rural municipalities. The distribution of these categories is illustrated in figure 1. Municipalities classified as large cities are limited to the capital, Stockholm, as well as the two next largest cities, Göteborg and Malmö, and their suburbs. Further, manufacturing-dependent municipalities are limited to the southern half of Sweden, while towns and rural municipalities are distributed throughout the country, although rural municipalities are more common in the north. Additionally, several rural municipalities—especially in the south—have a relatively high ratio of manufacturing employment, but are too sparsely populated to be defined as manufacturing municipalities.

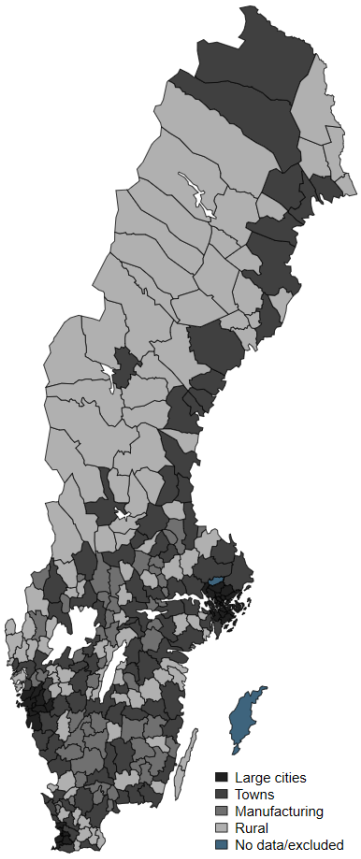

Figure 1: Municipality classification

Table 1 illustrates some general statistics for the different municipalities in 2018—the end of this paper's observation period. Large cities generally have higher employment rates, incomes, and education levels. Manufacturing municipalities on the other hand have the lowest levels of incomes, education, and employment rates. Rural areas perform somewhat similar, but have lower levels of unemployment and higher employment rates, as well as disposable incomes. Towns have higher levels of education, tax power, and disposable income compared to manufacturing and rural municipalities. However, their employment rate is similar to that of rural municipalities, and their unemployment rate is somewhat higher. To illustrate how the groups have changed over time, the evolution of employment rates by municipality group is shown in appendix A. In general, it can be noted that cities have had a consistently higher employment rate than all other groups, and manufacturing municipalities did not have a lower rate before the financial crisis, but appear to have been disproportionately affected by the crisis, and afterwards have had a consistently lower rate.

Table 1: General characteristics, 2018

	National	Large Cities	Towns	Manufacturing	Rural
Total population	35.25	90.10	51.98	14.36	10.21
	(73.54)	(171.7)	(42.19)	(9.905)	(4.737)
Tax power	212.0	251.3	213.5	199.5	201.8
	(25.61)	(40.46)	(13.81)	(11.94)	(13.45)
Disposable income	218.1	251.6	216.3	205.1	213.5
	(23.68)	(41.84)	(10.34)	(9.207)	(14.72)
Tertiary education share	28.47	41.27	30.88	22.16	24.64
	(8.593)	(8.818)	(7.277)	(3.149)	(4.597)
Employment rate	66.81	70.26	66.62	64.34	66.88
	(3.735)	(3.096)	(2.918)	(3.891)	(3.529)
Unemployment rate	5.575	3.876	5.957	6.913	5.227
	(1.996)	(1.715)	(1.671)	(1.984)	(1.814)
N	288	40	91	52	105

Unweighted average values based on 2018 values. Standard deviations in parentheses. Population, tax power, and income per capita in thousands. Education, employment, and unemployment in percent. Unemployment rate based on own calculations using data from the Swedish Employment Agency. All other variables are based on own calculations using data from Statistics Sweden.

In table 2, the main variables for personal income and municipal finances used in this paper's analysis are presented. As shown, the level of employee compensation varies significantly between the different types of municipalities, with large cities having the highest levels, followed by towns, manufacturing municipalities, and rural municipalities respectively. The same relationship can be seen in terms of capital incomes. With regard to benefits, rural municipalities receive the highest amounts, towns and manufacturing municipalities receive relatively similar levels, and large cities receive the lowest amounts. Furthermore, large cities pay more in taxes and social fees compared to the other groups, both in levels and as a share of income. Finally, there is a much larger discrepancy between disposable income and employee compensation for large cities.

In appendix A, the evolution of employee compensation and disposable income over time, by group, is illustrated. It can be noted that there appears to be a lower spread of disposable incomes between municipality groups compared to employee compensation, which indicates some degree of redistribution, and also smaller changes from one year to another, indicating that there is some stabilisation.

Table 2: Summary statistics

	Personal Income				
	National	Large Cities	Towns	Manufacturing	Rural
Employee compensation	192.7	248.8	191.6	178.8	179.3
	(36.44)	(42.93)	(24.15)	(19.09)	(27.92)
Capital income	14.72	22.82	14.47	13.07	12.65
	(12.37)	(26.41)	(7.094)	(7.386)	(7.266)
Benefits	71.70	64.19	71.57	71.94	74.56
	(10.75)	(8.303)	(8.575)	(9.759)	(12.26)
Other transfers	−2.097	−1.148	−1.871	−2.171	−2.618
	(1.726)	(1.484)	(1.467)	(1.720)	(1.828)
Taxes	−61.10	−79.88	−60.84	−56.67	−56.37
	(13.55)	(24.98)	(6.367)	(5.407)	(7.076)
Social fees	−35.10	−45.38	−35.53	−33.20	−31.75
	(7.391)	(8.759)	(5.465)	(4.485)	(5.603)
Disposable income	180.9	209.4	179.4	171.7	175.7
	(30.66)	(42.51)	(25.38)	(22.26)	(26.60)
N	5472	760	1729	988	1995
	Municipal Finances				
	National	Large Cities	Towns	Manufacturing	Rural
Tax income	41.12	44.23	41.44	40.39	40.01
	(4.529)	(6.071)	(4.177)	(3.398)	(4.022)
Tax rate	21.51	19.72	21.52	21.81	22.04
	(1.175)	(1.243)	(0.868)	(0.618)	(0.900)
Income equalisation	8.434	1.393	8.158	9.807	10.68
	(4.419)	(6.095)	(2.268)	(2.584)	(2.600)
Cost equalisation	0.684	0.837	−0.550	0.278	1.895
	(2.594)	(2.067)	(1.347)	(1.439)	(3.372)
Other grants	1.137	−0.00175	1.232	0.814	1.648
	(1.900)	(0.976)	(1.628)	(1.366)	(2.346)
Property fee	1.830	1.620	1.788	1.781	1.971
	(0.258)	(0.174)	(0.155)	(0.126)	(0.321)
Structural cost	36.38	36.56	35.15	35.98	37.59
	(3.515)	(3.436)	(2.721)	(2.760)	(4.048)
Net operating cost	44.31	40.76	43.25	43.91	46.78
	(5.400)	(4.258)	(4.378)	(4.143)	(6.003)
N	4032	560	1274	728	1470

Unweighted average values in thousand SEK per capita. Standard deviations in parentheses. Personal income covers the period 2000-2018, municipal finances 2005-2018. Property fees and net operating costs from own calculations based on data from SKR and Kolada, respectively. All other variables from own calculations based on data from Statistics Sweden. Net operating costs only include costs for activities covered by the cost equalisation system. Averages for property fee only based on values from 2008 and later, when the fee was introduced.

There are, as with personal incomes, also several group level differences in municipal finances. First, while it can be noted that taxes make up the majority of municipal financing for all groups, there are still differences in the size of tax income, with total tax income per capita having an inverse relationship with tax rates, illustrating the stark contrasts in tax power. For all groups except the large cities, income equalisation makes up a large proportion of municipal incomes, while other grants and the property fee—though not negligible—constitute a much smaller proportion of income. There are also no large differences in official structural costs, with large cities and rural areas having slightly higher structural costs than towns and manufacturing-dependent municipalities, but not to a major degree. On the other hand, the differences are clearer in terms of net costs, which appear to not have a strong relationship with structural costs, and are especially high for rural areas, and lower for large cities.

Also in appendix A, the time series of tax power and tax rates for each municipal group are plotted. Several things are worth noting: first, municipal tax power is consistently significantly higher in large cities compared to the three other groups. Second, manufacturing municipalities have similar levels of tax power to towns prior to the financial crisis, and fall behind in the periods thereafter. At the end of this paper's period of study, they are more similar to rural municipalities in terms of tax power. Further, municipal tax rates appear to be relatively stable on average, but there is a clear decreasing trend in large cities, and slight increases in the other groups—especially in manufacturing municipalities—although the magnitude of these changes is small.

Figures 2 and 3 show the relation between our main variables of interest for the entire period. In figure 2, the relationship for personal incomes is illustrated. A flat distribution would indicate a weak relationship between disposable income and employee compensation, and thus a high degree of redistribution. Visually, there is a clear relationship between compensation and income, but it seems as if this is not a one-to-one relationship, which indicates that there is some degree of redistribution present.

The left pane in figure 3 plots municipal tax power against total municipal income per capita, and compared to personal income, the relationship between the two variables is much weaker, indicating a higher degree of risk sharing. In the right pane, all municipalities are assumed to have equal tax rates, corresponding to the national weighted average tax rate. In this case, there seems to be a more positive relationship between tax power and total income per capita, suggesting that the degree of redistribution may be overestimated without adjusting for differences in tax rates. Furthermore, the spread of incomes is decreased after normalising tax rates. These relationships are thus in line with the differences in tax rates shown in table 2.

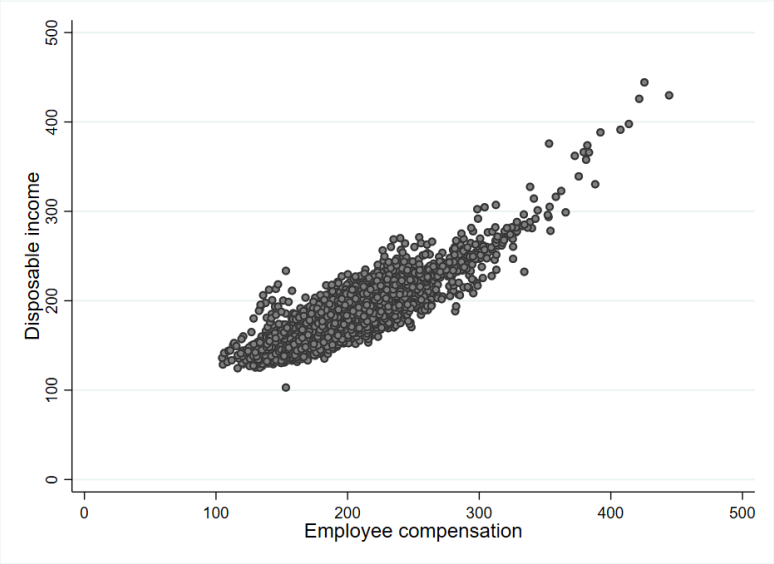

Figure 2: Employee compensation and disposable income, thousand SEK per capita, 2000-2018. Source: Data from Statistics Sweden.

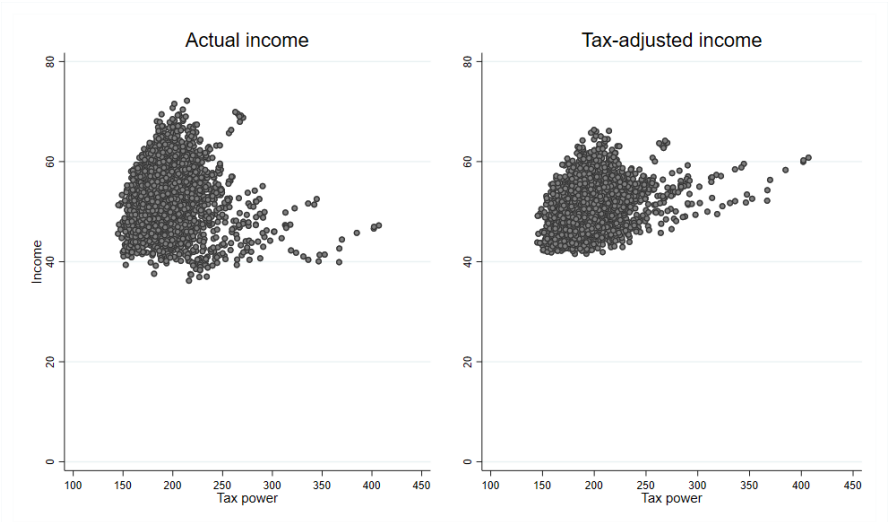

Figure 3: Tax power related to total municipal income and tax-adjusted municipal income, thousand SEK per capita, 2005-2018. Source: Own calculations using data from Statistics Sweden.

5 Empirical Strategy

In our analysis, we use an empirical strategy based on Bayoumi and Masson (1995) and Asdrubali et al. (1996), which has also been used in several subsequent papers (e.g. Mélitz and Zumer (2002); Borge and Matsen (2004); Andersson (2008); Hepp and von Hagen (2013)). The empirical strategy is based on analysing the degree of risk sharing, by relating income to disposable income, while controlling for aggregate changes. Thus, there is no attempt to

quantify the aggregate effect of a shock to the country as a whole, but only the extent to which the shock has heterogeneous effects on different regions. The control for aggregate changes may be performed either by introducing time fixed effects or dividing the variables by the national level, where we have chosen the latter. Furthermore, as in some of the previously mentioned papers, we analyse redistribution and stabilisation separately, where redistribution concerns the cross-sectional long-run equalisation, and stabilisation concerns the stabilisation of transitory changes, using within-municipality variation. We further express all variables in terms of their natural logarithms. With full redistribution, income should not be related to disposable income, when taken over the period as a whole. Specifically, consider the following cross-sectional relationship:

$$\overline{\frac{DI_i}{DI_N}} = \alpha + \delta \overline{\frac{I_i}{I_N}} + \epsilon_i \tag{1}$$

where i is a municipal index and N is an index for the national average, and thus $\overline{\frac{DI_i}{DI_N}}$ is the average share of disposable income over the entire period, and $\overline{\frac{I_i}{I_N}}$ is the average share of income before redistribution. Thus, this equation relates income in a given municipality, as a share of the national average income, to the disposable income. If there is full redistribution, there should be no correlation between the two, while there should be perfect correlation if there is no risk sharing. Reformulating the above to

$$\overline{\frac{I_i}{I_N}} - \overline{\frac{DI_i}{DI_N}} = \alpha + \beta \overline{\frac{I_i}{I_N}} + \epsilon_i \tag{2}$$

allows us to interpret β (which is equal to 1-δ) as the degree of risk sharing, where $\beta = 1$ would imply full redistribution.

In order to quantify the degree of stabilisation, we want to relate changes in income to changes in disposable income. We therefore take the first difference of our variables and run the following regression:

$$\Delta(\frac{I_{it}}{I_{Nt}}) - \Delta(\frac{DI_{it}}{DI_{Nt}}) = \gamma \Delta(\frac{I_{it}}{I_{Nt}}) + \epsilon_{it} \tag{3}$$

This is a first-differences equation relating yearly changes in income to yearly changes in disposable income. γ measures the degree of stabilisation, with $\gamma = 1$ implying full stabilisation.

Further, we also decompose degree the risk sharing into its different components, in order to analyse the separate channels of risk sharing. For example, consider a scenario where two mechanisms affect stabilisation of income: taxes and transfers. In this case, the decomposition could take the form of

$$\Delta(\frac{I_{it}}{I_{Nt}}) - \Delta(\frac{ATI_{it}}{ATI_{Nt}}) = \gamma_T \Delta(\frac{I_{it}}{I_{Nt}}) + \epsilon_{it} \tag{4}$$

$$\Delta(\frac{ATI_{it}}{ATI_{Nt}}) - \Delta(\frac{ABI_{it}}{ABI_{Nt}}) = \gamma_B \Delta(\frac{I_{it}}{I_{Nt}}) + \epsilon_{it} \tag{5}$$

where ATI is after-tax income and ABI is the income after taxes and benefits, which is equal to disposable income. In this case, γ_T would measure the stabilising effect of taxes and γ_B measures the stabilising effect of benefits. Together, $\gamma_T + \gamma_B$ measures total stabilisation.

We further experiment with increasing the differencing interval, to allow for a wider interpretation of short-run effects, as in the case of e.g. Asdrubali et al. (1996), Sørensen and Yosha (1998), and Borge and Matsen (2004). This will allow us to capture stabilising effects that might not be instant. For example, benefits payments might require an application and not be paid out until several months after the income shock, and thus might not be captured when limiting the analysis to a single year. However, as the interval is increased, it might not be as reasonable to interpret the result as the direct stabilisation of a shock, if this effect is visible only after several years.

These regressions will allow for an analysis of both redistribution and stabilisation. However, it is important to consider how different policies can have different effects on these two concepts. Since all variables are expressed as shares of the national average, only disproportional relationships between employee compensation and other components will lead to a redistributive or stabilising effect on disposable income. For example, in regard to personal incomes, a flat tax at a constant rate would be neither redistributive nor stabilising, as the relationship between employee compensation and disposable income would be constant for all levels of income. On the other hand, a progressive tax system, such as the Swedish one which has varying tax rates depending on the level of individual incomes, will have a redistributive effect on individual incomes as those with high enough incomes pay a significantly higher rate, thus equalising the disposable incomes. However, it will have a lower stabilising effect, as the relationship between employee compensation and disposable incomes—though different for high and low incomes—will not change for a given individual as their income changes marginally. The only stabilising effect would be when the incomes cross the threshold, as the relationship will change at that instance, with those crossing the threshold paying a larger share in taxes after the change in income compared to previously, and vice versa.

As a further example, consider a benefits structure such that anyone with an income below a threshold receives a compensation corresponding to the entire difference between their income and the threshold, but those above the threshold do not receive any compensation at all. In this case, stabilisation would be 100% for anyone below the threshold, as changes

in personal income would not affect disposable income at all, and zero for those above. In this case, the benefits system would both be stabilising, for reasons previously mentioned, and redistributive, as everyone below the threshold would have the same disposable income regardless of personal income.

We perform this analysis on both municipal-level personal incomes and local government finances, which are affected by different risk sharing systems. Most previous papers study the effect of central government decisions on personal incomes, but we further include local government decisions, such as local taxes and transfers, as well. In part, this is due to a lack of data, but also because Swedish municipalities have a large responsibility for many services, and receive major support from the central government to accomplish this. Further, we analyse the effects separately for the four different types of municipalities, by adding interaction terms for each group respectively. First, we analyse personal incomes, relating employee compensation to disposable income. The effect is decomposed into several channels, according to table 3.

Table 3: Decomposition of personal income

	Employee compensation
+	Net capital income
+	Benefits
+	Other transfers
=	**Total income**
-	Taxes
-	Social fees
=	**Disposable income**

We further decompose taxes in order to analyse the effect of different taxes and tax reductions.

Table 4: Decomposition of personal taxes

	Total income
-	Municipal income tax
-	State income tax
-	State capital gains tax
+	Earned income tax credit
+	ROT/RUT
-	Other taxes
=	**Total effect of taxes**

Next, we perform similar analyses for municipal finances, using the tax base per capita as an independent variable. In contrast to individuals, there is no explicit tax for municipal governments. However, they still have to offer a variety of mandatory services to their inhabitants,

some of which are less flexible than others. The cost equalisation system is an attempt to compensate municipalities for their different cost structures related to these services. If the compensation is not perfect, a municipality that is undercompensated would have a lower "disposable income", as they would be required to spend more in order to deliver the same level of services as a municipality with lower structural costs.

Thus, in order to attempt to capture the fact that this system may not be fully functioning, we deduct expenditures exceeding the national structural costs, since by definition they are compensated for deviations in their own structural costs relative to the national structural costs. If the municipalities are fully compensated for their spending, then the coefficient for cost equalisation and the costs exceeding national structural costs should add up to zero.

Naturally, the actual amount spent on these services may also depend on factors related to efficiency, ambition, or other considerations for which the cost equalisation system is not intended to compensate for. We therefore generate a crude adjusted structural cost for each municipality and year by multiplying each municipality's structural cost by the average ratio of expenditures to structural costs for each group, in an attempt to capture group level differences in actual structural costs while not allowing individual municipalities to choose their own costs. For this to be accurate, however, there can be no group-level differences in voluntary spending behaviour, since the difference in scaling factor between groups will otherwise include factors not related to structural costs. We also have to assume that the relative official structural costs accurately capture within-group differences between municipalities. In other terms, while official structural costs can be too high or too low, they must correctly capture the different structural components between municipalities, since otherwise the scaling factor can be representative for some municipalities and not for others.

We then decompose the various components adding up to municipal disposable income as stated in table 5.

Table 5: Decomposition of municipal income

	Tax income
+	Tax rate adjustment
+	Income equalisation
+	Other general government grants
+	Property fee
=	**Total income**
+	Cost equalisation
-	Costs exceeding national structural costs
=	**Disposable income**

We also decompose other state grants further, according to table 6, where *Other grants* refers to various smaller grants as well as certain extraordinary grants, such as those paid out in 2015-2017, in conjunction with the migrant crisis.

Table 6: Decomposition of other municipal grants

	Adjusted tax income and income equalisation
+	Structural grant
+	Transitional grant
+	Adjustment grant
+	LSS grant
+	Other grants
=	**Total effect of other grants**

5.1 Service Provision

Since there are issues associated with studying the total degree of risk sharing for municipalities—specifically the endogenous nature of costs—we also extend the analysis using a different approach to the question of whether there has been full risk sharing or not, by studying changes in the quality of services. In this case, we will not quantify the exact degree of risk-sharing, but rather mainly test the hypothesis of full risk-sharing. In order to test this, we use data on education outcomes. Education is one of the core services provided by municipalities, and is one of their main expenditures. Full risk sharing would imply that education outcomes should be uncorrelated with municipal tax power, if adequate controls are used.

As a first attempt, we use actual merit ratings and shares of pupils fulfilling the minimum requirements. However, municipal tax power is likely to correlate with other variables that also influence education outcomes, such as the socio-economic status of parents. Thus, we also use the residuals from the SALSA model described in section 4, in order to control for socio-economic factors. We also control for municipal tax rates, since these are an endogenous choice and not related to the degree of risk sharing, and as municipalities with higher tax rates would be able to spend more on education for a given level of tax power. There might still be other potential factors influencing education outcomes, which we do not control for, such as differences in political priorities among municipalities, differences in grading behaviour and differences in the number of private schools. If these factors are correlated with municipal tax power, this could bias our results. Some of the variables are not possible to control for, due to a lack of data, while we believe others only have minor effects in comparison to for instance socioeconomic factors. Thus, since we are mainly interested in studying whether there is full risk sharing or not, and due to the scope of this paper, we decide not to attempt to control for additional potential confounders. We run similar regressions to the previous ones concern-

ing municipal finances, with a few modifications. In particular, education outcomes are not transformed into natural logarithms—which would not be possible with the SALSA residuals, as they are often negative. Taxes are also expressed in their absolute rates, while tax power is expressed in natural logarithms. We further use time fixed effects instead of shares, but otherwise run regressions that are similar to both the redistribution and stabilisation equations shown previously. First, to test the relationship between average tax power levels and average education outcomes between municipalities, analogous to the redistribution case, we run the following regression:

$$\overline{educ}_i = \alpha + \beta_1 \overline{taxpower}_i + \beta_2 \overline{tax}_i + \epsilon_i \tag{6}$$

where $\overline{taxpower}_i$ is the log average municipal tax power over the period, and $\overline{tax}_i$ is the average municipal tax rate. In this case, unlike in the previous sections, a β_1 of zero would imply full risk sharing, whereas one greater than zero would imply less than full than full risk sharing. However, as mentioned previously, this assumes that there are no other variables which are related to both tax power and education outcomes given controls for tax rates.

Further, we use the same model in first differences, analogous to the stabilisation analysis above.

$$\Delta educ_{it} = \gamma_1 \Delta taxpower_{it} + \gamma_2 \Delta tax_{it} + \lambda_t + \epsilon_{it} \tag{7}$$

$taxpower_{it}$ is log tax power, and thus γ_1 has the same interpretation as above. λ_t represents time fixed effects, and tax_{it} is the municipal tax rate in the specific year. In both cases, β_1 and γ_1 are the variables of interest, which we shall focus on. Further, we also analyse if there are time-varying effects using the same strategy for incomes, by varying the differencing intervals.

6 Results

6.1 Individual

6.1.1 Redistribution

The results for the level of redistribution of personal income is shown in table 7. In total, the level of redistribution across all municipalities, corresponding to β in equation 2, is estimated at roughly 44%. The coefficients illustrate how the relationship between employee compensation and personal income is affected by consecutively adding each component of total risk sharing. Before including any other component apart from employee compensation, this relationship is obviously 1, which would translate into a coefficient of 0. Analysing the decomposition of the channels of redistribution in table 7 from top to bottom, we find

that capital incomes reduce redistribution by 6.2%. This means that the relationship between employee compensation and personal income after adding capital income is stronger than 1, since a one percent higher employee compensation relative to the national level is related to a 1.062 percent higher relative after-capital income. Next, adding benefits, we find that redistribution is increased by 36.4%. This means that the benefits weaken the relationship between employee compensation and personal income after capital income and benefits, relative to the relationship only including capital income. Total redistribution thus far would then be -6.2% + 36.4% = 30.2%. The same logic applies to all subsequent components. Other transfers decrease redistribution by about one percent, while taxes and social fees increase redistribution by 8% and 7.2% respectively. Thus, in total, the relationship between employee compensation and personal income after accounting for capital income, benefits, other transfers, taxes and social fees is weakened by 44%, so that the remaining correlation is 0.56. In other terms, a SEK 100 higher employee compensation than the national level is only associated with a SEK 56 higher disposable income, and vice versa for a lower level.

The analysis for the separate municipal groups refers to the relationship between employee compensation and personal income within each group, which in practice is done by adding an interaction term for each group. For example, the degree of risk sharing in large cities, at 24.7%, is significantly lower compared to the national level, which means that the relationship between employee compensation and personal income is stronger. A SEK 100 higher level of employee compensation is therefore associated with a roughly SEK 75 higher level of disposable income for municipalities defined as large cities. For rural municipalities, with a degree of risk sharing of 60.1%, the corresponding amount would be SEK 40. The decomposition is to be interpreted as in the national case.

Table 7: Individual redistribution, 2000-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Capital	−0.062	−0.141	0.012	−0.006	−0.012
	(0.027)	(0.071)	(0.021)	(0.018)	(0.014)
Benefits	0.364	0.211	0.478	0.429	0.483
	(0.017)	(0.014)	(0.027)	(0.024)	(0.019)
Transfers	−0.013	−0.013	−0.006	−0.010	−0.016
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Taxes	0.080	0.145	0.014	0.026	0.041
	(0.011)	(0.020)	(0.011)	(0.009)	(0.006)
Social fees	0.072	0.044	0.069	0.063	0.104
	(0.007)	(0.014)	(0.011)	(0.008)	(0.007)
Total	0.440	0.247	0.567	0.501	0.601
	(0.037)	(0.074)	(0.038)	(0.031)	(0.029)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

The results show that, on a national level, benefits are the main drivers of Swedish redistribution of personal incomes across municipalities, although taxes and social fees are significant contributors as well, while capital incomes reduce redistribution. In appendix B, a decomposition of different taxes is shown. The municipal income taxes have a negative effect on redistribution, which is not unexpected as poorer municipalities often have higher tax rates. However, the state income tax and the state capital gains tax have the opposite effect, and do contribute to redistribution, as expected since the state income tax is only levied on higher incomes, and since capital incomes are also correlated with higher levels of employee compensation. Thus, these two taxes reduce the difference in disposable income between municipalities. There are also statistically significant effects from the two tax reductions analysed, with the EITC being redistributive and the ROT/RUT deductions decreasing the amount of redistribution, but the magnitude of these effects is rather small.

Analysing the result for the different municipality groups, it can be noted that there is considerable heterogeneity between large cities and the other groups—both in terms of total risk sharing and in terms of primary components. For instance, taxes contribute to a higher degree of risk sharing in large cities, potentially due to progressive state income taxes and capital taxes, as cities in general have higher levels of income—both in terms of employee compensation and capital—and are thus more likely to be affected by these taxes. Indeed, as shown in the detailed decomposition of taxes appendix B, the effect of these taxes is significantly larger for cities. Additionally, the EITC has a slightly higher redistributive effect, potentially due to

the fact that the size of the reduction is capped at a certain income level, and even decreases thereafter in the latter periods of our sample.

Benefits on the other hand have a much lower contribution to the degree of risk sharing in cities, due to the fact that benefits are a smaller share of total income in these municipalities, thereby reducing their impact on total redistribution. This could be due to benefits potentially being linked to being below certain income thresholds, and cities generally having higher incomes, as well as the proportion of unemployed individuals qualifying for unemployment benefits. However, even benefits which are provided as fixed sums to all people would contribute to this effect, since they will constitute a larger proportion of total income for lower income individuals.

The total level of redistribution is also significantly lower in larger cities, which in addition to the lower benefits mentioned above is further caused by a large negative redistributive effect of capital incomes, in turn implying that the relationship between employee compensation and capital incomes is stronger in these municipalities. The total reduction in risk sharing from benefits and capital is only partially offset by increased risk sharing from taxes.

There are also small differences between the other groups, with manufacturing municipalities potentially having slightly lower levels of redistribution than towns and rural areas. This effect is mainly driven by lower redistribution from benefits, even though the explanations given in relation to urban municipalities would not hold for these, as these municipalities do not have high average incomes. Without being able to decompose benefits further, it is difficult to conclude what drives this result. However, this could indicate that the system is not as apt in supporting these municipalities, which have experienced a significant decline over the period in relation to the other groups.

Compared to previous estimates in the literature, our estimates of the total degree of redistribution is in the higher range. For instance, Bayoumi and Masson (1995) find a level of redistribution of 22% for the US and 39% for Canada, although they consider only redistribution by the federal level, and include not only transfers to persons, but grants to local governments as well, which increases total redistribution. Excluding these local government grants, they find levels of redistribution of around 18% for both countries. Similarly, Mélitz and Zumer (2002) find levels of redistribution at around 16% for the same countries, using the definition excluding local government grants, and 26% and 38% for the UK and France, respectively. Hepp and von Hagen (2011), studying the effect of the federal fiscal system of Germany, find redistribution levels from this system of about 38%, using a definition including local government grants, comparable to that of Bayoumi and Masson (1995).

Compared to these estimates for a variety of countries, and specifically to those excluding local government grants, our results indicate a generally higher level of redistribution in Sweden, though rather close to the level found in France by Mélitz and Zumer (2002). However,

these comparisons should be interpreted with caution, as the exact accounting choices as well as the time periods analysed can differ between papers.

6.1.2 Stabilisation

The results with regard to stabilisation are, in total, of a similar magnitude as the results for redistribution, with a total stabilising effect of 39%—corresponding to γ in equation 3. This can be interpreted as an increase in income of SEK 100, relative to the national level, leading to a relative increase in disposable income of SEK 61, and vice versa for a relative decrease.

As in the case of redistribution, benefits are the largest source of risk sharing, at 37.6%. The interpretation of this coefficient is similar as for redistribution, but should now be interpreted as showing the degree to which a one period change within a municipality, relative to the national change, is stabilised. This would mean that a one percent change in employee compensation in a given period, relative to the national change that period, will change relative income after benefits and capital (which has no effect) by 0.623 percent. No other components have any major effects, although taxes decrease stabilisation by 2.7%, mainly driven by the municipal income tax (see appendix B), and with some positive stabilisation from the state income tax. The negative effect on risk sharing from municipal taxes may be due to municipalities increasing their tax rates when their level of employee compensation decreases, and vice versa.

Table 8: Individual stabilisation, 2000-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Capital	0.000	0.111	0.018	−0.036	−0.010
	(0.016)	(0.122)	(0.021)	(0.019)	(0.019)
Benefits	0.376	0.290	0.326	0.395	0.404
	(0.017)	(0.041)	(0.027)	(0.015)	(0.031)
Transfers	0.009	0.013	0.005	−0.006	0.017
	(0.002)	(0.005)	(0.004)	(0.004)	(0.004)
Taxes	−0.027	−0.066	−0.006	−0.035	−0.026
	(0.008)	(0.021)	(0.011)	(0.014)	(0.014)
Social fees	0.034	0.041	0.051	0.048	0.019
	(0.005)	(0.019)	(0.007)	(0.007)	(0.010)
Total	0.392	0.389	0.394	0.366	0.404
	(0.027)	(0.105)	(0.035)	(0.025)	(0.050)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

The fact that benefits dominate the degree of stabilisation is not entirely unexpected, as anything which varies proportionally over time—such as a proportional tax rate—will lead to changes in the absolute degree of payments, but will have no relative effect. Benefits on the other hand are much more likely to change as a response to changes in employee compensation. For instance, consider an employed individual with no initial benefits. If they become unemployed, they will experience a large decrease in employee compensation and an increase in benefits, thereby creating a stabilising effect. However, in terms of a proportional income tax, they will reduce their tax payments when losing their income, but the reduction is proportional to the reduction of their compensation, meaning that there is no stabilising effect. It is therefore also natural that the main effect from the coefficient on taxes is due to the municipal tax, since the municipal tax rate changes more frequently in comparison to the state income and state capital taxes. Any stabilising effect from the state income tax will instead occur due to incomes crossing the thresholds, as this will change the effective tax rate for these individuals. Similarly, for capital taxes, there will be some effect on stabilisation as the composition of capital incomes change, since the tax rate can differ somewhat depending on the type of capital income.

For the different groups, the total degree of stabilisation is generally in the same magnitude as in the national case. However, the relative contribution of benefits is lower in cities and towns, potentially partly due to their higher income levels causing reductions in employee compensations to not cross thresholds for benefit eligibility. An additional explanation may be that more individuals become unemployed in manufacturing and rural municipalities compared to the other groups. Furthermore, capital income in cities has a much larger stabilising effect—although the estimate is not statistically significant, and should be interpreted with caution. Excluding the stabilising effect of capital, the results indicate that the level of stabilisation from the public sector is lower for these municipalities.

Our estimates of the total national degree of stabilisation in relation to previous literature is in the higher range. Compared to the results for Sweden by Andersson (2004), this degree is significantly larger, although the analysis in Andersson has a narrower scope and does not use the same definitions, which makes it difficult to compare to our estimates. Our estimates are also high in relation to other countries. For instance, Bayoumi and Masson (1995) find stabilisation effects of 23% and 14% for the US and Canada, or 30% and 17% respectively if local government grants are included. Mélitz and Zumer (2002) find effects ranging from 10% to 26%, with the highest level being in the UK. Hepp and von Hagen's (2011) study of Germany find that the federal fiscal system provides a stabilisation of roughly 20%, and as high as 47% for pre-unification West Germany. Again, all of these results should be compared with caution, as the exact definitions of income and which components are included varies somewhat between papers.

6.2 Municipalities

6.2.1 Redistribution

The results for the degree of redistribution of municipal finances is to be interpreted as in the case of redistribution of personal income. However, the independent variable is now municipal tax power instead of employee compensation. Our estimate with regard to municipal income prior to cost equalisation grants and costs suggest that there is full redistribution of incomes. The coefficient of 1.037 can be interpreted as a one percent higher level of tax power than the national level being associated with a 0.037 percent lower relative level of total local government income, using standardised tax rates. This implies full risk sharing in the long run. The coefficient for tax illustrates the degree to which incomes are affected by differences in local tax rates. The positive coefficient of 0.321 means that those municipalities with relatively lower tax power also have relatively higher tax rates, which would equalise incomes by 32.1% by themselves. Since local tax rates are not a part of explicit interregional risk sharing, we exclude this effect by standardising tax incomes to conform to the national average tax rate. The coefficient for standardised tax shows that this eliminates the redistributive effect. The absolute majority of the total redistributive effect, when differences in taxes are excluded, is due to the income equalisation system, causing almost full risk sharing by itself—which is expected given the nature of the system. Other grants also have a positive effect on redistribution, though there is no major effect from any individual grant (see decomposition in appendix B), and there is also a small positive effect from the municipal property fee.

In terms of heterogeneity between the municipality groups, there are no large differences in total redistribution for most groups, although it is somewhat higher for rural municipalities, driven by other grants, and in particular the structural grant. However, the income equalisation has a lower redistributive effect in cities, which is expected as the compensation rate in the system is lower for municipalities with a level of tax power higher than 115% of the national average tax power. This decrease in redistribution for cities is somewhat counteracted by other grants contributing more to redistribution in these municipalities, which brings the total degree of redistribution in line with towns and manufacturing municipalities.

Table 9: Municipal redistribution, 2005-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Tax	0.321	0.463	0.018	0.145	0.237
	(0.032)	(0.065)	(0.080)	(0.065)	(0.051)
Tax, standardised	−0.322	−0.463	−0.015	−0.145	−0.237
	(0.032)	(0.066)	(0.080)	(0.065)	(0.051)
Income equalisation	0.967	0.895	0.985	1.025	1.049
	(0.020)	(0.025)	(0.017)	(0.015)	(0.010)
Other grants	0.061	0.058	−0.005	−0.048	0.112
	(0.019)	(0.024)	(0.075)	(0.045)	(0.043)
Property fee	0.010	0.009	−0.000	0.002	0.015
	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)
Total excluding costs	1.037	0.961	0.982	0.980	1.176
	(0.033)	(0.044)	(0.087)	(0.054)	(0.049)
Cost equalisation	0.064	−0.172	0.097	0.166	0.367
	(0.045)	(0.033)	(0.039)	(0.044)	(0.054)
Costs, actual spending	−0.311	−0.180	−0.083	−0.168	−0.594
	(0.058)	(0.076)	(0.107)	(0.090)	(0.085)
Total, actual spending	0.790	0.610	0.996	0.978	0.949
	(0.032)	(0.038)	(0.055)	(0.049)	(0.040)
Cost equalisation	0.064	−0.172	0.097	0.166	0.367
	(0.045)	(0.033)	(0.039)	(0.044)	(0.054)
Costs, adjusted structural	−0.307	−0.042	−0.340	−0.324	−0.677
	(0.064)	(0.058)	(0.057)	(0.060)	(0.073)
Total, adj. structural costs	0.794	0.747	0.739	0.822	0.865
	(0.022)	(0.027)	(0.081)	(0.059)	(0.054)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Comparing this to previous literature, our estimates suggest a higher degree of redistribution. For instance, Smart (2002) also finds that there is full redistribution among Canadian provinces, when only including provinces that are eligible for equalisation grants. However, when he includes the full sample of provinces, the redistributive effect is much lower—at just about 45%—since those not eligible for grants do not have to pay any fees, in contrast to the Swedish system. Hepp and von Hagen (2011) find a higher level of redistribution among pre-unification West German states of 72%, and 78% in reunified Germany. Although our results indicate a higher degree of redistribution, we study local governments at a lower level than either of the previous papers, and it is therefore not necessarily an appropriate comparison.

Due to the explicit cost equalisation system, which has an established goal of equalising conditions for delivering certain services among municipalities—given average ambition levels and efficiency—we also include costs and cost equalisation grants to attempt to tentatively analyse how well the system works. Since the services included in the cost equalisation sys-

tem are mandatory, it could be argued that municipalities that are not fully compensated for higher structural costs would have lower effective disposable incomes, while any municipalities that are overcompensated would have comparatively higher disposable incomes, and thus risk sharing would decrease. First, we add the cost equalisation grant and deduct actual expenditures exceeding national official structural costs. If differences in actual expenditure is only attributed to different actual structural costs between municipalities, the cost equalisation system should fully compensate for these differences. In terms of our estimates, this would mean that the estimate of the cost equalisation grant and actual expenditures should add to zero. If they do not add upp to zero, the results could indicate that the cost equalisation system does not sufficiently compensate for differences in structural costs, or it could be caused by municipal choices related to non-structural factors, such as ambition levels or adjustment of spending to comply with fiscal rules, since long-term deficits are not allowed. As an example, municipalities with lower levels of tax power may be forced to reduce their costs in order to attain balanced budgets. This would in turn lead to an overestimation of the degree of risk sharing, since it would misleadingly suggest that these municipalities have lower structural costs, as the implicit assumption is that their actual expenditures also reflect their true structural costs.

In order to attempt to mitigate the ability of individual municipalities to adjust their spending due to non-structural reasons, we also include another measure of costs based on the official structural costs used by the equalisation system, where we scale each municipality's official structural cost by the average relationship between actual spending and official structural costs in the municipality group. This would only allow for endogenous choices to the extent that they are common to the entire group, and changes by individual municipalities would only have a marginal effect.

Once we include costs, according to either of our definitions of costs, and cost equalisation grants related to categories included in the cost equalisation system, the degree of municipal redistribution decreases by about 20 percentage points, thereby suggesting that equalisation of costs does not occur to the same degree as equalisation of incomes. If this difference does not simply reflect differences in endogenous municipal priorities, efficiency, or ambitions, this could indicate that the cost equalisation system does not work as intended.

When analysing the municipal groups, there are some large differences to be discussed. The negative estimates for both costs and cost equalisation for cities, using actual spending, suggests that those municipalities receiving cost equalisation payments also have lower net spending, and vice versa—which may, for example, be due to the fact that the demographic-based part of the system provides large grants to municipalities with a high proportion of minors, and the larger cities have a generally younger population. For rural municipalities, the combined coefficients also suggest a negative effect on redistribution. However, this is

potentially explained by the fact that these municipalities have higher levels of income redistribution, and thus have a larger spending capacity.

The fact that the estimates for costs and cost equalisation are close to cancelling each other out for manufacturing municipalities and towns suggests that cost equalisation matches actual spending quite well for these groups, although this is no longer the case using adjusted structural costs. The estimates using adjusted structural costs could suggest that municipalities—with the exception of those in cities—with low degrees of tax power tend to have disproportionately high structural costs, and that they are not fully compensated for this. If instead, the assumption is made that true structural costs are reflected in actual expenditures, the cost equalisation system seems to perform relatively well, except for cities and rural municipalities, although the latter appears to be compensated via other systems. Once again, it is not possible to entirely separate structural effects from endogenous choices, however.

6.2.2 Stabilisation

With regard to stabilisation, the total degree of risk sharing of municipal incomes is lower compared to redistribution, at 74%, meaning that a one percent change in tax power relative to the national change is associated with a 0.26 percent change in municipal income relative to the change in national municipal income. The main reason for this difference is the decreased stabilising effect of income equalisation, which in turn is driven by the fact the payments from the equalisation system are calculated on a per capita basis, using population numbers from an earlier date than the one used in our calculations. This affects both tax power and equalisation payments. Specifically, since the income equalisation system is based on the population on 1 November the preceding year, while our per capita estimates are based on 31 December the current year—due to the timing of annual income statements—changes in population levels will influence the exact relationship between equalisation and tax power. The results from performing the calculations using the population in November of the preceding year are shown in appendix C.

As an example, an increase in population levels between these two dates will decrease tax power and the level of income equalisation per capita, thereby reducing the negative correlation between changes in tax power and corresponding changes in income equalisation inherent in the system. The same analogous reasoning is applicable to changes of population in the other direction, since higher tax power—relative to the population in November—then become associated with higher levels of income equalisation. This will therefore effectively reduce the total degree of compensation from the income equalisation system. Furthermore, this general effect will be apparent in all of the grants related to the equalisation systems, since they are all based on the November population.

Despite the lower risk sharing effect of income equalisation, it still accounts for almost

the entire effect on risk sharing of incomes, with other grants and the property fee not having much of an effect, which is also not entirely unexpected as they are not as explicitly tied to changes in tax power. Furthermore, the results for the contribution to the degree of stabilisation for each type of grant does not indicate that any particular grant has a large effect on the total degree of stabilisation (see appendix B).

The risk sharing effect of tax changes is also much smaller compared to in the case of redistribution, and even has a destabilising effect, meaning that it amplifies the effect of changes in tax power, rather than being used to compensate for them. One reason for this could be that tax rates are generally not changed drastically from year to year, but rather changed in smaller increments over time. For instance, if there is a shock to tax power, and tax rates are increased successively in periods thereafter, while tax power recovers, there would be a positive association established. Another reason may be that municipal tax income is based on tax power, which in turn is defined as the per capita taxable income from two years prior. Thus, if municipalities react instantaneously with changes in tax rates to a shock in taxable incomes, despite this not having an effect on their tax income until two years thereafter—for instance due to an increase in costs associated with the shock— the correlation between tax power and tax rates will be affected.

In terms of heterogeneity between groups, there are no major differences in the total degree of stabilisation, although the degree of income equalisation is somewhat lower for manufacturing municipalities and cities. For the cities, this is expected given the lower compensation rate inherent in the income equalisation system. For manufacturing municipalities, a major part of the difference is due to population changes (see appendix C). Additionally, other grants in manufacturing municipalities contribute to stabilisation, which is likely affected by specific grants in relation to the migration crisis. See decomposition of other grants in appendix B, where migration-related grants are included in remaining grants.

Table 10: Municipal stabilisation, 2005-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Tax	−0.020	−0.057	0.016	−0.047	−0.013
	(0.011)	(0.022)	(0.024)	(0.023)	(0.016)
Tax, standardised	0.016	0.024	−0.012	0.053	0.007
	(0.011)	(0.020)	(0.022)	(0.023)	(0.016)
Income equalisation	0.742	0.714	0.759	0.686	0.769
	(0.014)	(0.029)	(0.018)	(0.030)	(0.023)
Other grants	0.020	−0.024	0.004	0.095	0.002
	(0.020)	(0.020)	(0.030)	(0.060)	(0.029)
Property fee	−0.017	−0.014	−0.013	−0.014	−0.021
	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)
Total excluding costs	0.740	0.644	0.754	0.773	0.744
	(0.027)	(0.031)	(0.036)	(0.075)	(0.040)
Cost equalisation	0.039	0.005	0.054	0.053	0.035
	(0.016)	(0.051)	(0.026)	(0.027)	(0.025)
Costs, actual spending	0.268	0.155	0.209	0.288	0.310
	(0.044)	(0.079)	(0.070)	(0.096)	(0.074)
Total, actual spending	1.047	0.803	1.017	1.114	1.089
	(0.050)	(0.092)	(0.067)	(0.095)	(0.089)
Cost equalisation	0.039	0.005	0.054	0.053	0.035
	(0.016)	(0.051)	(0.026)	(0.027)	(0.025)
Costs, adjusted structural	−0.051	−0.022	−0.079	−0.010	−0.066
	(0.021)	(0.050)	(0.036)	(0.038)	(0.034)
Total, adj. structural costs	0.728	0.626	0.729	0.816	0.713
	(0.038)	(0.038)	(0.044)	(0.096)	(0.062)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Comparing our estimates of total stabilisation of municipal incomes to previous literature, Smart (2004) finds a stabilising effect of slightly above 40% for Canada after controlling for tax rates, while Hepp and von Hagen (2011) find that there was full stabilisation for pre-unification West Germany, and 87% for unified Germany.

Further, including expenditures exceeding national structural costs has a large effect on stabilisation, suggesting that decreases in tax power is associated with lower costs, while the cost equalisation grant has a smaller positive effect. However, a positive stabilising effect of expenditures could be driven by endogenous choices, as discussed previously in the section regarding redistribution. Once we apply adjusted structural costs instead of actual expenditures, there is instead a destabilising effect of these costs, suggesting increased adjusted structural costs for municipalities with decreases in tax power. Furthermore, if this measure is accurate, the fact that the combined coefficient for cost equalisation and the adjusted structural costs is close to zero implies that municipalities are compensated for increases in their

structural costs. Both measures indicate that the total degree of risk sharing is rather high. If it is assumed that actual expenditures most accurately represent true structural costs, there is full risk sharing for all municipalities except large cities. If in turn adjusted structural costs is a better measure of capturing true structural costs, the degree of risk sharing, though still high, is significantly less than full. Moreover, the choice of which population to base the per capita values on will have an effect on costs, as in the case with the equalisation systems (see appendix C).

6.3 Analysis of Subperiods

6.3.1 Individual

In table 11, the results for total individual redistribution during different time periods, specifically 2000-2007, 2008-2011, and 2012-2018, are shown. For a detailed decomposition, see appendix D. On a national level, the degree of redistribution is much lower during and after the financial crisis of 2008, falling by about a third to a level similar to that found by Mélitz and Zumer (2002) for France—although their estimate is based on data from the 1980s. The same pattern can be noted for all municipality groups, with the largest relative decrease in cities and rural municipalities. The decreased level of redistribution in large cities is mainly driven by changes in capital, both during the crisis and increasingly so after the crisis. This means that capital incomes were disproportionately more concentrated in municipalities with higher employee compensation following the crisis. For the other municipal groups, the decreased level of redistribution is mainly driven by changes in benefits, which do not seem to return to their original redistributive level after the crisis. While it is impossible, given our access to data, to determine exactly why this is the case, it may for example have been influenced by changes in the illness and disability insurance systems, which were subject to several large reforms around this time. It could also indicate that the redistributive systems were relatively efficient in a more stable economy, but were unable to cope with a large shock. Furthermore, taxes have a somewhat less redistributive effect during the crisis, but returns in the period thereafter.

Table 11: Individual redistribution, subperiods

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
2000-2007	0.532	0.296	0.652	0.574	0.727
	(0.041)	(0.072)	(0.051)	(0.036)	(0.038)
2008-2011	0.380	0.221	0.511	0.469	0.487
	(0.035)	(0.075)	(0.033)	(0.031)	(0.025)
2012-2018	0.373	0.198	0.499	0.450	0.503
	(0.036)	(0.076)	(0.033)	(0.027)	(0.028)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

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With regard to stabilisation, there is a similar total effect as in the case of redistribution. However, the causes for the lower degree of risk sharing are different (see appendix D). Benefits are significantly more stabilising during the crisis years, which could be explained by higher unemployment and larger decreases in income leading to more individuals qualifying for various benefits. The largest cause of the decrease during the crisis is that capital income is significantly destabilising. This could for instance partly be caused by capital incomes recovering quickly after the crisis, and that these were concentrated in municipalities where employee compensation also recovered quickly.

During the period prior to the financial crisis, towns generally had a slightly lower level of stabilisation, while the three other types of municipality groups had relatively equal degrees of stabilisation. In the period between 2008 and 2011, cities and rural municipalities became much less stabilised. The main reason for the lower stabilisation within cities had to do with changes in the destabilising effect of capital, which may be due to reasons mentioned previously. For rural municipalities, the main contributor was a decrease in the stabilising effect of taxes.

In the period between 2012 and 2018, the degree of stabilisation in large cities recovers to its initial level, and the same is true for towns. However, both manufacturing and rural municipalities experience a much lower degree of stabilisation during this period compared to the period prior to the financial crisis. For rural municipalities, the effect is primarily caused by a decrease in stablisation from benefits and transfers, while the effect for manufacturing municipalities is mainly caused by a destabilising effect of capital.

Table 12: Individual stabilisation, subperiods

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
2000-2007	0.454	0.393	0.322	0.388	0.552
	(0.050)	(0.114)	(0.052)	(0.060)	(0.087)
2008-2011	0.328	0.225	0.491	0.402	0.217
	(0.033)	(0.097)	(0.037)	(0.056)	(0.051)
2012-2018	0.361	0.554	0.426	0.305	0.341
	(0.034)	(0.175)	(0.060)	(0.054)	(0.056)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

6.3.2 Municipalities

Table 13 reports municipal redistribution for the periods 2005-2012 and 2013-2018. The former contains the shock from the financial crisis, while the latter includes the migrant crisis of 2015-2016. The results show no major differences in municipal redistribution for the two periods, neither for the country as a whole nor for the various municipal groups. For a full decomposition, see appendix D.

Table 13: Municipal redistribution, subperiods

			Municipality Groups			
		National	Cities	Towns	Manufacturing	Rural
	Total excluding costs	1.046	0.964	0.971	0.980	1.189
		(0.037)	(0.049)	(0.084)	(0.063)	(0.052)
2005-2012	Total, actual spending	0.802	0.628	1.023	0.995	0.961
		(0.035)	(0.036)	(0.067)	(0.058)	(0.044)
	Total, adj. structural costs	0.807	0.764	0.740	0.819	0.877
		(0.024)	(0.025)	(0.084)	(0.068)	(0.056)
	Total excluding costs	1.021	0.955	0.992	0.968	1.151
		(0.027)	(0.037)	(0.079)	(0.042)	(0.045)
2013-2018	Total, actual spending	0.794	0.584	1.003	0.982	0.958
		(0.034)	(0.046)	(0.056)	(0.048)	(0.041)
	Total, adj. structural costs	0.783	0.724	0.757	0.830	0.856
		(0.022)	(0.031)	(0.068)	(0.048)	(0.051)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 14 shows the results of the same analysis on municipal stabilisation. As in the case of redistribution, a full decomposition can be studied in appendix D. Again, there is no major impact on the total degree of risk sharing of incomes, although it is slightly lower across the board in the latter period. However, other grants are significantly more stabilising for manufacturing and rural municipalities in the latter period, most likely due to the introduction

of temporary general grants provided in conjunction with the migration crisis, which in turn could be correlated with decreases in relative tax power. These types of municipalities were disproportionately large receivers of such grants. Furthermore, the stabilising effect of the income equalisation is reduced for all groups except cities, and especially so for manufacturing and rural municipalities, most likely due to relatively larger migration flows, exacerbating the effect of population changes between 1 November of the preceding year and 31 December the current year.

There are rather major differences when accounting for costs, however. Using actual spending, stabilisation of disposable municipal incomes is higher for all municipality groups in the 2013-2018 period, and particularly for rural areas and manufacturing municipalities. The large increase in stabilisation using actual expenditures may potentially partly be attributed to population changes, but also to targeted government grants being included in the definition of net expenditures. Thus, a targeted grant is included as a reduction in costs, as opposed to income, as in the case of general grants. If large targeted grants are handed out to municipalities with a relative decrease in tax power in this period, this would cause the estimates for stabilisation to increase, as net expenditures would decrease. Since a significant part of the grants during the migration crisis were targeted, this is likely to have had an effect on net expenditures. Unfortunately, given our data access, we cannot separate out the effect of these targeted grants. Using adjusted structural costs, stabilisation is lower for cities and towns in the latter period, but greater for rural areas, and much greater for manufacturing municipalities.

Table 14: Municipal stabilisation, subperiods

			Municipality Groups			
		National	Cities	Towns	Manufacturing	Rural
2005-2012	Total excluding costs	0.749	0.660	0.779	0.765	0.755
		(0.028)	(0.030)	(0.045)	(0.045)	(0.049)
	Total, actual spending	0.948	0.755	0.961	0.877	1.019
		(0.060)	(0.127)	(0.097)	(0.116)	(0.100)
	Total, adj. structural costs	0.705	0.632	0.802	0.654	0.709
		(0.037)	(0.036)	(0.060)	(0.052)	(0.065)
2013-2018	Total excluding costs	0.730	0.621	0.726	0.780	0.730
		(0.047)	(0.059)	(0.056)	(0.135)	(0.064)
	Total, actual spending	1.169	0.870	1.079	1.323	1.191
		(0.077)	(0.109)	(0.107)	(0.136)	(0.144)
	Total, adj. structural costs	0.757	0.618	0.647	0.960	0.718
		(0.067)	(0.067)	(0.065)	(0.170)	(0.107)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

6.4 Varying Differencing Intervals

6.4.1 Individual

Table 15: Individual stabilisation, varying intervals, 2000-2018

	k = 1	k = 2	k = 3	k = 4	k = 5	k = 7	k = 10
Capital	0.000	−0.007	0.003	0.003	−0.001	0.010	0.028
	(0.016)	(0.015)	(0.014)	(0.011)	(0.010)	(0.011)	(0.012)
Benefits	0.376	0.420	0.441	0.467	0.506	0.538	0.532
	(0.017)	(0.019)	(0.023)	(0.026)	(0.031)	(0.036)	(0.035)
Transfers	0.009	0.008	0.022	0.026	0.025	0.021	0.015
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Taxes	−0.027	0.005	0.033	0.048	0.054	0.070	0.062
	(0.008)	(0.007)	(0.008)	(0.009)	(0.010)	(0.011)	(0.010)
Social fees	0.034	0.068	0.096	0.107	0.113	0.124	0.124
	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)
Total	0.392	0.494	0.595	0.651	0.697	0.763	0.760
	(0.027)	(0.031)	(0.036)	(0.040)	(0.048)	(0.056)	(0.055)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3. k refers to the length of the differencing intervals, in years.
Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

We further experiment with increasing the differencing interval, to allow for a wider interpretation of short-run effects, as in the case of e.g. Asdrubali et al. (1996), Sørensen and Yosha (1998), and Borge and Matsen (2004). This will allow us to capture stabilising effects that might not be instant. For example, benefits payments might require an application and not be paid out until several months after the income shock, and thus might not be captured when limiting the analysis to a single year. However, as the interval is increased, it might not be as reasonable to interpret the result as the stabilisation of a shock, if this effect is visible only after several years.

In general, the level of stabilisation initially increases with the length of the differencing intervals, with the largest effects in the first few periods, and thereafter stays at a constant rate. After five periods, the total stabilising effect is almost 80% higher compared to the immediate stabilising effect. This effect is driven mainly by the increased stabilising effect of transfers, taxes, and social fees over the time period considered. Thus, a change in relative employee compensation is, for example, stabilised not only by immediate increases in benefits, but also higher benefits in periods thereafter. One potential explanation for this may be that benefits are affected by delays in payments of benefits, or delays in obtaining eligibility for them. The increased contribution to stabilisation from taxes are in turn mainly driven by the capital gains tax and the municipal tax (see appendix E for a detailed decomposition). Transfers also increase their stabilising effect somewhat over time, while capital incomes generally have no

stabilising effect—although there is a small tendency towards some level of stabilisation with the largest differencing intervals.

6.4.2 Municipalities

Table 16: Municipal stabilisation, varying intervals, 2005-2018

	k = 1	k = 2	k = 3	k = 4	k = 5	k = 7	k = 10
Tax	−0.020	−0.043	−0.045	−0.044	−0.031	0.015	0.060
	(0.011)	(0.014)	(0.016)	(0.018)	(0.020)	(0.024)	(0.025)
Tax, standardised	0.016	0.039	0.042	0.046	0.034	−0.009	−0.054
	(0.011)	(0.014)	(0.015)	(0.017)	(0.019)	(0.023)	(0.024)
Income equalisation	0.742	0.795	0.782	0.780	0.790	0.814	0.852
	(0.014)	(0.011)	(0.009)	(0.009)	(0.009)	(0.011)	(0.010)
Other grants	0.020	0.046	0.047	0.068	0.075	0.096	0.123
	(0.020)	(0.019)	(0.019)	(0.018)	(0.018)	(0.020)	(0.023)
Property fee	−0.017	−0.025	−0.027	−0.031	−0.030	−0.025	−0.022
	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.006)	(0.007)
Total excluding costs	0.740	0.811	0.800	0.820	0.839	0.891	0.960
	(0.027)	(0.023)	(0.022)	(0.021)	(0.021)	(0.022)	(0.025)
Cost equalisation	0.039	0.112	0.140	0.163	0.166	0.109	0.058
	(0.016)	(0.018)	(0.021)	(0.023)	(0.025)	(0.026)	(0.029)
Costs, actual spending	0.268	0.246	0.218	0.202	0.163	0.132	0.100
	(0.044)	(0.044)	(0.040)	(0.040)	(0.042)	(0.045)	(0.052)
Total, actual spending	1.047	1.169	1.157	1.185	1.169	1.132	1.118
	(0.050)	(0.049)	(0.043)	(0.044)	(0.046)	(0.049)	(0.052)
Cost equalisation	0.039	0.112	0.140	0.163	0.166	0.109	0.058
	(0.016)	(0.018)	(0.021)	(0.023)	(0.025)	(0.026)	(0.029)
Costs, adjusted structural	−0.051	−0.090	−0.116	−0.105	−0.111	−0.111	−0.128
	(0.021)	(0.023)	(0.023)	(0.026)	(0.028)	(0.030)	(0.032)
Total, adj. structural costs	0.728	0.833	0.823	0.878	0.894	0.889	0.889
	(0.038)	(0.033)	(0.030)	(0.028)	(0.026)	(0.027)	(0.031)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3. k refers to the length of the differencing intervals, in years.
Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 16 shows the results for the analysis of longer-period stabilisation on municipal incomes. There is some increase in stabilisation of incomes when considering longer intervals, in part driven by increased stabilisation from the income equalisation, but also from other grants, which have a much larger effect when considering several periods. This is mainly driven by increased compensation from the system of structural grants and remaining grants—which includes grants in relation to the migration crisis (see appendix E). Furthermore, the property fee becomes even more destabilising over time, which is not unexpected as it is based on property values, which are likely to covary with tax power. Further, the cost equalisation system seems to have a much larger stabilising effect when considering more periods, though this effect decreases with time. Both actual spending and adjusted structural costs show lower levels of stabilisation over time, which in the former case translates to a smaller positive effect, and

in the latter to a larger destabilising effect. One potential explanation could be that costs are initially reduced once a shock occurs, but over time the municipalities have to deliver a certain quality of their services, and may therefore raise tax rates or reduce costs for services not included in the equalisation system in periods thereafter. In total, both cases show greater levels of stabilisation when considering several periods. Using actual spending, there is a peak at 4 years, and for adjusted structural costs at 5-7 years. In neither case do the levels decrease significantly after this, however.

6.5 Service Provision

Due to the problems we have previously mentioned in regard to the endogeneity of costs, it is difficult to conclude whether the close to full risk-sharing of municipal incomes also translates to full risk-sharing of true structural costs. Using education outcomes, we are able to use a measure of municipal service provision and test the hypothesis of full risk sharing in a different manner. Reductions in municipal spending on services could be forced by municipalities having lower income, in which case reductions should affect service outcomes, or they could occur as a result of decreasing true structural costs of service provision, in which case they should not affect the quality. It is difficult to separate these two using spending alone, as we have discussed, but by analysing actual service outcomes we are able to test the hypothesis of less than full risk sharing by assuming that tax power should not be related to service outcomes given full risk sharing.

Table 17 shows the relationship between long-run average tax power—expressed in natural logarithms—and long-run average merit ratings, as well as the share of individuals passing the requirements for graduation, controlling for average tax rates. For example, this shows that a municipality with a one percent higher average tax power, over the period in general has a merit rating that is 0.606 points higher. Furthermore, the results are presented both in terms of actual grades and share of pupils passing the minimum requirements, as well as the deviation from the SALSA adjusted grades and share passing the requirements. In terms of non-adjusted variables, there is a strong relationship between the level of average tax power and school outcomes, and it is similar for all municipality groups. This estimate is likely to be biased, however, as it does not control for other factors that are correlated with higher grades and tax power levels, such as socio-economic background. Once using the SALSA estimates, however, there is in general no statistically significant relationship, although there is slight negative effect using merit ratings on a national level. Therefore, if SALSA appropriately controls for variables correlated with tax power and school outcomes, and there are no other confounders, this can be interpreted as not finding evidence for less than full risk sharing. Of course, there are other potential factors which may induce bias—such as the share of pupils

attending independently operated schools, which could have different grading behaviour, or the supply of teachers, and their corresponding human capital, both of which could be correlated with tax power. However, we believe that the most important sources of bias would be socioeconomic factors, which are controlled for by SALSA.

Table 17: Service provision, long-run, 2005-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Merit rating,	0.606	0.596	0.595	0.591	0.597
actual	(0.045)	(0.047)	(0.048)	(0.048)	(0.048)
Merit rating,	−0.088	−0.057	−0.059	−0.057	−0.056
residual	(0.040)	(0.042)	(0.043)	(0.043)	(0.043)
Requirements,	0.324	0.368	0.369	0.367	0.371
actual	(0.029)	(0.032)	(0.033)	(0.033)	(0.033)
Requirements,	−0.021	0.020	0.020	0.021	0.022
residual	(0.023)	(0.027)	(0.028)	(0.028)	(0.028)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β_1 in equation 6. Coefficients divided by 100 to facilitate interpretation, as regressions are level-log. Tax rate controls are included.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Further results with regard to the effects of within-municipality changes of logarithmised tax power on school outcomes, controlling for changes in tax rates and time trends, are given in table 18. In this case, the only statistically significant relationship is with regard to actual merit ratings in cities, indicating that a one percent change in tax power causes a 0.420 point increase in merit ratings, given appropriate controls. The results with regard to deviations from the model values in terms of requirements for towns show a slightly decreased positive deviation with increases in tax power. However, it is only statistically significant on a 10% level. Thus, year-by-year changes within municipalities also do not seem to indicate less than full risk sharing. As in the cross-sectional case, there may be sources of bias, but in this case they must vary with the levels of tax power and the outcome variable, since only within-municipality changes are analysed. Thus, as an example, if independently operated schools increase enrolment faster in municipalities with increasing tax power, and these have a different effect on grades, this could bias the result.

Table 18: Service provision, short-run, 2005-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Merit rating, actual	0.159	0.420	0.100	0.096	0.101
	(0.124)	(0.134)	(0.133)	(0.158)	(0.136)
Merit rating, residual	−0.025	0.099	−0.088	0.029	−0.061
	(0.114)	(0.127)	(0.118)	(0.141)	(0.134)
Requirements, actual	0.033	0.193	0.001	−0.001	−0.007
	(0.097)	(0.096)	(0.103)	(0.131)	(0.107)
Requirements, residual	−0.122	−0.118	−0.178	−0.073	−0.111
	(0.091)	(0.093)	(0.098)	(0.123)	(0.103)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ_1 in equation 7. Coefficients divided by 100 to facilitate interpretation, as regressions are level-log. Tax rate controls are included.
Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Using longer differencing intervals, shown in table 19, it appears that the relation between an increase in tax power and actual outcomes grows stronger over time. The relation with the SALSA residuals also turns significant for certain periods, but is never very large, and always negative. This can be interpreted as not providing any evidence for less than full risk sharing—if anything, the results would indicate more than full risk sharing—even when allowing for the effect to occur over several years, assuming that SALSA residuals are accurate measurements of outcomes and that there are no other omitted variables which change over time and are correlated with changes in tax power and school outcomes.

Table 19: Service provision, varying intervals, 2005-2018

	k=1	k=2	k=3	k=4	k=5	k=7	k=10
Merit rating, actual	0.159	0.132	0.234	0.225	0.289	0.360	0.803
	(0.124)	(0.094)	(0.068)	(0.053)	(0.088)	(0.075)	(0.048)
Merit rating, residual	−0.025	−0.068	−0.119	−0.090	−0.135	−0.137	−0.154
	(0.114)	(0.081)	(0.058)	(0.046)	(0.072)	(0.060)	(0.040)
Requirements, actual	0.033	0.072	0.096	0.108	0.165	0.191	0.063
	(0.097)	(0.067)	(0.052)	(0.040)	(0.061)	(0.051)	(0.031)
Requirements, residual	−0.122	−0.101	−0.112	−0.095	−0.127	−0.105	0.002
	(0.091)	(0.063)	(0.049)	(0.038)	(0.052)	(0.045)	(0.027)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ_1 in equation 7. Coefficients divided by 100 to facilitate interpretation, as regressions are level-log. Tax rate controls are included. k refers to the length of the differencing intervals, in years.
Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

7 Discussion

Our results suggest that Sweden has considerably higher degrees of risk sharing compared to what previous research has found for other countries, both in terms of personal income and municipal finances. This generally holds for both redistribution and stabilisation, though less so for the latter in regard to municipal finances.

We also find that there is a considerable degree of heterogeneity between the municipality groups in terms of individual incomes, with public benefits systems contributing to a lower degree of risk sharing in cities. Since cities include those municipalities that have the highest incomes, this could suggest that the Swedish welfare state is more redistributive and stabilising of low and medium incomes than high incomes, which seem to be less affected.

Our findings also suggest that both the degree of redistribution and the degree of stabilisation of personal incomes have decreased over time. This effect seems to be primarily caused by decreased risk sharing from public benefits systems. Since our data is limited, we are not able to discern the exact causes of why this has been the case, although potential explanations could include institutional changes of the systems, or structural changes in the economy which the traditional systems have not been able to accommodate.

The degree of risk sharing is vastly higher for municipalities than for individuals, and the results imply almost full risk sharing of municipal incomes—both in terms of redistribution and stabilisation. The fact that municipal finances are almost fully stabilised, while personal incomes are not, means that a shock to individual income will in large part also affect individual disposable incomes, while municipal incomes will not experience any major change. Furthermore, the relationship has been much more stable over time for municipal incomes, which is expected given that there have been no major changes of the income equalisation system during the time period.

If actual expenditures with regard to mandatory municipal services are included, the results still indicate close to full risk sharing. When adjusted structural costs are used instead, both the degree of redistribution—except for cities—and stabilisation falls significantly. Since the purpose of the analysis including costs is to determine whether the compensation for true structural costs of mandatory municipal services is adequate, which estimate to consider depends on which measure of costs is believed to most accurately represent these true structural costs.

As discussed in the results, the choice of which population to base the per capita values on also has large effects on the degree of municipal stabilisation, since the equalisation system is based on a population and tax power from the previous year. Our choice of using the population on 31 December is based on the date used for municipal income statements. However, the optimal population to use would be the one most representative of the services the mu-

nicipality must provide and the spending related to this—since for instance a person moving to a specific municipality at the end of the year will have had a minimal impact on costs, but will artificially reduce spending per capita. Similarly, if the population in November the previous year is used, individuals which have had an impact on costs will not be included, and spending will thus seem artificially high if there has been a population increase. Thus, one could also argue for using other definitions, such as the average population over the year or a population from the middle of the year.

Since both measures of costs have flaws, we also perform the analysis of service outcomes, which suggests that municipal services are not affected by shocks to tax power, indicating full risk sharing among municipalities. The implications of this are that a temporary shock to a specific municipality will affect individual utility through personal income, but not through deterioration of municipal services. However, the fact that municipal tax rates vary widely and are negatively correlated with tax power does still suggest that there is some degree of imperfect risk sharing, since there would otherwise be no need for different tax rates given similar ambition levels and efficiency. The results from the analysis of education could be caused by education being a core municipal service, and that municipalities prioritise spending on education when experiencing declines in available spending. In this case, an analysis of other services would have to be undertaken in order to find the effects of the imperfect risk sharing. Another explanation for our results could of course also be that SALSA is an imperfect control for background variables, or that other variables, besides municipal tax power, could be more important for school outcomes.

In conclusion, we find that the Swedish system seems to be able to provide close to full risk sharing of municipal incomes, but that the results are less clear when costs for mandatory municipal services are included. It is also less apt at providing risk sharing of individual incomes, and its efficacy has been decreasing over time, which could exacerbate regional divides, although the degree is still high in relation to other countries. However, further research on the subject is needed. Specifically, such research could analyse additional municipal services to study whether the preliminary results in this paper holds, as well as use more detailed data on individual incomes to analyse which parts of the benefits system that are responsible for the risk sharing we find, and why it has changed significantly over the period. Additionally, developing a more accurate measure for true structural costs of municipalities would aid in finding more reliable estimates for the degree of risk sharing after delivering mandatory municipal services.

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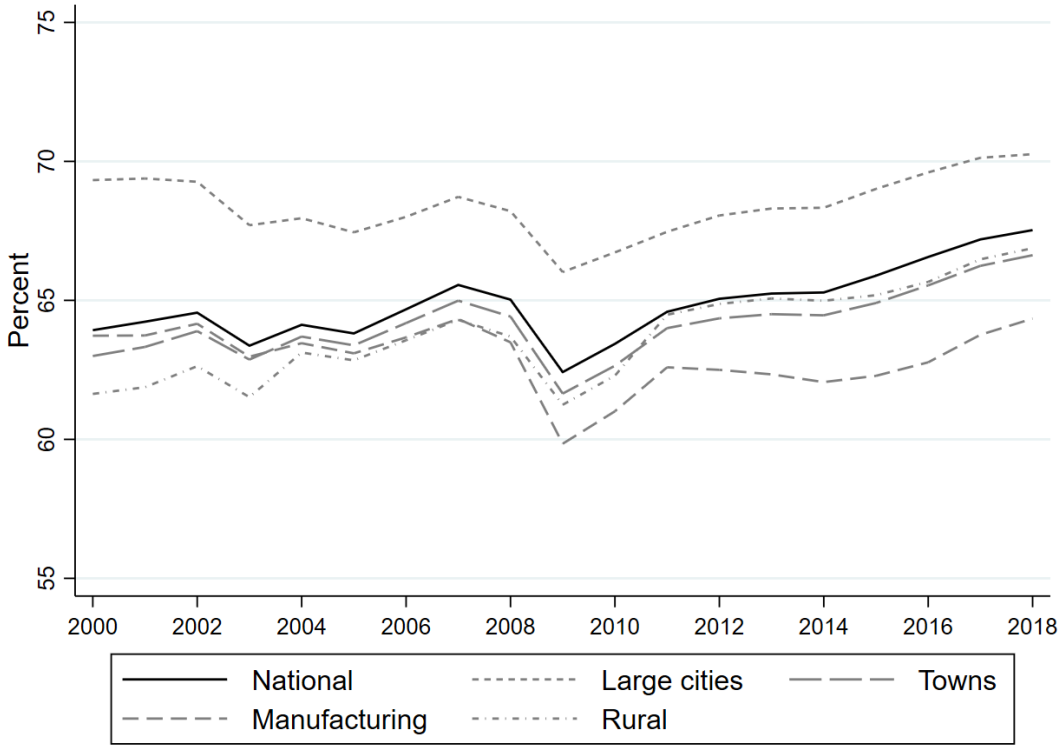
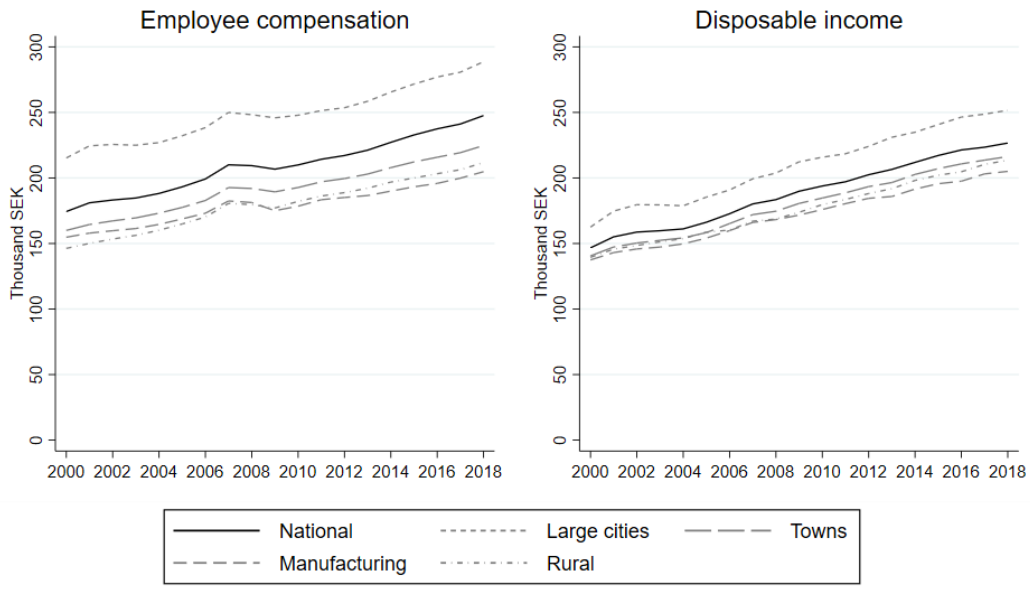
A Descriptive Statistics



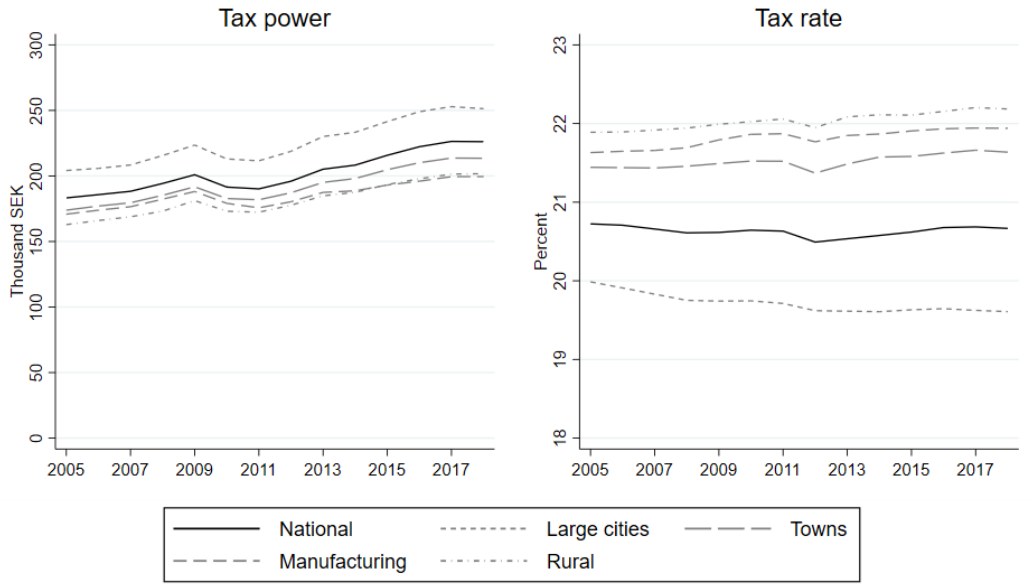
Source: Own calculations using data from Statistics Sweden.

Figure 4: Employment rate, 2000-2018



Source: Own calculations using data from Statistics Sweden.

Figure 5: Wages and Disposable Income, 2000-2018



Source: Own calculations using data from Statistics Sweden.

Figure 6: Tax power and tax rates, 2005-2018

B Decompositions of Taxes and Grants

Table 20: Individual redistribution, taxes, 2000-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Municipal tax	−0.040	−0.042	−0.056	−0.060	−0.028
	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)
State income tax	0.061	0.090	0.036	0.040	0.041
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
State capital tax	0.040	0.075	0.017	0.026	0.012
	(0.002)	(0.006)	(0.002)	(0.002)	(0.001)
EITC	0.010	0.017	0.004	0.005	0.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROT/RUT	−0.003	−0.004	−0.002	−0.002	−0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Other taxes	0.012	0.009	0.015	0.016	0.014
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Total	0.080	0.145	0.014	0.026	0.041
	(0.002)	(0.005)	(0.002)	(0.002)	(0.001)

Coefficients refer to the cross-sectional relationship, equivalent to β in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 21: Individual stabilisation, taxes, 2000-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Municipal tax	−0.044	−0.080	−0.030	−0.036	−0.048
	(0.006)	(0.025)	(0.008)	(0.008)	(0.010)
State income tax	0.016	0.034	0.025	0.009	0.012
	(0.002)	(0.013)	(0.005)	(0.002)	(0.002)
State capital tax	−0.008	−0.036	−0.006	−0.001	−0.007
	(0.007)	(0.025)	(0.009)	(0.012)	(0.011)
EITC	0.005	0.008	0.004	0.005	0.005
	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)
ROT/RUT	0.002	0.003	0.001	0.001	0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Other taxes	0.002	0.006	0.001	−0.013	0.010
	(0.004)	(0.022)	(0.007)	(0.008)	(0.006)
Total	−0.027	−0.066	−0.006	−0.035	−0.026
	(0.008)	(0.021)	(0.011)	(0.014)	(0.014)

Coefficients refer to the first-differences relationship, equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 22: Municipal redistribution, other grants, 2005-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Structural grant	0.015	0.029	−0.119	−0.058	0.047
	(0.012)	(0.011)	(0.057)	(0.024)	(0.027)
Transitional grant	−0.005	−0.008	−0.009	−0.000	0.000
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Adjustment grant	0.000	0.000	0.001	0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LSS grant	0.036	0.036	0.120	−0.021	0.036
	(0.012)	(0.017)	(0.029)	(0.031)	(0.023)
Remaining grants	0.014	0.002	0.003	0.032	0.029
	(0.002)	(0.002)	(0.004)	(0.007)	(0.004)
Total, other grants	0.061	0.058	−0.005	−0.048	0.112
	(0.019)	(0.024)	(0.075)	(0.045)	(0.043)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 23: Municipal stabilisation, other grants, 2005-2018

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Structural grant	0.002	−0.003	0.015	0.001	−0.002
	(0.002)	(0.002)	(0.009)	(0.002)	(0.002)
Transitional grant	0.005	−0.003	0.010	−0.003	0.010
	(0.003)	(0.012)	(0.007)	(0.005)	(0.004)
Adjustment grant	0.002	−0.001	−0.001	0.000	0.004
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
LSS grant	−0.009	−0.003	−0.006	−0.000	−0.017
	(0.008)	(0.015)	(0.017)	(0.014)	(0.013)
Remaining grants	0.021	−0.014	−0.015	0.097	0.008
	(0.020)	(0.015)	(0.021)	(0.059)	(0.028)
Total, other grants	0.020	−0.024	0.004	0.095	0.002
	(0.020)	(0.020)	(0.030)	(0.060)	(0.029)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

C Results Using Population in November

Table 24: Municipal redistribution, November

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Tax	0.326	0.459	0.067	0.166	0.245
	(0.029)	(0.062)	(0.080)	(0.060)	(0.047)
Tax, standardised	−0.326	−0.459	−0.064	−0.166	−0.244
	(0.029)	(0.063)	(0.080)	(0.060)	(0.047)
Income equalisation	0.933	0.873	0.975	0.987	0.990
	(0.014)	(0.017)	(0.009)	(0.008)	(0.006)
Other grants	0.070	0.054	0.033	−0.025	0.126
	(0.019)	(0.024)	(0.072)	(0.044)	(0.042)
Property fee	0.009	0.010	−0.000	0.002	0.013
	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)
Total excluding costs	1.013	0.936	1.010	0.963	1.130
	(0.028)	(0.035)	(0.074)	(0.045)	(0.043)
Cost equalisation	0.075	−0.182	0.122	0.183	0.374
	(0.044)	(0.033)	(0.040)	(0.042)	(0.052)
Costs	−0.336	−0.171	−0.164	−0.218	−0.620
	(0.057)	(0.075)	(0.108)	(0.086)	(0.080)
Total	0.752	0.583	0.969	0.928	0.884
	(0.028)	(0.042)	(0.059)	(0.053)	(0.040)

Coefficients refer to the cross-sectional relationship, equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 25: Municipal redistribution, November

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Total before costs	1.013	0.936	1.010	0.963	1.130
	(0.028)	(0.035)	(0.074)	(0.045)	(0.043)
Cost equalisation	0.075	−0.182	0.122	0.183	0.374
	(0.044)	(0.033)	(0.040)	(0.042)	(0.052)
Adjusted structural costs	−0.290	−0.009	−0.365	−0.314	−0.641
	(0.061)	(0.054)	(0.055)	(0.056)	(0.069)
Total	0.798	0.745	0.768	0.833	0.863
	(0.020)	(0.027)	(0.072)	(0.051)	(0.048)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 26: Municipal stabilisation, November

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Tax	−0.012	−0.045	0.004	−0.040	0.002
	(0.011)	(0.022)	(0.025)	(0.023)	(0.017)
Tax, standardised	0.003	0.007	−0.006	0.044	−0.012
	(0.011)	(0.021)	(0.023)	(0.024)	(0.017)
Income equalisation	0.994	0.970	0.996	0.969	1.009
	(0.005)	(0.029)	(0.007)	(0.008)	(0.006)
Other grants	0.108	−0.013	0.089	0.237	0.084
	(0.022)	(0.025)	(0.028)	(0.068)	(0.028)
Property fee	−0.025	−0.016	−0.016	−0.024	−0.031
	(0.003)	(0.005)	(0.004)	(0.005)	(0.005)
Total excluding costs	1.067	0.904	1.067	1.185	1.051
	(0.022)	(0.039)	(0.026)	(0.067)	(0.028)
Cost equalisation	0.017	0.046	0.034	0.032	−0.001
	(0.016)	(0.066)	(0.028)	(0.033)	(0.023)
Costs	0.141	0.048	0.055	−0.008	0.254
	(0.047)	(0.089)	(0.079)	(0.087)	(0.077)
Total	1.225	0.998	1.155	1.209	1.304
	(0.053)	(0.095)	(0.081)	(0.106)	(0.088)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 27: Municipal stabilisation, November

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Total before costs	1.067	0.904	1.067	1.185	1.051
	(0.022)	(0.039)	(0.026)	(0.067)	(0.028)
Cost equalisation	0.017	0.046	0.034	0.032	−0.001
	(0.016)	(0.066)	(0.028)	(0.033)	(0.023)
Adjusted structural costs	−0.048	−0.067	−0.029	−0.066	−0.042
	(0.020)	(0.062)	(0.037)	(0.037)	(0.031)
Total	1.037	0.883	1.071	1.152	1.008
	(0.029)	(0.048)	(0.036)	(0.085)	(0.038)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 28: Municipal redistribution, other grants, November

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Structural grant	0.021	0.026	−0.095	−0.048	0.055
	(0.011)	(0.012)	(0.053)	(0.024)	(0.026)
Transitional grant	−0.004	−0.008	−0.008	0.001	0.001
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Adjustment grant	0.000	0.000	0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LSS grant	0.038	0.035	0.127	−0.012	0.041
	(0.011)	(0.017)	(0.029)	(0.030)	(0.022)
Remaining grants	0.015	0.001	0.008	0.034	0.030
	(0.002)	(0.002)	(0.004)	(0.007)	(0.004)
Total, other grants	0.070	0.054	0.033	−0.025	0.126
	(0.019)	(0.024)	(0.072)	(0.044)	(0.042)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 29: Municipal stabilisation, other grants, November

		Municipality Groups			
	National	Cities	Towns	Manufacturing	Rural
Structural grant	0.000	−0.000	0.013	−0.002	−0.003
	(0.002)	(0.004)	(0.008)	(0.003)	(0.002)
Transitional grant	0.011	0.011	0.011	0.007	0.013
	(0.003)	(0.017)	(0.008)	(0.006)	(0.003)
Adjustment grant	0.001	0.000	−0.002	0.001	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LSS grant	−0.025	−0.012	−0.013	−0.008	−0.038
	(0.008)	(0.014)	(0.016)	(0.013)	(0.014)
Remaining grants	0.119	−0.012	0.079	0.239	0.108
	(0.021)	(0.012)	(0.023)	(0.067)	(0.025)
Total, other grants	0.107	−0.012	0.089	0.236	0.083
	(0.022)	(0.025)	(0.028)	(0.068)	(0.028)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

D Analysis of Subperiods

Table 30: Individual redistribution, subperiods

			Municipality Groups			
		National	Cities	Towns	Manufacturing	Rural
2000-2007	Capital	−0.038	−0.097	0.017	−0.001	0.001
		(0.025)	(0.070)	(0.021)	(0.018)	(0.012)
	Benefits	0.413	0.212	0.552	0.495	0.565
		(0.023)	(0.016)	(0.037)	(0.029)	(0.027)
	Transfers	−0.013	−0.013	−0.007	−0.012	−0.014
		(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
	Taxes	0.085	0.144	0.010	0.021	0.054
		(0.011)	(0.021)	(0.013)	(0.011)	(0.008)
	Social fees	0.085	0.051	0.080	0.072	0.122
		(0.007)	(0.014)	(0.012)	(0.009)	(0.007)
	Total	0.532	0.296	0.652	0.574	0.727
		(0.041)	(0.072)	(0.051)	(0.036)	(0.038)
2008-2011	Capital	−0.048	−0.134	0.027	0.017	0.003
		(0.027)	(0.070)	(0.021)	(0.018)	(0.014)
	Benefits	0.334	0.207	0.438	0.405	0.420
		(0.015)	(0.014)	(0.023)	(0.023)	(0.016)
	Transfers	−0.020	−0.019	−0.009	−0.016	−0.024
		(0.001)	(0.003)	(0.003)	(0.003)	(0.002)
	Taxes	0.057	0.129	0.002	0.011	0.009
		(0.011)	(0.018)	(0.011)	(0.009)	(0.007)
	Social fees	0.057	0.037	0.053	0.052	0.079
		(0.006)	(0.014)	(0.010)	(0.008)	(0.008)
	Total	0.380	0.221	0.511	0.469	0.487
		(0.035)	(0.075)	(0.033)	(0.031)	(0.025)
2012-2018	Capital	−0.095	−0.201	−0.004	−0.024	−0.034
		(0.029)	(0.071)	(0.021)	(0.017)	(0.015)
	Benefits	0.329	0.216	0.409	0.379	0.413
		(0.014)	(0.015)	(0.022)	(0.021)	(0.017)
	Transfers	−0.009	−0.008	−0.002	−0.005	−0.014
		(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
	Taxes	0.084	0.153	0.029	0.038	0.042
		(0.011)	(0.020)	(0.010)	(0.008)	(0.007)
	Social fees	0.065	0.039	0.067	0.063	0.095
		(0.007)	(0.015)	(0.010)	(0.007)	(0.008)
	Total	0.373	0.198	0.499	0.450	0.503
		(0.036)	(0.076)	(0.033)	(0.027)	(0.028)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 31: Individual stabilisation, subperiods

			Municipality Groups			
		National	Cities	Towns	Manufacturing	Rural
2000-2007	Capital	0.044	0.136	0.018	0.072	0.025
		(0.020)	(0.154)	(0.016)	(0.026)	(0.013)
	Benefits	0.370	0.293	0.302	0.329	0.433
		(0.037)	(0.057)	(0.048)	(0.030)	(0.065)
	Transfers	0.033	0.025	0.019	0.021	0.045
		(0.003)	(0.006)	(0.005)	(0.008)	(0.005)
	Taxes	−0.038	−0.115	−0.049	−0.078	−0.002
		(0.014)	(0.040)	(0.022)	(0.037)	(0.021)
	Social fees	0.046	0.054	0.033	0.044	0.050
		(0.008)	(0.019)	(0.010)	(0.013)	(0.013)
	Total	0.454	0.393	0.322	0.388	0.552
		(0.050)	(0.114)	(0.052)	(0.060)	(0.087)
2008-2011	Capital	−0.044	−0.145	0.025	−0.074	−0.038
		(0.026)	(0.067)	(0.028)	(0.053)	(0.044)
	Benefits	0.446	0.420	0.385	0.519	0.425
		(0.017)	(0.031)	(0.029)	(0.027)	(0.029)
	Transfers	−0.016	−0.008	−0.008	−0.022	−0.017
		(0.002)	(0.004)	(0.003)	(0.002)	(0.003)
	Taxes	−0.062	−0.030	0.026	−0.063	−0.107
		(0.015)	(0.043)	(0.023)	(0.018)	(0.027)
	Social fees	0.004	−0.012	0.063	0.042	−0.047
		(0.010)	(0.023)	(0.012)	(0.012)	(0.013)
	Total	0.328	0.225	0.491	0.402	0.217
		(0.033)	(0.097)	(0.037)	(0.056)	(0.051)
2012-2018	Capital	−0.023	0.312	0.011	−0.096	−0.039
		(0.030)	(0.165)	(0.065)	(0.039)	(0.048)
	Benefits	0.318	0.144	0.312	0.316	0.343
		(0.011)	(0.040)	(0.024)	(0.016)	(0.019)
	Transfers	−0.003	0.001	−0.006	−0.013	0.003
		(0.006)	(0.013)	(0.010)	(0.010)	(0.011)
	Taxes	0.023	0.036	0.038	0.040	0.006
		(0.010)	(0.031)	(0.017)	(0.018)	(0.017)
	Social fees	0.046	0.060	0.071	0.058	0.028
		(0.007)	(0.033)	(0.011)	(0.011)	(0.013)
	Total	0.361	0.554	0.426	0.305	0.341
		(0.034)	(0.175)	(0.060)	(0.054)	(0.056)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 32: Municipal redistribution, subperiods

			Municipality Groups			
		National	Cities	Towns	Manufacturing	Rural
	Tax	0.314	0.467	−0.039	0.120	0.211
		(0.033)	(0.068)	(0.083)	(0.073)	(0.053)
	Adjusted Tax	−0.312	−0.467	0.046	−0.116	−0.208
		(0.033)	(0.069)	(0.083)	(0.074)	(0.053)
	Income equalisation	0.975	0.907	0.979	1.042	1.052
		(0.022)	(0.028)	(0.018)	(0.021)	(0.011)
	Other grants	0.062	0.050	−0.019	−0.075	0.125
		(0.021)	(0.025)	(0.075)	(0.050)	(0.047)
	Property tax	0.007	0.006	0.005	0.010	0.009
		(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
2005-2012	Total, ex. costs	1.046	0.964	0.971	0.980	1.189
		(0.037)	(0.049)	(0.084)	(0.063)	(0.052)
	Cost equalisation	0.077	−0.169	0.087	0.177	0.392
		(0.050)	(0.033)	(0.043)	(0.054)	(0.059)
	Costs, actual spending	−0.321	−0.168	−0.035	−0.162	−0.620
		(0.062)	(0.074)	(0.104)	(0.116)	(0.089)
	Total, actual spending	0.802	0.628	1.023	0.995	0.961
		(0.035)	(0.036)	(0.067)	(0.058)	(0.044)
	Cost equalisation	0.077	−0.169	0.087	0.177	0.392
		(0.050)	(0.033)	(0.043)	(0.054)	(0.059)
	Costs, adjusted structural	−0.316	−0.031	−0.318	−0.337	−0.704
		(0.071)	(0.060)	(0.059)	(0.072)	(0.078)
	Total, adjusted structural	0.807	0.764	0.740	0.819	0.877
		(0.024)	(0.025)	(0.084)	(0.068)	(0.056)
	Tax	0.313	0.454	0.063	0.152	0.251
		(0.032)	(0.062)	(0.077)	(0.054)	(0.050)
	Adjusted Tax	−0.316	−0.457	−0.063	−0.155	−0.254
		(0.032)	(0.062)	(0.076)	(0.054)	(0.049)
	Income equalisation	0.952	0.881	0.975	0.991	1.032
		(0.017)	(0.021)	(0.017)	(0.013)	(0.012)
	Other grants	0.062	0.064	0.027	−0.012	0.104
		(0.018)	(0.023)	(0.067)	(0.037)	(0.039)
	Property tax	0.010	0.013	−0.009	−0.008	0.019
		(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
2013-2018	Total, ex. costs	1.021	0.955	0.992	0.968	1.151
		(0.027)	(0.037)	(0.079)	(0.042)	(0.045)
	Cost equalisation	0.051	−0.167	0.100	0.136	0.320
		(0.038)	(0.035)	(0.037)	(0.037)	(0.049)
	Costs, actual spending	−0.278	−0.204	−0.089	−0.122	−0.514
		(0.051)	(0.080)	(0.113)	(0.072)	(0.082)
	Total, actual spending	0.794	0.584	1.003	0.982	0.958
		(0.034)	(0.046)	(0.056)	(0.048)	(0.041)
	Cost equalisation	0.051	−0.167	0.100	0.136	0.320
		(0.038)	(0.035)	(0.037)	(0.037)	(0.049)
	Costs, adjusted structural	−0.289	−0.064	−0.335	−0.274	−0.616
		(0.053)	(0.058)	(0.055)	(0.051)	(0.069)
	Total, adj. structural costs	0.783	0.724	0.757	0.830	0.856
		(0.022)	(0.031)	(0.068)	(0.048)	(0.051)

Coefficients refer to the cross-sectional relationship. The final row is equivalent to β in equation 2.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 33: Municipal stabilisation, subperiods

			Municipality Groups			
		National	Cities	Towns	Manufacturing	Rural
	Tax	−0.021	−0.079	−0.010	−0.008	−0.016
		(0.013)	(0.031)	(0.024)	(0.036)	(0.018)
	Tax, standardised	0.018	0.040	0.015	0.018	0.014
		(0.013)	(0.025)	(0.020)	(0.037)	(0.019)
	Income equalisation	0.801	0.712	0.797	0.782	0.832
		(0.019)	(0.023)	(0.029)	(0.032)	(0.034)
	Other grants	−0.035	−0.000	−0.013	−0.030	−0.053
		(0.015)	(0.033)	(0.028)	(0.024)	(0.024)
	Property fee	−0.014	−0.012	−0.010	0.003	−0.023
		(0.004)	(0.006)	(0.005)	(0.006)	(0.007)
2005-2012	Total excluding costs	0.749	0.660	0.779	0.765	0.755
		(0.028)	(0.030)	(0.045)	(0.045)	(0.049)
	Cost equalisation	0.032	−0.009	0.075	−0.025	0.047
		(0.017)	(0.065)	(0.034)	(0.036)	(0.024)
	Costs, actual spending	0.168	0.103	0.107	0.137	0.216
		(0.055)	(0.127)	(0.096)	(0.123)	(0.087)
	Total, actual spending	0.948	0.755	0.961	0.877	1.019
		(0.060)	(0.127)	(0.097)	(0.116)	(0.100)
	Cost equalisation	0.032	−0.009	0.075	−0.025	0.047
		(0.017)	(0.065)	(0.034)	(0.036)	(0.024)
	Costs, adjusted structural	−0.075	−0.019	−0.052	−0.086	−0.093
		(0.021)	(0.053)	(0.055)	(0.048)	(0.028)
	Total, adj. structural costs	0.705	0.632	0.802	0.654	0.709
		(0.037)	(0.036)	(0.060)	(0.052)	(0.065)
	Tax	−0.019	−0.026	0.046	−0.081	−0.008
		(0.017)	(0.038)	(0.040)	(0.025)	(0.028)
	Tax, standardised	0.013	0.003	−0.043	0.084	−0.003
		(0.017)	(0.038)	(0.039)	(0.025)	(0.028)
	Income equalisation	0.669	0.718	0.716	0.600	0.678
		(0.017)	(0.046)	(0.022)	(0.038)	(0.025)
	Other grants	0.088	−0.056	0.023	0.206	0.083
		(0.042)	(0.039)	(0.050)	(0.110)	(0.064)
	Property fee	−0.021	−0.017	−0.016	−0.029	−0.020
		(0.003)	(0.005)	(0.004)	(0.006)	(0.004)
2013-2018	Total excluding costs	0.730	0.621	0.726	0.780	0.730
		(0.047)	(0.059)	(0.056)	(0.135)	(0.064)
	Cost equalisation	0.048	0.024	0.029	0.122	0.016
		(0.023)	(0.052)	(0.039)	(0.037)	(0.044)
	Costs, actual spending	0.391	0.226	0.324	0.421	0.445
		(0.065)	(0.082)	(0.107)	(0.111)	(0.122)
	Total, actual spending	1.169	0.870	1.079	1.323	1.191
		(0.077)	(0.109)	(0.107)	(0.136)	(0.144)
	Cost equalisation	0.048	0.024	0.029	0.122	0.016
		(0.023)	(0.052)	(0.039)	(0.037)	(0.044)
	Costs, adjusted structural	−0.020	−0.027	−0.108	0.057	−0.028
		(0.038)	(0.069)	(0.049)	(0.051)	(0.076)
	Total, adj. structural costs	0.757	0.618	0.647	0.960	0.718
		(0.067)	(0.067)	(0.065)	(0.170)	(0.107)

Coefficients refer to the first-differences relationship. The final row is equivalent to γ in equation 3.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

E Varying Differencing Intervals

Table 34: Individual stabilisation, taxes, varying intervals

	k = 1	k = 2	k = 3	k = 4	k = 5	k = 7	k = 10
Municipal Tax	−0.044	−0.040	−0.026	−0.016	−0.006	0.010	0.008
	(0.006)	(0.006)	(0.007)	(0.007)	(0.009)	(0.010)	(0.010)
State tax	0.016	0.017	0.018	0.017	0.017	0.017	0.019
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Capital gains tax	−0.008	0.023	0.033	0.030	0.027	0.023	0.013
	(0.007)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
EITC	0.005	0.006	0.005	0.002	−0.001	−0.006	−0.006
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
ROT/RUT	0.002	0.002	0.002	0.003	0.003	0.005	0.006
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Other taxes	0.002	−0.002	0.001	0.012	0.013	0.021	0.021
	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Total	−0.027	0.005	0.033	0.048	0.054	0.070	0.062
	(0.008)	(0.007)	(0.008)	(0.009)	(0.010)	(0.011)	(0.010)

Coefficients refer to the first-differences relationship, equivalent to γ in equation 3. k refers to the length of the differencing intervals, in years.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.

Table 35: Municipal stabilisation, other grants, varying intervals

	k = 1	k = 2	k = 3	k = 4	k = 5	k = 7	k = 10
Structural	0.002	0.002	0.004	0.009	0.011	0.014	0.020
grant	(0.002)	(0.004)	(0.005)	(0.006)	(0.007)	(0.009)	(0.012)
Transitional	0.005	0.004	0.001	−0.000	−0.007	−0.006	−0.014
grant	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.008)
Adjustment	0.002	−0.000	−0.000	−0.001	−0.001	−0.000	−0.000
grant	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LSS grant	−0.009	−0.010	−0.012	−0.006	0.002	0.013	0.015
	(0.008)	(0.009)	(0.011)	(0.013)	(0.013)	(0.016)	(0.017)
Remaining	0.021	0.050	0.054	0.065	0.070	0.075	0.102
grants	(0.020)	(0.017)	(0.015)	(0.014)	(0.013)	(0.012)	(0.014)
Total, other	0.020	0.046	0.047	0.068	0.075	0.096	0.123
grants	(0.020)	(0.019)	(0.019)	(0.018)	(0.018)	(0.020)	(0.023)

Coefficients refer to the first-differences relationship, equivalent to γ in equation 3. k refers to the length of the differencing intervals, in years.

Clustered standard errors in parentheses, $p < 0.10$, $p < 0.05$, $p < 0.01$.