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INCOME TAX COMPETITION AT THE STATE AND LOCAL LEVEL IN SWITZERLAND

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Abstract

Tax competition is supposed to lead to inefficiencies in the provision of public goods and difficulties for decentralized redistribution. A necessary condition for these effects to occur is that residence and location decisions are determined by fiscal considerations. In this paper, the impact of personal income taxes and transfer payments on residence decisions of taxpayers is analyzed using cross sectional data on the distribution of different groups of taxpayers in different income groups among the 26 Swiss cantons and the 137 largest Swiss cities. We find that tax competition with respect to personal income taxes is relatively strong in Switzerland.

Keywords Tax competition, fiscal federalism, personal income taxes, transfer payments

JEL Classification: H71, H73

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Income Tax Competition at the State and Local Level in Switzerland

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1 Introduction

Since TIEBOUT's (1956) seminal paper, the impact of fiscal competition on the efficiency of public goods' provision and the effectiveness of decentralized income redistribution is widely discussed in the literature. Following TIEBOUT'S arguments, fiscal autonomy may be categorized as a precondition for achieving a Pareto-efficient allocation of local public goods. By 'voting with their feet' citizens choose their residence in a community with the optimal combination of fiscal burden and of public goods according to their preferences. This migration process forces the other communities to realize that they are in a competitive framework. Yet, in equilibrium, different levels in the provision of public goods will persist to the extent that there are differences in citizens' preferences while people sort themselves in relatively homogeneous jurisdictions with respect to their incomes and preferences.

However, it has to be noted that quite a number of restrictive and idealized assumptions are required for envisioning an efficient supply of public goods as a result of competition between local communities or regions. For instance, if the assumption of constant (as it is employed by TIEBOUT) or increasing marginal costs is dropped, because public goods are characterized by increasing returns to scale with respect to the number of users, then competition does not really work. The main reason is that public goods, if produced at all, would be provided at marginal cost prices which do not cover the higher inframarginal production costs. Thus, as SINN (1990, 1997) points out, the community would incur a loss if a competitive marginal tax price was set. As a consequence, no public goods would be provided, especially no pure public goods, which are costless *in use* due to the non-rivalness in consumption.

In the latter case, if such goods have been provided, communities will compete with each other until the tax price approaches zero. If this outcome is expected, no

community will engage in the provision of a pure public good or immobile factors have to bear the tax burden fully which implies a considerable distributive problem. Thus, given goods like these, a pessimistic assessment of the efficiency and the distributive impact of tax competition seems inevitable.[1)]

As SCHWAB and OATES (1991) show, peer group effects may lead to inefficiencies as well, in particular because of the jurisdictional homogeneity induced by the TIEBOUT mechanism.[2)] If for example a person with a low crime probability resides in a neighborhood with low crime rates, average costs of the provision of public safety decrease in that neighborhood. Consequently, residents in neighborhoods with a low level of public safety bear external costs since they have to pay higher taxes in order to get higher public safety levels. Although the average level of public safety increases in the economy, the social marginal product of an incremental increase in homogeneity that is achieved by an additional resident with a low crime probability in a low crime neighborhood is smaller than if he resides in the high crime neighborhood.[3)]

The mobility of individuals will also jeopardize any decentralized tax policy aimed at achieving the distributional goal, which in this case consists in reducing income inequality by means of tax financed transfer programs. A large government sector for distribution purposes can hardly be maintained in a decentralized system with tax competition. First, it will become difficult if not impossible for a single community to levy the necessary redistribution tax upon the rich and mobile. Second, such a policy, if undertaken in one community, will attract poor individuals from other jurisdictions and, thus, erode the internal redistribution policy. As a consequence, those who consider redistribution as an efficiency enhancing activity will be in favor of tax rates which are harmonized by collective arrangements between all jurisdictions (SINN, 1990, p. 503). On the other hand, those who suppose that the government behaves like a Leviathan welcome tax competition as a possibility to constrain public redistributive activities.[4)]

All these theoretical arguments cast some doubts on the reasonable working of the TIEBOUT mechanism. But scrutinizing the elegant theory of TIEBOUT'S critics also reveals some strong assumptions which do not seem particularly realistic by themselves. Two of these assumptions are perfect mobility of skilled labor and capital which, in reality, hold at best to a limited extent.

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1. Fiscal externalities and spillovers are other mechanisms that may lead to an inefficiently low provision of public goods in a setting of fiscal competition. See GORDON (1983), INMAN and RUBINFELD (1996) and WELLISCH (1996) for a comprehensive analysis of different externalities in a TIEBOUT-framework. Similar arguments hold with respect to capital income taxation. See WILSON (1986), ZODROW and MIESZKOWSKI (1986), OATES and SCHWAB (1988), WILDASIN (1988), BUCOTEVSKY (1991), BUCOTEVSKY and WILSON (1991), BRAID (1996) and JANEBA (1997) as well as FELD (1999) for a survey.

2. See also OATES (1981), ARNOTT and ROWSE (1987), BRUECKNER and LEE (1989) and DE BARTHOLOME (1990).

3. For an analysis of policies that internalize these externalities see NECHYBA (1996) and EPPLE and ROMANO (1998).

4. See BRENNAN and BUCHANAN (1977, 1980) and EDWARDS and KEEN (1996).

However, as soon as it is assumed that mobility is restricted, differences in tax rates can prevail. Thus the theoretical discussion becomes inconclusive: Fiscal autonomy with respect to taxation of the single subfederal jurisdictions could have net benefits but could also generate detrimental effects for the citizens involved. Therefore, it is important to look at some empirical evidence. Although fiscally induced mobility is empirically analyzed to a large extent in migration and capitalization studies, evidence on fiscally induced homogeneity of jurisdictions is seldomly provided.[5)] Homogeneity of jurisdictions is, however, of most interest because „*The smaller and more homogeneous is each of the communities in a system of local governments, the more likely it is that services provided will be consistent with desires of each and every member of the population. ... On the other hand, local redistributive goals ... are likely to be thwarted if communities are small and homogeneous.*" (RUBINFELD, 1987, p. 572).

In this respect, an empirical analysis of fiscal competition in Switzerland can play an important role because of the very decentralized Swiss fiscal system.[6)] In fact, KIRCHGÄSSNER and POMMEREHNE (1996) and POMMEREHNE, KIRCHGÄSSNER and FELD (1996) present empirical evidence that tax competition in Switzerland is considerable. In this paper, we analyze one aspect of fiscal competition in Switzerland using more disaggregated data on the Swiss cantons and the largest 137 Swiss cities in 1990: whether taxes and public services have an impact on residence decisions of self-employed taxpayers, retirees and dependent workers empirically in a homogeneity model. (We do, however, not explicitly investigate to what extent the political determination of taxes and public services is led by the fiscal policies of competing jurisdictions although this aspect is considered implicitly in the econometric approach proposed below.) In the next section (*Section 2*), a brief introduction to the Swiss fiscal system is given. The econometric model that is used is outlined in *Section 3*. The results on the relationship between the geographical distribution of individual taxpayers in different income groups and decentralized tax and transfer policies are presented in *Section 4*.[7)] We conclude with some final remarks in *Section 5*.

2 Switzerland's Fiscal Constitution

Switzerland consists of three government levels which establish strong fiscal competencies of the single cantons and local government units. This holds especially true for the tax structure: The main

5. See DOWDING, JOHN and BIGGS (1994) for a survey on the empirical TIEBOUT literature.

6. Only three OECD countries, the U.S., Canada, and Switzerland, offer enough policy variation at a decentralized level to undertake empirical analyses of fiscal competition. Other OECD countries either have centralized or harmonized fiscal policies. A comparison between different countries is not useful since international labor mobility is restricted by many factors which can hardly be kept constant. Moreover, fiscal policies among OECD countries are not easily comparable. Canada has too few provinces to conduct statistical analyses. The U.S. states have only limited possibilities to tax their citizens with a progressive income tax. The latter is mainly assigned to the federal level. (See KENYON and KINCAID (1996) for a description of fiscal federalism in the U.S.) Thus, Switzerland is the only country for which such an analysis can be done.

7. Because data on corporate income tax competition and its impact are not available, the econometric analysis is only conducted for individual residence decisions.

progressive taxes on personal and corporate income are state and local taxes. The cantons have the basic power to tax income, wealth and capital. The local jurisdictions can levy a surcharge on cantonal direct taxes and raise own property taxes. The central government relies mainly on indirect (proportional) taxes, the general sales tax and specific consumption taxes like the mineral oil tax. It also relies on a source tax on income from interest, the so called '*Verrechnungssteuer*'. There is, moreover, a small but highly progressive federal income tax, which, together with revenue from the source tax on interest income, amounts to 34 percent of total federal tax revenue in 1995, while the cantons and municipalities rely on income and property taxes to about 50 percent of their total revenue and 95 percent of their tax revenue. The federal income tax has a maximal marginal tax rate of 13.2 percent and a maximal average tax rate of 11.5 percent. Owing to a basic tax exemption the highest 3 percent of income taxpayers pay for 50 percent of the revenue of the federal income tax.[8)] Due to the small size of the country and its subfederal units, private and corporate taxpayers can easily move to places with low tax burdens.

Table 1 near here

As *Table 1* reveals, personal income taxes in Switzerland vary considerably between the cantons. From anecdotal evidence it is well known that there are two tax havens in or near Switzerland, the small country of Liechtenstein, which forms an economic union with Switzerland, and the canton of Zug. Taking the value of the (weighted) average for Switzerland as 100, the index of the tax burden of personal income and property taxes has been varying from 56.1 in the canton of Zug to 154.1 in Valais in 1990. For instance, a family with two children that earns a gross income of SFr 175,000 had to pay SFr 16,083 in cantonal and local income taxes in Zug, but SFr 34,475 in Berne, two cities within a distance of around 120 kilometers. Moreover, cantonal personal income tax burdens have not converged over time. The correlation between those indexes of 1980 and 1996 is 0.84 while their standard deviation has increased from 13.9 to 19.0. The respective index of tax burden for a sample of 137 Swiss cities exhibits even stronger variation from 20.8 in Glarus to 156.7 in Le Locle (canton of Neuchâtel) in the year 1990 and its standard deviation of 27.4 is higher than that of the cantonal indexes. Similar variations can be found with respect to corporate income tax burdens.

On the benefit side of the public budget, a decentralization of competencies can be observed as well, although the Swiss welfare state is much more a hybrid between centralization and decentralization than the tax system. The pension system of Switzerland consists of three so called 'pillars' with different economic regimes which are laid down in Art. 34^{quater} of the Swiss constitution. The first pillar, the AHV/IV, is an old age, dependents' and invalidity insurance, respectively, and is based on a mandatory pay-as-you-go system. According to Art. 34^{quater} of the Swiss constitution, the AHV/IV ought to provide the primary support of retirees. The second pillar, the '*Pensionskasse*' (pension fund) is based on a mandatory fully funded system. It is a private pension system subject to certain federal mandates and regulations and enables retirees enjoying their usual standard of living. The third

8. See BUNDESAMT FÜR STATISTIK, *Statistisches Jahrbuch der Schweiz 1998*, NZZ, Zurich 1997, pp. 395ff.

pillar consists of a voluntary private care whereby individuals save to ensure a living standard for themselves which is higher than the 'usual' one. Under the third pillar, employees and self-employed persons may make tax deductible contributions to other pension schemes assimilated to the second pillar occupational schemes. Although the Swiss pension system seems to be centralized, cantons have some autonomy. This is particularly the case with respect to supplementary pensions to the AHV/IV that are granted to retirees with AHV/IV pensions that are below a minimum living standard. Cantons can determine the amount of supplementary pension benefits according to federal mandates. *Table 1* shows that in 1990, supplementary pensions per capita vary from SFr 74 in Zug to SFr 346 in Vaud.

Unlike social security, social assistance in Switzerland ('*Fürsorge*') is not a concern or responsibility of the federal government. The control of social assistance by local jurisdictions and the cantons has been jealously guarded since the origins of the confederation in 1848 (SEGALMAN, 1986). *Table 1* provides figures on social assistance per capita in the different cantons of Switzerland in 1990. Social assistance per capita differs between SFr 72 in the canton of Nidwalden and SFr 960 in the canton of Geneva. Social assistance is partly financed by the local jurisdictions and partly by the cantons. Excluding the canton of the city of Basle, which more or less covers the largest share of social assistance of the three local jurisdictions in Basle-City, the share of social assistance which is borne by the municipalities of the different cantons varies from 9 percent in the canton of Appenzell Innerrhoden to 98 percent in the canton of Appenzell Ausserrhoden.[9)] There is also a strong decentralization of public spending like, e.g. roads, garbage collection, water and power delivery, that is not supposed to immediately redistribute income.[10)] With the exception of the federal income tax and the federal source tax on interest income on the revenue side, as well as the first pillar of the Swiss pension system on the expenditure side of the budget, the Swiss system of income redistribution can be characterized as pretty decentralized making it possible to analyze fiscal competition.

3 Taxes, Transfers and Residence Decisions of Households

Usually the impact of fiscal variables on residence decisions is empirically analyzed in migration studies. *Table 1* also shows the number of immigrants to the Swiss cantons and their population. A first inspection reveals that migration between cantons does not seem to correspond with the index of personal income and property taxes. Cantonal immigration and emigration vary between 4 and 6 percent of the cantonal population in 1990. For migrations within the region of Basle, FREY (1981, p.35f., p.48) is unable to find robust fiscal influences. Of course, migration between local jurisdictions is much higher. In a sample of 137 Swiss cities, immigration and emigration vary

9. See EIDGENÖSSISCHE FINANZVERWALTUNG, *Öffentliche Finanzen der Schweiz 1990*, Berne, pp. 70 and 96.

10. See for a more detailed description of the Swiss fiscal constitution, an investigation into the details of cantonal tax laws and for the assignment of competencies in the provision of public services FELD (1999). For a description of the Swiss pension system see FELD, KIRCHGÄSSNER and SAVIOZ (1997).

between 2 and 30 percent of local population. Nevertheless, FELD (1999, chap. 4) also finds no robust results of fiscally induced migration between Swiss cantons and cities in the eighties.

Another possibility to estimate the impact of taxes and public transfer payments on the residence decision of taxpayers is to look at the regional spread of taxpayers and explain the dispersion. To what extent do differences in the tax burden result in an uneven distribution of taxpayers throughout the country? There is certainly an incentive for high income people to live in cantons with low tax rates. In 1990, the share of taxpayers with taxable income no less than SFr 100,000 was 9.41 percent in the low-tax canton of Zug, as compared to 2.53 percent in the high-tax canton of Jura and an average of 5.47 percent in Switzerland as a whole. Thus, we present an econometric model which explains the shares of taxpayers in different income classes in the different Swiss cantons as a function of tax rates and public transfers.

3.1 An Econometric Model[11)]

Assume that individual residence decisions have no influence on the housing market, the provision of public goods and the tax burden, and that labor market conditions and individual incomes are given. In this world, a household will migrate to the jurisdiction that offers the highest utility, captured by its indirect utility function V^*, in a jurisdiction j *(j = 1, ..., z)*:[12)]

$$(1) \qquad V_j^* = F(Q_j, S) + G^*(Y - C_j, p_1, \ldots, p_m, S)$$

with Q_j as a vector of public goods in jurisdiction j $\left[Q_j = (q_1, \ldots, q_r)\right]$, S a vector of observable household characteristics $\left[S = (s_1, \ldots, s_t)\right]$, Y the household income and C_j the cost for choosing jurisdiction j (taxes, commuting costs and so on). p_i is the price of the i-th private good. The household under consideration will choose jurisdiction k, if:

$$(2) \qquad V_k^* \geq V_j^* \qquad \forall\ k \neq j.$$

Inserting *(1)* into *(2)* and assuming G to be homogenous of degree one,[13)] yields the following criterion to choose jurisdiction k for residence:

$$(3) \qquad \left[F(Q_k, S) - F(Q_j, S) - \frac{(C_k - C_j)}{P}\right] \geq 0,$$

11. This model uses the conditional LOGIT-model of MCFADDEN (1978). See also MADDALA (1983). A similar model can be found in FRIEDMAN (1981) and NECHYBA and STRAUSS (1998). Their econometric analysis is, however, on the basis of individual data while we use aggregate data in this paper.

12. For simplicity, separable utility functions are assumed.

13. Then $G^*(Y - C_j, p_1, \ldots, p_m, S) = (Y - C_j) / P(p_1, \ldots, p_m, S)$, i.e. the indirect utility function is linear in income corrected by $P(p_1, \ldots, p_m, S)$.

with $P = P(p_1, \ldots, p_m, S)$ as a price index for all households with characteristics S and for all goods that are not residence specific.

The decision of a taxpayer of income group g to reside in jurisdiction k therefore depends on the characteristics of this jurisdiction. Defining $W_{g,k}$ as the probability of such a residence decision, these considerations yield

(4) $W(g \cap k) = f_g(Q_k, C_k),$

However, the data we use only allow us to capture the conditional probability that a taxpayer who has residence in jurisdiction k belongs to income group g, $W(g \mid k)$, for which *relation (5)* holds

(5) $W(g \mid k) = W(g \cap k) / W(k).$

Thus, our data simultaneously reflect the decision of those taxpayers who belong to income group g in jurisdiction k as well as the decision of all residents of this jurisdiction. The problem is, that the impact of both decisions goes in opposite directions. Taking logarithms we get

(6) $ln(W(g \mid k)) = ln(W(g \cap k)) - ln(W(k)).$

If all taxpayers react in the same way, if, e.g., an improvement in the infrastructure leads to a proportionately equal influx of taxpayers of all income groups, then $W(g \cap k)$ will exhibit the same proportional increase, which is equal to the relative increase of $W(k)$, for all g groups. Thus, there will be no effect on $ln(W(g \mid k))$. A reduction in the tax rate of the highest income group will, on the other side, have – *ceteris paribus* – hardly any effect on the decisions of taxpayers in other income groups. The impact on all taxpayers will be the effect on the highest income group weighted by the share of this group in the population, and we will observe a positive effect on $ln(W(g \mid k))$. A reduction of the tax rate of a lower income group will have hardly any effect on the behavior of the highest income group, but a strong positive effect on other income groups and, therefore, a non-negligible impact on $W(k)$. Thus, we might observe a negative effect on $ln(W(g \mid k))$.

To estimate *relation (6),* we follow MADDALA (1983, p. 96ff) and use a logit formulation:

(7) $$L_{g,k} = \ln\left(\frac{W(g/k)}{1 - W(g/k)}\right) = X_k' b^* + e_{g,k} .$$

Instead of individual data, we use aggregate data for groups of taxpayers (self-employed, retirees and dependent employees) of the $k = 1, \ldots, 26$ Swiss cantons ($k = 1, \ldots, 137$ cities) in 1990. The unobserved probability, W_k, is thus substituted by the observed share of taxpayers, $\hat{W}_{k,g} = S_{k,g}$, in $g = 1, \ldots, 7$ income classes. Data on the distribution of taxpayers according to their gross income as well as on the respective tax burden are given for a number of different incomes. The income group below SFr 15,000 is not considered here because of specific small sample properties in this case

due to the low relative frequency (less than two percent). The remaining data are grouped into the following gross income classes:

$S_{k,1}$: SFr 15,000 $Y_{k,1}$ < SFr 20,000; where $Y_{r,1}$ = 17,000

$S_{k,2}$: SFr 20,000 $Y_{k,2}$ < SFr 30,000; where $Y_{r,2}$ = 25,000

$S_{k,3}$: SFr 30,000 $Y_{k,3}$ < SFr 40,000; where $Y_{r,3}$ = 35,000

$S_{k,4}$: SFr 40,000 $Y_{k,4}$ < SFr 50,000; where $Y_{r,4}$ = 45,000

$S_{k,5}$: SFr 50,000 $Y_{k,5}$ < SFr 75,000; where $Y_{r,5}$ = 60,000

$S_{k,6}$: SFr 75,000 $Y_{k,6}$ < SFr 100,000; where $Y_{r,6}$ = 85,000

$S_{k,7}$: SFr 100,000 $Y_{k,7}$; where $Y_{r,7}$ = 175,000

with $S_{k,g}$ being the share of taxpayers in income class g in jurisdiction k, $Y_{k,g}$ the gross income in group g and $Y_{r,g}$ denoting the representative income of this income group (on the basis of the calculated mean income of this class). Taxpayers are disaggregated in the groups of dependent employees, self-employed and retired taxpayers. Tax data are available for retirees, singles, married taxpayers and married taxpayers with two children. The model is estimated with the tax rate of married taxpayers with two children in the case of dependent employees and self-employed taxpayers while we use the tax burden of retired taxpayers in the different income classes of retirees.

3.2 Factors Influencing Residence Decisions

In order to capture the impact of fiscal competition on residence decisions of taxpayers, three different types of variables are used: tax rates, t_k, public transfer payments, tr_k, and public services, Q_k. In a TIEBOUT-framework, we would expect the fiscal variables to have an impact on residence decisions either if public goods are not provided efficiently or taxes and expenditures serve to redistribute income to a non-negligible extent. In a TIEBOUT-equilibrium, however, there is no redistributive activity and citizens consume public services at a level and quality that suit their preferences best paying adequate tax prices. Since most efficiency analyses have clear redistributive implications because immobile factors have to bear the tax burden to finance public goods if the rich, able and mobile factors cannot be taxed,[14)] we focus on the redistributional impact of the fiscal variables.

As tax variables, we thus use the average effective cantonal and (weighted) local income tax rates on gross incomes of SFr 17,000, $t_{k,17}$, and of SFr 175,000, $t_{k,175}$. While one would expect a clear negative impact of the tax rate on high incomes on the share of taxpayers in the high income classes and a negative impact of the tax rate on low incomes on the share of taxpayers in the low income

14. See SINN (1997) for such an argument.

classes, the opposite signs depend upon which income class gains from redistribution by income taxes. If income is redistributed from the rich to the poor in Swiss cantons and cities, then the impact of the tax rate on high incomes on the share of taxpayers in low income classes will be positive while the tax rate on low incomes will have a positive impact on the share of taxpayers in the higher income classes. The same signs of the tax rates can be expected if income is redistributed from the poor to the rich. Since the low income groups mainly consider their own tax burden, the quantitative impact of the tax rate on high income on the share of taxpayers in low income groups should be relatively small however. The same logic applies to high income taxpayers.

On the expenditure side of the public budget, social transfers, tr_k, are the main instruments of redistribution. Two variables are used to measure the impact of transfers on the share of taxpayers in different income groups: In the cantonal model, cantonal expenditures for supplementary pensions per capita are used since they are a transfer instrument that can mainly be used by the cantons. In the model of local jurisdictions, local expenditures for social welfare per capita, that mainly consists of the expenditures for social assistance payments, are used as the indicator for social transfers at the local level.[15)] Since taxpayers with low incomes are to a larger extent less skilled than those with high incomes, they have a higher probability to become unemployed and thus be a potential recipient of social assistance. Moreover, only retirees with low incomes are supposed to receive supplementary pensions by the Swiss cantons. Social transfer payments should thus have a positive sign on the share of taxpayers in low income classes. Low income taxpayers reside in jurisdictions with higher social transfers. Their impact in the upper income classes is however ambiguous. High social transfers may either threat high income people from residing (or staying) in a jurisdiction because they are an indicator of a high level of redistribution or they may induce them to stay or reside because they indicate social peace. The latter interpretation very much hinges on the potential of exploitation of high by low income people. If high income people feared to be exploited by the poorer majority, they would choose to stay away from the respective canton. If this fear were minor, they would actually be willing to pay for some level of redistribution.

In the econometric model proposed, the fiscal attractiveness of the canton is also measured by an index of the quality of public infrastructure, Q_k, as the average of the ranks of the three criteria 'education', 'medical services' and 'public traffic' based on the results of the Swiss recruits' survey of the quality of life conducted by WALTER-BUSCH (1997). High income people will demand – *ceteris paribus* – a better infrastructural equipment if infrastructural goods are superior consumption goods and if they do not provide them privately. Since this variable is represented as the ranks attributed to different jurisdictions by the recruits, a negative sign for this variable is expected. Cantonal private infrastructure, P_k, is measured as the average of the ranks of the two criteria

15. In both cases expenditures per capita are used instead of transfer rates because the latter are not available. Moreover, not only the level of rates but also the differentiation in the supply of social transfers as well as the higher anonymity of transfer recipients in jurisdictions with high transfer spending may have a positive impact on the share of taxpayers in low income classes who are potential transfer recipients.

'shopping possibilities' and 'entertainment possibilities', while cantonal site specific advantages, $SITE_k$, are captured by the average of the ranks of the three criteria 'silence', 'landscape' and 'beauty of the locality' of the survey of Swiss recruits. Since the availability of both, private infrastructure and site specific advantages, depend upon transport costs to a larger extent than public infrastructure, high income taxpayers put a lower value on their availability than low income taxpayers. For high income Swiss people it is fashionable to fly to New York for their Christmas shopping or to Milan for buying the new *haute couture*. Although they will also attempt to get the best medical treatment in the world and the impact of public infrastructure may thus also be influenced by the transport cost argument, high income taxpayers will strongly favor excellent medical services in their jurisdiction of residence because of urgency medical treatments that do not allow to fly abroad. Because of their coding in ranks, it is thus expected that public infrastructure and site specific advantages have a negative impact on the share of taxpayers in the low income groups and the opposite sign in high income classes indicating that both variables increase the attractiveness of a canton for low income taxpayers. Since there is not such detailed information on the quality of life at the local level, the attractiveness of the Swiss cities is only measured by the aggregate quality of life index from the recruits' survey.

Earning opportunities in the cantons and cities are captured by monthly average salaries, w^w_k, of the cantons or the agglomerations, respectively. Because salaries are largely paid in the service sector, while wages are paid in the industrial sector, and because the service sector produces non-tradable goods to a large extent, this variable is more interesting than average wages. Moreover, salaries are still paid to high income taxpayers, i.e. white-collar workers, despite the emergence of low salary services. Thus, average salaries are expected to have a positive impact on the share of taxpayers in high income classes. Finally, as the discussion of the Swiss fiscal constitution in *Section 2* may indicate, the canton of Geneva is a special case. Thus, we include a dummy variable for this canton, D_{GE}, in the model.

One can argue that there is a simultaneous relationship between the distributions of (income) tax rates and the shares of taxpayers in different income groups and that taxes are also decided in the political process. As a result, the tax rates of the canton are not really exogenous variables. An instrumental variable estimator should be used because the estimated coefficients of the tax rates are inconsistent and biased if the tax rates are correlated with the error terms. We use the cantonal and (weighted) local tax rates of the cantons in 1988 and 1986, i.e. the previous two periods where tax rates are available, cantonal expenditures for supplementary pensions of 1980 or local expenditures for social welfare of 1988, respectively, an infrastructural index of 1976 and monthly average salaries of 1982 as instruments. Moreover, a number of political economic variables is used as instruments. Following ROUBINI and SACHS (1989) the number of coalition parties is included. Coalitions which consist of many parties are supposed to vote for higher income tax rates since they have to satisfy different constituencies with heterogeneous interests. Because leftist parties are typically assumed to vote for a higher extent of redistribution and for higher tax rates in the higher income groups (POMMEREHNE

and SCHNEIDER, 1983), the share of leftist parties in the executive is included in the instruments list. Moreover, we include a dummy variable for purely representative democratic determination of the tax rate indicating a weaker institutional constraint on representatives because they do not have to get tax rate changes approved by the citizens. In order to measure the extent to which there should occur a higher extent of redistribution due to the vote of the citizens, the ratio of mean to median income is introduced (MELTZER and RICHARD, 1981). Finally, we follow the interest group approach and include the share of self-employed from all employed people as well as the relative income of the self-employed, measured as the share of self-employed from all employed times the income of the self-employed in the different income classes, as two proxies indicating the strength of the self-employed as an interest group (RENAUD and VAN WINDEN, 1987).

As the sizes of the cantons and cities are rather different, instead of using the simple LOGIT-procedure, we perform a weighted regression, using the inverse of the square root of the population as a weight and include a population variable, N_k, in the equation. Thus, the following model for explaining the shares of taxpayers in different income groups in 1990 is specified:

$$(8) \qquad \left[\ln\left[\frac{S_{k,g}}{100 - S_{k,g}}\right]\right] = (b_0 + b_1 \cdot t_{k,17} + b_2 \cdot t_{k,175} + b_3 \cdot tr_k + b_4 \cdot Q_k + b_5 \cdot X_k + b_6 \cdot SITE_k + b_7 \cdot w_k^w + b_8 \cdot D_{GE} + b_9 \cdot N_k)$$

with:

$S_{k,g}$ = share of taxpayers in income class g $(g = 1,\ldots,7)$ in percent of all taxpayers;

$t_{k,17}$ = cantonal and (weighted) local average effective tax rate on gross income of SFr 17,000 in percent;

$t_{k,175}$ = cantonal and (weighted) local average effective tax rate on gross income of SFr 175,000 in percent;

tr_k = cantonal expenditure for supplementary pensions or local social welfare spending per capita of the population (in SFr 100,000);

Q_k = indicator for cantonal public infrastructure as the average of the ranks of the three criteria ‘education’, ‘medical services’ and ‘public traffic’ of the survey of Swiss recruits;

X_k = indicator for cantonal private infrastructure as the average of the ranks of the two criteria ‘shopping possibilities’ and ‘entertainment possibilities’ of the survey of Swiss recruits;

$SITE_k$ = indicator for cantonal site specific advantages as the average of the ranks of the three criteria 'silence', 'landscape' and 'beauty of the locality' of the survey of Swiss recruits;

$(QUAL_k$ = indicator for regional quality of living as the average of the ranks of all criteria of the survey of Swiss recruits);

w^w_k = monthly average (cantonal or local) salaries (in SFr 1,000);

D_{GE} = Dummy variable for the canton of Geneva;

N_k = cantonal and local population (in million inhabitants).

The subscript k denotes the $k = 1, \ldots, 26$ cantons ($k = 1, \ldots, 137$ cities), the subscript g the $g = 1, \ldots, 7$ income groups, and the group with the highest incomes contains those with a gross income of SFr 100,000 or above. In addition, the same model is applied to the other income groups and the seven equations resulting from this specification are estimated simultaneously using the *Zellner-Aitken Seemingly Unrelated Regression (SUR)* procedure. Since the shares of taxpayers in different income groups add up to hundred percent, the estimation of the model should produce significant results for the income groups at the top and at the bottom, with opposite signs, respectively. However, this does not have to hold for the tax rate because of the redistributional impact mentioned above.

4 Econometric Results

The cantonal results from the simultaneous equations model of *equation (8)* for the different groups of taxpayers (self-employed, retirees, dependent employees with tax rates for married taxpayers with two children and for retirees respectively) for the year 1990 are presented in *Tables 2* to *4* and the results for the 137 Swiss cities in *Tables 5* to *7*.

4.1 Cantonal Results

On the whole, the model explains the cantonal share of self-employed in all income classes to a large extent. The variance of the dependent variable can be explained to about 40 to 56 percent. According to the $\hat{c}^2$-test statistics in *Table 2* all variables in the system as a whole are significant at least at the 5 percent level. The only exception are expenditures for supplementary pensions per capita which are not significant at all. The tax rate on gross income of SFr 17,000 has a negative impact on the share of taxpayers in the lower four and a positive impact in the upper three income classes. However, it is only significantly different from zero at the 1 percent level in the second and sixth income class, at the 5 percent level in the third and at the 10 percent level in the fifth income group. The higher the tax burden of low income taxpayers, the less likely a self-employed taxpayer with a gross income of SFr 20,000 to 40,000 takes his residence in this canton. The residence

probability of a taxpayer with gross income between SFr 50,000 and 100,000 is the higher, the higher the tax rate of low incomes.

Table 2 near here

The tax rate on gross incomes of SFr 175,000 is significantly different from zero at least at the 5 percent level in nearly all income groups except the fifth group. It has a positive impact in the four lowest income classes and a negative impact on the share of high income self-employed in the upper two income groups. The probability that self-employed with high income reside in a canton where they have to pay high taxes, decreases, the higher this tax rate. On the other hand, the probability that low income self-employed will reside in a canton increases if high income taxpayers pay relatively high taxes. This evidence indicates that taxes have a strong impact on the residence decision of taxpayers. Moreover, the tax rate of gross incomes of SFr 175,000 turns out to have a stronger impact on the share of self-employed in the upper income groups than the tax rate on gross incomes of SFr 17,000 has on the lower income classes while both tax rates exert the relatively stronger impact on the income groups to which those taxes apply.[16)] The marginal utility of a tax rate reduction is higher for high income than for low income self-employed. This is also evidence for the redistributional impact of income taxation at the cantonal level redistributing income from high to low income groups. Finally, these results indicate that Swiss cantons are more homogeneous with respect to income due to the impact of taxes.

As well, self-employed with high incomes value public infrastructure positively while low-income self-employed put a lower value on it. This is different with respect to private infrastructure. Self-employed in low income classes prefer shopping and leisure possibilities relatively stronger than high income self-employed. Site specific advantages of the cantons are however largely prefered by middle income goups. They reside to a significantly stronger extent in such cantons than self-employed with high or low incomes. Average cantonal salaries do not play a strong role in most income classes. An exception are self-employed with low incomes. High salaries deter them because they mean higher labor costs to them and low income self-employed have less leeway in profits to bear relatively high labor costs than self-employed in other income groups. Finally, the dummy variable for the canton of Geneva is significantly negative in income groups two to four and significantly positive only in the highest income group. Self-employed do not appear to be strongly attracted by the special role of Geneva as the location of international organizations.

Table 3 near here

16. The LOGIT-model only allows for a relative comparison of magnitudes without allowing for a more illustrative quantitative interpretation. In order to compare the impact of both tax rates in the different income groups, the maximum impact of both tax rates is computed as the difference between the maximum and minimum of the respective tax rate times their coefficients in the different income classes. With the exception of the fourth income class, the maximum impact of the tax rate on high incomes has the relatively stronger impacts on the share of taxpayers in different income groups.

Table 3 contains the results for the share of retirees in different income classes. Surprisingly the homogeneity model appears to perform better in the case of retirees than of self-employed: With the exception of the third income group the model explains more than sixty percent of the variance in all income groups. The result of the Wald-test corroborates this high explanatory power. The hypothesis that the share of retirees in all income classes is independent from the explanatory variables can be rejected for each factor at least at the 5 percent level. Despite these results, neither cantonal salaries nor the indicator of private infrastructure have a significant impact in the single equations. Salaries do not play a role for residence decisions of retirees because they are retired. Moreover, leisure possibilities that are highly valued by the recruits do not meet the taste of retirees. Shopping possibilities do not play an important role for retirees as well because they do not very easily change the shops they used to buy in for years.

The tax rate on low incomes is significantly different from zero only at the 10 percent level in the highest income group. Since the basic tax exemption for retirees' incomes is relatively larger than the basic tax exemption for incomes of the active population in nearly all cantons this result does not really surprise. However, the tax rate on high incomes has a lower impact on the share of retirees in the different income groups as well, at least compared to the estimation results for self-employed taxpayers. The tax burden of high income retirees has a significantly positive impact in the third and fourth income class, while the residence probability of high income retirees is significantly lower if cantons have high taxes on high and low incomes. In contrast to the results for self-employed, middle income retirees appear to profit from redistribution by income taxes.

These results are accentuated by the significantly negative impact of expenditures for supplementary pensions per capita in the middle income classes. Supplementary pensions are targeted to retirees with low incomes which are usually tax exempt. Thus, supplementary pensions have the expected positive sign in the two lowest income groups but do not reach any conventional significance level. Higher supplementary pensions on the other hand reduce the extent to which middle income retirees can gain from redistribution by income taxes. Therefore, higher expenditures for supplementary pensions per capita reduce the probability that retirees with a gross income of SFr 30,000 to SFr 75,000 reside in this canton.

With respect to public infrastructure, particularly medical services and public traffic, plausible results are obtained as well. As compared to self-employed and dependent employees, retirees prefer a higher level of public infrastructure to a larger extent. While high income retirees put a relatively higher value to better public infrastructure than low income retirees, the relatively smaller preference of low income retirees does not gain significant momentum and the relatively higher preference in the upper income groups is stronger than in the case of self-employed and dependent employees. Moreover, middle income retirees value site specific advantages of the cantons less than low income retirees. The special role of Geneva does not play an important role for retirees while the cantonal population exerts a positive impact in the three highest income groups.

Table 4 near here

Table 4 contains the results for the group of dependent employees. These results are complementary to those of the other two groups. Again the explanatory power of the model is relatively high concerning the adjusted coefficient of determination and the Wald statistics. The explanatory variables explain the share of dependent employees in the different income classes pretty well. With respect to the tax burden, to public and private infrastructure and site specific advantages a similar pattern results as in the case of self-employed taxpayers. Again the results indicate an income redistribution by personal income taxes from high to low income taxpayers. The negative impact of expenditures for supplementary pensions per capita is evidence that low income dependent employees are aware of the income redistribution to the low income retirees induced by supplementary pensions. This has opportunity costs for dependent employees. Geneva specifically attracts dependent employees with high incomes. The special role of Geneva is thus more a 'mass phenomenon' than expected.

Comparing the impact of fiscal variables on the share of the different groups of taxpayers,[17)] the tax rate on high incomes has a quantitatively stronger impact than that on low incomes for all three groups of taxpayers. The marginal utility of a tax rate reduction is thus higher for high than for low income people. This difference is however less pronounced for self-employed than for retirees and for dependent employees. Residence decisions of self-employed are influenced to a larger extent by the tax rate on low incomes than the two other groups of taxpayers. With respect to the tax rate on high incomes this statement mainly holds for the higher income self-employed while residence decisions of low income dependent employees are influenced to the largest extent by the tax rate on high incomes. The strongest impact of the tax rate on high incomes in the fifth income class is highest in the case of retirees.

We also performed all these equations including a dummy variable for the canton Zug which, as stated above, is well known as a tax heaven. However, using a likelihood ratio tests for omitted variables this variable did not make a significant contribution in none of the three estimated systems. Thus, we conclude that besides from its favorable tax conditions the canton Zug did not particularly attract high income taxpayers in 1990.

In total, the results suggest that there is fiscal competition between Swiss cantons, and that especially high income earners choose their place of residence depending on the amount of income taxes they have to pay. Since social transfers are mainly insignificant, cantonal fiscal competition rather consists of tax competition than of transfer competition. Moreover, the impact of public infrastructure is not compensated for by that of the income tax rate. The hypothesis that both impacts do not differ from each other can be rejected at any conventional significance level. Thus, a necessary condition for an efficient TIEBOUT-equilibrium is violated. Tax competition is stronger for self-employed than for

17. Again the maximum impact of the variables is computed as the difference between the maximum and minimum of the respective variable times their coefficients in the different income classes.

dependent employees and retirees. Obviously, the provision of public services is the most important factor for residence decisions of retirees. With the exception of retirees, income is redistributed from high to low income taxpayers. On the contrary, middle income retirees gain from the redistribution by income taxes. A higher tax burden on high incomes in a canton reduces – *ceteris paribus* – the probability that the rich reside in such a canton. In particular due to the redistributive effects of personal income taxes cantonal population is more homogenous with respect to its income. Does this picture change if local tax competition is considered?

4.2 Results for 137 Swiss Cities

Fiscal competition should be the stronger, the smaller the distance is between competing jurisdictions because moving costs in form of transport and housing costs, but also the loss of social networks are lower or less likely. In the case of Swiss cantons, additional mobility restrictions hold due to cantonal regulations of self-employed. Thus, local tax competition at the level of the largest 137 Swiss cities should be stronger than cantonal tax competition. Basically the same model as outlined in *equation (8)* is used. Differences occur mainly in two variables: the cantonal and local average effective tax rates are used without weighting the local tax burden and the quality of life indexes are not available on a disaggregated basis making it necessary to use the aggregate regional quality of life index. Moreover, we include a dummy variable for the cities located in the canton of Zug from the beginning. We focus mainly on the fiscal variables and leave the interpretation of other factors influencing residence decisions at the local level to the reader.

Table 5 near here

Table 5 contains the results for self-employed taxpayers. As compared to the cantonal model, the explanatory power of the local model is lower ranging roughly speaking from about 15 to 60 percent of the variances for all three groups of taxpayers. The hypothesis that the shares of self-employed in the seven income groups are independent from the explanatory variables can be rejected at least at the 5 percent level for nearly all variables. Exceptions are the local expenditures for social welfare per capita and the indicator for quality of life. Moreover, the hypothesis of independence of the dummy variable of Zug is with $\hat{c}^2 = 12.982$ (with 7 degrees from freedom) only rejected at the 10 percent level.

Concerning the impact of the high income tax rate on the residence probability of self-employed taxpayers, similar results are obtained as in the case of the cantonal model. The cantonal and local tax rate on gross income of SFr 175,000 is significantly different from zero at the 1 percent level in all but the fourth and fifth income group being insignificant only in the latter case. A higher tax rate on high incomes increases the probability that self-employed with incomes between SFr 15,000 and SFr 50,000 reside in such cities, and decreases the probability that those with incomes above SFr 75,000 live there. The low income tax rate has a significantly positive impact on the residence probability only in the highest income group, but is significantly negative in the three lowest income

classes. The higher the tax rate of high incomes in a city, the lower the probability that high income self-employed taxpayers will reside there and the higher the tax rate on low incomes in a city, the lower the probability that low income self-employed reside there. In addition, both, the impact of social transfers and of public infrastructure on the distribution of self-employed among the 137 Swiss cities, are not very strong.

Table 6 near here

The results on the distribution of retirees among the Swiss cities in *Table 6* are similar to the cantonal results. Again the index of the quality of life, in particular containing public infrastructure of the cities, has the quantitatively strongest impact as compared to self-employed and dependent employees while the impact of taxes on residence decisions is minor. Moreover, social welfare spending is without importance for retirees since low income retirees to a larger extent obtain supplementary pensions.

Table 7 near here

Table 7 presents the results for dependent employees. As compared to retirees, public expenditures for social welfare per capita have a stronger impact on the share of dependent employees in the lowest income class and as compared to the self-employed, this impact has about the same magnitude. To a smaller degree than for the self-employed, residence decisions of dependent employees are strongly influenced by tax rates as well, in particular by that on high incomes. In the case of dependent employees as well as of self-employed tax competition is stronger than transfer competition or competition in public spending.

Quantitatively, there exists a similar pattern of fiscal competition at the Swiss local level as at the cantonal level. Fiscal competition can be characterized as consisting mainly of tax competition and less of transfer competition. Moreover, the tax rate of high income taxpayers has a quantitatively stronger impact than that of low income taxpayers indicating that redistribution by income taxes at the local level is pro-poor as well. The negative impact of the tax rate on high incomes is however not exclusively stronger for self-employed than for dependent employees. The tax rate on high incomes has a stronger impact in the case of self-employed only in the highest and in the second to fourth income class. At the local level, mobility of self-employed does not seem to be stronger than that of dependent employees which may be due to the geographical closeness of suburbs rendering it possible for dependent employees to gain from tax differences in a similar way as the self-employed. Comparing the cantonal and local results, tax competition is stronger at the local than at the cantonal level.[18)]

18. Again this result is obtained by computing the maximum impact of both tax rates at the local and the cantonal shares of taxpayers. The maximum differences induced by income taxation happen to be higher in nearly all income classes, with the exception of the fourth group, in the case of high income tax rates and in four of seven groups in the case of low income tax rates.

5 Concluding Remarks

In this paper, we have investigated one aspect of fiscal competition, namely that citizens choose their place of residence according to fiscal incentives. Summarizing, the results suggest that there is fiscal competition between Swiss cantons and between Swiss cities, and that especially high income earners choose their place of residence depending on the amount of income taxes they have to pay. Since social transfers are mainly insignificant, fiscal competition rather consists of tax competition than of transfer competition. Moreover, the impact of public infrastructure is not compensated for by that of the income tax rate implying that a necessary condition for an efficient TIEBOUT-equilibrium is violated. Tax competition is stronger for self-employed than for dependent employees and retirees. The provision of public services is the most important factor for residence decisions of retirees. With the exception of retirees income is redistributed from high to low income taxpayers. Only middle income retirees gain from the redistribution by income taxes. Comparing the cantonal and local results, tax competition is stronger at the local than at the cantonal level. A higher tax burden on high incomes reduces – *ceteris paribus* – the probability that the rich reside in such a jurisdiction. In particular due to the redistributive effects of personal income taxes cantonal and local population is more homogenous with respect to its income.

The question immediately emerges whether this kind of fiscal competition in Switzerland leads to the expected inefficiencies in the provision of public goods and reduces the effectiveness of Swiss income redistribution. The higher homogeneity of Swiss subfederal jurisdictions leads to a higher probability that services provided will be consistent with desires of each and every member of the population. Although INMAN and RUBINFELD (1997) suggest that the evidence of the U.S. is in favor of this conjecture, there are no comparable results for Switzerland. Since the efficiency of public goods provision in a TIEBOUT-framework is not easily testable empirically, the efficiency conjecture of fiscally induced homogeneity in Switzerland remains open for future research.

Anyway, the impact of tax competition on redistribution is more interesting in the political discussion than efficiency considerations. Indeed, decentralized redistributive goals are likely to be thwarted if jurisdictions are more homogeneous. In a companion paper, FELD (1999a) presents evidence that two thirds of income redistribution undertaken by the Swiss governments are conducted at the cantonal and local level (excluding the redistributional impact of the Swiss pension system). Despite considerable tax competition in Switzerland, as measured by the changes of Gini coefficients, decentralized income redistribution (excluding redistribution by the social security system) has increased from 1977 to 1992 accompanied by an increase in the share of redistribution undertaken by taxes. Thus, the Swiss welfare state has not collapsed due to tax competition. On the other hand, Swiss decentralized redistribution is shaped by (at least) three institutions that stabilize such an outcome.

One of those institutional arrangements consists in the partial centralization of redistributional competencies in Switzerland. The progressive federal income tax, the source tax on interest income

and the pay-as-you-go part of the Swiss pension system (AHV/IV) are centralized and exert a strong positive impact on income equalization. The second post constitutional rule which presumably plays a role in Swiss transfer policies is the citizenship principle for social assistance. Although the citizenship principle is not as far reaching as strict residential requirements of a minimum time of residence in order to get social assistance and does not establish that immigrating recipients only get the level of payments they would get in their home canton (local jurisdiction), cantons have an incentive to reduce the dependency ratio of recipients. Such a weak residence requirement may serve its purpose because it reduces the probability that transfer competition occurs which may be more detrimental for decentralized income redistribution than tax competition (HINDRIKS, 1998). The fact that mainly tax competition occurs in Switzerland is evidence in favor of this conjecture.

The final institutional arrangement hinges on the notion of procedural fairness. In the context of redistribution it implies that the same redistributional amount is valued differently by taxpayers with respect to their influence on the redistributional outcome in the decision-making process. Since Swiss cantons to differing degrees enable voters to participate directly in fiscal decision-making by referenda on tax rates, the budget or budget deficits, and because institutional competition of direct with representative democratic cantons induces the latter to deviate not too much from basic redistributive concerns, fiscal competition in Switzerland may not lead to a collapse of the welfare state as well. Actually, tax competition is less pronounced in cantons with a tax referendum than in those without one (FELD, 1997). The Swiss referendum democracy stabilizes decentralized redistribution as well.

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Appendix 1 Data Sources

A) Tax Variables, 1990

$S_{k,g}$ share of taxpayers in income class g *($g = 1,...,7$; see Section 4.1)* in percent of all taxpayers.

$t_{k,17}$ cantonal and (weighted) local average effective tax rate on taxable income of SFr 17,000 in percent.

$t_{k,175}$ cantonal and (weighted) local average effective tax rate on taxable income of SFr 175,000 in percent.

Source: EIDGENÖSSISCHE STEUERVERWALTUNG, Bern, Unpublished data on income taxes of cantons and local jurisdictions.

B) Other Fiscal Variables, 1990

tr_k cantonal expenditure for supplementary pensions or local social welfare spending per capita of the population.

Source: BUNDESAMT FÜR SOZIALVERSICHERUNG, Bern, personal correspondence.

STATISTIK DER SCHWEIZER STÄDTE, Statistisches Jahrbuch des Schweizer Städteverbandes 1992, Zurich and Bern 1992, pp. 58f.

C) Variables of Quality of Living, 1990

Q_k Indicator for cantonal public infrastructure as the average of the ranks of the three criteria 'education', 'medical services' and 'public traffic' of the survey of Swiss recruits.

P_k Indicator for cantonal private infrastructure as the average of the ranks of the two criteria 'shopping possibilities' and 'entertainment possibilities' of the survey of Swiss recruits.

$SITE_k$ Indicator for cantonal site specific advantages as the average of the ranks of the three criteria 'silence', 'landscape' and 'beauty of the locality' of the survey of Swiss recruits.

$QUAL_k$ Indicator for regional quality of living as the average of the ranks of all criteria of the survey of Swiss recruits.

Source: WALTER-BUSCH, E. (1997), *Regionale Lebensqualität in der Schweiz: Ergebnisse der Rekrutenbefragungen 1996, 1987 und 1978*, Sauerländer, Aarau 1997, pp. 27ff. (for the cantons) and pp. 81f. (for the regions).

D) OtherVariables, 1990

$w^w{}_k$ monthly average (cantonal or local) salaries.

Source: BUNDESAMT FÜR INDUSTRIE, GEWERBE UND ARBEIT (BIGA), Abteilung Wirtschaft und Statistik, Sektion Lohnstatistik, Durchschnittliche Löhne nach Kantonen und Agglomerationen, Bern, 1990.

N_k cantonal and local population.

Source: BUNDESAMT FÜR STATISTIK, Statistisches Jahrbuch der Schweiz 1992, Zurich 1991, pp. 22f.

STATISTIK DER SCHWEIZER STÄDTE, Statistisches Jahrbuch des Schweizer Städteverbandes 1990, Zurich and Bern 1990, p. 8.

E) Instrument Variables

Cantonal and (weighted) local average effective tax rate on taxable income of the years 1988 and 1986.

Source: EIDGENÖSSISCHE STEUERVERWALTUNG, Bern, Unpublished data on income taxes of cantons and local jurisdictions.

Cantonal expenditure for supplementary pensions of 1980 or local social welfare spending per capita of the population of 1988.

Source: BUNDESAMT FÜR SOZIALVERSICHERUNG, Bern, personal correspondence.

STATISTIK DER SCHWEIZER STÄDTE, Statistisches Jahrbuch des Schweizer Städteverbandes 1990, Zurich and Bern 1990, p. 54.

Infrastructural index of the Swiss Commission of Economic Experts of 1976.

Source: BUNDESAMT FÜR KONJUNKTURFRAGEN, Bern, personal correspondence.

Monthly average (cantonal or local) salaries of 1982.

Source: BUNDESAMT FÜR INDUSTRIE, GEWERBE UND ARBEIT (BIGA), Abteilung Wirtschaft und Statistik, Sektion Lohnstatistik, Durchschnittliche Löhne nach Kantonen und Agglomerationen, Bern, several years.

Number of coalition parties in the executive in 1990.

Share of Social Democrats in the executive in 1990.

Source: BUNDESAMT FÜR STATISTIK, Statistisches Jahrbuch der Schweiz 1992, Zurich 1991, p. 342.

STATISTIK DER SCHWEIZER STÄDTE, Statistisches Jahrbuch des Schweizer Städteverbandes 1990, Zurich and Bern 1991, p. 64.

Dummy Variable being 1, if the jurisdiction has no referendum on tax rates.

Source: POMMEREHNE, W.W. and H. WECK-HANNEMANN (1996), Tax Rates, Tax Administration and Income Tax Evasion in Switzerland, *Public Choice* 88 (1996), 161 – 170.

Ratio of average to median income in 1990.

Source: EIDGENÖSSISCHE STEUERVERWALTUNG, Bern, Unpublished data on taxable income of cantons and local jurisdictions.

Share of self-employed from employment in 1990.

Source: EIDGENÖSSISCHE STEUERVERWALTUNG, Bern, Unpublished data on the distribution of taxpayers of cantons and local jurisdictions.

BAK BASEL, personal correspondence.

Relative income of self-employed, as the share of self-employed from employment times taxable income of self-employed in different income classes in 1990.

Source: EIDGENÖSSISCHE STEUERVERWALTUNG, Bern, Unpublished data on the distribution of taxpayers and on taxable income of cantons and local jurisdictions.

BAK BASEL, personal correspondence.

Appendix 2 Descriptive Statistics and Correlations of Explanatory Variables

Table A.1: Descriptive Statistics of Cantonal Explanatory Variables

Variables	Mean	Median	Minimum	Maximum	Standard Deviation	Jarque-Bera-Statistics
$t_{k,17}$	0.303	0.155	0.000	1.930	0.449	48.713**
$t_{k,175}$	16.135	16.650	9.190	19.785	2.710	2.459
tr_k	185.84	144.23	74.311	346.23	90.463	3.479
Q_k	2.559	2.542	1.497	3.017	0.337	8.950*
P_k	2.801	2.828	1.925	3.320	0.269	13.266**
$SITE_k$	2.103	2.078	1.630	2.660	0.216	0.815
w^w_k	5393.77	5395.00	4847.00	5840.00	249.38	0.454
N_k	0.264	0.204	0.014	1.179	0.284	24.271**

See *Appendix 1* for a description of the variables. Cantonal expenditures for supplementary pensions, tr_k, are in SFr 1000 per capita. The cantonal population, N_k, is in Millions. '(*)', '*', or '**' indicate significance at the 10, 5, or 1 percent level, respectively.

Table A.2: Correlation of Cantonal Explanatory Variables

Variables	$t_{k,17}$	$t_{k,175}$	tr_k	Q_k	P_k	$SITE_k$	w^w_k	N_k
$t_{k,17}$	1.000							
$t_{k,175}$	-0.096	1.000						
tr_k	-0.313	0.586	1.000					
Q_k	0.244	-0.006	-0.228	1.000				
P_k	-0.098	-0.035	-0.292	0.760	1.000			
$SITE_k$	-0.385	0.255	0.396	-0.728	-0.478	1.000		
w^w_k	-0.049	-0.087	-0.245	-0.589	-0.474	0.439	1.000	
N_k	-0.242	0.193	0.243	-0.329	-0.125	0.410	0.344	1.000

For notes see *Table A.1*.

Table A.3: Descriptive Statistics of Local Explanatory Variables						
Variables	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**	**Jarque-Bera-Statistics**
$t_{k,17}$	0.238	0.070	0.000	1.995	0.386	954.465**
$t_{k,175}$	16.243	16.469	8.420	20.644	2.701	4.492
tr_k	501.82	459.55	21.178	1944.15	288.23	141.275**
$QUAL_k$	2.523	2.500	2.290	2.800	0.107	2.900
$w^w{}_k$	5502.76	5518.00	4847.00	5859.00	266.68	6.018*
N_k	0.023	0.014	0.002	0.365	0.039	11361.16**

See *Appendix 1* for a description of the variables. Local expenditures for social welfare, tr_k, are in SFr 1000 per capita. The local population, N_k, is in Millions. '(*)', '*', or '**' indicate significance at the 10, 5, or 1 percent level, respectively.

Table A.4: Correlation of Local Explanatory Variables						
Variables	$t_{k,17}$	$t_{k,175}$	tr_k	$QUAL_k$	$w^w{}_k$	N_k
$t_{k,17}$	1.000					
$t_{k,175}$	0.067	1.000				
tr_k	-0.193	-0.029	1.000			
$QUAL_k$	0.062	0.241	-0.094	1.000		
$w^w{}_k$	-0.229	-0.225	0.106	-0.493	1.000	
N_k	-0.091	0.053	0.485	-0.204	0.135	1.000

For notes see *Table A.3*.

Table 1: Migration, tax burden and social assistance of Swiss cantons in 1990

State (Canton)	Popula-tion	Immi-grants	Tax burden	Social assistance	Supplementary pensions
Zürich (ZH)	1,179,044	55,273	76.9	192	160
Bern (BE)	958,192	53,678	118.2	353	246
Luzern (LU)	326,268	15,865	129.4	190	207
Uri (UR)	34,208	1,236	131.0	99	120
Schwyz (SZ)	111,964	5,600	77.7	93	114
Obwalden (OW)	29,025	1,253	120.7	121	124
Nidwalden (NW)	33,044	1,737	83.0	72	90
Glarus (GL)	38,508	3,159	123.3	162	145
Zug (ZG)	85,546	4,550	56.1	157	74
Fribourg (FR)	213,571	11,881	122.7	130	293
Solothurn (SO)	231,746	13,420	100.0	97	147
Basel-Stadt (BS)	199,411	6,411	92.9	396	331
Basel-Landschaft (BL)	233,488	11,862	98.3	193	143
Schaffhausen (SH)	72,160	3,451	105.4	198	133
Appenzell a. Rh. (AR)	52,229	2,759	96.3	102	128
Appenzell i. Rh. (AI)	13,870	654	121.0	101	132
St. Gallen (SG)	427,501	22,643	87.8	140	175
Graubünden (GR)	173,890	9,776	94.5	148	112
Aargau (AG)	507,508	28,832	100.7	151	88
Thurgau (TG)	209,362	13,051	87.4	120	138
Ticino (TI)	282,181	16,199	97.2	206	342
Vaud (VD)	601,816	36,600	112.8	190	346
Valais (VS)	249,817	9,505	154.1	124	117
Neuchâtel (NE)	163,985	8,417	112.6	127	331
Genève (GE)	379,190	21,148	101.2	960	309
Jura (JU)	66,163	2,808	127.3	200	286

Notes: Population and immigrants are denoted in absolute figures. The tax burden is measured by the index of the total property and personal income tax burden of the Swiss cantons and the weighted average of their municipalities with the average of Switzerland as 100. Social assistance and supplementary pensions are the respective expenditures denoted in SFr per capita.

Table 2: SUR-model of the share of self-employed in different income groups in 26 Swiss cantons in 1990, state and (weighted) local tax rate on gross income of married taxpayers with two children

Dep. variable	$\ln\left[\frac{S_{k,1}}{100-S_{k,1}}\right]$	$\ln\left[\frac{S_{k,2}}{100-S_{k,2}}\right]$	$\ln\left[\frac{S_{k,3}}{100-S_{k,3}}\right]$	$\ln\left[\frac{S_{k,4}}{100-S_{k,4}}\right]$	$\ln\left[\frac{S_{k,5}}{100-S_{k,5}}\right]$	$\ln\left[\frac{S_{k,6}}{100-S_{k,6}}\right]$	$\ln\left[\frac{S_{k,7}}{100-S_{k,7}}\right]$	
$\mathbf{Y_{k,g}}$	**15-20**	**20-30**	**30-40**	**40-50**	**50-75**	**75-100**	**>100**	$\hat{c}^2$
constant	1.156	0.336	1.087	- 0.287	- 2.154	- 4.709	- 2.382	
$t_{k,17}$	- 0.149 (-1.36)	- 0.211** (-2.73)	- 0.205* (-2.30)	- 0.084 (-1.10)	0.098$^{(*)}$ (1.75)	0.249** (3.01)	0.180 (1.54)	16.396*
$t_{k,175}$	0.039** (2.63)	0.034** (3.31)	0.032** (2.70)	0.021* (2.02)	- 0.003 (-0.46)	- 0.036** (-3.21)	- 0.050** (-3.19)	23.560**
tr_k	- 0.970 (-1.53)	- 0.443 (-0.99)	- 0.291 (-0.56)	- 0.208 (-0.47)	0.310 (0.96)	0.744 (1.55)	- 0.080 (-0.12)	11.875
Q_k	0.994** (3.43)	0.980** (4.79)	0.372 (1.58)	- 0.249 (-1.23)	- 0.609** (-4.12)	- 0.447* (-2.04)	-0.259 (-0.84)	44.734**
X_k	- 1.714** (-5.23)	- 1.315** (-5.69)	- 0.583* (-2.19)	0.310 (1.35)	0.895** (5.35)	0.622* (2.51)	0.119 (0.34)	51.561**
$SITE_k$	0.458$^{(*)}$ (1.86)	0.200 (1.15)	- 0.504* (-2.52)	- 0.682** (-3.97)	- 0.263* (-2.09)	0.196 (1.05)	0.694** (2.64)	59.190**
$w^w{}_k$	- 0.683** (-2.88)	- 0.397* (-2.37)	- 0.266 (-1.38)	- 0.082 (-0.50)	0.113 (0.93)	0.366* (2.05)	0.075 (0.30)	21.445**
D_{GE}	- 0.097 (-0.57)	- 0.221$^{(*)}$ (-1.85)	- 0.319** (-2.32)	- 0.207$^{(*)}$ (-1.75)	0.002 (0.02)	0.200 (1.56)	0.535** (2.96)	18.112*
N_k	0.041 (0.38)	- 0.029 (-0.38)	- 0.067 (-0.75)	- 0.024 (-0.31)	0.023 (0.41)	- 0.018 (-0.22)	0.152 (1.31)	15.016*
$\overline{R}^2$	0.396	0.542	0.492	0.464	0.467	0.419	0.557	
SER	0.248	0.184	0.186	0.146	0.113	0.159	0.236	
$m_{S_{k,g}}$	3.351	10.827	15.935	15.953	24.406	11.012	17.593	
$s_{S_{k,g}}$	1.018	2.608	3.528	2.619	2.833	2.010	4.820	

Notes: The numbers in parentheses are the t-statistics of the estimated parameters. '(*)', '*', or '**' denote significance at the 10, 5, or 1 percent level, respectively. The $\hat{c}^2$-test tests on independence of the individual residence probability from the explanatory variables (with 7 degrees of freedom). $\overline{R}^2$ is the adjusted coefficient of determination (corrected by the degrees of freedom), SER is the standard error of regression, $m_{S_{k,g}}$ is the mean and $s_{S_{k,g}}$ the standard deviation of the dependent variable before the LOGIT-transformation. While the t-statistics relate to the weighted regression, the adjusted R-squared and the SER are given for the unweighted regression. For the instrument list see *Section 3.2*. The computations have been performed by

Table 3: SUR-model of the share of retired taxpayers in different income groups in 26 Swiss cantons in 1990, state and (weighted) local tax rate on gross income of retirees

Dep. variable	$\ln\left[\frac{S_{k,1}}{100-S_{k,1}}\right]$	$\ln\left[\frac{S_{k,2}}{100-S_{k,2}}\right]$	$\ln\left[\frac{S_{k,3}}{100-S_{k,3}}\right]$	$\ln\left[\frac{S_{k,4}}{100-S_{k,4}}\right]$	$\ln\left[\frac{S_{k,5}}{100-S_{k,5}}\right]$	$\ln\left[\frac{S_{k,6}}{100-S_{k,6}}\right]$	$\ln\left[\frac{S_{k,7}}{100-S_{k,7}}\right]$	
$\mathbf{Y_{k,g}}$	**15-20**	**20-30**	**30-40**	**40-50**	**50-75**	**75-100**	**>100**	$\hat{c}^2$
constant	- 2.842	- 2.967	- 1.405	- 0.340	1.464	0.343	3.306	
$t_{k,17}$	0.012 (0.32)	0.001 (0.00)	0.010 (0.71)	0.006 (0.22)	- 0.029 (-0.61)	- 0.058 (-0.90)	- 0.133$^{(*)}$ (-1.72)	14.226*
$t_{k,175}$	- 0.015 (-1.26)	- 0.002 (-0.20)	0.012** (2.86)	0.018* (2.17)	0.019 (1.29)	- 0.003 (-0.17)	- 0.060* (-2.49)	94.203**
tr_k	0.786 (1.11)	0.558 (1.20)	- 0.740** (-2.96)	- 1.274* (-2.56)	- 1.642$^{(*)}$ (-1.84)	- 0.717 (-0.60)	0.767 (0.53)	45.570**
Q_k	0.378 (1.64)	0.288$^{(*)}$ (1.90)	0.037 (0.45)	- 0.219 (-1.35)	- 0.827** (-2.86)	- 0.989* (-2.53)	- 0.961* (-2.06)	32.765**
X_k	0.106 (0.42)	0.102 (0.61)	- 0.088 (-0.98)	- 0.226 (-1.26)	0.035 (0.11)	0.085 (0.20)	- 0.109 (0.21)	17.681*
$SITE_k$	-0.454* (-2.17)	- 0.069 (-0.50)	0.235** (3.18)	0.280$^{(*)}$ (1.90)	0.062 (0.23)	- 0.125 (-0.35)	- 0.286 (-0.67)	78.339**
w^w_k	0.200 (0.99)	0.216 (1.62)	- 0.081 (-1.13)	- 0.232 (-1.63)	- 0.350 (-1.38)	- 0.253 (-0.74)	- 0.523 (-1.28)	23.197*
D_{GE}	0.262$^{(*)}$ (1.97)	- 0.092 (-1.05)	- 0.141** (-2.98)	- 0.116 (-1.23)	0.093 (0.56)	0.226 (1.00)	0.423 (1.56)	159.872**
N_k	- 0.004 (-0.05)	- 0.091 (-1.60)	- 0.032 (-1.05)	0.050 (0.83)	0.197$^{(*)}$ (1.81)	0.400** (2.72)	0.438* (2.50)	61.680**
$\overline{R}^2$	0.615	0.611	0.481	0.603	0.692	0.724	0.715	
SER	0.135	0.081	0.075	0.101	0.173	0.224	0.313	
$m_{S_{k,g}}$	17.750	29.297	19.054	10.784	9.580	2.581	2.788	
$s_{S_{k,g}}$	2.948	2.610	1.635	1.549	2.748	1.100	1.441	

For notes see *Table 2.*

Table 4: SUR-model of the share of dependent employees in different income groups in 26 Swiss cantons in 1990, state and (weighted) local tax rate on gross income of married taxpayers with two children

Dep. variable	$\ln\left[\frac{S_{k,1}}{100-S_{k,1}}\right]$	$\ln\left[\frac{S_{k,2}}{100-S_{k,2}}\right]$	$\ln\left[\frac{S_{k,3}}{100-S_{k,3}}\right]$	$\ln\left[\frac{S_{k,4}}{100-S_{k,4}}\right]$	$\ln\left[\frac{S_{k,5}}{100-S_{k,5}}\right]$	$\ln\left[\frac{S_{k,6}}{100-S_{k,6}}\right]$	$\ln\left[\frac{S_{k,7}}{100-S_{k,7}}\right]$	
$\mathbf{Y_{k,g}}$	**15-20**	**20-30**	**30-40**	**40-50**	**50-75**	**75-100**	**>100**	$\hat{c}^2$
constant	- 0.133	0.535	- 0.881	- 1.292	- 2.082	- 5.094	- 5.477	
$t_{k,17}$	- 0.078 (-1.00)	- 0.085$^{(*)}$ (-1.96)	- 0.026 (-1.07)	0.049* (2.40)	0.063 (1.45)	- 0.034 (-0.52)	0.008 (0.07)	24.497**
$t_{k,175}$	0.064** (6.15)	0.030** (5.21)	0.008* (2.49)	0.003 (1.02)	- 0.013* (-2.24)	- 0.042** (-4.82)	- 0.099** (-6.66)	116.477**
tr_k	- 1.236** (-2.78)	- 0.356 (-1.41)	0.194 (1.40)	- 0.117 (-0.98)	- 0.059 (-0.23)	0.708$^{(*)}$ (1.88)	1.986 (3.10)	61.169**
Q_k	0.648** (3.18)	0.354** (3.06)	0.203** (3.19)	0.134* (2.48)	- 0.355** (-3.08)	- 0.723** (-4.19)	- 0.890** (-3.03)	26.239**
X_k	- 0.912** (-3.96)	- 0.446** (-3.41)	- 0.182* (-2.53)	- 0.160* (-2.61)	0.417** (3.20)	0.811** (4.16)	1.051** (3.17)	26.930**
$SITE_k$	- 0.236 (-1.36)	- 0.394** (-4.02)	- 0.172** (-3.19)	0.078$^{(*)}$ (1.70)	0.148 (1.51)	0.219 (1.50)	0.448$^{(*)}$ (1.80)	54.140**
$w^w{}_k$	- 0.400* (-2.40)	- 0.239* (-2.54)	- 0.050 (-0.96)	- 0.071 (-1.59)	0.122 (1.30)	0.413** (2.93)	0.351 (1.47)	20.848**
D_{GE}	- 0.574** (-4.82)	- 0.574** (-8.51)	- 0.283** (-7.63)	- 0.005 (-0.16)	0.199** (2.96)	0.579** (5.75)	1.047** (6.11)	149.613**
N_k	0.097 (1.26)	- 0.012 (-0.28)	- 0.023 (-0.96)	0.003 (0.15)	- 0.050 (-1.14)	- 0.014 (-0.22)	0.123 (1.12)	12.559$^{(*)}$
$\overline{R}^2$	0.593	0.808	0.779	0.563	0.445	0.780	0.730	
SER	0.153	0.089	0.048	0.045	0.099	0.157	0.239	
$m_{S_{k,g}}$	5.352	17.592	20.379	17.257	25.749	7.566	4.554	
$s_{S_{k,g}}$	1.182	2.770	1.615	0.987	2.511	2.262	2.105	

For notes see *Table 2.*

Table 5: SUR-model of the share of self-employed in different income groups in 137 Swiss cities in 1990, state and local tax rate on gross income of married taxpayers with two children

Dep. variable	$\ln\left[\frac{S_{k,1}}{100-S_{k,1}}\right]$	$\ln\left[\frac{S_{k,2}}{100-S_{k,2}}\right]$	$\ln\left[\frac{S_{k,3}}{100-S_{k,3}}\right]$	$\ln\left[\frac{S_{k,4}}{100-S_{k,4}}\right]$	$\ln\left[\frac{S_{k,5}}{100-S_{k,5}}\right]$	$\ln\left[\frac{S_{k,6}}{100-S_{k,6}}\right]$	$\ln\left[\frac{S_{k,7}}{100-S_{k,7}}\right]$	
$\mathbf{Y_{k,g}}$	**15-20**	**20-30**	**30-40**	**40-50**	**50-75**	**75-100**	**>100**	$\hat{c}^2$
constant	- 1.120	- 1.609	- 0.436	- 1.807	- 1.938	- 2.771	- 2.056	
$t_{k,17}$	- 0.194$^{(*)}$ (-1.96)	- 0.190** (-2.60)	- 0.114* (-2.07)	- 0.027 (-0.55)	- 0.031 (-0.77)	0.071 (1.60)	0.249** (3.21)	16.970*
$t_{k,175}$	0.047** (2.91)	0.057** (4.76)	0.061** (6.70)	0.018* (2.26)	0.009 (1.33)	- 0.034** (-4.54)	- 0.074** (-5.76)	60.230**
tr_k	0.195$^{(*)}$ (1.66)	0.059 (0.69)	- 0.086 (-1.32)	- 0.041 (-0.70)	- 0.052 (-1.07)	- 0.056 (-1.05)	0.064 (0.70)	7.847
$QUAL_k$	- 0.339 (0.82)	0.217 (0.71)	- 0.028 (-0.12)	0.290 (1.42)	0.160 (0.94)	- 0.145 (-0.78)	- 0.172 (-0.53)	5.040
$w^w{}_k$	- 0.450** (-2.82)	- 0.411** (-3.49)	- 0.437** (-4.92)	- 0.206** (-2.62)	0.053 (0.80)	0.321** (4.44)	0.446** (3.56)	40.646**
D_{GE}	0.402* (2.58)	0.079 (0.69)	- 0.123 (-1.42)	- 0.057 (-0.74)	- 0.151* (-2.35)	0.063 (0.90)	0.118 (0.96)	15.490*
D_{ZG}	0.525$^{(*)}$ (1.84)	0.080 (0.38)	0.319* (2.01)	0.207 (1.47)	0.057 (0.48)	- 0.355** (-2.74)	- 0.303 (-1.36)	12.982$^{(*)}$
N_k	1.802** (3.83)	2.046** (5.90)	1.314** (5.03)	0.337 (1.45)	- 0.313 (-1.61)	- 0.742** (-3.48)	- 1.267* (-3.44)	52.455**
$\overline{R}^2$	0.191	0.257	0.349	0.164	0.024	0.246	0.309	
SER	0.457	0.339	0.254	0.229	0.188	0.188	0.323	
$m_{S_{k,g}}$	2.955	8.874	12.480	12.921	24.452	12.788	24.681	
$s_{S_{k,g}}$	1.362	3.010	3.188	2.748	3.507	2.372	7.431	

For notes see *Table 2.*

Table 6: SUR-model of the share of retired taxpayers in different income groups in 137 Swiss cities in 1990, state and local tax rate on gross income of retirees

Dep. variable	$\ln\left[\frac{S_{k,1}}{100-S_{k,1}}\right]$	$\ln\left[\frac{S_{k,2}}{100-S_{k,2}}\right]$	$\ln\left[\frac{S_{k,3}}{100-S_{k,3}}\right]$	$\ln\left[\frac{S_{k,4}}{100-S_{k,4}}\right]$	$\ln\left[\frac{S_{k,5}}{100-S_{k,5}}\right]$	$\ln\left[\frac{S_{k,6}}{100-S_{k,6}}\right]$	$\ln\left[\frac{S_{k,7}}{100-S_{k,7}}\right]$	
$Y_{k,g}$	**15-20**	**20-30**	**30-40**	**40-50**	**50-75**	**75-100**	**>100**	$\hat{c}^2$
constant	- 4.523	- 2.404	- 1.325	- 0.486	- 0.146	- 1.874	- 2.467	
$t_{k,17}$	0.094** (2.88)	0.035 (1.57)	0.006 (0.46)	- 0.008 (-0.34)	- 0.072$^{(*)}$ (-1.90)	- 0.090 (-1.62)	- 0.185** (-2.73)	19.537**
$t_{k,175}$	- 0.001 (-0.06)	0.004 (0.77)	- 0.001 (-0.10)	- 0.003 (-0.60)	0.000 (0.00)	- 0.014 (-1.20)	- 0.048** (-3.39)	40.454**
tr_k	0.032 (0.41)	0.035 (0.65)	0.025 (0.76)	0.019 (0.33)	- 0.038 (-0.42)	- 0.033 (-0.25)	- 0.048 (-0.30)	2.157
$QUAL_k$	1.421** (4.97)	0.676** (3.47)	- 0.087 (-0.72)	- 0.821** (-4.04)	- 1.423** (-4.27)	- 1.487** (-3.06)	- 1.784** (-3.01)	26.912**
w^w_k	- 0.164 (-1.48)	- 0.076 (-1.01)	0.016 (0.34)	0.110 (1.39)	0.327* (2.53)	0.464* (2.46)	- 0.092 (-0.40)	31.003**
D_{GE}	0.398** (3.98)	0.070 (1.03)	- 0.085* (-2.03)	- 0.139$^{(*)}$ (-1.95)	- 0.216$^{(*)}$ (-1.85)	- 0.157 (-0.92)	- 0.082 (-0.40)	33.112**
D_{ZG}	0.421* (2.23)	0.245$^{(*)}$ (1.90)	- 0.025 (-0.31)	- 0.185 (-1.38)	- 0.417$^{(*)}$ (-1.89)	- 0.638* (-1.98)	- 0.365 (-0.93)	7.514
N_k	0.760* (2.42)	0.220 (1.03)	- 0.155 (-1.18)	- 0.487* (-2.18)	- 0.832* (-2.27)	- 0.583 (-1.09)	0.218 (0.34)	16.015*
$\overline{R}^2$	0.234	0.173	0.004	0.152	0.265	0.255	0.243	
SER	0.300	0.191	0.128	0.209	0.319	0.488	0.621	
$m_{S_{k,g}}$	15.854	27.412	19.030	11.720	11.684	3.565	3.655	
$s_{S_{k,g}}$	4.113	4.001	1.942	2.274	3.816	2.074	3.167	

For notes see *Table 2.*

Table 7: SUR-model of the share of dependent employees in different income groups in 137 Swiss cities in 1990, state and local tax rate on gross income of married taxpayers with two children

Dep. variable	$\ln\left[\frac{S_{k,1}}{100-S_{k,1}}\right]$	$\ln\left[\frac{S_{k,2}}{100-S_{k,2}}\right]$	$\ln\left[\frac{S_{k,3}}{100-S_{k,3}}\right]$	$\ln\left[\frac{S_{k,4}}{100-S_{k,4}}\right]$	$\ln\left[\frac{S_{k,5}}{100-S_{k,5}}\right]$	$\ln\left[\frac{S_{k,6}}{100-S_{k,6}}\right]$	$\ln\left[\frac{S_{k,7}}{100-S_{k,7}}\right]$	
$Y_{k,g}$	**15-20**	**20-30**	**30-40**	**40-50**	**50-75**	**75-100**	**>100**	$\hat{c}^2$
constant	- 4.827	- 1.251	- 0.695	- 1.184	- 1.798	- 3.014	- 1.438	
$t_{k,17}$	0.131** (3.05)	0.007 (0.21)	- 0.034 (-1.37)	0.067** (3.20)	0.028 (0.98)	- 0.062 (-1.31)	- 0.098 (-1.04)	51.660**
$t_{k,175}$	0.059** (8.31)	0.041** (7.06)	0.016** (3.87)	0.001 (0.36)	- 0.016** (-3.40)	- 0.046** (-5.93)	- 0.087** (-5.59)	95.742**
tr_k	0.164** (3.22)	0.048 (1.15)	- 0.033 (-1.12)	- 0.000 (-0.00)	- 0.038 (-1.15)	- 0.042 (-0.75)	0.054 (-0.48)	19.020**
$QUAL_k$	0.564** (3.14)	0.376* (2.54)	0.092 (0.88)	0.027 (0.30)	0.017 (0.15)	- 0.556** (-2.83)	- 0.858* (-2.18)	17.920*
w^w_k	- 0.137* (-1.98)	- 0.373** (-6.51)	- 0.216** (-5.34)	- 0.099** (-2.92)	0.188** (4.15)	0.515** (6.77)	0.381* (2.50)	89.354**
D_{GE}	- 0.383** (-5.66)	- 0.475** (-8.49)	- 0.217** (-5.51)	0.081* (2.44)	0.120** (2.70)	0.444** (5.97)	0.747** (5.02)	101.587**
D_{ZG}	0.504** (4.06)	0.334** (3.27)	0.102 (1.41)	0.009 (0.15)	- 0.099 (-1.22)	- 0.399** (-2.93)	- 0.469$^{(*)}$ (-1.72)	21.227**
N_k	0.240 (1.17)	0.228 (1.36)	0.483** (4.06)	0.536** (5.36)	- 0.218 (-1.63)	- 0.681** (-3.04)	- 0.519 (-1.16)	72.741**
$\overline{R}^2$	0.514	0.620	0.391	0.231	0.182	0.602	0.416	
SER	0.188	0.161	0.112	0.095	0.125	0.208	0.419	
$m_{S_{k,g}}$	4.522	16.096	19.527	16.674	27.182	8.913	5.732	
$s_{S_{k,g}}$	1.229	3.415	2.175	1.486	2.651	2.605	3.626	

For notes see *Table 2.*