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THREE ESSAYS ON THE FORMATION AND IMPACT OF ECONOMIC POLICY

THESE

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par

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Hans Ulrich BACHER

Sa thèse remplit les exigences liées à un travail de doctorat.
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Prof. Monika BÜTLER
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To my parents, Marianne and Rudolf Bacher,

and my wife, Mirjam Bacher

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Hans Ulrich Bacher
Lausanne, April 2009

Contents

It's called political economy because
it is has nothing to do with either politics or economy.
Stephen Leacock (Canadian writer and economist, 1869-1944)

Introduction

In my thesis I argue that economic policy is all about economics and politics. Consequently, analysing and understanding economic policy ideally has at least two parts. The economics part, which is centered around the expected impact of a specific policy on the real economy both in terms of efficiency and equity. The insights of this part point into which direction the fine-tuning of economic policies should go. However, fine-tuning of economic policies will be most likely subject to political constraints. That is why, in the politics part, a much better understanding can be gained by taking into account how the incentives of politicians and special interest groups as well as the role played by different institutional features affect the formation of economic policies.

The first part and chapter of my thesis concentrates on the efficiency-related impact of economic policies: how does corporate income taxation in general, and corporate income tax progressivity in specific, affect the creation of new firms? Reduced progressivity and flat-rate taxes are in vogue. By 2009, 22 countries are operating flat-rate income tax systems, as do 7 US states and 14 Swiss cantons (for corporate income only). Tax reform proposals in the spirit of the "flat tax" model typically aim to reduce three parameters: the average tax burden, the progressivity of the tax schedule, and the complexity of the tax code. In joint work, Marius Brülhart and I explore the implications of changes in these three parameters on entrepreneurial activity, measured by counts of firm births in a panel of Swiss municipalities. Our results show that lower average tax rates and reduced complexity of the tax code promote firm births. Controlling for these effects, reduced progressivity inhibits firm births. Our reading of these results is that tax progressivity has an insurance effect that facilitates entrepreneurial risk taking. The positive effects of lower tax levels and reduced complexity are estimated to be significantly stronger than the negative effect of reduced progressivity. To the extent that firm births reflect desirable entrepreneurial dynamism, it is not the flattening of tax schedules that is key to successful tax reforms, but the lowering of average tax burdens and the simplification of tax codes. Flatness *per se* is of secondary importance and even appears to be detrimental to firm births.

The second part of my thesis, which corresponds to the second and third chapter,

concentrates on how economic policies are formed. By the nature of the analysis, these two chapters draw on a broader literature than the first chapter. Both economists and political scientists have done extensive research on how economic policies are formed. Thereby, researchers in both disciplines have recognised the importance of special interest groups trying to influence policy-making through various channels. In general, economists base their analysis on a formal and microeconomically founded approach, while abstracting from institutional details. In contrast, political scientists' frameworks are generally richer in terms of institutional features but lack the theoretical rigour of economists' approaches. I start from the economist's point of view. However, I try to borrow as much as possible from the findings of political science to gain a better understanding of how economic policies are formed in reality.

In the second chapter, I take a theoretical approach and focus on the institutional policy framework to explore how interactions between different political institutions affect the outcome of trade policy in presence of special interest groups' lobbying. Standard political economy theory treats the government as a single institutional actor which sets tariffs by trading off social welfare against contributions from special interest groups seeking industry-specific protection from imports. However, these models lack important (institutional) features of reality. That is why, in my model, I split up the government into a legislative and executive branch which can both be lobbied by special interest groups. Furthermore, the legislative has the option to delegate its trade policy authority to the executive. I allow the executive to compensate the legislative in exchange for delegation. Despite ample anecdotal evidence, bargaining over delegation of trade policy authority has not yet been formally modelled in the literature. I show that delegation has an impact on policy formation in that it leads to lower equilibrium tariffs compared to a standard model without delegation. I also show that delegation will only take place if the lobby is not strong enough to prevent it. Furthermore, the option to delegate increases the bargaining power of the legislative at the expense of the lobbies. Therefore, the findings of this model can shed a light on why the U.S. Congress often practices delegation to the executive.

In the final chapter of my thesis, my coauthor, Antonio Fidalgo, and I take a narrower approach and focus on the individual politician level of policy-making to explore how connections to private firms and networks within parliament affect individual politicians' decision-making. Theories in the spirit of the model of the second chapter show how campaign contributions from lobbies to politicians can influence economic policies. There exists an abundant empirical literature that analyses ties between firms and politicians based on campaign contributions. However, the evidence on the impact of campaign contributions is mixed, at best. In our paper, we analyse an alternative channel of in-

fluence in the shape of personal connections between politicians and firms through board membership. We identify a direct effect of board membership on individual politicians' voting behaviour and an indirect leverage effect when politicians with board connections influence non-connected peers. We assess the importance of these two effects using a vote in the Swiss parliament on a government bailout of the national airline, Swissair, in 2001, which serves as a natural experiment. We find that both the direct effect of connections to firms and the indirect leverage effect had a strong and positive impact on the probability that a politician supported the government bailout.

Progressive Taxes and Firm Births*

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December 2008

Abstract

Tax reform proposals in the spirit of the "flat tax" model typically aim to reduce three parameters: the average tax burden, the progressivity of the tax schedule, and the complexity of the tax code. We explore the implications of changes in these three parameters on entrepreneurial activity, measured by counts of firm births in a panel of Swiss municipalities. The Swiss fiscal system offers sufficient intra-national variation in tax codes to allow us to estimate these effects with considerable precision. We find that high average taxes and complicated tax codes depress firm birth rates, while tax progressivity *per se* promotes firm births. The latter result supports the existence of an insurance effect from progressive corporate income taxes for risk averse entrepreneurs.

JEL Classification: H32, H2, H7, R3

Keywords: progressive taxation, entrepreneurship, risk taking, firm location, count models

<All figures and tables at end>

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1 Introduction

Flat-rate taxes are in vogue. By December 2008, 22 countries are operating flat-rate income tax systems, as do seven US states.[1] Many other countries and regions are considering reforms that would flatten their tax schedules. The most frequently invoked argument in favor of flat taxes is that they simplify both compliance and enforcement. However, in addition to affecting the ease of tax collection, moving towards flat-rate taxation has a host of other economic implications, in terms of both efficiency and equity.[2] In this paper, we focus on one efficiency-related dimension of a particular type of flat tax: the impact of flat-rate *corporate income* taxes on the generation of *new firms*.[3]

The specific choice between flat or progressive corporate tax rates is a topic of ongoing debate in a number of industrialized countries. The United States, for example, raises a progressive federal corporate income tax, as do Japan and the United Kingdom. Conversely, Canada, France, Germany, Italy and Spain apply essentially flat-rate corporate taxes (with some exceptions for small businesses). The two approaches sometimes coexist at sub-national level. In the United States, for example, 31 states levy flat-rate corporate income taxes, 17 states levy progressive corporate income taxes and 3 states do not tax corporate income.

Births of new firms, in turn, are of interest for at least two reasons. First, we consider them a proxy for entrepreneurship, which, following Schumpeter, has come to be regarded as a key driver of economic growth.[4] Second, the number of firms choosing to start operations in a particular jurisdiction can be taken as a measure of that jurisdiction's locational attractiveness.

Our empirical work is based on data for Switzerland, which offers a well suited setting for the analysis of this issue. While the Swiss federal government levies a flat-rate corporate income tax, a wide variety of (flat and progressive) tax schedules are applied at the sub-federal level, by Switzerland's 26 fiscally autonomous cantons. Furthermore, below the

[1] See http://en.wikipedia.org/wiki/Flat_tax.

[2] See, e.g., Keen, Kim and Varsano (2008) for a general appraisal of recent flat-tax reforms.

[3] By considering corporate taxes in isolation, we take a narrower view than the most radical flat-tax model, in which a single tax rate is applied across all tax bases and corporate income may be taxed only when paid out as dividends (see, e.g., Hall and Rabushka, 2007).

[4] This intuitive assertion finds theoretical support in endogenous growth models, where entrepreneurs are primarily cast in the role of conduits between scientific research and market-oriented production (see, e.g., Michelacci, 2003). We can also invoke some relevant empirical evidence. Reynolds, Miller and Maki (1995) and Audretsch and Fritsch (2002) have found that regions with higher firm formation rates enjoy higher growth, in the United States and Germany respectively. These results were broadly confirmed by a number of country-level studies in the January 2008 special issue of *Small Buisness Economics* (see Fritsch, 2008). Employing indirect measures of entrepreneurship, Glaeser, Kallal, Scheinkman and Shleifer (1992) have found industry-level employment growth to be higher in US with below-average firm sizes; and Murphy, Shleifer and Vishny (1991) have reported positive growth effects of the share of engineering graduates in a large cross section of countries.

cantonal level, some 2,700 municipalities levy taxes at often very different average rates and with some further variations in progressivity.

We exploit the variation of tax schedules within Switzerland for an analysis of the impact of corporate tax progressivity on the creation of new firms. Our analysis is organized around three dimensions of corporate income taxes: the implications of higher or lower average tax burdens (the "level effect"), the implications of progressivity (the "insurance effect"), and the implications of tax complexity. To the best of our knowledge, ours is the first study to evaluate these three effects jointly. The smallness and regulatory homogeneity of Switzerland coupled with considerable intra-national variance in tax regimes limit the potential for estimation bias due to unobserved locational determinants of firm births (unlike interregional analyses within large countries such as the United States or international comparisons).

The remainder of this paper is organized as follows. In the next section we review the salient literatures on firm births, firm location, taxation and risk taking. In Section 3, we present a simple model of risk taking and progressive taxation to formalize the intuition of the insurance effect. In Section 4 we present our empirical model and our data set for Switzerland. Estimation results are presented and discussed in Section 5. Section 6 concludes.

2 Literature background: taxes and firm births

The three dimensions of corporate tax policy we focus on have previously been subject to very different degrees of scientific scrutiny. While we can build on an extensive theoretical and empirical literature on the effect of changes in the level of (average and marginal) corporate tax rates, much less attention has been paid to the insurance effect of progressive taxation, and even less evidence exists on the implications of tax complexity.

2.1 The tax level effect

A sizeable empirical literature shows that firms seek to maximize post-tax profits and therefore prefer low corporate taxes to high corporate taxes, *ceteris paribus*. In a meta-analysis of 25 empirical studies on taxation and location choices of foreign investors, De Mooij and Ederveen (2003), for example, report a median value of the tax-rate semi-elasticity of -3.3, implying that a one-percentage-point reduction in the host-country corporate tax rate raises foreign direct investment into that country by fully 3.3 percent. In a qualitative survey of much the same literature, Hines (2007) detects signs of an increase over time in the tax responsiveness of international investment.

Negative coefficients are also estimated in the majority of studies relating counts of new firms to local corporate tax burdens using discrete choice modeling.[5] A noteworthy recent development in this research area is the use of finely spatially disaggregated data, allowing precise estimation of tax effects in the face of spatial heterogeneity. For example, Guimaraes, Figueiredo and Woodward (2004) have estimated a count model of firm births at the level of US counties, again finding significantly negative local tax rate elasticities, controlling for local factor costs and agglomeration effects. US counties cover an average area of some 2,650 square kilometers. Rathelot and Sillard (2008) zoomed the analysis to an even finer spatial level, drawing on data on firm births in French municipalities, which on average cover an area of 15 square kilometers. Their data did not allow them to control for spatial variations in factor costs, a problem they circumvented by comparing neighboring municipalities on either side of the borders separating larger administrative regions. They detected a rather small but statistically significant negative elasticity of firm-birth rates relative to local taxes. Brülhart, Jametti and Schmidheiny (2007), using data on firm births in a sample of Swiss municipalities (which on average cover an area of some 20 square kilometers) found that high corporate taxes act as a deterrent to local firm creation, but that this relationship is weaker in spatially concentrated sectors than in dispersed sectors.[6] The most spatially disaggregated study is by Duranton, Gobillon and Overman (2007), who compared firm births and employment growth of firms within one kilometer on either side of English regional boundaries. They found that local taxes impact significantly negatively on firm's employment growth, but they detected no significant effect of tax differentials on firm births. Duranton *et al.* (2007) explain the seeming irrelevance of local taxes for firm births by pointing out that local corporate taxes in the UK are somewhat unusual in that they take the form of property taxes and are therefore likely to be largely capitalized in into property prices.

In a related strand of literature, economists have explored the impact of corporate tax levels on "income shifting" between the personal and the corporate tax base. Most tax systems leave considerable room for manoeuvre on this choice, mainly via different organizational forms and via flexible accounting rules governing the heading under which the remuneration of owner-workers is declared. Several available studies show that, not surprisingly, the share of income that is declared as corporate is higher the lower is the level of corporate relative to personal income taxes (see, e.g., Gordon and Slemrod, 2000; Goolsbee, 2004; Cullen and Gordon, 2007; and de Mooij and Nicodème, 2008). Some of

[5] The seminal contributions are Carlton (1983) using the conditional logit estimator, and Papke (1991) using the Poisson count mondel.

[6] Using spatially more aggregate (canton-level) data, Feld and Kirchgässner (2003) also found that high corporate income taxes impact negatively on local firm numbers and employment in Switzerland.

the observed income shifting into the corporate tax base is due to the incorporation of previously non-corporate organizations or due to the division of larger corporations into smaller firms. In that sense, income shifting also contributes to the creation of new firms.

Overall, therefore, the available evidence strongly supports the existence of a moderating impact of the level of corporate taxes on firm births at both the national and the local level.

2.2 The tax progressivity effect (insurance effect)

If tax payers' decisions are made under uncertainty, the progressivity of tax schedules will have implications that differ from those of the level of (average effective) taxes. Thus, under uncertainty, the variance of the tax bill matters in addition to the expected level of the tax bill.

Domar and Musgrave (1944) have famously shown that taxation can encourage risk taking.[7] Whilst assuming a flat tax schedule, they also took account of loss-offset provisions that imply a negative tax in case of losses. A higher tax rate then reduces both the expected level and the expected variance of post-tax income, which, depending on investor preferences, may make risky ventures relatively more attractive by reducing risk through an implied insurance effect of taxation.

The Domar-Musgrave model, by featuring a flat tax over positive income, is not well suited to a formal distinction between the implications of changes in the level of the expected tax bill and changes in progressivity *per se*. An intuitive conjecture from the Domar-Musgrave result is that increased progressivity, provided it does not affect the expected tax bill, should be favorable to entrepreneurial risk taking.[8] This intuition is supported to some extent by formal analysis. Ahsan (1974) considered investment in a risky asset under a flat-rate tax with and without a tax-exempt threshold, the former corresponding to a progressive schedule. Conditional on constant expected tax revenue, he found that risk taking is greater under the progressive tax than under the proportional tax, given standard assumptions on investors' aversion to risk. In a similar model, Cowell (1975) found that progressivity favours investment in the risky asset if the utility function is assumed to be quadratic, but may deter risk taking under different preferences.[9] Waterson (1985) has considered the implications of assuming a quadratic tax function,

[7] A corresponding analysis concerning personal income taxes has been provided by Varian (1980).

[8] Cullen and Gordon (2006) have put it as follows: "For any given tax treatment of losses, a progressive tax schedule on profits, holding expected taxes constant, should encourage risk taking. With progressive rather than proportional taxes, the owners get to keep a smaller fraction of large profits but a larger fraction of small profits. If expected tax payments are held fixed, this is a trade-off that any risk-averse individual gains from making."

[9] Cowell (1975) used the term "compensation" for what we refer to as the "constant expected tax bill" condition.

again assuming a constant expected tax bill. He also concluded that, while the effect of progressivity on risk taking can be positive for certain parameter configurations, its sign cannot be established in general.[10]

Empirically, the impact of personal income tax progressivity on entry into self-employment has been explored by Gentry and Hubbard (2000, 2005). They report negative impacts of personal income progressivity on entrepreneurship. The main explanation for these findings is that progressive taxation acts as a "success tax" on profitable ventures: since entrepreneurs on average have higher incomes than employees, progressive income taxation discourages entrepreneurial risk taking. Crucially, however, this effect confounds the impact of tax progressivity with that of the expected tax bill.[11]

Cullen and Gordon (2007) estimate a model of entrepreneurial risk, controlling for both level and progressivity effects of corporate tax schedules using US data. Entrepreneurial risk taking is defined empirically as the fraction of single tax filers who report active non-corporate losses in excess of 10 percent of reported wage income. While their estimated regression coefficients represent the impact of composite terms capturing "income shifting" and "combined risk" effects inherent in the tax code, and therefore elude simple interpretation, their derived simulation results reported in Cullen and Gordon (2006a) show that a revenue-neutral shift to a flat tax à la Hall and Rabushka (2007) would reduce entrepreneurial risk taking by more than half. Their results are thus consistent with economically significant insurance effects. The main difference between our approach and that of Cullen and Gordon (2006a, 2007) is that we explore the impact of taxation on the birth rates of incorporated firms across different locations, whereas they focus on entrepreneurial individuals reporting high losses across quantiles of predicted potential earnings. Our empirical setting offers inter-jurisdictional variation in the entire tax schedule. It thereby allows a simple quantification of the various relevant dimensions of tax policy.

[10] If entrepreneurial ventures are externally financed and entrepreneurs are subject to moral hazard (i.e. they have an incentive to shirk if their stake in the success of the venture is low), then the risk-reducing element implicit in progressive taxation may impede entrepreneurship (see e.g. Keuschnigg and Nielsen, 2004; and Hagen and Sannarnes, 2007). To the extent that the incidence of progressive taxation is felt by financiers rather than by entrepreneurs, however, the findings of the earlier literature on taxation and risk taking still apply.

[11] Gentry and Hubbard (2000, 2005) have regressed the probability that an individual switches from employment to self-employment on a set of variables including (a) the projected tax rate in case of unchanged employment status and (b) a measure of tax progressivity computed as the difference in tax rates between a "successful" scenario, where taxable income increases by x percent, and an "unsuccessful" scenario, where taxable income decreases by y percent. They did not, however, control for the expected (i.e. probability weighted) tax rate in case of a switch to self-employment.

2.3 The tax complexity effect

A third way in which a change to a flat corporate income tax could potentially influence entrepreneurship (in sectors other than accounting and legal services) is by simplifying compliance via a reduction in complexity. Complexity has two components: the number of tax brackets and the definition of the tax base.

First, calculating tax liabilities is simpler with a single statutory tax rate than with a progressive tax schedule featuring multiple tax brackets. It seems reasonable, however, to question the practical importance of the complexity implied by progressive schedules alone.[12]

The most compelling case for the view that complexity raises compliance costs can be made if one moves beyond the narrow implications of progressivity alone and considers the statutory definitions of the tax base. Administrative complications are most evident where numerous different types of tax bases are distinguished and where the definitions of tax bases are subject to exceptions, deductions, tax credits and the like. Such complexity is not a necessary correlate of progressivity, but flat-tax proposals usually involve a reduction both in progressivity and in the complexity of the determination of the tax base.

Edmiston, Mudd and Valev (2004) found that the number of special corporate tax rates had a significantly negative impact on flows of foreign direct investment into European and Asian transition countries in the 1990s. However, and somewhat paradoxically, they report positive coefficients on an alternative complexity variable defined as the number of lines in the respective tax codes (similar to the measure that we will apply).[13] We are not aware of any prior empirical work relating *firm births* to the two components of tax complexity.

3 A simple model of tax progressivity and entrepreneurship

In this section, we present a highly stylized model to formal the effect of progressivity on entrepreneurial risk taking, *given a certain expected tax bill.* As noted above, this effect has been analyzed before (Ahsan, 1974; Cowell, 1975; Waterson, 1985). We propose a much simpler framework primarily for its heuristic value.[14]

[12] To cite Slemrod and Bakija (2004, p. 166), "a graduate tax-rate structure does not by itself directly contribute any significant complexity to the taxpaying process. Once taxable income is computed, looking up tax liability in the tax tables is a trivial operation (...)."

[13] Edmiston *et al.* (2004) explain the apparent positive effect of the length of tax codes by pointing out that more lines could imply greater legal precision - an aspect which might indeed be relevant in transition countries.

[14] The main simplification of our approach compared to existing theory is that we constrain the range of choices to two options. This simplification allows us to posit a general (Bernoulli) utility function, which, unlike those adopted in prior studies, need not exhibit increasing absolute risk aversion (see also Feldstein,

Suppose a risk averse entrepreneur has to choose where to locate her firm. She will make a high or low profit at the end of the year with a certain probability. The only salient difference between two potential locations arises from their corporate income tax schedules: one location features a flat tax while the other location has a progressive schedule. We ask which location the entrepreneur is better off choosing, provided that the expected corporate tax payments are the same in both locations. This *constant expected tax bill condition* is crucial to our analysis. Keeping the expected after-tax profit constant, progressive taxation reduces the variance of profits by more than linear taxation. As a consequence, tax progressivity serves as an insurance device: in bad times, an entrepreneur has to pay less than under a flat tax, whereas in good times the tax bill is higher. This, in a nutshell, is how progressivity can favor entrepreneurial risk taking.

To formalize the intuition, consider a risk averse entrepreneur with a standard Bernoulli utility function over income w, $U(w)$, with $U_w(w) > 0$ and $U_{ww}(w) < 0$. The entrepreneur faces a simple lottery $L = (p_L, p_H)$ over two possible profit outcomes $\{\pi_L, \pi_H\}$, with $\pi_H > \pi_L$ and $\pi_L \neq 0$.[15]

Profits are subject to either a flat or progressive tax schedule, defined as:

- flat tax rate: t
- progressive tax rate: $t_L^{prog} = t + k_L$ if $\pi = \pi_L$ and $t_H^{prog} = t + k_H$ if $\pi = \pi_H$ with $k_L < 0 < k_H$, where k_L, k_H are constants.

In addition, we impose the following three conditions:

Condition 1 Constant expected tax bill condition
The expected tax bill is constant:

$$[t + k_L]\, p_L \pi_L + [t + k_H]\, p_H \pi_H = t p_L \pi_L + t p_H \pi_H.$$

Hence, expected after-tax income is assumed to be the same under the two tax schedules.

Condition 2 Spread condition
Risk is a function of the spread (the difference) of the two outcomes, π_L and π_H, whereas the probabilities and expected pretax profits are held constant.

1969). Cullen and Gordon (2006) propose a similar model, taking utily as the log of income.

[15] The model also applies to cases where $\pi_L < 0$. In this case, the corporate tax rate turns negative, implying a subsidy (e.g. through loss-offset or carry-forward provisions). Since taxation in our model does not include a lump-sum tax part (payable independently of the realisation of profits), we exclude $\pi_L = 0$. In our model, if $\pi_L = 0$, only π_H would be taxed (at the same rate as the flat tax rate).

This defines π_L:

$$\pi_L = \frac{\bar{\Pi} - \bar{p}_H \pi_H}{\bar{p}_L}, \tag{1}$$

where $\bar{\Pi} = p_L \pi_L + p_H \pi_H \geq 0$ is expected pre-tax profit, and upper bars design constants.

This condition implies that an increase in the variance of post-tax income w (and thus in risk) follows only from an increase in the spread of the two pre-tax profit levels. For notational ease, we suppress the upper bars henceforth.[16]

Conditions 1 and 2 allow us to express k_L as a function of π_L, π_H and k_H:

$$k_L = -\frac{p_H \pi_H}{\Pi - p_H \pi_H} k_H. \tag{2}$$

Condition 3 No-reversal condition

Post-tax income in the low-profit outcome cannot be higher than post-tax income in the high-profit outcome:

$$[1 - t - k_L] \pi_L \leq [1 - t - k_H] \pi_H.$$

Hence, tax rates are not allowed to be so progressive as to reverse the ordering of the post-tax outcomes relative to the pre-tax outcomes.

Expected utility with a flat tax schedule then takes the following form:

$$\begin{aligned} EU(w^{flat}) &= p_L U\left([1-t]\,\pi_L\right) + p_H U\left([1-t]\,\pi_H\right) \\ &= p_L U\left([1-t]\,\frac{\Pi - p_H \pi_H}{p_L}\right) + p_H U\left([1-t]\,\pi_H\right), \end{aligned}$$

while expected utility with a progressive tax schedule becomes:

$$\begin{aligned} EU(w^{prog}) &= p_L U\left([1-t-k_L]\,\pi_L\right) + p_H U\left([1-t-k_H]\,\pi_H\right) \\ &= p_L U\left(\left[1 - t + \frac{p_H \pi_H}{\Pi - p_H \pi_H} k_H\right] \frac{\Pi - p_H \pi_H}{p_L}\right) \\ &\quad + p_H U\left([1-t-k_H]\,\pi_H\right). \end{aligned}$$

We can now explore whether a change from a flat to a progressive tax schedule benefits a risk-averse entrepreneur.

Proposition 1 *Expected utility is higher with a progressive tax schedule than with a flat-rate tax:*

$$\frac{\partial \left[EU(w^{prog}) - EU(w^{flat})\right]}{\partial k_H} \mid_{k_H = 0} > 0.$$

[16] In what follows, brackets are used for mathematical operations, whereas parentheses are used for functions.

Proof. *Taking the derivative with respect to* k_H *around* $k_H = 0$ *results in:*

$$\frac{\partial \Delta EU\,(w)}{\partial k_H} \mid_{k_H=0} = -p_H \pi_H \left[U_w(w_H^{prog}) - U_w(w_L^{prog})\right] > 0,$$

where: $\Delta EU\,(w) = EU(w^{prog}) - EU(w^{flat})$, *and* $U_w(w_\ell^{prog}) = U_w([1 - t - k_\ell]\,\pi_\ell)$, $\ell = \{L, H\}$. ■

This is the insurance effect: progressive taxation reduces the variance (and thus risk) by more than a flat rate. Therefore, the expected utility of after-tax income is higher under progressive taxation and a risk averse entrepreneur prefers progressive to flat taxation.

The logic of this simple model can be applied both to the location decision (choice between a location with a progressive tax and a location with a flat tax) and the entry-into-self-employment decision. Figure 1 illustrates this. Take the location decision, and suppose the two possible realizations π_L and π_H are equally probable. The entrepreneur can choose between two locations. The first one has a flat tax rate, and the corresponding after-tax realizations of π_L and π_H are w_L^{flat} and w_H^{flat}, respectively. At the second location, after-tax realizations of π are w_L^{prog} and w_H^{prog} as well. By the definition of progressive taxation and given the *no-reversal condition*, $w_L^{flat} < w_L^{prog} < w_H^{prog} < w_H^{flat}$. From the concavity of the utility function it follows that expected utility with a progressive tax, $EU\,(w^{prog})$, is higher than expected utility with a flat tax, $EU\left(w^{flat}\right)$: the entrepreneur prefers the location with the progressive tax.

The same analysis can be applied to the entry decision. Again, suppose equally probable realizations π_L and π_H. Suppose that under a progressive tax the potential entrepreneur is just indifferent between entering self-employment and being employed, in which case she receives a fixed wage corresponding to the certainty equivalent of $EU\,(w^{prog})$.[17] Imagine a switch to a flat tax. As a consequence, and easily seen in Figure 1, the expected utility from being self-employed, $EU\left(w^{flat}\right)$ decreases and so does the corresponding certainty equivalent (not drawn). Now, the potential entrepreneur unequivocally prefers remaining in risk-free employment.

It is intuitive, given the logic of the insurance effect of progressive taxation, that this effect becomes more pronounced for riskier ventures: the greater is the dispersion of uncertain outcomes, the more a potential entrepreneur stands to gain from progressive taxation. This can be expressed formally as follows.

Proposition 2 *The greater is the spread between* π_L *and* π_H*, the more an increase in*

[17] The certainty equivalent of $EU\,(w^{prog})$ is not represented in Figure 1. From Jensen's inequality it follows that this point is located to the left of $E\left(w^{flat,\ prog}\right)$.

progressivity is preferred:

$$\frac{\partial^2 \Delta EU\left(w\right)}{\partial k_H \partial \pi_H} > 0$$

Proof. *See Appendix 1.* ■

4 Empirical model and data

4.1 A count model of firm births

Our empirical project is straightforward: we seek to estimate the impact of the level, the progressivity and the complexity of corporate taxes on entrepreneurial activity.

We represent increases in entrepreneurial activity by the entry of new firms. New firms can be created in a jurisdiction through two basic processes. In the "latent-startup" process, immobile local residents are potential entrepreneurs who continuously compute the discounted expected utility from creating a firm and become active once that value exceeds the utility associated with their safe(r) outside option. In the "footloose-startup" process, entrepreneurs are mobile and scan potential locations for the best certainty-equivalent profit opportunity, conditional on having decided to set up a firm.

Despite the fundamental differences between the two processes, they both have been shown formally to be compatible with a Poisson count model of firm births. The latent-startup process has been modelled by Becker and Henderson (2000) and shown to lead directly to a Poisson model, subject to standard regularity conditions. Starting with Carlton (1983), the footloose-startup process has traditionally been modelled through a conditional logit representation, which can be formally derived from firm-level profit functions. Guimaraes, Figueiredo and Woodward (2003) have demonstrated that Poisson estimation with group fixed effects returns identical coefficients to those obtained with conditional logit estimation.

We can therefore directly write an expression for $E\left(n_{ijt}\right)$, the expected number of new firms (or of jobs in new firms) created in jurisdiction i, sector j and year t:

$$\begin{aligned} E\left(n_{ijt}\right) &= \lambda_{ijt} \\ &= \exp(\alpha_1 corptaxlevel_{ijt} + \alpha_2 corptaxprogressivity_{it} \\ &\quad + \alpha_3 risk_j * corptaxprogressivity_{it} + \alpha_4 corptaxcomplexity_{it} \\ &\quad + \boldsymbol{\beta}' \mathbf{taxcontrols}_{ijt} + \boldsymbol{\gamma}' \mathbf{othercontrols}_{ijt} + \boldsymbol{\theta}' \mathbf{d}_j + \boldsymbol{\zeta}' \mathbf{d}_t), \end{aligned} \tag{3}$$

where n_{ijt} follows a Poisson distribution, *corptaxlevel* is a measure of of the expected

average corporate income tax rate, *corptaxprogressivity* is a measure of the progressivity of the corporate income tax schedule, *corptaxcomplexity* is a measure of the complexity of the corporate tax code, *risk* is a measure of the inherent riskiness of entrepreneurial ventures in sector j, **taxcontrols** is a vector of variables to represent tax burdens other than those on corporate profits, **othercontrols** is a vector of non-tax factors influencing the likelihood of firm births, $\mathbf{d}_j$ is a set of sector dummies, and $\mathbf{d}_t$ is a set of year dummies.

Our four hypotheses are:

1. $\alpha_1 < 0$ (the effect on firm births of the expected corporate income tax level is negative),

2. $\alpha_2 > 0$ (following Proposition 1, the effect on firm births of tax progressivity is positive),

3. $\alpha_3 > 0$, (following Proposition 2, the positive effect of tax progressivity is stronger in inherently riskier sectors), and

4. $\alpha_4 < 0$ (the effect on firm births of tax schedule complexity is negative).

4.2 Identification and inference

When seeking to identify the coefficients of our empirical model (3), we need to think carefully about identification. One evident potential problem is that, in general, corporate tax rules may be both cause and consequence of firms' location choices. Resident firms influence local tax provisions through the local tax base or through the political process of local tax setting. Our strategy for avoiding potential simultaneity bias is to study location choices of *new* firms *in narrow sectors*. While it is easy to conceive how existing firms in a jurisdiction together may influence local taxation, we consider it highly unlikely that entrants in a particular sector, location and period exert significant and systematic influence on pre-existing local tax rates. In our empirical setting, local jurisdictions are legally bound to apply identical statutory taxes across all sectors.[18] This allows us to treat tax rates as exogenous not only from the viewpoint of an individual firm but also from that of a cohort of new firms in a particular sector, location and period.

Another challenge to identification concerns the variable *corptaxlevel*, which stands for the expected corporate tax rate. With progressive tax schedules, the expected tax rate depends on expected profitability, which also affects the rate of firm births. Hence,

[18] Corporate taxation in Switzerland is based on legally binding statutory rates that depend solely on firms' profitability and capital base. The definitions of these tax bases have been harmonized countrywide by a federal law that has been in force since 1993 and that foresees no firm-specific or sector-specific regimes except for some clauses to avoid double taxation of holding companies. Some (mainly industrial) firms can be offered tax rebates for a maximum of ten years after setting up a new operation. Available evidence suggests that they affect less than 4 percent of new firms (see Brülhart *et al.*, 2007).

our estimates of α_1 might be biased. Furthermore, to underestimate expected profitability would tend to bias estimates of α_2 and α_3 downward, and to overestimate it would tend to bias them upward, because progressivity would then correlate with the mismeasured expected tax rate. Specifically, when expected profitability is underestimated, this will tend to induce a positive correlation between the unobserved component of the true expected tax rate and the progressivity measure, thus biasing downward the estimated α_2. It is therefore important to take account of any systematic differences in expected profitability. We compute *corptaxlevel* separately for each sector-location pair, based on observed sector-average profitability rates. To the extent that firms' expected profitability is sector specific conditional on the included regressors, our main coefficient estimates will be unbiased.

We need to take account of some features of our research design that affect inference. First, the Poisson model implies that the expected count, λ_{ijt}, is equal to the variance of n_{ijt}. This is a strong assumption in our applications, as the variance mostly exceeds the expected count (overdispersion), and as we observe a large number of zero observations on the dependent variable. Second, our model includes several explanatory variables that are purely municipality-year specific (such as the progressivity of the corporate tax schedule), while the dependent variable is municipality-sector-year specific. Such aggregate variables bias the estimated standard errors downward if not correctly adjusted for (Moulton, 1986). Third, we observe firm startups over five years. We cannot exploit this panel structure by including location-sector fixed effects, as the changes over time in our main explanatory are too small for the identification of any statistically significant effects. However, the likely presence of location-sector random effects needs to be taken into account when estimating standard errors. All three issues are addressed by clustering standard errors in the two dimensions: by municipality-year and by municipality-sector. We therefore apply multi-way clustering as proposed by Cameron, Gelbach and Miller (2007). Clustering by municipality-year takes care of the second issue discussed above, clustering by municipality-sector addresses the third issue, and either of the clusters automatically accommodates the first issue.

4.3 Data

4.3.1 The Swiss corporate tax system

Several features of its political structure and tax system make Switzerland particularly well suited to serve as a laboratory for research on the effects of fiscal policy. Specifically, the Swiss system features three propitious characteristics.

1. Local tax autonomy

   Swiss taxes on corporate as well as on personal income are levied at three hierarchically nested jurisdictional levels: by the federal government, by the 26 cantons and by some 2,700 municipalities. The federal government taxes profits at a flat rate of 8.5% and does not tax corporate capital. The cantons enjoy complete autonomy in the setting of their tax schedules. They all levy taxes on profits and corporate capital as well as on personal income and wealth. In 21 of the 26 cantons, municipalities apply a single multiplier to the applicable cantonal tax schedules.[19] In the remaining cantons, the same multiplier applies to all municipalities within the canton, implying no municipal authority (see Table 1, last column). Hence, while the levels of the corporate tax burdens vary within a majority of cantons, the tax schedules do not.

2. Heterogenous tax schedules

   The autonomy of local tax setters yields large intra-national variance in taxation. The geography of corporate tax burdens is illustrated in Figure 2, which shows consolidated cantonal and municipal average corporate income tax rates on a representative firm for the 26 cantonal capitals. The highest tax rate (Geneva, 23.5%) exceeds the lowest tax rate (Zug, 6.4%) by a factor of nearly four. As can be gleaned from Figures 3 to 6 for 2001 and 2005 respectively, the progressivity of these tax schedules exhibits similar intra-national heterogeneity. Eleven cantons, among them the cantons of Zurich (since 2005) and Geneva, apply a flat tax rate on profits. The remaining fifteen cantons apply progressive schedules with two or more tax brackets. Additional heterogeneity arises from the fact that some cantons base the calculation of the simple tax on the amount of profits, others on profitability (Basel-Stadt, Basel-Land and Uri), and some on a combination (Aargau, St. Gallen and Zurich before 2005). Figures 3 to 6 show that the progressivity of the tax schedule for these six cantons is not significantly affected by the size of the capital stock. This allays potential concerns that heterogeneity in the calculation of the simple tax results in a natural sorting, where new firms with a small capital stock choose cantons that define the rate in terms of the amount of profits and where large new firms choose cantons with simple taxes based on profitability. Recent changes in the degree of progressivity have without exception been in the direction of flatter tax schedules, as is evident in Figure 7.

[19] In 8 of those 21 cantons, municipalities decide on a single multiplier that applies to both personal and corporate taxes. In the remaining 13 cantons, at least some municipalities apply separate multipliers to the two tax bases.

3. Comparable jurisdictions

   Switzerland has an area of 41,285 square kilometers and a population of 7.5 million. It therefore covers about twice the area, and hosts roughly the same population, as the US state of Massachusetts. Many hard-to-measure geographical, cultural or political differences that affect international comparisons should not be of much concern in a study across jurisdictions at such a small spatial scale. In addition, institutional features such as the social security system, unemployment insurance and health insurance are either governed by federal law or substantively harmonized across cantons.

As our interest is in differential firm birth rates as a function of differences in tax schedules, we need to ascertain that corporate income taxes indeed affect these firms. In Switzerland, distributed profits are taxed twice, first at the level of the firm, through the corporate income tax, and then at the level of the individuals receiving dividend payments, through the personal income tax. When a profitable firm's owners are also their employees - a frequent occurrence in startup firms - then these owners have an incentive to declare these profits as wages in order to avoid the corporate income tax. If there were no limits to this practice, the corporate income tax would become largely irrelevant for firms run by owner-employees. Swiss fiscal law, however, explicitly bans the "disguised" distribution of profits via inflated wages, and jurisprudence consistently applies the "arm's-length principle", whereby wage payments to owner-employees have to conform to standard remuneration levels in the given occupation and sector.[20] Therefore, corporate income taxation is of relevance also to small owner-run firms.

4.3.2 Variables used

Our study is based on a municipality-sector level panel data set for the five years from 2001 to 2005. The number of municipalities for which we have the required tax data ranges from 665 in 2001, covering 72 percent of the Swiss population, to 846, covering 83 percent of the population.[21] Sectors are defined according to the two-digit level of Eurostat's NACE classification, which distinguishes 51 sectors.[22]

[20] See Henneberger and Ziegler (2008).

[21] The average population of our sample municipalities was 7,928 in 2001 and 7,243 in 2005. These municipalities were host to 85 (89) percent of all new firms in 2001 (2005).

[22] A more sectorally disaggregated approach is not possible since our data on the distribution of profits and capital are available at the two-digit level only. We were forced to omit four sectors, for which no firm births were observed in our sample period: NACE 10 (coal mining), 12 (ore mining), 13 (uranium mining) and 23 (coke, refined petroleum and nuclear fuel). We also had to drop NACE 16 (tobacco) due to missing wage data. We therefore work with 46 sectors throughout.

We work with rather narrow sector definitions: the average share of a sector in terms of both new firms and new jobs per year across our sample municipality is 2.17 percent. Furthermore, municipalities where all new firms are created in one or a small number of sectors are very rare. Over the sample period, there exist only four municipalities where all new firms are created within a single sector.[23] The total number of new firms created in these municipalities varies between two and three and the total number of new jobs varies between 2 and 15. Table 2 lists our variables and data sources, Table 3 reports summary statistics, and Table 4 reports raw correlations.

Our dependent variable, *newfirms*, is the count of new firms per municipality, sector and year. The alternative dependent variable, *newjobs*, is the count of full-time and part-time jobs created by those new firms. The data set covers all new firms created in Switzerland between 2001 and 2005. The average new firm has 2.6 employees at birth, and 43 percent of new firms have a single employee. Using *newjobs* as an alternative regressand may be useful by reducing the weight of one-person firms in driving our results. Firms are defined as market-oriented incorporated organizations that are operating for at least 20 hours per week. New entities created by mergers, takeovers, breakups, changes of their legal form or as branches of foreign firms are not counted. This provides us with data for 25,419 new firms and 64,927 new jobs created over the sample period.

The main component of the explanatory part of our model are corporate tax burdens. In order to construct sector-specific representative corporate tax rates, we first need data on representative profits and capital stocks. While nation-wide statistics exist neither at the level of firms nor at the level of sectors, we can draw on a firm-level data set for one of the 26 cantons (Aargau). This data set, obtained from the cantonal tax authority, reports pre-tax profits and capital bases for 2004. It covers the universe of 15,731 firms based in that canton, which represents 11 percent of Swiss firms in 2004. We have two reasons to be confident that the micro data for Aargau are representative of patterns for Switzerland at large. First, the overall distribution of firm-level profits in that canton closely matches that for the whole country.[24] Second, the corporate tax burden in the canton of Aargau, computed by the federal tax administration, is very close to the national average.[25] From the Aargau data we can compute average profits, average capital stocks

[23] Either in NACE 45 (construction) or in NACE 74 (other business activities).

[24] The first, third and fifth sextiles for pre-tax rate of returns are 3, 12 and 37 percent (canton of Aargau) against 2, 9 and 32 percent (Switzerland). The quantiles for Aargau are based on firm-level reported profit data, whereas the national quantiles are calculated using the national profit and capital distributions published by the Federal Tax Administration.

[25] The index of the corporate income tax burden computed by the Federal Tax Administration for the year 2004 has a value of 97.4 for the canton of Aargau. The national average is 100, with values ranging from 57.3 (Schwyz) to 126.7 (Geneva). Aargau levies a minimum corporate tax of 500 Swiss francs ($\approx$ 500 US dollars) on profits and capital together. Therefore, to calculate sector averages, we excluded all observations with a simple tax of 500 francs, even if they declared positive but very low profits. Furthermore, we considered

and average profitability for corporations with positive profits per two-digit sector.

Based on these data, we then construct sector-specific corporate-income tax measures.

- Level of the corporate income tax (*corptaxlevel*): Based on statutory tax rates and estimated industry-level average profits and capital stocks, we calculate the industry-specific effective average tax rate (EATR) on profits for all sample municipalities and years.[26]

- Progressivity of the corporate income tax (*corptaxprogressivity*): Based on the national distribution of capital and profitability across all sectors, we collected tax rates for first, third and fifth sextile profitability firms, characterized by profits amounting to 2, 9 and 32 percent, respectively, of own capital.[27] This was done separately for three capital levels, representing the first, second and third quartile of the distribution of capital. Our three alternative progressivity measures are then computed as weighted averages across the three representative capital levels.[28] The first progressivity measure, *corptaxprogressivity*1, is the difference between the EATR for firms with high (32 percent) and low (2 percent) profitability. The second progressivity measure, *corptaxprogressivity*2, corrects for the tax level: we divide *corptaxprogressivity*1 by the arithmetic mean of the EATR for firms with low, median and high profitability. A third measure of progressivity, *corptaxprogressivity*3, measures the redistributive impact of a given tax schedule compared with a proportional tax. By construction, this index ranges from -1 to +1. A value of *corptaxprogressivity*3 > 0 (< 0) indicates a progressive (regressive) tax system, while *corptaxprogressivity*3 $= 0$ stands for a proportional system.[29] Table 4 shows

firms with an implied pre-tax rate of return of more than 200 percent to be outliers and excluded them.

[26] The Swiss corporate tax system allows corporations to deduct actual tax payments from their pre-tax income. Therefore, our EATRs are defined as $\frac{t^{\pi}\left(\pi - t^{K}K\right)}{(1+t^{\pi})\pi}$, where π denotes pre-tax profits, K is own capital, t^{π} is the statutory corporate income tax rate and t^{K} is the statutory capital tax rate.

[27] Due to some small cell sizes, the Aargau data do not allow us to calculate sufficiently reliable sector-level distributions. We therefore prefer to rely on frequency distributions for Switzerland as a whole (available aggregated across sectors) for the profitability dispersion measure.

[28] The weights applied are 0.375 for the cases of low and high capital and 0.25 for the median-capital case, thus taking into account that the low and high cases refer to the upper end of the first and third quartile respectively. The fact that two of our progressivitiy measures have negative minima (see Table 3) is explained by one canton (Aargau) applying a fixed minimum tax of CHF 500 on all incorporated firms, which implies regressive taxation for certain small firms with low profitability. Furthermore, the definiton of EATRs implies that there is some small within-canton variation in progressivity even though municipalities apply a single multiplier to the canton-level tax schedule. Eliminating this variation by taking averages of the progressivity measures within each canton and year has no discernible impact on our results.

[29] This measure is known as a "relative share adjustment" (see, e.g., Kesselman and Cheung, 2004). It is a weighted average of a local index of tax progressivity, RSA_k, where $RSA_k = \frac{1-ATR_k}{1-ATR} - 1$. ATR_k is the average tax rate for the k^{th} income group, and ATR is the aggregate average tax rate. RSA_k has an intuitive interpretation, since it can be used to calculate the gain or loss to a specific income group

that these three measures are highly but not perfectly correlated, with correlation coefficients ranging from 0.89 to 0.98.

- Industry-specific risk (*risk*): In accordance with Condition 2, we define *risk* as the standard deviation of industry profits, expressed as a deviation from the cross-sector average standard deviation (*risk* therefore has mean zero), and based on the firm-level data for Aargau. This variable is then interacted with the three measures of corporate tax progressivity to provide a test of Proposition 2.

- Complexity of the corporate income tax schedule (*corptaxbrackets*): Following Slemrod (2005), we define *corptaxbrackets* as the number of different statutory corporate income tax brackets.

- Complexity of the entire corporate tax code (*corptaxwordcount*): We define this variable as the count of words in the cantonal corporate tax codes.[30]

In addition, we control for a range of other relevant tax variables affecting both corporate and personal income (**taxcontrols**).

- Level of capital tax (*captaxlevel*): We calculate an industry-specific EATR on corporate capital for all municipalities and years.

- Provisions to alleviate double taxation of dividends (*dividendprovision*): Dummy variable which is set equal to 1 if a canton has a reduced tax rate on dividend income and to 0 otherwise.

- Level of the personal income tax (*incometaxlevel*): The Swiss federal tax administration publishes representative EATRs on personal income for all of the municipalities

of switchig to a fully proportional tax. For example, if $RSA_k = 0.03$, a k-type taxpayer would suffer an income loss of 3 percent if the existing system were replaced by a proportional tax. The global index of progressivity, RSA_G, is then calculated as follows: $RSA_G = \sum_{k=1}^{K} \phi_k RSA_k$, where $\phi_k = \theta_k \left(\theta_k + 2 \sum_{l=k+1}^{K} \theta_l \right)$, and $\theta_k = \frac{w_k}{\sum_{k=1}^{K} w_k}$ is post-tax income share of the k^{th} taxpayer (w_k being post-tax income of the k^{th} taxpayer).

[30] Word counts are based on the official compendium of cantonal tax laws *Steuern der Schweiz*. This compendium reproduces the content of all cantonal tax laws in a standardized format. It has the advantage of using harmonized terminology and thus allowing meaningful comparisons of word counts. The fact, that three Swiss cantons are officially bilingual and have identical tax codes in both French and German, allows us to quantify the "excess words" in tax codes due to the French language. In the canton of Berne, the French version of the tax code is 36 percent longer than the German one, and in the cantons of Fribourg and Valais, these differences correspond to 44 and 29 percent respectively. Thus, the average "surplus word count" due to to the French language is 37 percent. Therefore, we devide the word count for Latin cantons by 1.37 (the tax code for the Italian-speaking canton of Ticino being recorded in French in the compendium).

in our sample.[31] As we cannot know what municipality the owners of our sample firms reside in, we have considered two hypotheses for all personal taxes: (a) firm owners live in the municipality their firm is located in, or (b) owners live in the canton their firm is located in. Since the results do not differ significantly, we report results based on the second hypothesis. We thus compute *incometaxlevel* as the weighted average personal income tax burden, using the published cantonal sample mean of the EATR on low, median and high income households (corresponding to the first, third and fifth sextile of the national household income distribution).

- Progressivity of the personal income tax (*incometaxprogressivity*): Based on the published canton-average EATR on low, median and high income, we define *incometaxprogressivity*1, *incometaxprogressivity*2 and *incometaxprogressivity*3 analogously to *corptaxprogressivity*1-3.

- Level of the wealth tax (*wealthtaxlevel*): We compute this variable as the cantonal-average EATRs for a person with taxable wealth of 300,000 Swiss francs ($\approx$ 300,000 US dollars), which corresponds approximately to the mean wealth level among individuals with non-zero declared wealth over our sample period.

- Inheritance tax (*inheritancetax*): This variable takes the value of 1 if a canton has an inheritance tax for direct descendants in a given year and 0 otherwise.

Finally, we control for a range of factors that are also likely to determine firm birth rates (**othercontrols**).

- Public expenditure (*publicexp*): Firms not only pay taxes, they may also benefit from public spending. We construct this variable as the sum of municipal and cantonal per-capita public spending, excluding social transfers and deflated with the consumer price index. The public spending items included in *publicexp* are public administration, security, education, culture and sports, roads, and public transport.[32]

- Wage level (*wage*): We control for average monthly wages per sector and region, deflated by the consumer price index.[33]

[31] The published EATRs correspond to average cantonal, municipal and church tax rates for a representative household (married couple with two children) and for a range of reference incomes.

[32] Annual municipal expenditures are only available for the 26 canton capitals and 16 other municipalities. However, the Swiss Federal Finance Adminstration publishes overall annual municipal spending for each canton. We compute annual municipal spending for the other municipalities by substracting the expenditure of the (26 + 16) municipalities from overall municipal expenditures and then dividing it by the population of the remaining municipalities. Thereby, the remaining municipalities are attributed identical values of *publicexp* within each canton.

[33] Wage data are compiled by the Swiss Federal Statistical Office for seven Swiss regions, five of which

- Property prices (*propertyprice*): This variable is defined as the unweighted average of median municipality–year-level market prices per square meter of retail space, office space and industrial real estate, deflated by the consumer price index.[34]

- Geography: To capture accessibility (and thus potentially agglomeration effects), we include three additional control variables: *disthighway*, the road distance from every municipality to the nearest highway access, *distairport*, the road distance to the nearest international airport, and *distuniversity*, the distance to the nearest university.

- Culture (*latin*): We control for potential cultural and attitudinal differences by introducing the dummy variable *latin* that takes the value of 1 if the main language of a canton is French or Italian and 0 if it is German.

- Size of the municipality (*munsize*): We use the log of the average resident population per year and municipality as the exposure variable.

5 Results

5.1 Baseline estimates

We estimate equation (3) using fixed-effects Poisson regression with two-way clustered standard errors. Table 5 reports the baseline estimations for six different variants of our empirical model.

Our results are reassuringly consistent across specifications: all tax variables and all statistically significant controls retain their sign across the six regression runs. Whether we define our dependent variable as counts of new firms (columns 1-3) or as counts of jobs created by those new firms (columns 4-6), is of no discernible consequence to our estimates. Any observed regularities, therefore, do not seem to be driven by particularly small or particularly large new firms. The estimated coefficient signs generally conform with expectations. Firm births are relatively high in large municipalities and in municipalities with high (non-transfer) public expenditure, and they are relatively low in remote municipalities (in terms of distance from the highway network). The one counterintuitive statistically significant result on the control variables concerns property prices, for which we estimate a positive coefficient. This result very likely reflects the fact that property

comprise several cantons (the cantons of Zurich and Ticino representing regions on their own), and for sectoral aggregates that correspond roughly to the NACE 1-digit level. These data are available for the years 2002 and 2004. We linearly extrapolate *wage* for the remaining years.

[34] We obtained these data from the consultancy firm Wüest & Partner.

prices correlate with certain relevant but unobserved location-specific features without fully capitalizing them.[35]

Turning to the corporate tax variables, we find confirmation for our main hypotheses.

1. The **level** of taxation has a statistically significantly negative impact, with our corporate income tax variable *corptaxlevel* returning statistically highly significantly negative coefficients throughout. The existence of a negative tax level effect is corroborated by the finding that capital taxes (*captaxlevel*), personal income taxes (*incometaxlevel*) and inheritance taxes (*inheritancetax*) also consistently yield statistically negative coefficient estimates. The only exception are wealth taxes (*wealthtaxlevel*), for which we obtain positive coefficients in five of the six regression runs. None of these estimates, however, are statistically significant. Overall, therefore, the conclusion that high average taxes depress firm births is strongly supported.

2. The estimated effects of tax **progressivity** are positive throughout, in line with our Proposition 1. These coefficients are generally measured with less precision than those on the tax level variables. Nonetheless, four of the six coefficients estimated on the variants of *corptaxprogressivity* are found to be statistically significant at the 5 percent level. And the pattern found for corporate income taxes is again corroborated by the corresponding coefficients found on the variables representing the progressivity of income tax schedules, *incometaxprogressivity*, which are consistently positive though never statistically significant. Finally, our estimated coefficients on the interactions of corporate income tax progressivity with our proxy measures for sector-specific risk are all positive, which is in line with Proposition 2. None of these interaction terms is statistically significant at the 5 percent level, which is very likely due to the inevitably approximate measure of risk in our empirical context. Taken together, these estimates lend support to the prediction that, given a certain expected tax bill, progressivity promotes firm births.

3. We find no significant evidence that the **complexity** of the corporate income tax schedule itself (*corptaxbrackets*) affects the rate of firm births. The number of different tax brackets *per se* therefore seems to be of no consequence for entrepreneurial activity. In contrast, the complexity of the overall corporate tax code, measured via *corptaxwordcount*, has a statistically significantly negative impact. Hence, entrepreneurship-promoting simplification of corporate taxation would seem to be best achieved not by reducing the number of brackets of the tax schedule but by simplifying the tax code.

[35] Unobserved location-specific variables can be fully controlled for by including municipality-level fixed effects. We found that inclusion of such fixed effects has no significant impact on our results.

5.2 Robustness

In Table 6, we report variations on the baseline estimates of Table 5, in order to gauge the sensitivity of the baseline estimates. Given the similarity of the two sets of estimates reported in Table 5, we now concentrate on specifications with *newfirms* as the dependent variable.

We report estimates for twelve specifications, alternatively dropping variables from the baseline runs. In columns 1 to 3, we drop the control for the sector-specific expected level of the corporate income tax bill, *corptaxlevel*. This reverses the sign of the coefficients on corporate tax progressivity, implying a negative effect of progressivity - in line with the "success tax" argument proposed by Gentry and Hubbard (2000, 2005). These estimations show clearly that any verdict on the implications of tax progressivity hinges on whether or not one controls for the expected tax bill.

We also experiment with dropping the two complexity measures, *corptaxbrackets* (columns 4 to 6) and *corptaxwordcount* (columns 7 to 9). These changes turn out not to affect any of our coefficient estimates qualitatively, but they strengthen the measured positive impact of corporate tax progressivity. This could suggest that progressivity tends to be associated with more complex tax codes. However, we observe that it is especially the omission of the complexity measure *corptaxwordcount* that boosts the estimated coefficients on the progressivity measures (columns 7 to 9), although these variables are basically uncorrelated (see Table 4). The low bivariate correlations suggest that progressive schedules are perfectly compatible with simple tax codes. The regression results, however, imply that, conditional on other factors, these two variables do comove, and that this comovement to some extent dampens the measured positive effect of corporate tax progressivity.

As a final robustness test, we drop all variables not related to corporate taxation bar the scaling variable *munsize*. These results are shown in columns 10 to 12 of Table 7. The signs and significance levels on our coefficients of interest are remarkably similar to those found for the full model in Table 5. Unlike in the baseline estimations, the impact of capital taxes is now estimated to be statistically significantly negative. The coefficients on *corptaxwordcount* are up to 40 percent smaller, but they remain statistically significantly negative throughout. Less plausibly, the coefficient on *dividendprovision* turns statistically significant negative. Our main results, however, do not seem to be driven by the particular set of conditioning variables chosen for the baseline estimations.

We have conducted a number of additional sensitivity tests not reported here but available on request. The main alternatives we tried were (a) models with *newjobs* as the dependent variable, (b) models with the coefficient on the exposure variable *munsize* forced to unity, (c) models with municipality-level fixed effects, (d) models with a

dummy variable for cantons where the calculation of the simple tax is based on profitability or a combination of profits and profitability, (e) models with canton-level instead of municipality-level personal tax variables, and (f) models with sector-level coefficient estimates on *wage* and *propertyprice* to account for different factor intensities. None of our qualitative findings turned out to be affected.

5.3 Quantitative effects

Our central research question is qualitative in nature: does corporate tax progressivity promote firm births, given the expected corporate tax bill? The answer appears to be yes. We can go further than this, however, and evaluate the magnitudes of the various determinants of firm births, related to taxes and otherwise. The Poisson coefficients reported so far are semielasticities, measuring the proportionate change in the conditional mean of firm births for a one-unit change in the respective regressor. Since the scales of our regressors differ considerably (see Table 3), these semielasticities are not directly comparable.

In Table 7, we therefore show transformations of the baseline coefficient estimates that can be compared across variables. Columns 4 to 6 report elasticities, computed as the product of the Poisson coefficients (columns 1-3) multiplied by the means of the relevant regressors (column 10). They represent the percentage effect of a one-percent change in the value of the respective regressor. As an alternative, we report semistandardized coefficients in columns 7 to 9, defined as the product of the Poisson coefficients (columns 1-3) multiplied by the standard deviations of the relevant regressors (column 11). The semistandardized coefficients quantify the percentage effect of a one-standard-deviation change in the value of the respective regressors.

Both sets of transformed coefficients highlight the importance of taxes for firm births. Of all regressors included in our model, by far the strongest effects are measured for corporate tax levels, with an elasticity of around 3.3 in absolute value, followed by income tax levels, with an elasticity just slightly below unity. Differences in corporate and income taxation clearly have strong effects on firm formation rates across Swiss municipalities. The large elasticity on the level of corporate taxes is particularly striking, as it suggests a more that proportional reaction of firm births to tax changes.[36]

Second to the impact of the expected level of the corporate tax bill comes the impact of the expected level of the personal tax bill, with an elasticity of slightly below 1 in absolute value. Given the difficulty of attributing relevant personal tax variables to municipalities

[36] It would of course be erroneous to read into these estimates a potential for revenue-increasing tax reductions, as our model does not capture responses of the entire tax base.

(due to commuting), this variable likely suffers from some mismeasurement. This in turn implies attenuation bias for the coefficient estimate, which makes the strong estimated effect of personal taxes all the more remarkable. The next most important dimension of taxation is the complexity of the corporate tax code (*corptaxwordcount*), with an elasticity of around -0.7. All other aspects of the tax code have comparatively minor effects on firm births. The average elasticity with respect to the progressivity of corporate taxes is estimated at around 0.07 - an order of magnitude smaller than the complexity effect. Similarly, the positive effect of progressive income taxes is an order of magnitude smaller than the negative effect of the expected level of the income tax bill. The smallest quantitative effect of all tax variables is found for *corptaxbrackets* and *dividendprovision*, with an average elasticity of essentially zero.

In sum, we find a clear hierarchy of tax effects, with tax *levels* having by far the strongest impact on firm birth rates, the *complexity* of tax codes coming second, and the *progressivity* of tax schedules having a comparatively small but positive impact.

6 Conclusion

Tax reforms in the spirit of the "flat tax" model have three central components: a reduction in the average tax rate, a reduction in the progressivity of the tax schedule, and a reduction in the complexity of the tax code. Using data on sub-federal jurisdictions in Switzerland, we estimate the separate effects of these three components of corporate income taxes on the incidence of firm births.

Our results confirm that lower average tax rates and reduced complexity of the tax code promote firm births. Controlling for these effects, reduced progressivity inhibits firm births. Our reading of this result is that tax progressivity has an insurance effect that facilitates entrepreneurial risk taking.

The positive effects of lower tax levels and reduced complexity are estimated to be significantly stronger than the negative effect of reduced progressivity. To the extent that firm births reflect desirable entrepreneurial dynamism, it is not the flattening of tax schedules that is key to successful tax reforms, but the lowering of average tax burdens and the simplification of tax codes. Flatness *per se* is of secondary importance and even appears to be detrimental to firm births.

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Appendix

A Proof of Proposition 2

From (1) and (2) it follows that

$$\frac{\partial \pi_L}{\partial \pi_H} = -\frac{p_H}{p_L}, \tag{4}$$

and

$$\frac{\partial k_L}{\partial \pi_H} = -\frac{\Pi p_H k_H}{(\Pi - p_H \pi_H)^2}. \tag{5}$$

Then, Proposition 1 and equations (4) and (5) imply:

$$\begin{aligned}
\frac{\partial^2 \Delta EU(w)}{\partial k_H \partial \pi_H} &= -p_H \Delta U_w(w^{prog}) - p_H \pi_H \left[\begin{array}{c} U_{ww}\left(w_H^{prog}\right)[1-t-k_H] \\ -U_{ww}\left(w_L^{prog}\right)\left[-\frac{\partial k_L}{\partial \pi_H}\pi_L + [1-t-k_L]\frac{\partial \pi_L}{\partial \pi_H}\right] \end{array} \right] \\
&= -p_H \Delta U_w(w^{prog}) - p_H \pi_H \left[\begin{array}{c} U_{ww}\left(w_H^{prog}\right)[1-t-k_H] \\ -U_{ww}\left(w_L^{prog}\right)\left[\begin{array}{c} \frac{\Pi p_H k_H}{(\Pi - p_H \pi_H)^2}\frac{\Pi - p_H \pi_H}{p_L} \\ -\left[1-t+\frac{p_H \pi_H}{\Pi - p_H \pi_H}k_H\right]\frac{p_H}{p_L} \end{array} \right] \end{array} \right] \\
&= -p_H \Delta U_w(w^{prog}) - p_H \pi_H [1-t-k_H]\left[U_{ww}\left(w_H^{prog}\right) + \frac{p_H}{p_L}U_{ww}\left(w_L^{prog}\right)\right] \\
&> 0,
\end{aligned}$$

where:

$$\begin{aligned}
U_{ww}\left(w_L^{prog}\right) &= U_{ww}\left([1-t-k_L]\pi_L\right) < 0, \\
U_{ww}\left(w_H^{prog}\right) &= U_{ww}\left([1-t-k_H]\pi_H\right) < 0, \\
\Delta U_w(w^{prog}) &= U_w(w_H^{prog}) - U_w(w_L^{prog}) < 0.
\end{aligned}$$

B Figures and tables

Figure 1: Expected utility with flat and progressive taxation

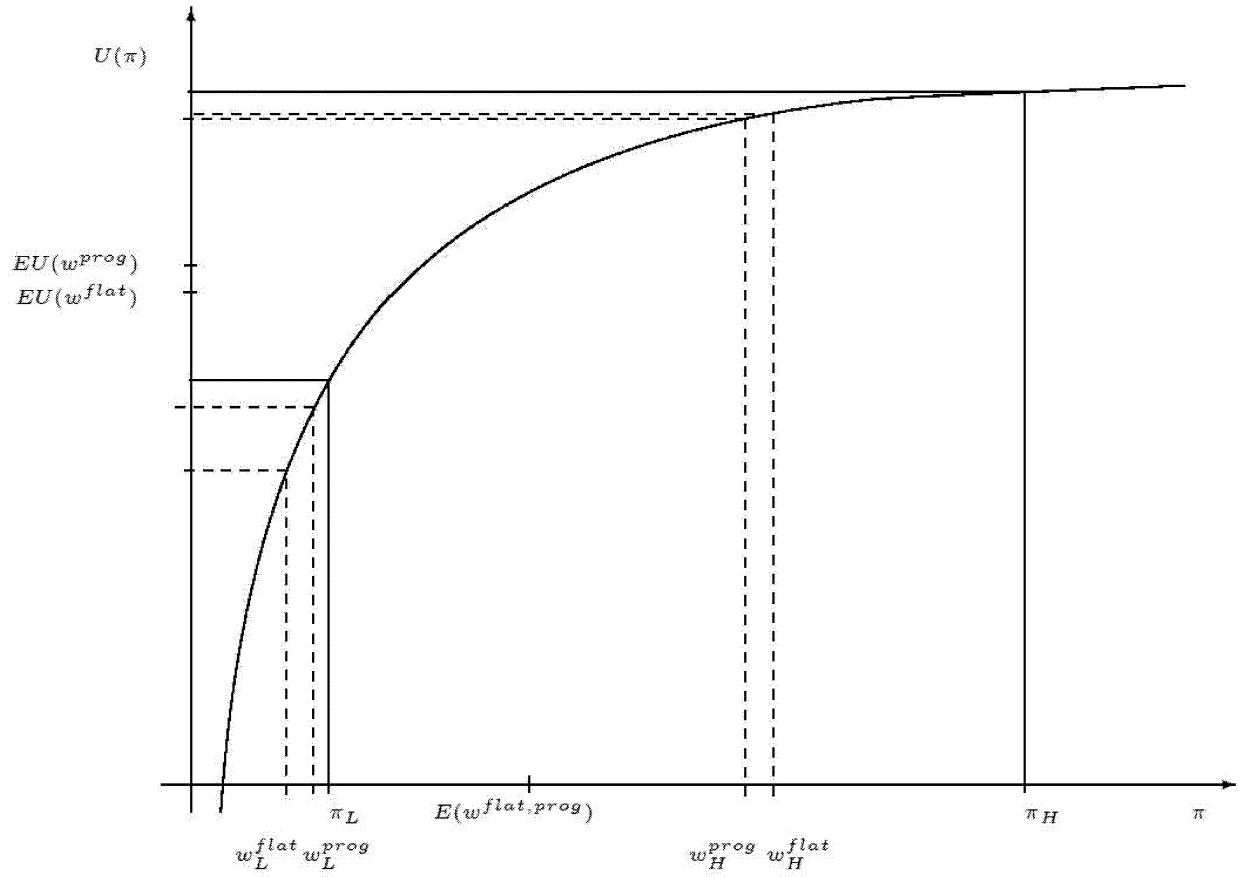
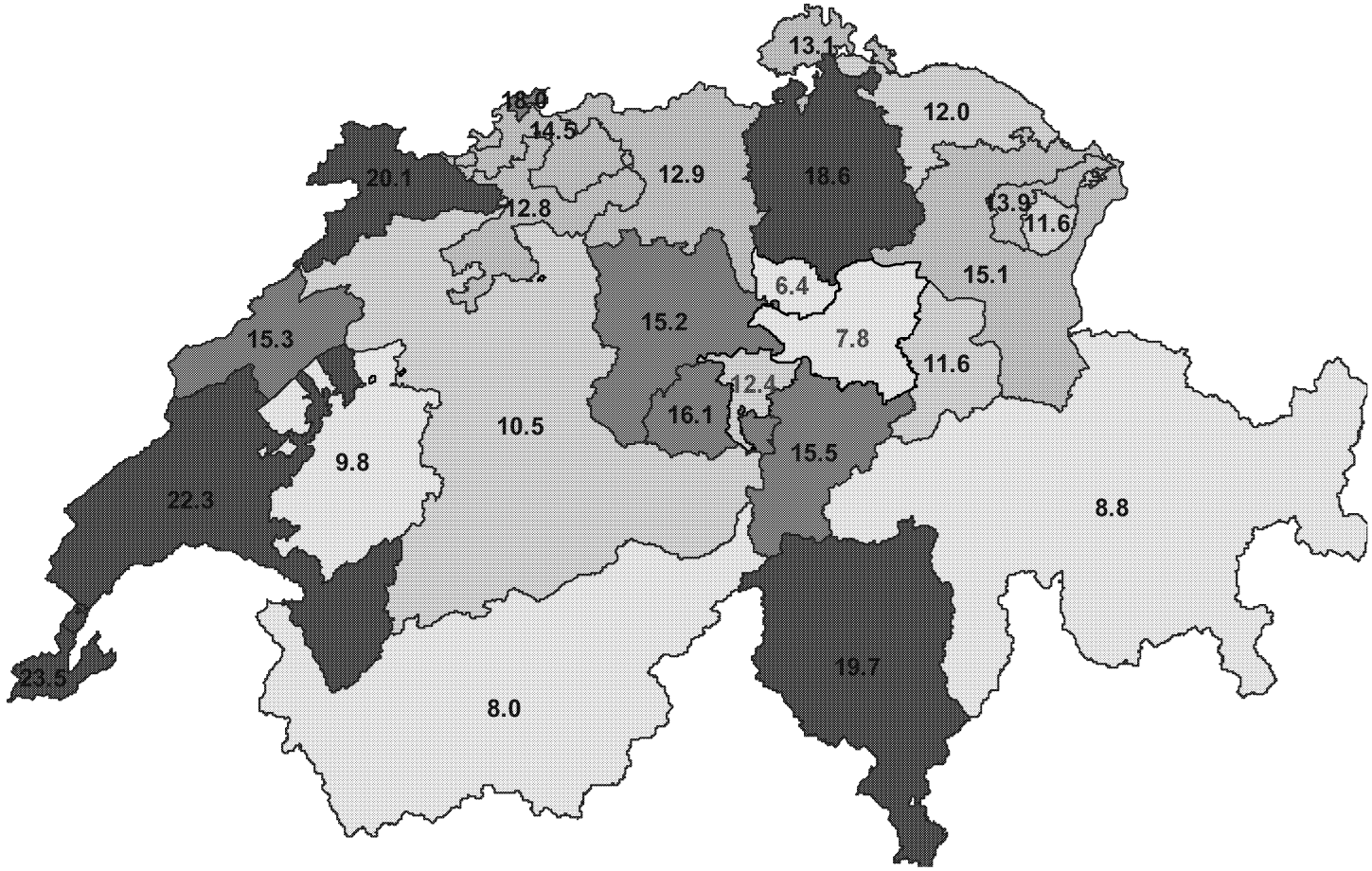


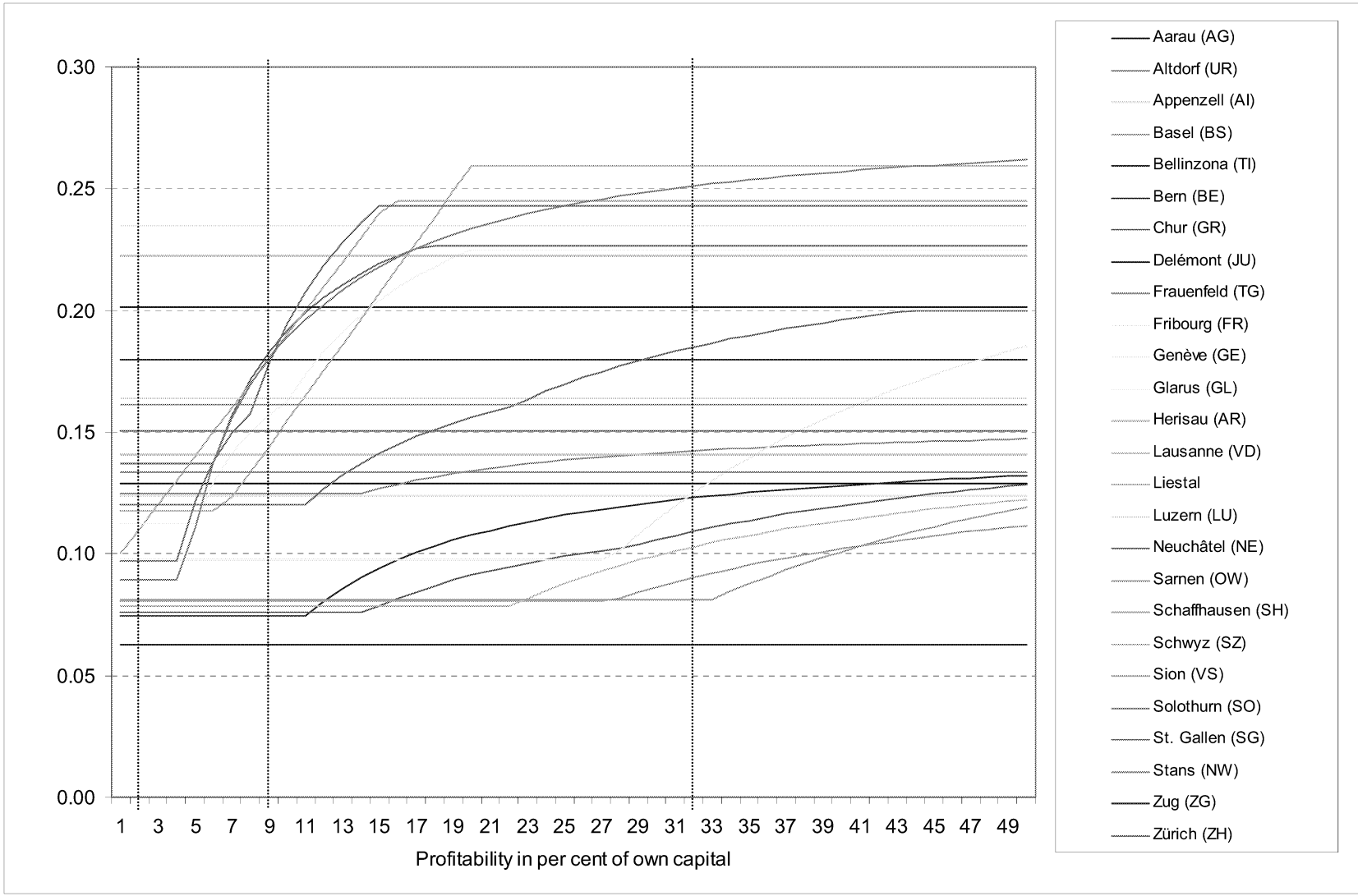
Figure 2: Average statutory corporate income tax rates, 2005

(consolidated cantonal and municipal corporate income tax rate on 9 percent profit in cantonal capital)



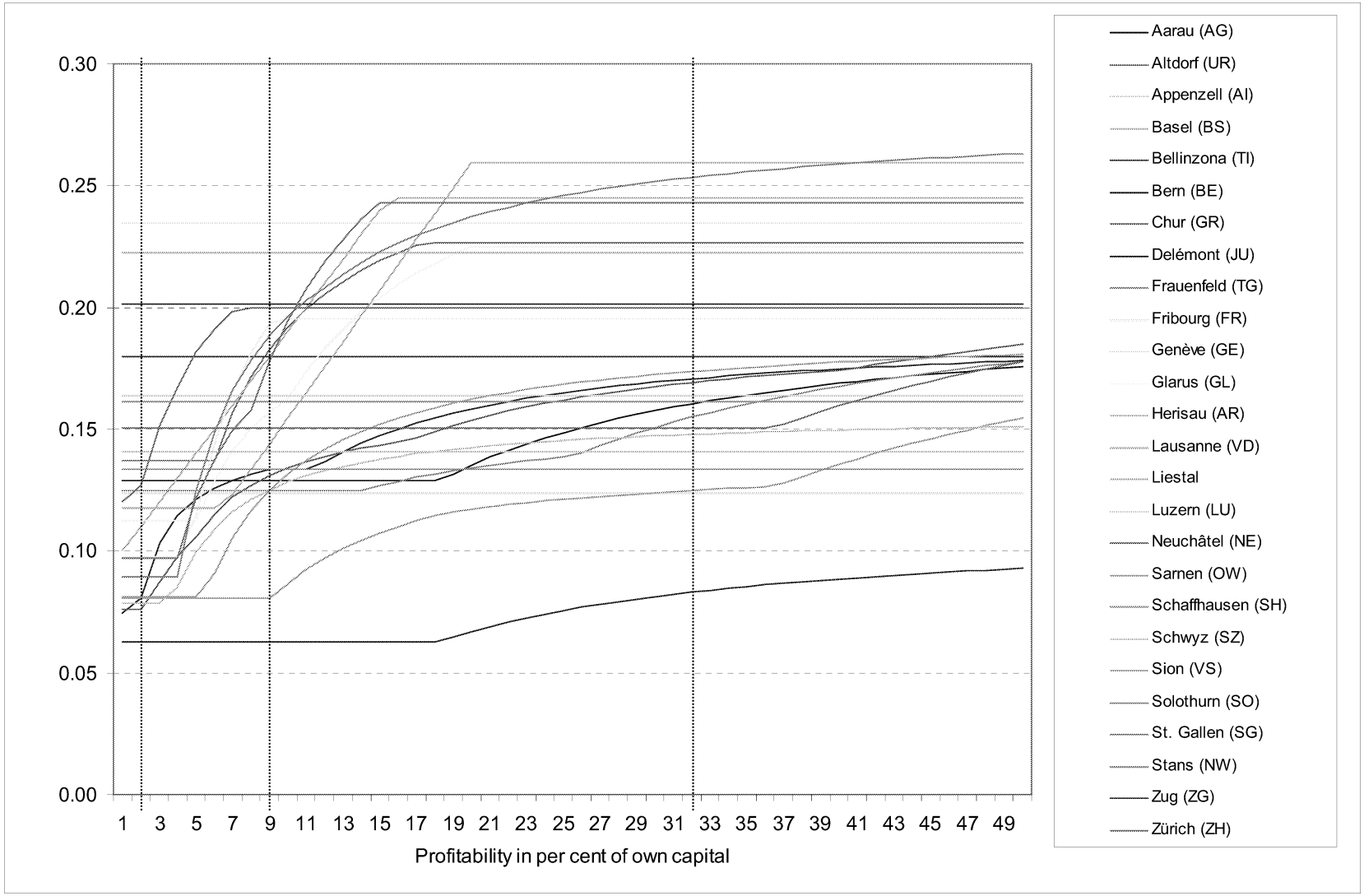
The map shows average statutory corporate income tax rates calculated for a corporation with a capital stock of CHF 188,000 and 9 percent profitability, which corresponds to the median value of the national distribution of capital stocks and profitability across all sectors. We define the average statutory tax rate as: (municipal + church + cantonal corporate income taxes) / gross profit. We do not allow for deductions nor for fixed minimum taxes. As some cantons differentiate their tax treatment of retained and of distributed profits, we assume a distribution rate of 50 percent of gross profits.

Figure 3: Average statutory corporate income tax schedules, 2001, own capital stock = CHF 91,000



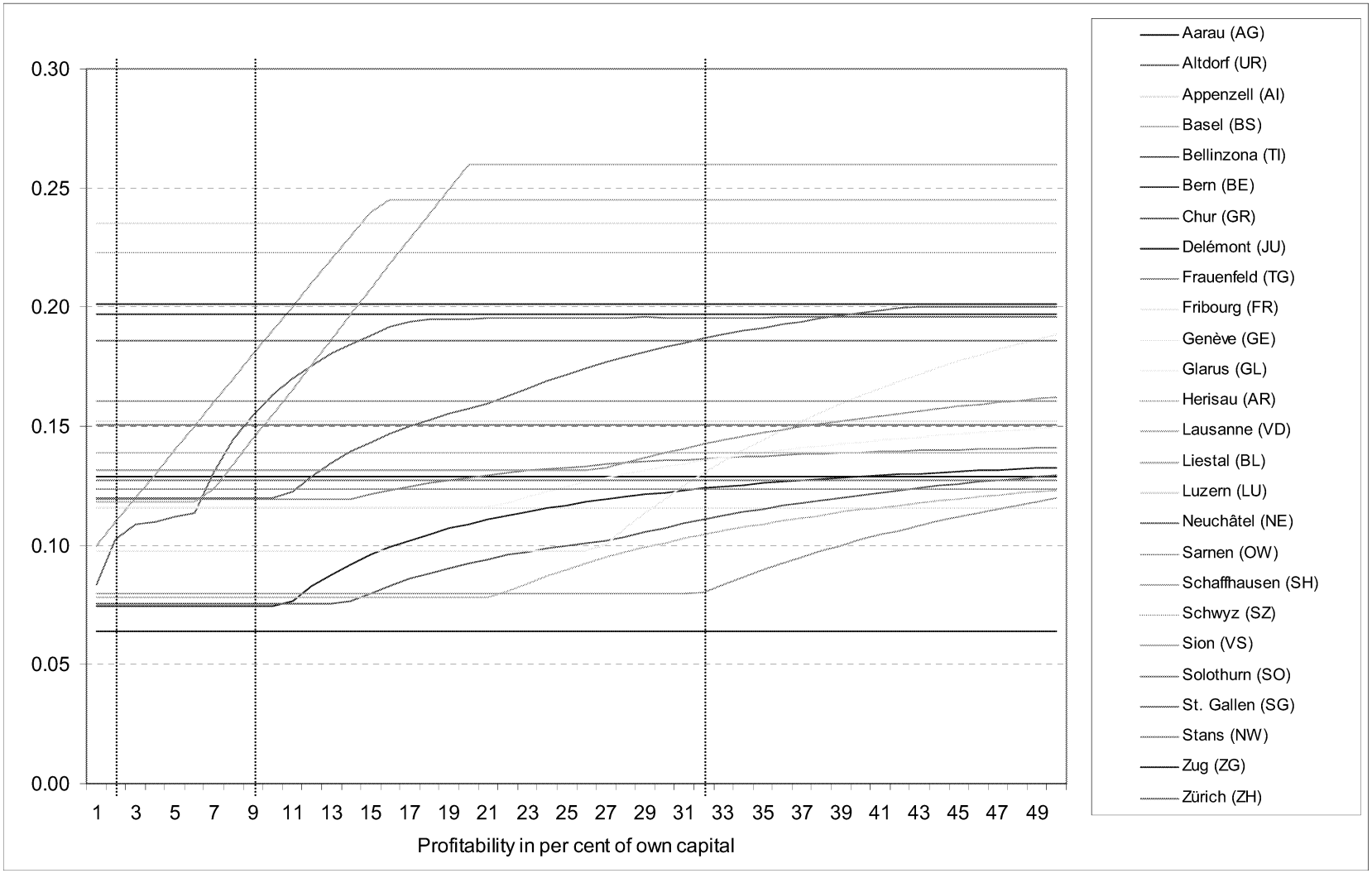
Average statutory corporate income tax rates are calculated for a corporation with a capital stock of CHF 91,000, which corresponds to the first quartile value of the national distribution of capital stocks across all sectors in 2001. We define the average statutory tax rate as: (municipal + church + cantonal corporate income taxes) / gross profit. We do not allow for deductions nor for fixed minimum taxes. As some cantons differentiate their tax treatment of retained and of distributed profits, we assume a distribution rate of 50 percent of gross profits. The dashed vertical lines correspond to profitabilities of 2, 9 and 32 percent of capital, which correspond to the first, third and fifth sextile of the national profitability distribution across all sectors. See Table 1 for an explanation of canton acronyms.

Figure 4: Average statutory corporate income tax schedules, 2001, own capital stock = CHF 548,000



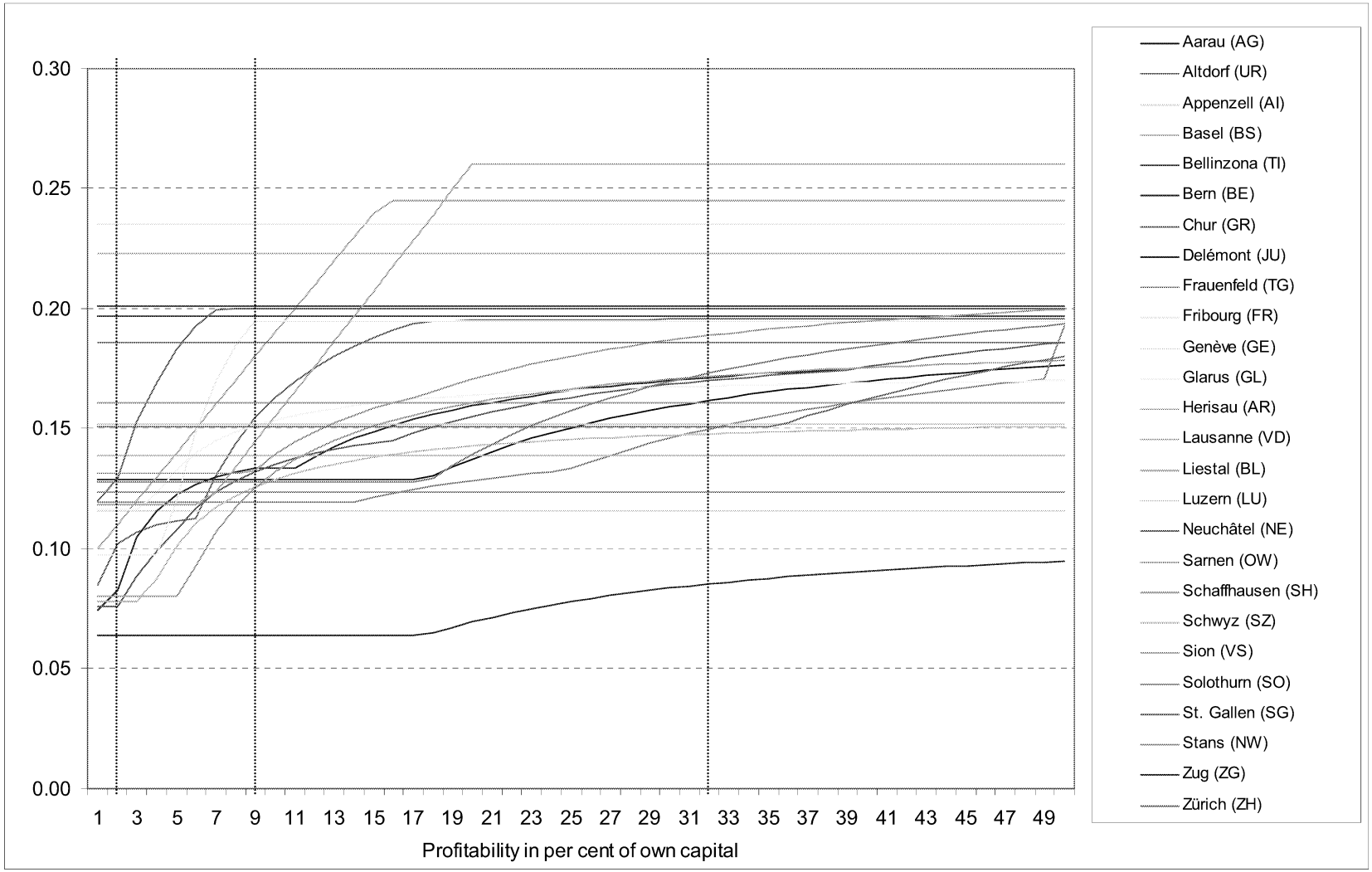
Average statutory corporate income tax rates are calculated for a corporation with a capital stock of CHF 548,000, which corresponds to the third quartile value of the national distribution of capital stocks across all sectors in 2001. We define the average statutory tax rate as: (municipal + church + cantonal corporate income taxes) / gross profit. We do not allow for deductions nor for fixed minimum taxes. As some cantons differentiate their tax treatment of retained and of distributed profits, we assume a distribution rate of 50 percent of gross profits. The dashed vertical lines correspond to profitabilities of 2, 9 and 32 percent of capital, which correspond to the first, third and fifth sextile of the national profitability distribution across all sectors. See Table 1 for an explanation of canton acronyms.

Figure 5: Average statutory corporate income tax schedules, 2005, own capital stock = CHF 94,000



Average statutory corporate income tax rates are calculated for a corporation with a capital stock of CHF 94,000, which corresponds to the first quartile value of the national distribution of capital stocks across all sectors in 2005. We define the average statutory tax rate as: (municipal + church + cantonal corporate income taxes) / gross profit. We do not allow for deductions nor for fixed minimum taxes. As some cantons differentiate their tax treatment of retained and of distributed profits, we assume a distribution rate of 50 percent of gross profits. The dashed vertical lines correspond to profitabilities of 2, 9 and 32 percent of capital, which correspond to the first, third and fifth sextile of the national profitability distribution across all sectors. See Table 1 for an explanation of canton acronyms.

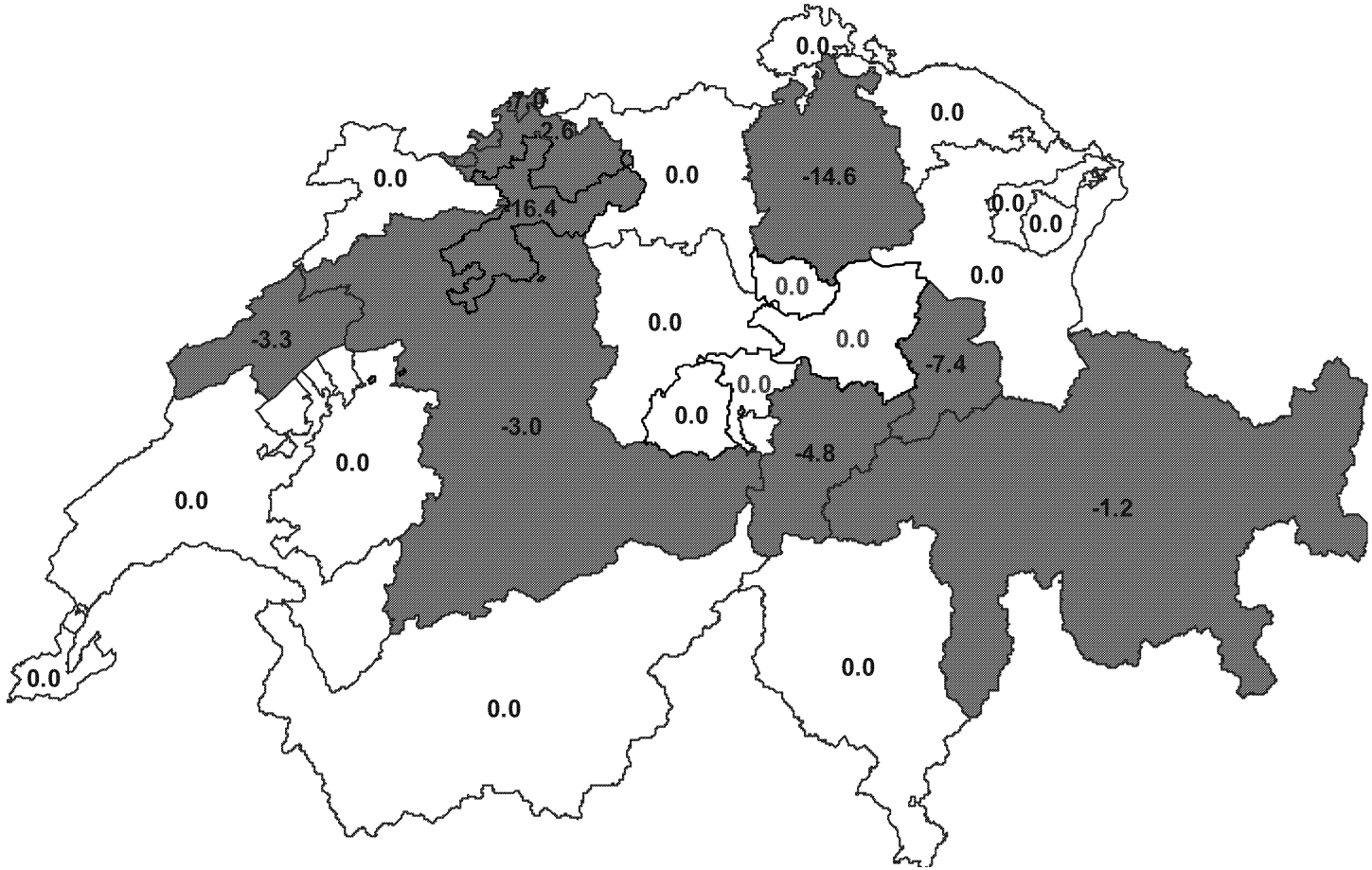
Figure 6: Average statutory corporate income tax schedules, 2005, own capital stock = CHF 566,000



Average statutory corporate income tax rates are calculated for a corporation with a capital stock of CHF 566,000, which corresponds to the third quartile value of the national distribution of capital stocks across all sectors in 2005. We define the average statutory tax rate as: (municipal + church + cantonal corporate income taxes) / gross profit. We do not allow for deductions nor for fixed minimum taxes. As some cantons differentiate their tax treatment of retained and of distributed profits, we assume a distribution rate of 50 percent of gross profits. The dashed vertical lines correspond to profitabilities of 2, 9 and 32 percent of capital, which correspond to the first, third and fifth sextile of the national profitability distribution across all sectors. See Table 1 for an explanation of canton acronyms.

Figure 7: Change in corporate income tax progressivity, 2001-2005

(change in *corptaxprogressivity*1, in tax percentage points)



The map shows the change between 2001 and 2005 in the difference between average statutory corporate income tax rates calculated for a corporation with 32 percent profitability and for a corporation with 2 percent profitability (i.e. $corptaxprogressivity1_{2005}$ – $corptaxprogressivity1_{2001}$). Firms are assumed to have a capital stock of CHF 188,000. We define the average statutory tax rate as: (municipal + church + cantonal corporate income taxes) / gross profit. We do not allow for deductions nor for fixed minimum taxes. As some cantons differentiate their tax treatment of retained and of distributed profits, we assume a distribution rate of 50 percent of gross profits.

Table 1: Corporate taxation in Swiss cantons and municipalities

Canton acronym	Canton name	No. of sample municipalities, 2001	No. of sample municipalities, 2005	Flat tax rate on capital	Flat tax rate on corp. inc.	Progressive corporate income tax schedule based on:			Unique tax multiplier within canton
						Profits	Profit rate	Both	
ZH	Zürich	77	108	x	x [1]				
BE	Bern	61	119	x		x			
LU	Luzern	38	44		x				
UR	Uri	5	5	x			x		
SZ	Schwyz	16	19	x		x			
OW	Obwalden	5	6	x	x				
NW	Nidwalden	6	7	x	x				
GL	Glarus	7	7	x		x			
ZG	Zug	10	10	x		x			
FR	Fribourg	20	26	x		x			
SO	Solothurn	28	33	x		x			
BS	Basel-Stadt	3	3	x			x		x
BL	Basel-Land	31	29	x			x		
SH	Schaffhausen	5	6	x		x			
AR	Appenzell-Ausserrhoden	8	7	x	x				
AI	Appenzell-Innerrhoden	5	5	x	x				x
SG	St. Gallen	59	60	x				x	x
GR	Graubünden	18	24			x			x
AG	Aargau	79	88	x				x	x
TG	Thurgau	32	38	x	x				
TI	Ticino	42	43	x	x				
VD	Vaud	45	68	x	x				
VS	Valais	22	37			x			
NE	Neuchâtel	16	16	x		x			
GE	Genève	20	28	x	x				
JU	Jura	7	9	x	x				
	Total	665	845						

[1] from 2005 onwards

Table 2: Data sources

Dependent variables	
newfirms	Swiss Federal Statistical Office (UDEMO database)
newjobs	Swiss Federal Statistical Office (UDEMO database)
Corporate tax variables	
corptaxlevel	Own calculations, based on statutory tax data from the official compendium of cantonal tax laws (*Steuern der Schweiz*, editions 2001- 2005), on cantonal and municipal tax multipliers obtained from the 26 cantonal tax authorities, and on sectoral profitability data for 2004 obtained from the tax authorities of the canton of Aargau
*corptaxprogressivity*1-3	Own calculations, based on statutory tax data from the official compendium of cantonal tax laws (*Steuern der Schweiz*, editions 2001-2005), on cantonal and municipal tax multipliers obtained from the 26 cantonal tax authorities, and on national profitability data published by the Swiss Federal Finance Administration
risk	Own calculations, based on sectoral profitability data for 2004 from the tax authorities of the canton of Aargau
corptaxbrackets	Own calculations, based on statutory tax data from the official compendium of cantonal tax laws (*Steuern der Schweiz*, editions 2001-2005)
corptaxwordcount	Own calculations, based on the official compendium of cantonal tax laws (*Steuern der Schweiz*, editions 2001- 2005)
captaxlevel	Own calculations, based on statutory tax data from the Swiss Federal Tax Administration and on sectoral profitability data provided by the tax authorities of the canton of Aargau
dividendprovision	Official compendium of cantonal tax laws (*Steuern der Schweiz*, editions 2001-2005)
Personal tax variables	
incometaxlevel	Effective average tax rates published by the Swiss Federal Tax Administration
*incometaxprogresssivity*1-3	Own calculations, based on effective average tax rates published by the Swiss Federal Tax Administration
wealthtaxlevel	Effective average tax rates published by the Swiss Federal Tax Administration
inheritancetax	Official compendium of cantonal tax laws (*Steuern der Schweiz*, editions 2001-2005)
Other control variables	
publicexp	Swiss Federal Department of Finance
wage	Swiss Federal Statistical Office
propertyprice	Wüest & Partner
disthighway	Swiss Federal Statistical Office
distairport	Swiss Federal Statistical Office
distuniversity	Swiss Federal Statistical Office
munsize	Swiss Federal Statistical Office

Note: For details on the construction of the variables, see Section 4.2.2.

Table 3: Summary statistics

	Obs	Mean	S.D.	Min	Max	Mun / cant with min[1]	Mun / cant with max[1]
Dependent variables							
newfirms	182,850	0.14	1.55	0	209	(*several*)	Zurich
newjobs	182,850	0.36	4.06	0	579	(*several*)	Zurich
Corporate tax variables							
corptaxlevel	182,850	0.21	0.02	0.12	0.28	Freienbach	(*several*)[2]
*corptaxprogressivity*1	182,850	0.05	0.04	-0.02	0.15	(*several*)[3]	Liestal
*corptaxprogressivity*2	182,850	0.29	0.23	-0.06	0.89	(*several*)[3]	Liestal
*corptaxprogressivity*3	182,850	0.01	0.01	0.00	0.02	(*several*)[4]	(*several*)[5]
risk × *corptaxprogressivity*1	182,850	0	0.24	-0.54	3.26	Liestal	Liestal
risk × *corptaxprogressivity*2	182,850	0	1.38	-3.23	19.45	Liestal	Liestal
risk × *corptaxprogressivity*3	182,850	0	0.03	-0.09	0.53	(*several*) [5]	(*several*)[5]
corptaxbrackets	182,850	2.64	2.35	1	15	(*several*)	GR
corptaxwordcount (in 100 words)	182,850	5.87	0.96	3.61	7.93	VS	GR
captaxlevel	182,850	0.0033	0.0013	0.0001	0.0123	(*several*)[6]	(*several*)[7]
dividendprovision	182,850	0.04	0.19	0	1	(*several*)	(*several*)
Personal tax variables							
incometaxlevel	182,850	0.09	0.02	0.03	0.14	ZG	JU
*incometaxprogresssivity*1	182,850	0.08	0.02	0.03	0.12	SZ	GE
*incometaxprogresssivity*2	182,850	0.96	0.25	0.55	1.88	OW	GE
*incometaxprogresssivity*3	182,850	0.01	0.00	0.00	0.01	SZ	GE
wealthtaxlevel	182,850	0.0025	0.0012	0.0004	0.0053	ZG	FR
inheritancetax	182,850	0.40	0.49	0	1	(*several*)	(*several*)
Other control variables							
publicexp (per capita/year, in CHF 10,000)	182,850	0.70	0.11	0.38	1.33	Appenzell	Zug
wage (monthly, in CHF 10,000)	182,850	0.56	0.10	0.20	0.99	TI	ZH
propertyprice (in CHF 1,000/m^2)	182,850	0.14	0.03	0.07	0.26	Couvet	Genève
disthighway (in 100 km)	182,850	0.06	0.08	0.00	0.95	Morges	Poschiavo
distairport (in 100 km)	182,850	0.59	0.41	0.00	2.27	(*several*)	Poschiavo
distuniversity (in 100 km)	182,850	0.23	0.17	0.00	1.00	Bern	Scuol
latin	182,850	0.26	0.44	0	1	(*several*)	(*several*)
munsize	182,850	8.42	0.80	5.36	12.81	Bourg-St-Pierre	Zurich

[1] acronyms (see Table 1) are used for cantons
[2] all of the municipalities in the canton of Graubünden
[3] all of the municipalities in the canton of Aargau
[4] all of the municipalities in the canton of St. Gallen
[5] all of the municipalities in the canton of Basel-Stadt
[6] all of the municipalities in the canton of Appenzell-Ausserrhoden
[7] several municipalities in the canton of Appenzell-Ausserrhoden

Table 4: Correlation matrix

	newfirms	*newjobs*	*corptaxlevel*	*corptaxprogressivity1*	*corptaxprogressivity2*	*corptaxprogressivity3*	*corptaxbrackets*	*risk × corptaxprogressivity1*	*risk × corptaxprogressivity2*	*risk × corptaxprogressivity3*	*corptaxwordcount*	*captaxlevel*	*dividendprovision*	*incometaxlevel*	*incometaxprogresssivity1*	*incometaxprogresssivity2*	*incometaxprogresssivity3*	*wealthtaxlevel*	*inheritancetax*	*publicexp*	*wage*	*propertyprice*	*disthighway*	*distairport*	*distuniversity*	*latin*	*munsize*
newfirms	1.000																										
newjobs	0.943	1.000																									
corptaxlevel	0.000	0.005	1.000																								
corptaxprogressivity1	0.013	0.017	0.388	1.000																							
corptaxprogressivity2	0.009	0.012	0.354	0.979	1.000																						
corptaxprogressivity3	0.009	0.012	0.351	0.888	0.916	1.000																					
corptaxbrackets	-0.007	-0.006	0.325	0.367	0.443	0.356	1.000																				
risk × corptaxprogressivity1	0.048	0.045	0.063	0.008	0.008	0.008	0.003	1.000																			
risk × corptaxprogressivity2	0.047	0.044	0.067	0.008	0.008	0.007	0.004	0.991	1.000																		
risk × corptaxprogressivity3	0.047	0.044	0.066	0.008	0.008	0.009	0.003	0.951	0.963	1.000																	
corptaxwordcount	-0.006	-0.006	-0.091	-0.029	0.030	0.126	0.416	0.000	0.000	0.001	1.000																
captaxlevel	-0.014	-0.011	0.172	0.232	0.284	0.357	0.307	0.000	0.001	0.004	0.286	1.000															
dividendprovision	-0.005	-0.006	-0.234	-0.097	-0.113	-0.146	-0.120	-0.001	-0.001	-0.001	0.029	-0.114	1.000														
incometaxlevel	-0.029	-0.026	0.120	0.122	0.118	-0.025	0.015	0.001	0.001	0.000	-0.146	-0.012	0.090	1.000													
incometaxprogresssivity1	-0.011	-0.009	0.279	-0.131	-0.152	-0.201	-0.075	-0.001	-0.001	-0.002	-0.243	0.030	-0.141	0.326	1.000												
incometaxprogresssivity2	0.020	0.018	0.078	-0.266	-0.286	-0.204	-0.125	-0.002	-0.002	-0.002	-0.096	0.043	-0.167	-0.603	0.513	1.000											
incometaxprogresssivity3	-0.011	-0.008	0.271	-0.099	-0.115	-0.177	-0.047	-0.001	-0.001	-0.002	-0.258	0.074	-0.148	0.356	0.986	0.484	1.000										
wealthtaxlevel	-0.030	-0.027	0.111	-0.076	-0.082	-0.290	-0.101	-0.001	-0.001	-0.003	-0.425	-0.047	0.009	0.596	0.445	-0.170	0.452	1.000									
inheritancetax	-0.015	-0.013	0.188	0.158	0.163	-0.029	0.139	0.001	0.001	0.000	0.041	0.000	0.030	0.433	0.391	-0.078	0.357	0.512	1.000								
publicexp	0.078	0.077	0.375	0.288	0.250	0.153	0.393	0.002	0.002	0.001	-0.070	0.103	-0.038	-0.047	0.030	0.100	0.041	-0.093	0.080	1.000							
wage	0.024	0.015	0.053	0.042	0.045	0.096	0.000	0.154	0.158	0.154	0.071	0.023	-0.014	0.017	-0.101	-0.105	-0.112	-0.116	-0.049	0.081	1.000						
propertyprice	0.110	0.109	0.057	0.135	0.115	0.138	0.057	0.001	0.001	0.001	0.103	-0.032	-0.023	-0.252	-0.038	0.212	-0.058	-0.303	-0.044	0.406	0.085	1.000					
disthighway	-0.028	-0.029	0.098	0.054	0.093	0.028	0.392	0.001	0.001	0.000	0.148	0.151	0.002	0.074	0.000	-0.080	0.010	0.069	0.167	0.110	-0.012	-0.101	1.000				
distairport	-0.029	-0.029	-0.053	-0.090	-0.058	-0.250	0.214	-0.001	-0.001	-0.002	-0.333	-0.022	0.017	0.113	0.149	0.074	0.191	0.376	0.124	-0.026	-0.202	-0.258	0.328	1.000			
distuniversity	-0.045	-0.046	0.065	-0.039	0.024	-0.025	0.445	0.000	0.000	0.000	0.039	0.262	-0.074	0.073	-0.058	-0.138	-0.027	0.097	0.007	0.013	-0.029	-0.314	0.437	0.425	1.000		
latin	0.004	0.004	0.144	-0.081	-0.138	-0.263	-0.261	-0.001	-0.001	-0.002	-0.647	0.119	-0.115	0.046	0.296	0.274	0.298	0.480	0.114	0.287	-0.070	0.050	-0.064	0.382	-0.041	1.000	
munsize	0.171	0.175	0.050	0.090	0.078	0.096	-0.012	0.001	0.001	0.001	0.008	-0.029	-0.024	-0.058	-0.065	-0.009	-0.062	-0.113	-0.066	0.185	0.049	0.440	-0.177	-0.187	-0.188	-0.071	1.000

Table 5: Baseline results

	Dependent variable= Number of new firms per municipality, sector and year (newfirms)			*Dependent variable= Employment by new firms per municipality, sector and year (newjobs)*		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
corptaxlevel	-15.84***	-15.63***	-16.21***	-15.18***	-15.10***	-15.58***
	(1.45)	(1.35)	(1.50)	(1.53)	(1.44)	(1.57)
*corptaxprogressivity*1	1.400**			1.532**		
	(0.68)			(0.77)		
*corptaxprogressivity*2		0.219*			0.245*	
		(0.12)			(0.13)	
*corptaxprogressivity*3			12.24**			12.40**
			(4.98)			(5.23)
risk × *corptaxprogressivity*1	0.0515			0.0608		
	(0.057)			(0.061)		
risk × *corptaxprogressivity*2		0.0116			0.0143	
		(0.0100)			(0.011)	
risk × *corptaxprogressivity*3			0.548*			0.632*
			(0.31)			(0.34)
corptaxbrackets	0.0154	0.0157	0.0112	0.0125	0.0127	0.00921
	(0.013)	(0.014)	(0.014)	(0.016)	(0.016)	(0.015)
corptaxwordcount	-0.124***	-0.126***	-0.109***	-0.115***	-0.115***	-0.103**
	(0.032)	(0.033)	(0.032)	(0.040)	(0.040)	(0.041)
captaxlevel	-13.50	-15.14	-27.07	-17.51	-20.69	-29.66
	(16.0)	(16.9)	(17.2)	(20.8)	(21.6)	(22.5)
dividendprovision	-0.0328	-0.0268	-0.0127	-0.0960	-0.0866	-0.0768
	(0.077)	(0.077)	(0.077)	(0.14)	(0.13)	(0.14)
incometaxlevel	-10.98***	-9.781***	-10.62***	-7.213***	-6.178**	-6.635***
	(2.47)	(2.89)	(2.35)	(2.64)	(3.11)	(2.54)
*incometaxprogresssivity*1	0.908			0.208		
	(1.83)			(1.89)		
*incometaxprogresssivity*2		0.0599			0.0335	
		(0.13)			(0.13)	
*incometaxprogresssivity*3			8.784			2.549
			(15.9)			(16.3)
wealthtaxlevel	39.75	33.18	43.53	1.110	-9.613	2.145
	(37.7)	(36.4)	(37.3)	(40.5)	(39.3)	(40.0)
inheritancetax	-0.150***	-0.151***	-0.141***	-0.136***	-0.140***	-0.128***
	(0.039)	(0.039)	(0.037)	(0.046)	(0.046)	(0.044)
publicexp	0.713***	0.712***	0.776***	0.602**	0.601**	0.669**
	(0.26)	(0.27)	(0.26)	(0.26)	(0.27)	(0.26)
wage	0.104	0.0798	0.0439	-0.0994	-0.0984	-0.158
	(0.42)	(0.42)	(0.43)	(0.44)	(0.44)	(0.45)
propertyprice	6.125***	6.124***	6.028***	5.460***	5.425***	5.370***
	(0.69)	(0.68)	(0.68)	(0.81)	(0.81)	(0.80)
disthighway	-1.335***	-1.336***	-1.324***	-1.730***	-1.732***	-1.727***
	(0.31)	(0.31)	(0.31)	(0.40)	(0.40)	(0.40)
distairport	0.0408	0.0292	0.0399	0.0348	0.0239	0.0337
	(0.089)	(0.088)	(0.088)	(0.095)	(0.094)	(0.095)
distuniversity	-0.129	-0.133	-0.0980	-0.0987	-0.0973	-0.0732
	(0.15)	(0.15)	(0.15)	(0.16)	(0.16)	(0.16)
latin	0.0688	0.0837	0.126	0.150	0.171	0.206*
	(0.097)	(0.098)	(0.098)	(0.11)	(0.11)	(0.11)
munsize	1.038***	1.039***	1.040***	1.081***	1.083***	1.082***
	(0.021)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
Log likelihood	-38,282	-38,283	-38,269	-95,285	-95,287	-95,249

Notes: Poisson estimation; 182,850 observations; fixed effects included for 46 sectors and 5 years but not reported; standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; standard errors clustered two-ways (by municipality-year and by municipality-sector)

Table 6: Robustness

	Dependent variable = Number of new firms per sector, year and municipality (newfirms)											
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
corptaxlevel	(***dropped***)	(***dropped***)	(***dropped***)	-15.61***	-15.38***	-16.09***	-16.17***	-15.79***	-16.75***	-16.91***	-16.45***	-17.29***
				(1.46)	(1.36)	(1.52)	(1.47)	(1.36)	(1.50)	(2.65)	(2.63)	(2.74)
*corptaxprogressivity*1	-1.576**			1.714**			2.530***			1.199*		
	(0.74)			(0.68)			(0.68)			(0.65)		
*corptaxprogressivity*2		-0.202			0.279**			0.432***			0.0952	
		(0.14)			(0.12)			(0.12)			(0.13)	
*corptaxprogressivity*3			-13.81**			13.87***			19.89***			10.96*
			(5.88)			(4.82)			(4.77)			(5.94)
risk × *corptaxprogressivity*1	0.0681			0.0519			0.0531			0.0485		
	(0.054)			(0.057)			(0.059)			(0.080)		
risk × *corptaxprogressivity*2		0.0138			0.0116			0.0119			0.0106	
		(0.0094)			(0.010)			(0.010)			(0.014)	
risk × *corptaxprogressivity*3			0.584**			0.549*			0.556*			0.541
			(0.29)			(0.31)			(0.32)			(0.45)
corptaxbrackets	-0.0270*	-0.0360**	-0.0228	(***dropped***)	(***dropped***)	(***dropped***)	-0.00518	-0.00630	-0.00684	-0.0183	-0.0125	-0.0244*
	(0.014)	(0.016)	(0.015)				(0.013)	(0.013)	(0.013)	(0.014)	(0.012)	(0.013)
corptaxwordcount	-0.164***	-0.143***	-0.183***	-0.109***	-0.110***	-0.0971***	(***dropped***)	(***dropped***)	(***dropped***)	-0.0772***	-0.0795***	-0.0875***
	(0.041)	(0.042)	(0.041)	(0.031)	(0.031)	(0.031)				(0.026)	(0.027)	(0.025)
captaxlevel	16.09	10.89	35.74	-14.36	-16.76	-28.99*	-47.63***	-52.31***	-63.40***	-49.03**	-46.26**	-52.40**
	(21.5)	(24.0)	(24.3)	(15.9)	(16.9)	(17.3)	(13.7)	(13.9)	(13.8)	(19.2)	(19.6)	(20.7)
dividendprovision	-0.0138	0.0147	-0.0466	-0.0471	-0.0389	-0.0206	-0.0432	-0.0337	-0.00723	-0.226**	-0.216**	-0.213**
	(0.087)	(0.085)	(0.091)	(0.075)	(0.075)	(0.076)	(0.080)	(0.080)	(0.079)	(0.10)	(0.10)	(0.10)
Controls	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*		***no***	***no***	***no***
Log likelihood	-38,775	-38,811	-38,768	-38,285	-38,286	-38,271	-38,314	-38,315	-38,291	-39,790	-39,803	-39,764

Notes: Poisson estimation; 182,850 observations; *munsize* and fixed effects for 46 sectors and 5 years included but not reported; standard errors in parentheses; controls include all variables shown in Table 5 but not here; *** p<0.01, ** p<0.05, * p<0.1; standard errors clustered two-ways (by municipality-year and by municipality-sector)

Table 7: Interpretation of coefficients (Baseline results)

	Dependent variable= Number of new firms per municipality, sector and year (newfirms)										
	Baseline estimates (Table 5)			Elasticities			Semistandarized coefficients			Mean	SD
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
corptaxlevel	-15.84***	-15.63***	-16.21***	-3.351	-3.307	-3.430	-0.296	-0.292	-0.303	0.212	0.019
*corptaxprogressivity*1	1.400**			0.067			0.057			0.048	0.041
*corptaxprogressivity*2		0.219*			0.063			0.050		0.287	0.227
*corptaxprogressivity*3			12.24**			0.081			0.074	0.007	0.006
risk × *corptaxprogressivity*1	0.0515			0			0.012			0	0.228
risk × *corptaxprogressivity*2		0.0116			0			0.015		0	1.325
risk × *corptaxprogressivity*3			0.548*			0			0.018	0	0.032
corptaxbrackets	0.0154	0.0157	0.0112	0.040	0.041	0.029	0.036	0.037	0.026	2.621	2.341
corptaxwordcount	-0.124***	-0.126***	-0.109***	-0.727	-0.739	-0.639	-0.119	-0.120	-0.104	5.862	0.956
captaxlevel	-13.5	-15.14	-27.07	-0.045	-0.050	-0.090	-0.017	-0.019	-0.035	0.003	0.001
dividendprovision	-0.0328	-0.0268	-0.0127	-0.001	-0.001	0.000	-0.006	-0.005	-0.002	0.036	0.186
incometaxlevel	-10.98***	-9.781***	-10.62***	-0.989	-0.881	-0.956	-0.219	-0.195	-0.212	0.090	0.020
*incometaxprogresssivity*1	0.908			0.076			0.015			0.083	0.016
*incometaxprogresssivity*2		0.0599			0.058			0.015		0.964	0.253
*incometaxprogresssivity*3			8.784			0.073			0.016	0.008	0.002
wealthtaxlevel	39.75	33.18	43.53	0.101	0.084	0.110	0.047	0.039	0.052	0.003	0.001
inheritancetax	-0.150***	-0.151***	-0.141***	-0.059	-0.060	-0.056	-0.073	-0.074	-0.069	0.395	0.489
publicexp	0.713***	0.712***	0.776***	0.498	0.497	0.542	0.080	0.080	0.087	0.699	0.112
wage	0.104	0.0798	0.0439	0.058	0.045	0.024	0.010	0.008	0.004	0.558	0.099
propertyprice	6.125***	6.124***	6.028***	0.848	0.848	0.835	0.191	0.191	0.188	0.138	0.031
disthighway	-1.335***	-1.336***	-1.324***	-0.079	-0.079	-0.078	-0.102	-0.102	-0.101	0.059	0.077
distairport	0.0408	0.0292	0.0399	0.024	0.017	0.024	0.017	0.012	0.017	0.599	0.414
distuniversity	-0.129	-0.133	-0.098	-0.030	-0.031	-0.023	-0.021	-0.022	-0.016	0.232	0.165
latin	0.0688	0.0837	0.126	0.018	0.022	0.034	0.030	0.037	0.056	0.267	0.442
munsize	1.038***	1.039***	1.040***	1.038	1.039	1.040	0.831	0.832	0.833	8.421	0.801

Notes: Poisson estimation; 182,850 observations; fixed effects included for 46 sectors and 5 years but not reported; standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; standard errors clustered two-ways (by municipality-year and by municipality-sector); elasticities = estimated coefficient multiplied by the sample mean of the explanatory variable; semistandardized coefficients = estimated coefficient multiplied by the standard deviation of the explanatory variable; *munsize* being in logs, the estimated coefficients already represent elasticities

Protection for Sale, Mr. President?
Trade Policy Formation with Bargaining over Delegation*

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Abstract

Delegation of trade authority from the legislative to the executive has long been recognised in the political science literature as a central element in explaining policy-making in the United States and elsewhere. In the economics literature, however, delegation of trade authority has attracted much less attention. Based on a two-sector version of the Grossman-Helpman (1994) model, I introduce an Executive, to which the Legislative can delegate its trade authority. I allow the Executive to compensate the Legislative in exchange for delegation. Thus splitting Grossman and Helpman's "government" into a Legislative and an Executive branch, I find that delegation to the Executive leads to lower equilibrium protection than predicted by the Grossman-Helpman setting. In equilibrium, a decrease in the size of the organised sector (and thus in the political power of the sector's capital owners) and a decrease in the concentration of sector-specific factor ownership leads, *ceteris paribus*, to more delegation.

JEL Classification: F13, D72
Keywords: Trade Policy, Lobbying, Delegation

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1 Introduction

Delegation of trade authority from Congress to the president is a fundamental institutional feature of American trade policy. Destler (1995) argues that American trade policies in the aftermath of the Smooth-Hawley Tariff Act of 1930 have all been about diverting protectionist pressure from the Congress. According to this view, delegation was succesful both in protecting the Congress from protectionist appeals and in reducing trade barriers. The importance of delegation has long been confirmed by the political science literature (see e.g. Lohmann and O'Halloran, 1994; Epstein and O'Halloran, 1999). Yet, the political economy literature on the formation of trade policy has remarkably little to say on the impact of delegation.[1]

The related literature in economics, strongly influenced by the seminal paper of Grossman and Helpman (1994, GH henceforth), places the influence of special interest groups (SIGs) through campaign contributions at the origin of trade distortions. In these models, multiple SIGs offer the government contributions in exchange for industry-specific protection. In contrast to most of the political science literature, predictions are derived from theoretical models with microeconomic foundations. One merit of political economy models based on GH is that they provide testable predictions. However, empirical tests of the GH predictions (see e.g. Goldberg and Maggi, 1999; Gawande and Bandyopadhay, 2000; Mitra et al., 2002; and Cadot et al. 2006; for a more general review of empirical results, see Gawande and Krishna, 2003) lead to a puzzle in the sense that they predict too much trade protection. Grossman and Helpman point out that "(...) some features of the reality are missing from the models." (2002, p. 20).

In this paper I argue that one of the features missing in these models is delegation from the legislative (Congress) to the executive. Consequently, I seek to address the following questions using a political economy framework: why does the legislative delegate trade authority to the executive? Under what circumstances does delegation take place? To what extent do trade policies under delegation differ from those in a setting without delegation?

To analyse these questions, I use a version of the GH model with a single industry. Thereby, I split GH's "government" into a Legislative and an Executive, to which the Legislative can delegate its trade authority. Importantly, I allow the Executive to compensate the Legislative in exchange for delegation. At the same time, the SIG can offer compensation to the Legislative to prevent delegation. Bargaining over tariff-setting authority prior to the tariff decision provides the Legislative with a rationale for delegation. To the best of my knowledge, this type of bargaining has not yet been modelled in a theoretical

[1] Recent exceptions are Damania and Fredriksson (2004) and Song (2003).

framework of trade policy formation.

There exists ample anecdotal evidence on the White House offering deals to representatives in exchange for trade votes or for the delegation of trade authority (see for example Public Citizen, 2005a). In a press round table on NAFTA in 1993 (White House, 2003), a journalist mentioned Congressman Tom Andrews (D-ME), who criticized the way in which both labour groups (SIGs) and the Clinton administration (Executive) had gone about trying to win his support. In a question addressed to president Clinton, the journalist quoted Rep. Andrews: "I've been asked in so many ways, 'what do you need, what will it take'. We do a great disservice to this country when we make this a matter of pork barrel auctioneering, or we make it an issue of what threats we will respond to." In a report on deals for trade votes, Public Citizen (2005b) lists more than 30 deals between the White House and representatives in exchange for their support of the Trade Act 2002 (which granted the fast-track authority to president Bush) and the support of a failed attempt to grant fast-track authority to president Clinton in 1997. Among others, Public Citizen (2005b) lists the deal between president Clinton and Rep. Matthew Martinez (D-CA). In this deal, the Clinton administration promised to build a freeway ramp in Martinez' district. In another deal, president Clinton promised three representatives from Ohio and Texas to visit their home district to show his gratitude for their support. In yet another deal, president Clinton promised to issue a statement that trade is important to national security. According to Public Citizen (2005b, p. 54), president Clinton even promised Rep. Howard Coble (R-NC) to "reinstate a tax break that allows homeowners to rent their primary residence tax free for the first fortnight, a measure geared to benefit homeowners in Coble's district who rent out their homes for an annual furniture show." Further evidence of deal-making between presidents and representatives is given in Kollman (1998) and in an article published in the Washington Post (December 26, 1993) and reprinted in the Congressional Record (Senate).[2]

Similar to the US, delegation of trade authority is an important issue within the European Union. Meunier and Nicolaïdis (1999) argue that starting from the 1990s, negotiations have been ongoing between member states (acting collectively through the Council of Ministers) and the European Commission over the scope of delegated trade competence. Bargaining over the Commission's trade authority concerns both its powers with respect to specific international negotiations (e.g. the extent of its mandate in the Uruguay Round) and its general powers as circumscribed by the treaties of the EU. Landau (1998, p. 456) argues that during these internal negotiations the Commission managed to increase its competencies by structuring packages "made up of many issues so that each member state

[2] Congressional Record - Senate, May 23, 2002, S4751

can sell the agreement to its constituents". However, the "confidentiality surrounding treaty reform negotiations" (Christiansen and Jorgensen, 1998, p. 445) makes it hard to find (anecdotal) evidence of specific deals between the Commission and member states in exchange for trade authority.

Assuming that the Executive is by the nature of its (nationwide) political constituency less protectionist than the Legislative, I find that delegation to the Executive leads to lower equilibrium protection than predicted by a standard GH setting with no option to delegate. In equilibrium, a decrease in an industry's output (and thus in the political power of the industry's specific factor owners) and a decrease in the concentration of specific factor ownership leads, *ceteris paribus*, to more delegation. The option to delegate also leads to an increase in the bargaining power of the Legislative at the expense of the SIG.

The remainder of this paper is structured as follows: In Section 2 I review the relevant literature. Section 3 presents a political contribution model with delegation based on a simplified GH model. Section 4 presents the results of a comparative statics analysis and Section 5 concludes.

2 Literature review

Delegation of authority is puzzling at a first view: why should an agent voluntarily cede his authortiy to a third party and thereby forgo possible benefits that come with it (e.g. contributions from SIGs)? By taking into account the willingness of the Executive to pay in exchange for tariff-setting authority, my model offers two rationales for delegation.

First, the Legislative delegates because it gets compensated for doing so by the Executive. This feature of the model differs from the existing literature, in which delegation serves to reduce the Legislative's transaction costs of policy-making or its workload (e.g. Epstein and O'Halloran, 1999 and De Bièvre and Dür, 2005), or where delegation is an instrument to overcome a time-consistency problem.

Second, delegation diverts protectionist pressure from the Legislative and leads to lower equilibrium protection, which is social welfare increasing. This aspect of delegation has been pointed out by political scientists such as, e.g., Destler. Destler (1995) argues that American trade policies in the aftermath of the devastating effects of the Smooth-Hawley Tariff Act of 1930 have all been about diverting protectionist pressure from the Congress. Starting with the Reciprocal Trade Agreement Act (RTAA) of 1934, "(...) Congress legislated itself out of [the] business of making product-specific trade law" (Destler, (1995), p. 13) by developing complex institutional mechanisms which delegated much of its power to

the president.[3] According to this view, the president, who has a national constituency, is less susceptible to SIG pressure and thus less willing to offer industry-specific protection. The institutional mechanisms developed relied both on formal delegation of authority to the executive (i.e. delegation based on acts) and informal delegation of authority to House and Senate committees and quasi-executive bodies, such as the U.S. Trade Representative (USTR). From the mid 1930s to the 1970s, this system proved to be successful in "protecting the Congress from protectionist appeals, pressing at the same time trading partners to open markets and offering some relief to industries hit hard by imports" (Destler, 1995, p. ix). Destler argues that even though in the 1970s the informal part of the system began to erode, elements of delegation remained, for example the fast-track authority, also known as presidential trade promotion authority.

Destler's view is part of a larger body of literature in political science. According to this literature, power delegation from Congress to the executive is a central element in explaining policy outcomes in trade as well as in other policy areas. Lohmann and O'Halloran (1994) were among the first to formalise this idea by developing a theoretical model of delegation of trade authority to the president. Their work has been extended in a comprehensive study on American congressional delegation by Epstein and O'Halloran (1999). Epstein and O'Halloran model the decision to delegate using a principal-agent approach that incorporates transaction costs of policy-making. Their argument is about the efficiency of the policy-making process which may be higher when decision-making is delegated to the executive or a specialised agency (e.g. the USTR) since they have, e.g., lower coordination costs or are better informed. At the same time, delegation can be costly to politicians, especially in areas where they can expect important campaign contributions from SIGs or where the executive's political preferences or motivations diverge from their own ones. Consequently, Congress delegates only in "areas where the political advantages of doing so outweigh the costs." (Epstein and O'Halloran, 1999, p. 232). Importantly, in their model, neither the "political advantages" nor the "costs" are influenced by the executive or special interests but rather by legislative organisation, parliamentary procedures or the informational intensity of the issue.[4] Common to these models and to more recent political science contributions on the delegation of trade authority (see e.g.

[3] The article I of the U.S. Constitution grants the Congress the sole power "to regulate commerce with foreign nations" and gives it the authority "to lay and collect ... duties".

[4] By charachterising legislative organisation, parliamentary procedures or the informational intensity of the issue as possible explanations of delegation, Epstein and O'Halloran (1999) offer a rationale for delegation of (trade) authority alternative to the one of Destler (1995). Among the legislative organisational features that influence the decision to delegate, they characterise committee composition, political preferences of committees relative to the median floor voter or heterogeneity of intraparty preferences. With respect to parliamentary procedures, their model predicts that multiple referral of bills or restrictive amendment rules affect the decision to delegate.

Sherman, 2002; Ehrlich, 2008) is the lack of a microeconomically founded theory and the explicit modelling of SIGs' (and the excutive's) lobbying over trade policy.

In the theoretical literature on the political economy of trade policy, the influence of different domestic institutional settings have not yet been afforded comparable attention.[5] A recent exceptions is Damania and Fredriksson (2004). Based on GH and Prat and Rustichini (2003), they develop a multi-principal-multi-agent model with, in addition, a random number of veto players which can be interpreted as the president, executive committees etc. They find that an increase in the number of veto players reduces sector-specific protection. Song (2003) uses the GH framework to introduce a welfare maximising executive player with agenda-setting authority. SIGs can then try to influence the Legislative's decision whether to ratify the Executive's trade policy proposition or not. Both models exclude the possibility that the Executive can lobby the Legislative for the delegation of trade authority.

Delegation - more precisely *strategic delegation* - has been a topic of extensive research in other fields of economics. In the industrial organisation literature, strategic delegation has been used in various settings. Reasons for delegation include mitigating conflicting interests in a principal-agent setting, raising the incentives of the agent or to extract some information about its type. In the political economy literature, strategic delegation has also been widely used in the context of central banking (starting with Rogoff, 1985) and taxation (e.g. Persson and Tabellini, 1994). Delegation can serve as means to overcome time inconsistency problems, to make credible commitments in situations where no binding contracts exist, or to address free-rider problems (see e.g. Chari et al., 2004). In a recent contribution, Willmann (2003) introduces majority voting in the GH setting to show that strategic delegation leads each district to elect a representative who is more protectionist than the median voter. Grossman and Helpman (2007) analyse a model of budget formation featuring separation of power. In their model, the legislative can delegate the public spending decision to the better informed executive serving a constituency which differs from the legislative's both in terms of its breadth and overlap. They show that the degree of authority delegated and the type of resulting budget bill depends on the relative size of the different constituencies the executive and legislative serve respectively. Common to all of these models is that delegation is exogenous or unilaterally attributed to an agency without prior bargaining over the decision to delegate or not.

[5] In contrast, the impact of international institutions on domestic trade policy outcomes has attracted more attention (see e.g. Maggi and Rodríguez-Clare (1998) on the value of free trade agreements).

3 A simple political contribution model with delegation

3.1 The benchmark model

As a benchmark for the model developed in Section 3.2, I use a simplified version of the GH model.[6]

In GH, the equilibrium tariff of a specific industry depends only on characteristics of this industry. For the purpose of this paper, it is therefore possible to abstract from the well understood influence of multi-sectoral pressure. Therefore, I concentrate on a two-factors-two-goods case with good 0 being the numeraire good. Good 0 is manufactured from labour alone with constant returns to scale and an input-ouput coefficient of 1. It is freely traded and has a world and domestic price equal to 1.

The model focuses on a competitive industry in a small, open economy. In such an economy, social welfare $W(p)$ is maximised when the domestic price equals the world price for a specific good. Consequently, free trade is the optimal policy and any government policy resulting in a departure from free trade introduces an inefficiency.

The economy is populated by individuals with identical quasi-linear preferences but different factor endowments.[7] While labour is uniformly distributed, only a fraction $\alpha \leq 1$ of the population owns capital.

The industry uses both, labour and capital to produce the nonnumeraire good 1. Labour is available in perfectly elastic supply at a fixed wage rate w. Capital is industry-specific and available in fixed supply. The capital owners form an organised interest group (SIG). The goal of the SIG is to maximise the total welfare of its members.

Let p^* be the world price of industry's output. The incumbent policymaker, the Legislative, may decide to levy an ad valorem tariff t. This tariff changes the domestic price to $p = p^*[1+t]$.[8] Tariff revenues are redistributed uniformly to the population. Given the elastic labour supply, the marginal value of labour equals the wage rate. Thus, industry "profits" correspond to the return on capital, and will be denoted $\pi(p)$.

The objective of the SIG is to maximise:[9]

$$U^{SIG}(p, C(p)) = W^{SIG}(p) - C(p),$$

where $W^{SIG}(p)$ is the gross-of-contributions joint welfare of the SIG members. I assume

[6] This part consists of components of GH94 and of Grossman and Helpman (2001). Only particular citations will be acknowledged separately. For notational ease some of the variables have been redefined.

[7] Individuals' utility function is given by: $U(x_0, x_1) = x_0 + u(x_1)$ where x_0 is consumption of good 0 and x_1 is consumption of good 1.

[8] In what follows, parantheses (.) are used for functions, whereas square brackets [.] are used for mathematical operations.

[9] In what follows, a superscript "*SIG*" stands for SIG, a superscript "*L*" for Legislative.

that:

$$\frac{\partial W^{SIG}(p)}{\partial p} > 0 \text{ and } \frac{\partial^2 W^{SIG}(p)}{\partial p^2} < 0$$

$C(p)$ represents the size of the contribution, assuming $C(p)$ to be feasible (i.e. $C(p) \geq 0$ and $C(p) \leq W^{SIG}(p)$). Specifically, $W^{SIG}(p)$ equals:

$$W^{SIG}(p) = l^{SIG} + \pi(p) + \alpha\left[S(p) + r(p)\right],$$

where l^{SIG} is total labour supply (and income) of the capital owners, $\pi(p)$ are industry profits and $\alpha\left[S(p) + r(p)\right]$ is the SIG's share of consumer surplus $S(p)$ and tariff revenue $r(p) = (p - p^*)\, m(p)$, collected on $m(p) = (c(p) - y(p))$ units of imports (where c is consumption of the good and y is domestic output).[10] Throughout the model, I assume that, in equilibrium, the country is a net importer. This implies that consumption and domestic output are such that the equilibrium autarky price is above p^*. The analysis and the results also hold it the country is a net exporter. In this case, the equilibrium trade policy is an ad valorem export subsidy.

To maximise its welfare, the SIG offers the Legislative a truthful contribution schedule.[11] A contribution schedule is a function that maps every possible tariff (and thus price) that the Legislative might choose into a contribution level. In other words, the SIG announces the Legislative a menu, which states for every tariff it sets the corresponding contribution it will receive.[12]

Then, the Legislative chooses the tariff, which maximises a weighted average of social welfare $W(p)$ and the contribution put forward by the SIG. The objective function of the Legislative has the following form:

$$U^L(p, C(p)) = a^L W(p) + C(p),$$

where a^L is the weight the Legislative puts on social welfare.

Social welfare is given by

$$W(p) = l + \pi(p) + S(p) + r(p).$$

The political equilibrium with campaign contributions must be jointly efficient for the

[10] The demand function $x_1 = c(p)$ is the inverse of $u'(x_1)$.

[11] Grossman and Helpman (2001) use the term "truthful" based on the notion of "truthfulness" defined in Bernheim and Whinston (1986).

[12] Bernheim and Whinston (1986) refer to this situation as a "menu auction".

policymaker and the SIG. Therefore the SIG maximises

$$U^{SIG}\left(p, C\left(p\right)\right) = W^{SIG}(p) - C\left(p\right), \tag{1}$$

subject to

$$U^{L}\left(p, C\left(p\right)\right) \geq \bar{U}^{L}, \tag{2}$$

where $\bar{U}^{L} = U^{L}\left(p^{*}, 0\right)$ is constant. The maximisation problem defined by (1) and (2) is equivalent to maximising

$$a^{L}W\left(p\right) + W^{SIG}(p) \tag{3}$$

with respect to p.[13] The resulting first order condition implies:[14]

$$a^{L}m'\left(p\right)\left[p - p^{*}\right] + y\left(p\right) + \alpha\left[y\left(p\right) + m'\left(p\right)\left[p - p^{*}\right]\right] = 0. \tag{4}$$

Equation (4) pins down the equilibrium price set by the Legislative, p^{L}:

$$p^{L} = p^{*} - \frac{\left[1-\alpha\right] y\left(p^{L}\right)}{\left[a^{L}+\alpha\right] m'\left(p^{L}\right)} > p^{*}, \tag{5}$$

where $m'\left(p^{L}\right) = \frac{dc}{dp} - \frac{dy}{dp}\Big|_{p=p^{L}} < 0$.

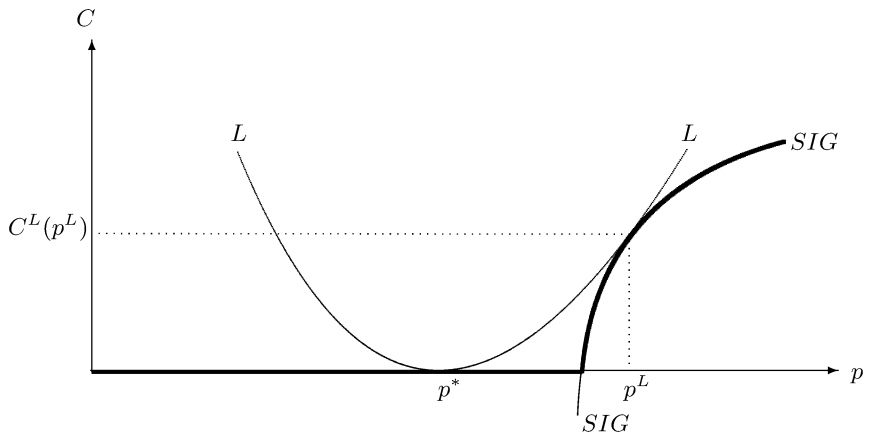

Figure 1: Truthful contribution schedule

Figure 1 illustrates the maximisation problem. For a given indifference curve of the Legislative (LL), the SIG will offer a contribution schedule that allows it to reach the highest possible utility level. The solution to the maximisation problem described by (3)

[13] $U^{SIG} = W^{SIG}(p) - C\left(p\right)$ is maximised when the SIG puts the Legislative on its participation constraint. It follows that: $C\left(p\right) = a^{L}\left[W\left(p^{*}\right) - W\left(p\right)\right]$. The maximisation problem can then be rewritten as: $\max_{p} \; a^{L}W\left(p\right) + W^{SIG}(p)$.

[14] The first order condition is based on the fact that $\frac{\partial \pi}{\partial p}$ gives the output (y) and that $\frac{\partial S}{\partial p}$ is equal to minus consumption ($-c$) (by Hotelling's Lemma).

corresponds to $\left(p^L, C^L\left(p^L\right)\right)$ in Figure 1. This price-contribution pair leaves the Legislative just indifferent compared to free trade $(p^*, 0)$. The SIG, however, gains from this deal. Indeed, its indifference curve $SIGSIG$ passing through $\left(p^L, C^L\left(p^L\right)\right)$ corresponds to a higher utility level than the one that would pass through $(p^*, 0)$.[15] There are many different contribution schedules that would allow the SIG to achieve $\left(p^L, C^L\left(p^L\right)\right)$. However, it is common to concentrate on the truthful (or compensating) contribution schedule. "A compensating contribution schedule is one that coincides with the group's indifference curve whenever the latter involves non-negative contributions, and coincides with the horizontal axis elsewhere. It is compensating in the sense that it (...) offers the compensating variation relative to some reference level of utility" (Grossman and Helpman, 2001, p. 232). The bold segment of the graph in Figure 1 shows this truthful (or compensating) contribution schedule, $C^L(p)$.[16]

Some simple manipulations of equation (5) yield the following equilibrium policy:

$$\frac{t^L}{1+t^L} = \frac{1-\alpha}{a^L+\alpha}\left[\frac{z^L}{e^L}\right], \tag{6}$$

where $z^L = \frac{y\left(p^L\right)}{m\left(p^L\right)}$ is the equilibrium ratio of domestic output to imports and $e^L = -\frac{m'\left(p^L\right)p^L}{m\left(p^L\right)}$is the elasticity of import demand or of export supply (the former defined to be positive, the latter negative).

As in GH, SIG pressure in the benchmark model will lead *ceteris paribus* to higher tariffs, if (i) the industry has a smaller import demand (or export supply) elasticity, (ii) political power, reflected by the ratio of domestic output to imports, is high, (iii) the weight the policymaker places on social welfare is low and (iv) the fraction of the population organised in a SIG is small.

A small import demand elasticity means a smaller deadweight loss from imposing a tariff, and thus an increased willingness of the Legislative to respond to SIG's demands. The political power of the SIG, reflected by the ratio of domestic output to imports, has a positive influence on the tariff level. If the industry has a large domestic output, "the specific-factor owners have much to gain from an increase in the domestic price, while (for a given import demand elasticity) the economy has relatively little to lose from protection when the volume of imports is low" (GH, p. 842). Furthermore, if industry specific factor

[15] Lower indifference curves of the SIG (with smaller contributions for a given price) correspond to higher levels of utility. The inverse is true for the indifference curves of the Legislative.

[16] $C^L(p)$ stands for the truthful contribution schedule, offered in equilibrium. $C^L\left(p^L\right)$ stands for the equilibrium contribution. Note that the equilibrium contribution $C^L\left(p^L\right)$ leaves the Legislative indifferent between the status quo and the new price p^L. The SIG can induce the Legislative to introduce the new tariff "by offering a tiny bit more than what is indicated in the figure" (Grossman and Helpman, 2001, p. 230).

ownership is concentrated (small value for α), the SIG members are few to share the benefits from higher tariffs and at the same time their share of the deadweight loss is small. Consequently the SIG is willing to contribute for more protection from imports than if it represented a large part of the population.

3.2 Extending the benchmark model: contributions and delegation

I extend the benchmark model of Section 3.1 in three main ways:

First, next to the SIG and the Legislative, I introduce a third player, the Executive.[17] Similar to the Legislative, the Executive also cares about social welfare, $W(p)$, and contributions from the SIG, $C(p)$. However, the weight the Executive places on social welfare, a^E, is different from that of the Legislative, a^L.

Second, I introduce a preliminary stage. At this first stage of the game, the Legislative decides whether to delegate its tariff-setting authority or not. If it does delegate, the players of the second stage are the Executive and the SIG. The second stage then corresponds to the menu auction of the benchmark model with the Executive having replaced the Legislative. If the Legislative does not delegate its authority, the second stage corresponds exactly to the benchmark model and the tariff is set through a menu auction between the Legislative and the SIG.

Finally, as another new element, I allow the Legislative to "sell" the decision whether to delegate or not at the first stage. In other words, both the Executive and the SIG can try to influence the Legislative's decision by offering compensation.

In what follows, I formally describe the players, their actions and payoffs, their equilibrium strategies and the equilibrium outcomes.

3.2.1 Players and their utilities

The players and their utilities are:

	Utility
Legislative	$U^L = a^L W(p) + C(p)$
Executive	$U^E = a^E W(p) + C(p)$
SIG	$U^{SIG} = W^{SIG}(p) - C(p)$

Both the Legislative and the Executive value social welfare, $W(p)$, and contribution from SIG, $C(p)$. However, only one of them will receive a positive contribution from the

[17] In what follow, "E" stands for the Executive.

SIG: the Legislative under *No Delegation* and the Executive under *Delegation*. In other words, contributions are zero-sum.

I assume that the Executive is less protectionist than the Legislative such that $a^E > a^L$.[18] Already Schattschneider (1935) noticed that benefits from protection are often (locally or sectorally) concentrated, whereas its costs are dispersed. Baldwin (1985), Destler (1995), Lohmann and O'Halloran (1994) and others have argued that presidents, who have a national constituency, are less susceptible to political particularism and are, on average, less protectionist than Congress.[19]

From (5) it is apparent to see that the equilibrium price under *Delegation* is lower if the Executive has a stronger standing for free trade than the Legislative ($a^E > a^L$). In the extreme case, where the weight on social welfare becomes very high ($a^E \to \infty$), the Executive will choose $p^E = p^*$.

From the definition of U^E it follows that the marginal rate of substitution between p and $C(p)$ increases in a^E. Graphically, in the $(p, C(p))$ space, this translats into a steeper indifference curve of the Executive (EE) compared to that of the Legislative (LL) for all $p \neq p^*$, as shown in Figure 2. As a consequence, the equilibrium outcome under *Delegation*, $\left(p^E, C^E\left(p^E\right)\right)$, corresponds to a lower utility for the SIG (represented by the indifference curve $SIG'SIG'$ in Figure 2), than under *No Delegation* $\left(p^L, C^L\left(p^L\right)\right)$. More formally:

Proposition 1 *For $a^E > a^L$, if Delegation, then $p^E < p^L$.*

Proof. From (5) if follows that $\frac{\partial p}{\partial a} < 0$. ■

Proposition 2 *For $a^E > a^L$, if $C^E(p) > 0$, then the utility of the SIG in equilibrium is highest under No Delegation and lowest in the status quo case:*

$$U^{SIG}\left(p^L, C^L\left(p^L\right)\right) > U^{SIG}\left(p^E, C^E\left(p^E\right)\right) > U^{SIG}\left(p^*, 0\right).$$

Proof. *See Appendix A.* ■

Corollary 1 *$C^L\left(p^L\right) > 0$ and $C^E\left(p^E\right) > 0$*

Proof. Follows from Proposition 2. ■

In Figure 2, the equilibrium contribution under *Delegation*, $C^E\left(p^E\right)$, is higher than the equilibrium contribution under *No Delegation*, $C^L\left(p^L\right)$. This is not a general result.

[18] I analyse the case where the Executive is more protectionist than the Legislative (such that $a^E < a^L$) in Appendix B.

[19] See, e.g., Karol (2000) for an overview of the "presidential liberalism" literature.

Since $W(p)$ and, consequently, $C(p)$ are not explicit functions, it is not possible to derive explicit conditions for $C^E\left(p^E\right) > C^L\left(p^L\right)$.

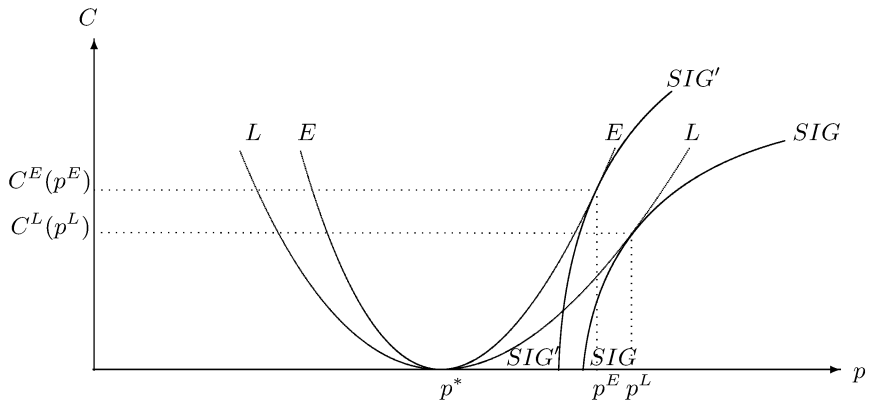

Figure 2: Indifference curves of the Legislative (LL), the Executive (EE) and the SIG ($SIGSIG$ and $SIG'SIG'$)

3.2.2 Stages of the game and actions of the players

First stage

At the first stage of the game, the Legislative can delegate its tariff-setting authority to the Executive. In contrast to the benchmark model, the Legislative is the first mover and therefore has all the bargaining power. Hence, it can "sell" its decision to delegate or not. As in GH, I assume complete information. Therefore, the Legislative knows the valuations of the Executive and the SIG and is able to make a take-it-or-leave-it offer to the bidder with the highest valuation. If the Executive gains more from *Delegation* than the SIG loses from it, then the Legislative will make the following offer to the Executive: "The price for *Delegation* is what you gain from it: $\Delta U^E = U^E(\textit{Delegation}) - U^E(\textit{No Delegation})$." Conversely, if the SIG looses more from *Delegation* than the Executive gains from it, the Legislative's offer to the SIG at the first stage will be: "The price for *No Delegation* is what you gain from it: $\Delta U^{SIG} = U^{SIG}(\textit{No Delegation}) - U^{SIG}(\textit{Delegation})$".

The corresponding action sets of the players at the first stage are:

	Set of actions (first stage)
Legislative	$\{\textit{Delegation},\ \textit{No Delegation}\}$
Executive	$B^E \in \left[0, \Delta U^E\right]$
SIG	$B^{SIG} \in \left[0, \Delta U^{SIG}\right]$

where B^E and B^{SIG} are the compensations offered to the Legislative by the Executive and the SIG at the first stage.

Second stage

At the second stage of the model, the benchmark model will be played between either the Executive and the SIG (if *Delegation*) or the Legislative and the SIG (if *No Delegation*).

The corresponding action sets of the players at the second stage are:

	Set of actions (second stage)
Legislative	set p to maximise $a^L W(p) + C^L(p)$ if *No Delegation*
Executive	set p to maximise $a^E W(p) + C^E(p)$ if *Delegation*
SIG	offer $C^E(p)$ to maximise $W^{SIG}(p) - C(p)$ if *Delegation*
	offer $C^L(p)$ to maximise $W^{SIG}(p) - C(p)$ if *No Delegation*

Figure 3 illustrates the sequence of the game and the actions of each player. E, L and SIG stand for Executive, Legislative and SIG, respectively; a circle stands for a decision node and p^E and p^L are the equilibrium prices under *Delegation* and *No Delegation*, respectively.

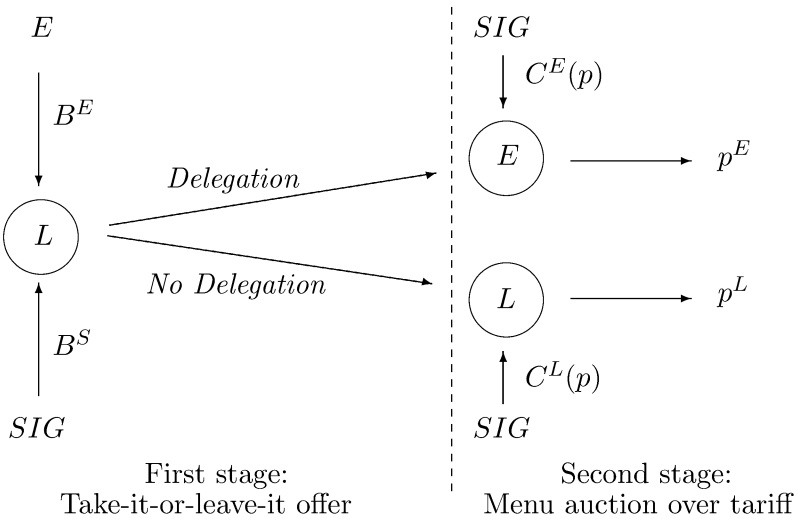

Figure 3: Sequence of the game and actions of the players

3.2.3 Payoffs

Since the game is solved through backward induction, I first describe the payoffs of the second stage, depending on the outcome of the first stage.

Second stage: menu auction

A. Under *Delegation*

If the Legislative decides to delegate its trade authority to the Executive at the first stage, the corresponding interim payoffs at the second stage are:

	Under *Delegation*
Legislative	$a^L W\left(p^E\right)$
Executive	$a^E W\left(p^E\right) + C^E\left(p^E\right)$
SIG	$W^{SIG}\left(p^E\right) - C^E\left(p^E\right)$

By analogy to the benchmark case, the SIG chooses the contribution schedule $C^E(p)$ that places the Executive on its participation constraint:

$$\begin{aligned} U^E\left(Delegation\right) &= a^E W\left(p^E\right) + C^E\left(p^E\right) \\ &= a^E W\left(p^*\right) \end{aligned}$$

B. Under *No Delegation*

If the Legislative decides not to delegate its trade authority at the first stage, the corresponding payoffs at the second stage are:

	Under *No Delegation*
Legislative	$a^L W\left(p^L\right) + C^L\left(p^L\right)$
Executive	$a^E W\left(p^L\right)$
SIG	$W^{SIG}\left(p^L\right) - C^L\left(p^L\right)$

By analogy to the benchmark case, the SIG chooses the contribution schedule $C^L(p)$ that places the Legislative on its participation constraint:

$$\begin{aligned} U^L\left(No\ Delegation\right) &= a^L W\left(p^L\right) + C^L\left(p^L\right) \\ &= a^L W\left(p^*\right) \end{aligned}$$

First stage: take-it-or-leave-it offer from the Legislative

A. Under *Delegation*

The payoffs of the second stage define the compensations the Executive and the SIG are willing to pay at the first stage of the game. The price of *Delegation* for the Executive

equals the difference in its utility under *Delegation* and *No Delegation*:

$$\begin{aligned} B^E &= \Delta U^E \\ &= U^E\left(Delegation\right) - U^E\left(No\ Delegation\right) \\ &= \left[a^E W\left(p^E\right) + C^E\left(p^E\right)\right] - a^E W\left(p^L\right) \\ &= a^E\left[W\left(p^*\right) - W\left(p^L\right)\right] \qquad (7) \\ &> 0. \end{aligned}$$

$\Delta U^E > 0$ follows from (5) where $p^L > p^*$.

B. Under *No Delegation*

By analogy, the price of *No Delegation* for the SIG equals the difference in its utility under *No Delegation* and *Delegation*:

$$\begin{aligned} B^{SIG} &= \Delta U^{SIG} \\ &= U^{SIG}\left(No\ Delegation\right) - U^{SIG}\left(Delegation\right) \\ &= W^{SIG}\left(p^L\right) - C^L\left(p^L\right) - \left[W^{SIG}\left(p^E\right) - C^E\left(p^E\right)\right] \qquad (8) \\ &> 0 \end{aligned}$$

(7) and (8) determine the interim payoffs of the Legislative, the Executive and the SIG at the first stage of the game. Under *Delegation*, the Legislative receives ΔU^E from the Executive (the SIG pays nothing); under *No Delegation*, the Legislative receives ΔU^{SIG} from the SIG (the Executive pays nothing).

Next, I derive the solutions of the game. I shall continue to concentrate on the case where the Executive has a stronger standing towards free trade than the Legislative ($a^E > a^L$). The solution for the case where the Executive is more protectionist than the Legislative ($a^E < a^L$) is given in Appendix B.

3.2.4 Solution of the game: conditions for *Delegation* with a pro-free trade Executive ($a^E > a^L$)

For *Delegation* to happen, it must be that the Legislative's maximum payoff under *Delegation* be at least as high as its maximum payoff under *No Delegation*. Formally :

$$U^L\left(Delegation\right) + \Delta U^E \geq U^L\left(No\ Delegation\right) + \Delta U^{SIG}$$

Proposition 3 *For $a^E > a^L$, $\frac{W^{SIG}(p^L) - W^{SIG}(p^E)}{W(p^E) - W(p^L)} \leq a^E + a^L$ is a necessary and sufficient condition for a unique subgame perfect Nash equilibrium with Delegation. The equilibrium*

strategies are:

$$\begin{array}{ll} \textit{Legislative} & \{\textit{Delegation}\} \\ \textit{Executive} & \left\{\Delta U^E, \arg\max_p \; a^E W(p) + C^E(p)\right\} \\ \textit{SIG} & \left\{0, \arg\max_{C(.)} \; W^{SIG}(p) - C(p)\right\} \end{array}$$

Proof. *Existence*: Since it is a finite game of perfect information, existence of a subgame perfect Nash equilibrium follows from Kuhn's Theorem (1953).
Uniqueness: Since no player has the same payoffs at any two terminal nodes, the optimal actions must be unique at every stage of the game. Then, backwards induction identifies a unique subgame perfect equilibrium.
Sufficient condition: Suppose $\frac{\left[W^{SIG}\left(p^L\right)-W^{SIG}\left(p^E\right)\right]}{\left[W(p^E)-W(p^L)\right]} \leq a^L + a^E$. Then:

$$\begin{array}{rcl} \dfrac{\left[W^{SIG}\left(p^L\right) - W^{SIG}\left(p^E\right)\right]}{\left[W\left(p^E\right) - W\left(p^L\right)\right]} & \leq & a^L + a^E \\ & \Leftrightarrow & \\ a^E\left[W\left(p^*\right) - W\left(p^L\right)\right] & \geq & a^L\left[W\left(p^*\right) - W\left(p^E\right)\right] + W^{SIG}\left(p^L\right) \\ & & -C^L\left(p^L\right) - \left[W^{SIG}\left(p^E\right) - C^E\left(p^E\right)\right] \\ & \Leftrightarrow & \\ a^L W\left(p^E\right) + a^E\left[W\left(p^*\right) - W\left(p^L\right)\right] & \geq & a^L W\left(p^*\right) + W^{SIG}\left(p^L\right) - C^L\left(p^L\right) \\ & & -\left[W^{SIG}\left(p^E\right) - C^E\left(p^E\right)\right] \\ & \Leftrightarrow & \\ U^L\left(\textit{Delegation}\right) + \Delta U^E & \geq & U^L\left(\textit{No Delegation}\right) + \Delta U^{SIG} \end{array}$$

Therefore, if $\frac{\left[W^{SIG}\left(p^L\right)-W^{SIG}\left(p^E\right)\right]}{\left[W(p^E)-W(p^L)\right]} \leq a^L + a^E$, then *Delegation*.
Necessary condition: Proof by contrapositive: Suppose $\frac{\left[W^{SIG}\left(p^L\right)-W^{SIG}\left(p^E\right)\right]}{\left[W(p^E)-W(p^L)\right]} > a^L + a^E$. Then, by analogy:

$$U^L\left(\textit{Delegation}\right) + \Delta U^E < U^L\left(\textit{No Delegation}\right) + \Delta U^{SIG}$$

Therefore, if *Delegation*, then $\frac{\left[W^{SIG}\left(p^L\right)-W^{SIG}\left(p^E\right)\right]}{\left[W(p^E)-W(p^L)\right]} \leq a^L + a^E$. ■

Figure 4 shows the range of $\frac{\left[W^{SIG}\left(p^L\right)-W^{SIG}\left(p^E\right)\right]}{\left[W(p^E)-W(p^L)\right]}$ for which there is *Delegation* in equilibrium.

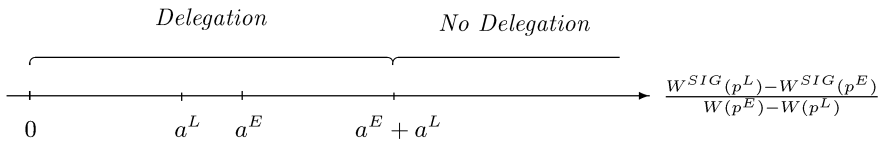

Figure 4: Range of $\frac{W^{SIG}(p^L)-W^{SIG}(p^E)}{W(p^E)-W(p^L)}$ for a SPNE with *Delegation*

Proposition 4 states that for $a^E > a^L$, a sufficient and necessary condition for *Delegation* is that the SIG's welfare gain from *No Delegation* ($W^{SIG}\left(p^L\right) - W^{SIG}\left(p^E\right)$) relative to the social welfare gain from *Delegation* ($W\left(p^E\right) - W\left(p^L\right)$) is smaller than the combined weight the Legislative and the Executive places on social welfare ($a^L + a^E$).

This result is intuitive: if the SIG has much to loose from *Delegation* and thus much to gain from *No Delegation* (compared to the society's gains from *Delegation*), it is willing to pay a high price at the first stage to prevent the Legislative from delegating its tariff-setting authority to the Executive.

By analogy to (1) - (5), it follows that the equilibrium contribution and price equal:

$$\left\{C^E\left(p^E\right), p^E = p^* - \frac{\left[1-\alpha\right] y\left(p^E\right)}{\left[a^E+\alpha\right] m'\left(p^E\right)}\right\}$$

4 Comparative statics

In this part I analyse how the condition for *Delegation* is affected in equilibrium by a change in demand, supply or the size of the SIG in the case of a pro-free trade Executive ($a^E > a^L$).

Suppose

$$\frac{W^{SIG}\left(p^L\right) - W^{SIG}\left(p^E\right)}{W\left(p^E\right) - W\left(p^L\right)} = a^E + a^L$$

In this case the Legislative is just indifferent between *Delegation* and *No Delegation*. Furthermore, suppose (for analytical ease) linear demand and supply schedules. Let $\Delta\pi = \pi\left(p^E\right) - \pi\left(p^L\right) < 0$, $b = S\left(p\right) + r\left(p\right)$, $\Delta b = S\left(p^E\right) + r\left(p^E\right) - \left[S\left(p^L\right) + r\left(p^L\right)\right] > 0$. $\Delta\pi$ is the reduction in producer surplus if the equilibrium outcome at first stage is *Delegation* instead of *No Delegation*. b is the sum of consumer surplus and tariff revenues. Consequently, Δb corresponds to the change in consumer surplus and tariff revenues if the Legislative chooses *Delegation* instead of *No Delegation* and $\Delta\pi + \Delta b$ corresponds to the change in social welfare if it chooses *Delegation* instead of *No Delegation*. Furthermore,

let:

$$R \equiv \frac{W^{SIG}\left(p^L\right) - W^{SIG}\left(p^E\right)}{W\left(p^E\right) - W\left(p^L\right)} = \frac{-\left[\Delta\pi + \alpha\Delta b\right]}{\Delta\pi + \Delta b}.$$

4.1 A shift (increase) in the demand schedule

The small open economy hypothesis implies, that a small change in domestic demand does not affect the equilibrium price of good 1. If the country is a net importer and demand increases, imports of good 1 increase without affecting the equilibrium output of domestic producers. Consequently, a small change in demand has no impact on producer surplus:

$$\left.\frac{\partial\Delta\pi}{\partial c}\right|_{p^L,p^E} = 0$$

Figure 5 shows this graphically: Under $c(p)$, the change in producer surplus ($\Delta\pi$) corresponds to the area $-a$ if the equilibrium outcome is *Delegation* (and the corresponding equilibrium price p^E) instead of *No Delegation* (p^L). The change in total welfare $\Delta\pi + \Delta b$ corresponds to $(b+c)+(d+e)$. An increase in demand from $c(p)$ to $c(p)'$ has no effect on the change in producer surplus ($-a$) and total welfare $(b+c)+(d+e)$, since it follows from the linearity of demand schedule that $(d+e) = (f+g)$. Hence,

$$\left.\frac{\partial\left[\Delta\pi + \Delta b\right]}{\partial c}\right|_{p^L,p^E} = 0.$$

It follows that

$$\left.\frac{\partial\Delta b}{\partial c}\right|_{p^L,p^E} = 0 \text{ and } \left.\frac{\partial\left[\Delta\pi + \alpha\Delta b\right]}{\partial c}\right|_{p^L,p^E} = 0$$

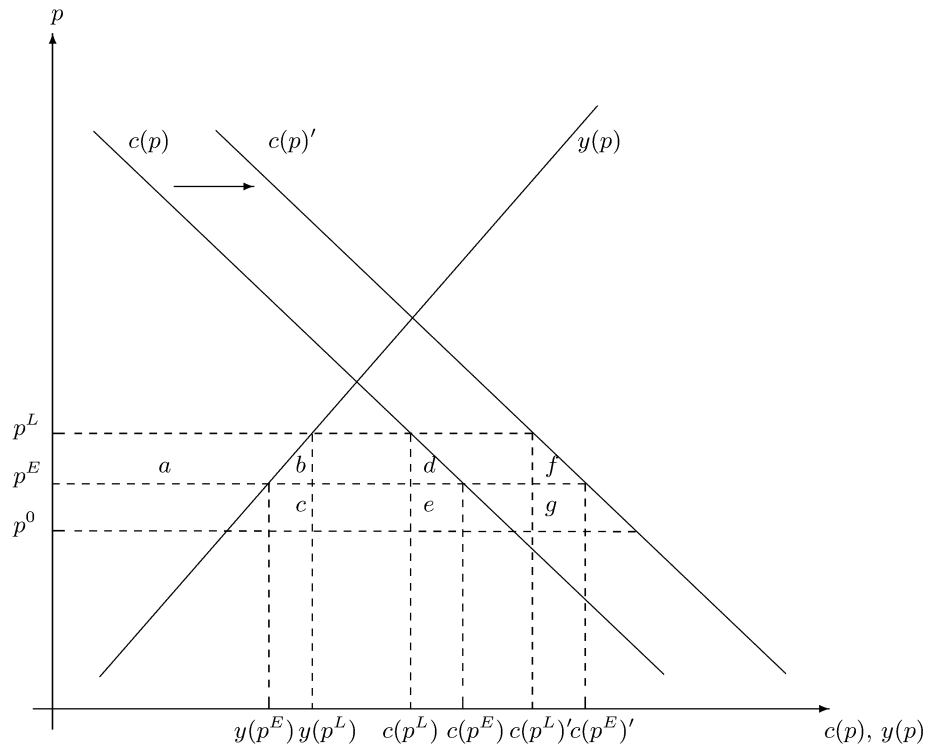

Figure 5: Equilibrium effect of an increase in demand

Then,

$$\left.\frac{\partial R}{\partial c}\right|_{p^L,p^E} = 0.$$

In equilibrium, a small change in demand has no effect on whether the Legislative delegates its trade authority or not. The intuition is straightforward: since the country is a net importer of the good consumed, a change in demand has no effect on producer surplus and thus no effect on the change in producer surplus if the Legislative chooses *Delegation* instead of *No Delegation*. Furthermore, the magnitude of the difference in consumer surplus and tariff revenues if the Legislative chooses *Delegation* instead of *No Delegation* is unaffected by a shift in a linear demand schedule. Thus, the indirect utility and, as a consequence, the equilibrium strategies of neither the Legislative, the Executive nor the SIG are affected by a small increase in demand.

4.2 A shift (decrease) in the supply schedule

By contrast, a change in the supply affects the Legislative's decision. From the linearity of the supply schedule it follows that

$$\left.\frac{\partial \Delta\pi}{\partial y}\right|_{p^L,p^E} < 0 \text{ and } \frac{\partial\left[\Delta\pi + \Delta b\right]}{\partial y} = 0.$$

Thus,

$$\frac{\partial \Delta b}{\partial y} = -\frac{\partial \Delta \pi}{\partial y}. \tag{9}$$

This is shown graphically in Figure 6. A decrease in supply from $y(p)$ to $y(p)'$ reduces the change in producer surplus $\Delta\pi$ (in absolute values) by $(f+h)$. A decrease in supply has no effect on the change in total welfare $(f+g)-(b+c)$, since it follows from the linearity of the supply schedule that $(f+g)=(b+c)$. Consequently, a decrease in supply increases Δb by an amount equal to $(f+h)$.

Then, using the definition of R and (9):

$$\begin{aligned}
\left.\frac{\partial R}{\partial y}\right|_{p^L,p^E} &= -\left[\frac{\partial \Delta \pi}{\partial y} + \alpha \frac{\partial \Delta b}{\partial y}\right][\Delta \pi + \Delta b]^{-1} \\
&\quad + [\Delta \pi + \Delta b]^{-2}\left[\frac{\partial \Delta \pi}{\partial y} + \frac{\partial \Delta b}{\partial y}\right][\Delta \pi + \alpha \Delta b] \\
&= -\left[\frac{\partial \Delta \pi}{\partial y} + \alpha \frac{\partial \Delta b}{\partial y}\right][\Delta \pi + \Delta b]^{-1} \\
&\geq 0.
\end{aligned}$$

A decrease in supply, y, weakly decreases R and thus the range for which there is an equlibrium with *Delegation*. Intuitively, the loss in producer surplus if the Legislative chooses *Delegation* instead of *No Delegation* is smaller if the supply decreases. This reduces the willingness of the SIG to compensate the Legislative for choosing *No Delegation*.

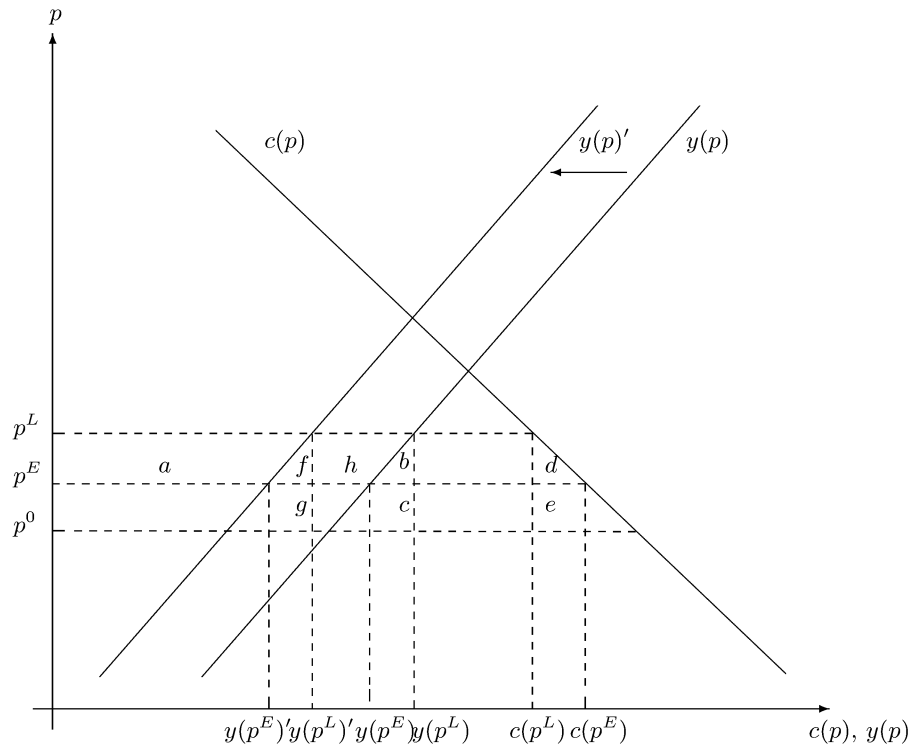

Figure 6: Equilibrium effect of a decrease in supply

4.3 An increase in the size of the SIG

$$\left.\frac{\partial R}{\partial \alpha}\right|_{p^L,p^E} = \frac{-\alpha \Delta b}{\Delta \pi + \Delta b} < 0$$

If the share of population the SIG represents, α, increases from a level in which the Legislative is just indifferent between *Delegation* and *No Delegation*, the Legislative will choose *Delegation*. In this case, the SIG's welfare gain associated with a lower price for good 1 under *Delegation* exceeds its the loss in producer surplus. This reduces the SIG's willingness to compensate the Legislative for *No Delegation* at the first stage. Thus, an increase of α increases the range of parameters where *Delegation* is an equilibrium.

4.4 Discussion

This simple political contribution model with delegation results in several predictions.

1. Delegation of tariff-setting authority from a protectionist Legislative to the Executive (with a stronger preference for free trade) leads to lower equilibrium tariffs and domestic prices than predicted by a standard GH model where the government is the Legislative and has no option to delegate. In a setting with no terms of trade gains due to tariffs, *Delegation* clearly increases social welfare. The inverse would hold

for *Delegation* to an Executive who that more protectionist than the Legislative. Recent empirical evidence supports the finding that delegation at a preliminary stage matters and can lead to lower tariffs. Ehrlich (2008, p. 444) finds that "(...) the decision to delegate has great influence over what final trade policy will be." Furthermore, he shows that "(...) delegation had a significant negative effect on tariff rates even after controlling for the increase in exports and other economic changes after WWII." (Ehrlich, p. 439)

2. A necessary and sufficient condition for *Delegation* is that the Executive and Legislative put sufficient weight $(a^E + a^L)$ on social welfare. Otherwise, the SIG's gains from *No Delegation*, $W^{SIG}\left(p^L\right) - W^{SIG}\left(p^E\right)$, outweighs the Executive's and the Legislative's joint gain from *Delegation*, $\left[a^E + a^L\right]\left[W\left(p^E\right) - W\left(p^L\right)\right]$, and the SIG is able to prevent *Delegation* at the first stage.

3. A small change in demand has no effect on the outcome of delegation. This is due to the fact that neither the difference in producer surplus, $\Delta\pi$, nor the difference in consumer surplus and tariff revenues, Δb, is affected by a change in demand.

4. In equilibrium, a small decrease in supply (and consequently an decrease in the ratio of domestic output to imports, z, and thus the political power of the industry) leads to more *Delegation*. Conversely, less authority will be delegated (in equilibrium) if the organised industry becomes more powerful. This is an intuitive result: the more powerful a SIG becomes, the more it is able (and willing) to compensate the Legislative to choose *No Delegation*.

5. An increase in the concentration of the industry-specific factor (capital in this model) reduces *Delegation*. Fewer capital owners will share the surplus of trade protection and at the same time their share of the deadweight loss that results from such a policy is reduced. Hence they have more to lose from *Delegation* and are willing to pay more to prevent it from happening.

These findings imply a qualification to a GH setting without delegation. On the one hand, if an industry becomes politically stronger (reflected by an increase in $z = \frac{y}{m}$) and / or its ownership becomes more concentrated (reflectec by a decrease in α) equilibrium tariffs increase (as in GH) and the result is the same as in GH, since no authority is delegated. On the other hand, if an industry looses political power and/or factor ownership becomes less concentrated, not only will this lead to lower tariffs according to the GH mechanism, but tariffs will be even lower due to *Delegation*.

The model can also help to explain why the U.S. Congress initially introduced delegation in the area of trade policy, with the RTAA in 1934. For the Legislative the option to delegate, is a source of bargaining power. By playing off the Executive against the SIG at the preliminary stage, the Legislative captures the entire surplus of either the Executive or the SIG. This finding stands in contrast to the result of a GH setting with a single SIG, where SIG captures the entire surplus.

In my model, the Legislative gains in several ways from the possibility to delegate. If it chooses to delegate, (i) the equilibrium price decreases and social welfare increases, (ii) it extracts the Executive's surplus and (iii) protectionist pressure (and thus potential blame for the chosen policy) is diverted from the Legislative. If it does not delegate, it captures at least the SIG's rent. In other words, the Legislative unambiguously gains from having the possibility to delegate.

5 Conclusion

Delegation of trade authority from Congress to the executive has long been recognised in the political science literature as a central element in explaining U.S. trade policy-making. In the political economy literature, however, delegation of trade authority has attracted much less attention. Taking a version of the Grossman-Helpman model (1994, GH) with a single industry at a second stage, I introduce a first stage and a third type of player, the Executive, to which the Legislative can delegate its trade authority. Thereby, I allow the Executive to compensate to the Legislative in exchange for delegation. Despite ample anecdotal evidence, such bargainng over trade policy authority has not yet been formally modelled in the literature.

The model results in several predictions. I find that *Delegation* leads to lower equilibrium protection than predicted by a standard GH model without delegation. In equilibrium, a decrease in industry's supply (and thus in the political power of the industry's capital owners) and a decrease in the concentration of capital ownership leads, *ceteris paribus*, to more *Delegation*. The option to delegate also leads to an increase in the bargaining power of the Legislative at the expense of the SIG.

This feature of the model helps to explain, why it was in the interest of the Congress to introduce the option to delegate its trade authority in the first place.

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Appendix

A Proof of Proposition 2

Proof. The proof has three steps:

(i) For $a^E > a^L$, if $C^E(p) > 0$, then it follows that $C^E(p) > C^L(p)$ and $U^{SIG}\left(p^L, C^L\left(p^L\right)\right) > U^{SIG}\left(p^L, C^E\left(p^L\right)\right)\ \forall p$. Proof by contradiction: suppose $C^E(p) < C^L(p)$. Then $U^{SIG}\left(p^L, C^L\left(p^L\right)\right) < U^{SIG}\left(p^L, C^E\left(p^L\right)\right)$. But then, $C^L(p)$ is no longer the utility maximising equilibrium contribution schedule under *No Delegation*, a contradiction.

(ii) From (i) it follows that $U^{SIG}\left(p^L, C^L\left(p^L\right)\right) > U^{SIG}\left(p^E, C^E\left(p^E\right)\right)$, since $U^{SIG}\left(p^L, C^E\left(p^L\right)\right) = U^{SIG}\left(p^E, C^E\left(p^E\right)\right)$ by the definition of $C^E(p)$.

(iii) Since $C(p) = 0$ is always feasible, in equilibrium it must be that $U^{SIG}\left(p^E, C^E\left(p^E\right)\right) > U^{SIG}(p^*, 0)$. ■

B Case of a protectionist Executive ($a^E < a^L$)

B.1 Conditions for *Delegation* with a protectionist Executive

If the Executive is more protectionist than the Legislative ($a^E < a^L$) it follows from (5) that in equilibrium under *Delegation* $\hat{p}^E > p^L$.[20] As a consequence, the SIG's utility under *Delegation*, $W^{SIG}\left(\hat{p}^E\right) - \hat{C}^E\left(\hat{p}^E\right)$, is higher than under *No Delegation*, $W^{SIG}\left(p^L\right) - C^L\left(p^L\right)$. With an Executive that is more protectionist than the Legislative, the SIG no longer tries to prevent *Delegation*. On the contrary, it colludes with the Executive at the first stage of the game. As before, I proceed again by backward induction.

At the second stage of the game, the expression for the payoffs of the players are identical to the case with $a^E > a^L$. However, the payoffs at the first stage of the game change, since both the Executive and the SIG offer compensations for *Delegation*:

	Under *Delegation*
Legislative	$B^E + B^{SIG}$
Executive	$-B^E$
SIG	$-B^{SIG}$

The Legislative puts both the Executive and the SIG on their participation constraint and asks for $B^E = \Delta U^E$ and $B^{SIG} = -\Delta U^{SIG}$.

If the Legislative chooses *No Delegation*, neither the Executive nor the SIG pay anything to the Legislative at the first stage and the corresponding payoffs at this stage are zero.

The following condition must hold for *Delegation*:

$$a^L W\left(\hat{p}^E\right) + \Delta U^E - \Delta U^{SIG} \geq a^L W\left(p^*\right) \tag{10}$$

Proposition 4 *For $a^E < a^L$, $\frac{W^{SIG}(p^L) - W^{SIG}(\hat{p}^E)}{W(\hat{p}^E) - W(p^L)} \geq a^E + a^L$ is a necessary and sufficient condition for a unique subgame perfect Nash equilibrium with Delegation. The equilibrium strategies are:*

[20] $\hat{p}^E$ and $\hat{C}^E(p)$ designate equilibrium price and contribution schedule under *Delegation* for $a^E < a^L$, where $\hat{p}^E > p^E$ and $\hat{C}^E(p) \leq C^E(p)$. Equilibrium price and contribution schedule under *No Delegation*, p^L and $C^L(p)$ are identical for $a^E \gtrless a^L$.

$$\begin{array}{ll} \textit{Legislative} & \{\textit{Delegation}\} \\ \textit{Executive} & \left\{\Delta U^E, \arg\max\limits_{p}\ a^E W(p) + \hat{C}^E(p)\right\} \\ \textit{SIG} & \left\{\Delta U^{SIG}, \arg\max\limits_{C(.)}\ W^{SIG}(p) - C(p)\right\} \end{array}$$

Proof. Analogous to the proof of Proposition 4. ■

By analogy to (1) - (5), it follows that the equilibrium contribution and price under *Delegation* equal

$$\left\{\hat{C}^E\left(\hat{p}^E\right), \hat{p}^E = p^* - \frac{[1-\alpha]\, y\left(\hat{p}^E\right)}{[a^E+\alpha]\, m'\left(\hat{p}^E\right)}\right\}$$

Corollary 2 *For $a^E < a^L$, if Delegation, then $\hat{p}^E > p^L$.*

B.2 Comparative statics with a protectionist Executive

In the case of a protectionist Executive, the predictions are reversed. More formally, suppose

$$\frac{W^{SIG}\left(p^L\right) - W^{SIG}\left(\hat{p}^E\right)}{W\left(\hat{p}^E\right) - W\left(p^L\right)} = a^E + a^L.$$

Let $\Delta\hat{\pi} = \pi\left(\hat{p}^E\right) - \pi\left(p^L\right) > 0$ and $\Delta\hat{b} = S\left(\hat{p}^E\right) + r\left(\hat{p}^E\right) - \left[S\left(p^L\right) + r\left(p^L\right)\right] < 0$ and $\hat{R} \equiv \frac{-\left[\Delta\hat{\pi}+\alpha\Delta\hat{b}\right]}{\Delta\hat{\pi}+\Delta\hat{b}}$.

As before, a shift (increase) in the demand schedule has no effect on $\hat{R}$ ($\frac{\partial\hat{R}}{\partial c}\Big|_{p^L,\hat{p}^E} = 0$) and consequently the decision to delegate or not.

A shift in the supply schedule (decrease) weakly decreases $\hat{R}$ ($\frac{\partial\hat{R}}{\partial y}\Big|_{p^L,\hat{p}^E} \geq 0$) and thus leads to a decrease in the range of parameters for which *Delegation* is the equilibrium outcome.

An increase in the size of the SIG ($\Delta\alpha > 0$) leads do a decrease in $\hat{R}$ ($\frac{\partial\hat{R}}{\partial\alpha}\Big|_{p^L,\hat{p}^E} < 0$) and to a decrease in the range of parameters for which *Delegation* is the equilibrium outcome.

Public Bailouts and Political Connections: A Natural Experiment*

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Abstract

We analyse the impact of personal connections among firms and politicians through board membership on legislators' behaviour in a vote on a large public bailout. We identify a direct effect of board membership (*connection effect*) and an indirect leverage effect when connected politicians influence non-connected peers (*network effect*). The importance of these two effects is assessed using a vote in the Swiss parliament on a government bailout of the national airline, Swissair, in 2001. This vote can serve as a natural experiment since it was an unexpected, isolated event and a list is available of private firms that promised to contribute to the public bailout conditional on its acceptance in parliament. This allows us to avoid concerns about the endogeneity and identification of connections. Based on the list of private investors and on the registry of board membership of Swiss parliamentarians, we are able to identify connected legislators. Using objective criteria, we subsequently define their networks in parliament. We find that both the *connection* and *network effect* have a strong and positive impact on the probability that a politician supports the government bailout. In particular, politicians' parliamentary networks are found to magnify the impact of their direct corporate connections by more than 40 percent.

JEL Classification: D72, D73

Keywords: Political connections, government bailout, Swissair, natural experiment

<All tables and figures at end>

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1 Introduction

Anecdotal evidence shows that leading politicians in many countries are directly connected to private firms via board memberships. Personal connections to politicians can be beneficial to firms for several reasons. They can facilitate access to bureaucrats and other political actors. Politicians can also provide firms with information at an early stage of policy-making or lend their reputation to firms and enhance their image.[1] Moreover, political connections give firms direct access to policy-makers and thereby can help firms to exert influence on policy decisions.[2]

Recent empirical evidence at the firm level shows that, indeed, connections to politicians can have a strong positive effect on individual firm values (see e.g. Fisman, 2001; Johnson and Mitton, 2003; Khwaja and Mian, 2005; Faccio, 2006; Faccio et al., 2006; or Goldman et al., 2006). While these studies establish a causal relation between political connections and firm values, most of them say nothing about how connections work and through which channels they affect the policy-making process and subsequently the firm value.

In contrast, there exists an abundant empirical literature that analyses ties between firms and politicians based on campaign contributions. By quantifying the impact of contributions on legislators' voting behaviour, the literature on campaign contributions shows how and through which channels policy decisions are affected. However, to the best of our knowledge, the empirical literature focuses solely on the effect of campaign contributions, but not on the effect of personal connections through board memberships. Furthermore, the evidence on the impact of campaign contributions is mixed, at best. Recent reviews conclude that campaign contributions have no effect in most cases (Ansolabehere et al., 2003 and Roscoe and Jenkins, 2005). There are two possible strands of explanations for this finding. According to a first view, campaign contributions simply have no significant impact on legislators' voting behaviour. Based on a review of 40 studies, Ansolabehere et al. (2003, p. 105) argue that the average contribution in the U.S. is too small to have an impact on policy decision and conclude that they "should be viewed *primarily* as a type of consumption good, rather than as a market for buying political benefits".[3] According to the second view, campaign contributions do have an effect on policy decisions, but the empirical identification of the effect is difficult. Indeed, the empirical literature on campaign contributions recognises at least two empirical challenges: first, the exact mapping

[1] For a overview of the literature on potential benefits from political connection to firms, see, e.g., Hillman et al. (1999)

[2] Connections to firms can also be valuable to politicians, see, e.g., Bertrand et al. (2004).

[3] According to Ansolabehere et al. (2003), corporate political action committees (PACs) give an average contribution of approximately USD 1,400 to legislators, well below the legal limit of USD 10,000.

between contributors' interests and particular floor (or committee) votes is often difficult to establish.[4] Second, inherent to the estimation of the impact of contributions is a potential endogeneity problem: is it campaign contributions that influence legislators' votes or is it the reverse? This identification problem can be reinforced by omitted variables, especially when failing to control for politicians' intrinsic preferences as well as those of their constituencies.[5]

The purpose of our paper is to analyse the impact of connections between firms and politicians on legislators' voting behaviour by taking into account these issues. To this end, we concentrate on personal connections based on board memberships, which we consider to be an alternative strategy for firms to gain influence on policy decisions. More specifically, we address the following two research questions. First, what is the effect of connections to private firms on politicians' voting behaviour? We refer to this direct impact of connections as the *connection effect*. Second, to what extent and through which channels is the value of such connections leveraged through colleagues of connected politicians? Thereby, we test whether colleagues of a connected Member of Parliament (MP) have a higher propensity to vote in favour of the connected firm than MPs outside the personal network of a connected MP. The underlying hypothesis is that connected MPs lobby on their firm's behalf among their colleagues in parliament. Consequently, we term this indirect impact the *network effect*.

Our study contributes to the literature on two levels. First, to the best of our knowledge, no empirical evidence exists on the impact of board membership on individual legislators' voting behaviour. Second, we are not aware of any empirical study on the impact of the *network effect* on policy outcomes in the context of political connections between firms and politicians.

We assess the *connection* and *network effects* using a natural experiment in the form of a vote in the Swiss national parliament on a government bailout of the national airline, Swissair, in November 2001. On 2 and 3 October 2001, insufficient liquidity led Swissair to suspend all its operations with immediate effect. The entire Swissair fleet - and with it thousands of passengers - were grounded all over the world. As a rescue plan, the Swiss government granted Swissair a loan of CHF 2.05 bn ($\approx$ USD 1.3 bn at the current exchange rate) which required approval by the national parliament on November 16, 2001. In addition, private investors publicly committed to add CHF 1.7 bn to the public rescue

[4] Hojnacki and Kimball (1998, p. 785) summarise this obstacle as follows: "Because no single source lists all organized interests involved in a particular issue, identifying a sampling frame is difficult."

[5] Fellowes and Wolf (2004, p. 317) argue that "the general finding that business contributions have a negligible effect on voting behavior now looks as though it may be an artifact of measurement and specification problems. Previous work measured business contributions too narrowly and business policy too ambiguously." In this line of arguement see also Stratmann (2005) and Roscoe and Jenkins (2005).

plan conditional on its acceptance by parliament.

Two important features make this vote a natural experiment and an interesting case to analyse. First, the subject matter of the vote was both unexpected and urgent, which allows us to avoid concerns that political connections were endogenous to the outcome of this vote. Second, most of the major private investors publicly declared the amount of their investment. Publicly revealed preferences allow us to identify the firms that had a particularly strong interest in a positive outcome of the vote on the Swissair rescue plan. Based on the list of private investors and the registry of board memberships of Swiss MPs, we are able to identify the connected MPs and, subsequently, their personal network with non-connected MPs to assess both the *connection* and the *network effects*.

Our results show a positive and statistically significant *connection effect*, conditional on a number of controls (such as legislators' ideologies etc.). Being connected to Swissair or to one of its private investors increases the probability of voting in favour of the government bailout by 50 percentage points. Our results show that the *connection effect* is leveraged through personal networks within parliament i.e., we find evidence supporting the existence of a *network effect*. MPs who belong to the same board as a connected MP, as well as MPs from the same canton and party as a connected MP, have a higher probability of supporting the government bailout than other MPs (by 17 and 44 percentage points, respectively). In a counterfactual analysis we find that without the *network effect*, at least fivecolleagues of the twelve connected MPs would not have supported the bailout.

The remainder of this paper is organised as follows. In Section 2 we review the relevant literature. In Section 3 we summarise the key elements of the Swiss political system and explain why the Swissair case is particularly well adapted to our study. In Section 4 we describe the data, the variables and the underlying hypotheses. In Section 5 we present our detailed results, robustness tests and counterfactual analysis, before we conclude with Section 6.

2 Literature review

The use of board memberships instead of campaign contributions as explanatory variable might explain why we find a strong impact of the *connection effect*, while much of the empirical literature on campaign contributions finds rather modest or no effects. In a review of nearly 40 studies, Ansolabehere et al. (2003) count the number of coefficients on campaign cantributions that are statistically significant and have the predicted sign, as well as the total number of contribution variables used in these studies. They find that in 75% of cases, the coefficients have either no statistically significant impact or the wrong sign. However, in a meta-analysis based on the same 40 articles, Stratmannn (2005)

finds that the "hypothesis that campaign contributions have no effect on voting behaviour is rejected at the 1% level". In another recent meta-analysis based on 33 studies Roscoe and Jenkins (2005) regress characteristics of the studies' individual tests on a dichotomous variable that indicates whether a contribution variable in a test was statistically significant and had the correct sign or not. They find that roughly one-third of roll call votes in the U.S. Congress are influenced by campaign contributions.

Overall, the literature on campaign contributions in the U.S. shows that there are signs of a positive influence on legislators' voting behaviour, however, identification of the effect of contributions is difficult and subject to considerable measurement challenges. The question arises whether this finding holds for other countries too, or whether it is an idiosyncrasy of the U.S. political system. Unfortunately, there is a lack of empirical evidence on campaign contributions for countries other than the U.S., since "[o]utside the US, there is very little systematic data collection." (Prat, 2000, p. 18) Furthermore, Prat (2000, p. 18) argues that with respect to Europe, "three patterns set the old continent apart from the US. First, parties play a much more important role in deciding how money is used. Second, the state often provides generous public funding of electoral campaigns (...). Third, campaign spending is not protected as free speech, and the expenditure side of campaign advertising can be regulated." Consequently, evidence on contributions is rather anecdotal and mostly related to party funding (see e.g. Pinto-Duschinsky, 2002 or Stratmannn, 2003 for recent international comparisons and anecdotal evidence).

According to Hall and Wayman (1990), weak empirical evidence on the impact of contributions on legislators' voting behaviour in the U.S. is due to an effect that parallels our *network effect*. They argue that the strategy of interest group allocations is not simply to influence the vote of legislators (at the final floor vote stage), but rather their participation in the legislative process (at the committee stage) which includes, among others, lobbying colleagues, negotiating compromises behind the scene etc.[6] Using data from three U.S. House committees, they find a positive and significant impact of business contributions on legislators' committee participation. This finding is confirmed by Hojnacki and Kimball (1998), who show that legislators with a strong network, such as committee leaders, have a statistically significantly higher probability to be lobbied by organised interests.[7]

To the best of our knowledge, there exist no empirical studies analysing the impact of the *network effect* on voting behaviour in relation to the *connection effect*.[8] With respect

[6] Hall and Wayman (1990, p. 803) use the term "mobilizing effect".

[7] Hojnacki and Kimball (1998, p. 776) speak of such legislators as legislative allies, who "act as agents on a group's behalf by lobbying colleagues, sponsoring legislation or amendments, keeping an issue off the agenda, and modifying the language of a bill."

[8] Several authors, see, e.g., Kriesi (1980) and Vögeli (2005) formally decribe the importance of networks among politicians, bureaucrats and interest groups in the Swiss polititical system. However, they do not analyse empirically the impact of such networks on individual legislators' voting behaviour.

to the *network effect* alone, Cho and Fowler (2007) note that even though studies of U.S. Congress have described in detail how intralegislative social relationship influence the voting decisions of members of Congress, the theory lacks empirical demonstration. Fowler (2006) describes social networks within Congress by creating a measure of connectedness between legislators. This measure uses information about the frequency of cosponsorhip and the number of cosponsors on each bill to proxy the social distance between legislators. Based on a sample of 280,000 pieces of legislation, he finds that the connectedness of the bill sponsor has a significant and positive impact on the probability that the bill passes the final vote on the floor. He identifies four underlying sources of social networks captured by his connectedness measure: institutional, regional, issue based and personal relationships. However, he does not quantify the individual impact of these four sources on the measure of connectedness or on voting behaviour. These sources are close to the four individual *network effects* we describe and test for in Sections 3 and 4.[9]

We interpret our results and the positive impact of the *connection* and *network effects* as (indirect) empirical evidence that political connections are valuable to firms. Fisman (2001) is among the first to estimate the value of political connections. He uses an index of political connections in Indonesia and finds that a large part of a well-connected firm's value can be derived from political connections. Johnson and Mitton (2003) find that imposing capital controls in Malaysia in the aftermath of the Asian financial crisis primarily benefited firms with strong ties to Prime Minister Mahatir. With respect to Pakistan, Khwaja and Mian (2005) find that politically connected firms receive preferential treatment from government banks in the form of 45% larger loans even though they have 50% higher default rates. With respect to the U.S., Goldman et al. (2006) find a positive two-day abnormal stock return of 1.2% in response to the announcement of the nomination to the board of a politically connected director. Ferguson and Voth (2008) show that politically connected firms are not a new phenomenon. Examining the value of connections between the German industry and the Nazi movement, they find that connected firms outperformed the market by 5 to 8% in early 1933. Based on a cross-country sample, Faccio (2006) finds more generally that corporate political connections exist in 35 of the 47 countries analysed. With respect to government bailouts, Faccio et al. (2006) show in a cross-country study that political connections lead to preferential bailouts and that lenders tend to lend more to connected firms, even though these firms tend to have a significantly poorer operating performance than their non-connected peers. These studies

[9] One could argue, that the *network effect* is a proxy for logrolling since networks among legislators reduce transaction costs and thus facilitate vote-trading. We do not exclude that the *network effect* captures some form of logrolling. At the same time, we cannot exclude that other motives, such as social ties and friendship (as in e.g. Bertrand et al., 2004; Cho and Fowler, 2007) play a role. Therefore, we interpret logrolling as a subset of the underlying factors that determine the *network effect*.

find a causal relation between political connections and firm values. However, most of them say nothing about how these connections work and through which channels firms influence the policy-making process.

3 The Swissair bailout

3.1 The Swiss political system

The Swiss federal parliament is a bicameral legislature. It consists of the National Council (200 seats, comparable to the U.S. House of Representatives) and the Council of States (46 seats, comparable to the U.S. Senate). Even though Switzerland has a multi-party system, the same four parties have been represented in the national government, the Federal Council, since 1943. These parties are: Social Democrats (SP), Christian Democrats (CVP), Radical-Liberal Party (FDP) and the Swiss People's Party (SVP).[10] The centre and right-wing parties (CVP, FDP and SVP, plus some small parties) have held a majority of parliamentary seats (and thus of government positions) throughout this period, with left-wing parties (SP, plus some small parties) totalling 20 to 30% of votes.

Votes in the National Council are cast individually. As a consequence, the personal voting record of each MP is available. However, no personal voting records are available for the Council of States, since its 46 members vote by show of hands and only the final result is recorded (equivalent to the *voice vote* in the U.S. Congress). For this reason, we have to restrict our attention to the National Council.

Switzerland has a non-professional federal parliament. Hence, members of both chambers exercise their mandates as an accessory activity, and they are free - within certain limits - to pursue other professional activities.[11] If MPs hold a leading position within a firm or organisation, they have to declare this in a publicly accessible "Declaration of Interest", published by the Parliamentary Services. In 2001, 185 out of 200 MPs declared their connection to at least one firm, professional association, union, foundation or non-governmental organisation. In total, the 200 members of the National Council held no less than 421 positions on boards of directors. MP Arthur Loepfe (CVP) alone held positions on 28 different boards.

In contrast to board memberships, donations to MPs and political parties are not regulated or limited by law, and there exists no legal obligation to disclose contributions in Switzerland. Furthermore, political parties are organised as associations and receive

[10] For a complete list of parties and acronyms, see Table 1.

[11] To prevent "conflicts of interest", MPs are not allowed to work for or to represent firms, foundations and associations that are financed, controlled or mandated by the federal administration.

only minor public funding.[12] As a consequence, they have no obligation to disclose their sources of income. This makes it impossible to track the origin of party and campaign funding and to establish the financial relationships between parties (or politicians) and firms. The few estimations available (e.g. Ladner, 2007) show that total resources of all national governmental parties amount to little more than CHF 10 mn a year. During an election year, total resources of all government parties together increase to some CHF 15 mn.[13] Thereof, between 12% (SP) and 61% (FDP) are raised through donations. The rest is raised mainly through party membership fees.

National political parties in Switzerland not only have relatively weak organisational and financial structures, but their members also have heterogenous political preferences and thus voting records. Figure 1 illustrates the ideological position of individual MPs of the National Council for the legislative period 1999 to 2003 relative to their peers. Dots of the same form represent MPs of the same party. The distance between two dots represents the political distance between two MPs, where political distance is measured as dissimilarity of voting behaviour in parliament. Figure 1 shows that MPs of the left-wing parties (SP and Green Party, GPS) and MPs of the Liberal Party (LPS) have a relatively homogenous voting behaviour. In contrast, MPs of centre (CVP) and right-wing parties (FDP and SVP) display considerably more heterogenous voting behaviour. Interestingly, this is not true for the Swissair vote. The CVP and FDP were uncharacteristically united in their support of the government intervention, as Table 5 shows.

3.2 The Swissair case

From the mid-1990s onwards, Swissair, the privately owned national airline pursued an aggressive strategy to expand its own alliance network, the "Qualiflyer Group".[14] This so-called "Hunter" strategy consisted of buying important stakes in various airline companies.[15] Common to all of them were their financial troubles.

These equity stakes and corresponding liabilities finally led to a debt of CHF 17 bn. To this had to be added the costs for balance sheet restructuring and ongoing deficits

[12] Political parties with five or more MPs in at least one of the two chambers receive public funding ("Fraktionsbeiträge" in German). Public funding consists of CHF 90,000 per party and CHF 16,500 for each MP a year. In 2001, the "Fraktionsbeiträge" range from CHF 915,000 (CVP) to CHF 1.1 mn (FDP) among the four major parties.

[13] This represents 0.004% of GDP in Switzerland. According to Ansolabehere et al. (2003) the hard and soft money accounts of political parties in the U.S. during the 2000 election (presidential election and election to the Congress) totaled $1.2 bn, which amounts to 0.01% of US GDP.

[14] In October 2001, the Swiss Federation held 3% of Swissair stock. All cantons and municipalities together held another 9.5%.

[15] Swissair held important stakes in the following airlines: Sabena (Belgium), AOM, Air Liberté, Air Littoral (all France), LTU (Germany), Volare, Air Europe (both Italy), LOT (Poland), Ukraine International (Ukraine), Cargolux (Luxemburg) and South African Airlines (South Africa). Swissair also held shares in a number of additional aviation companies all over the world.

aggravated by the slump in the airline industry after September 11, 2001. The accumulated debt of Swissair amounted to CHF 22 bn by mid-November 2001.

Insufficient liquidity finally led to the "grounding" of the Swissair fleet. On 2 and 3 October 2001, Swissair suspended its service with immediate effect. The pictures of the grounded Swissair planes and its stranded passengers were seen around the world.

The Swiss government reacted immediately by granting Swissair an emergency loan of CHF 450 mn to resume and maintain its activity until the end of October 2001. In addition, the Swiss government (with the approval of the "Finance Delegation" of the federal parliament) granted Swissair two additional loans of CHF 600 mn and 400 mn to maintain its activity until the end of 2001 (first loan) and until the end of March 2002 (second loan) and promised to subscribe to CHF 600 mn worth of shares in Swiss International Air Lines, the successor of Swissair.[16]

During its emergency session on November 16 and 17, 2001, the Swiss parliament thus had to approve (i) a credit of CHF 1.6 bn (the two loans of 400 and 600 mn and the shares of CHF 600 mn) and (ii) a credit for the emergency loan of CHF 450 mn (which had already been spent by Swissair). All of the loans were free of interest.

In addition to the CHF 2.05 bn invested by the Swiss government, private firms and investors pledged to contribute another CHF 1.7 bn. Almost all of the major private investors publicly confirmed their support and the amount invested. They had a clear interest in the public loan being granted, since the existence of Swissair and its successor, Swiss International Air Lines, and thus their investment, directly depended on the government contribution.

The fact that the private investors publicly confirmed their investment makes this vote unique. In contrast to other parliamentary votes, we are able to identify the most important private investors benefiting from the acceptance of the public loan to Swissair, and the "Declaration of Interest" allows us to identify MPs who were members of the board of directors either of Swissair or of the private investors.

4 Data and hypotheses

4.1 Variables used

We analyse the final floor vote on the Swissair bailout in the Swiss National Council on November 16, 2001.[17] Our study is based on the votes and characteristics of 199 out of

[16] The "Finance Delegation" is responsible for the examination and supervision of the entire federal budget. It is made up of three members of the National Council and three members of the Council of States, each of whom belongs to the Finance Committee of his or her respective Council.

[17] The name and number of the bill are "Bundesbeschluss über die Finanzierung des Redimensionierungskonzept für die nationale Zivilluftfahrt", no. 01.0067

200 MPs.[18] Table 3 lists our variables and data sources, Tables 4 and 5 report summary statistics, and Table 6 reports raw correlations.

4.2 The dependent variable

In our regressions, we focus on decisions of individual politicians. Therefore, our dependent variable *yes* is equal to 1 if an MP voted in favour of the public bailout and equal to 0 otherwise.[19]

4.3 The explanatory variables

4.3.1 The connection effect

We hypothesise that firms expect politicians on their board to vote in line with their interests. Consequently, we expect board membership to have a significant and positive impact on connected MPs' probability to support the Swissair bailout.

This effect is of particular interest if connected MPs have to trade off their firms' interests against their own political preferences. The Swissair vote was a typical example of such a conflict of interest for right-of-centre, "free-market" politicians. On the one hand, the bailout of Swissair was considered by most to run counter to free-market ideology. On the other hand, voting "yes" to the bailout clearly was in the interest of the private investors. Indeed, right wing politicians that voted "yes" were widely criticized for their support of a public intervention. Their decision was not only criticized by fellow right-of-centre politicians who voted against it, but also by academic economists (Frey, 2002). On November 14, 2001, two days before the vote in the National Council took place, 17 Swiss economics professors (Swiss Economics Professors, 2001) recommended a "no" vote through a joint open letter.

In our data set, the variable *connected* characterises a politician connected to Swissair or to a private investor. It takes the value of 1 if an MP is connected and 0 otherwise. Specifically, we consider an MP to be connected if (i) (s)he is or used to be a board member of or a managing employee of Swissair (or its subsidiary Crossair) or if (ii) the MP is a board member or managing employee of at least one of the 24 private investors

[18] We dropped the president of the National Council, Peter Hess (CVP), from our sample since the president does not vote. Furthermore, in some regressions we were forced to omit Giuliano Bignasca (Lega) from our sample due to missing ideology data.

[19] Consequently, we interpret the decision to abstain (18 MPs) or not to vote at all (15 MPs) as being against the public bailout. Our hypothesis is supported by the public statements of several MPs who either abstained or who were absent at the moment of the final floor vote. For example, MP Kurt Wasserfallen (FDP, BE) stated in the newspaper that he abstained in the sense of a "no" (Der Bund, 29.12.2001, p. 13). MPs Claude Frey (FDP, NE) and Jean Fattebart (FDP, VD) who were absent at the moment of the vote, declared to be against the public bailout during the debate preceding the vote (Parliamentary Services, 2001: Record of the National Council, pp 1476, 1485).

whom we can identify as contributors to the Swissair bailout.[20] 12 MPs are connected to Swissair or to private investors according to these criteria.[21] Seven of the connected MPs are members of the FDP, the other connected MPs belong to the CVP (3 MPs) and to the SVP (2 MPs).

The source of this variable is the "Declaration of Interest", published by the Parliamentary Services on March 31, 2001. At this time, more than seven months before the vote took place, the bailout and thus the vote were unexpected.[22] Therefore we can exclude any endogeneity concerns with respect to the variable *connected*.

4.3.2 The network effect

In addition to the connection effect, we explore the possibility that connected MPs also advocate their firms' case among their colleagues in parliament and thus leverage their own impact. We call an MP who is part of the network of a connected politician a "linked" MP. Importantly, linked MPs are not board members or managing employees of Swissair or one of the private investors. In an ideal world, we could draw a precise map of the network of every connected MP. Moreover, we could quantify the intensity of contacts. Unfortunately, we do not avail of enough information to determine the complete network of connected MPs. Therefore, we define all those non-connected politicians as linked who meet a connected MP in at least one particular body (e.g. party, committee etc.) or place. We focus exclusively on bodies with a publicly available member list. This allows us to define objective criteria for linking non-connected MPs to the personal networks of connected MPs. Based on documents from the Parliamentary Services, we characterise four broad types of links. The sum of these four links define the variable *network*. In our data, 58 MP are linked to a connected MP through at least one of the four types of links. The four types of links are, respectively:

(a) *"Board link"*. A large majority of MPs are board or committee members of one or more firms or professional associations. Therefore, several non-connected MPs meet connected MPs either on boards of other firms or in the steering committees of professional associations. The variable *board link* takes the value of 1 (and 0 otherwise) if an MP meets a connected MP in a board of directors (different from Swissair or the private investors) or in the steering committee of a professional association. The source of this variable is the "Declarations of Interests" of March 31, 2001 published by the Parliamentary Services.

[20] An MP that used to be (but no longer is) a member of the board of directors of Swissair during the five years preceding the vote, is considered to be "connected".

[21] See Table 2 for the list of private investors.

[22] After the presentation of Swissair's annual report 2000 on April 2, 2001 the Federal Office of Civil Aviation concluded that there were no reasons to believe that Swissair could not guarantee the maintenance of safe and regularly operations. *Source:* Geschäftsprüfungskommission des Ständerates (2002)

We consider this registry to be a reliable source, since a federal law obliges all MPs to declare (i) their membership in boards of directors and steering committees of professional associations and (ii) their profession and employer. As shown in Table 4, 15 MPs are linked to connected MPs through the channel *board link*.

(b) *"Party-canton link"*. In Switzerland, national parties are very heterogenous and important differences in political preferences can exist across cantonal sections of the same party. Moreover, the cantons constitute the electoral districts for the federal parliament. Thus, MPs from the same party and canton not only have the same constituency, but they also run together for office. We assume that common origins, on average, create strong (social and ideological) ties. The variable *party-canton link* is equal to 1 (and 0 otherwise) if a non-connected MP comes from the same party and canton as a connected one. In our sample, 18 MPs are linked to connected MPs trough this link.

(c) *"Committee link"*. The National Council has twelve committees, composed of 25 members each, that convene on average on three to four days per quarter. Parties are represented in committees proportionally to their size in the National Council. This implies that constituencies and political preferences of members of a given committee are rather heterogenous. Therefore, we do not expect the links among individual committee members to be strong a priori. However, several of the committee members have met each other for many years in the same committee, which could create some bonds between them. To test for this effect, we create the variable *committee link*. It is equal to 1 (and 0 otherwise) if a non-connected MP has met a connected MP for at least the last five years in the same committee. The source of this variable are the registries of committee and official delegation members published by the Parliamentary Services in 1996 and 2001.

(d) *"Seat link"*. We assume that MPs know their direct seat neighbour in parliament well. The variable *seat link* is equal to 1 (and 0 otherwise) if a non-connected MP sits next to a connected MP.[23]

4.3.3 Other explanatory variables

Recent reviews of the literature on campaign contributions (e.g. Stratmannn, 2005; Roscoe and Jenkins, 2005) stress the importance of controlling for legislators' characteristics such as ideology, partisanship and electoral margin, and to control for constituencies' preferences and participation in the political process when analysing a floor vote. Failing to do

[23] It is possible to conceive that MPs with very similar preferences choose to sit next to each other, which would create an endogeneity problem. However, in reality, the freedom to chose where to sit is strongly constrained by seniority and party hierachy (party and committee leaders tend to sit at the back of the chamber). Furthermore, we control for preferences by including control variables on partisanship, origin, free-market ideology and political preferences in general. Therefore, we consider this potential endogeneity problem to be negligible.

so might result in omitted variable bias.

To control for political preferences of individual MPs, we use two different measures. The first measure, *political ideology*, controls for general political preferences and was developed by Hohl and Jeitziner (2000). This variable measures the position of individual MPs on a left-right scale and ranges from -10 (left-of-centre position) to +10 (right-of-centre position). Its construction closely follows the technique employed by Americans for Democratic Action (ADA) for their measure of political liberalism of members of the U.S. Congress.[24] The median value of *political ideology* is 1.1 (mean: -0.1) for the whole sample, while the median value of connected MPs equals 5.4 (mean: 4.6).[25] Figure 2 shows that the Swissair bailout was mostly supported by MPs from the political centre. Their relative political positions correspond to the political position of the government majority. In other words, it might be that the Swissair vote did not follow a simple left-right divide, but rather a divide between government and opposition forces. To control for this political polarisation, we also express *political ideology* in devation from its median (in absolute values) and denote this variable with *political ideology (deviation)*.[26]

The second measure, *free-market ideology*, controls for the political preferences towards free markets and is developed by the research institute Sotomo (University of Zurich). Based on the voting record in the National Council, Sotomo constructs an index ranging from 0 (economically interventionist ideology) to 100 (free-market ideology) and calculates the corresponding value for each MP.[27] In our regressions, we divide the index by 100 and our prior is that it is negatively correlated with the dependent variable *yes*. The median value of *free-market ideology* is equal to 0.633, its mean is equal to 0.554. Interestingly, the median value of *free-market ideology* for the connected MPs is equal to 0.894 (mean: 0.818), which means that the connected MPs had - on average - a much stronger revealed preference for free markets than the non-connected MPs. Figure 3 plots the dependent variable *yes* against the *free-market ideology*. Each dot stands for an individual MP (large triangle dots stand for connected MPs). As Figure 3 shows, all but one of the connected MPs supported the Swissair bailout. We interpret this fact as a first indicator that connections can have an impact on the voting behaviour of MPs and that they can even be more important than free-market preferences. Interestingly, the MP with the

[24] Some minor differences in the construction technique allow for particularities of the Swiss data, namely the smaller number of roll-call votes and the high frequency of absences (see Hohl and Jeitziner (1997, p. 12).

[25] In our regressions, we divide this variable by 100.

[26] This is a common to quantifying political polarisation, see, e.g., Bütler and Maréchal (2007) who measure political polarisation of Swiss voters as the absolute deviation from the centre of a 0 (left) to 10 (right) scale of political opinion.

[27] To the best of our knowledge, this index created by the research institute Sotomo (University of Zurich) is the only free-market ideology measure for MPs in the National Council in 2001.

strongest free-market ideology, Johann N. Schneider (FDP), was connected and supported the Swissair bailout. Figure 3 also shows that, at first sight, the presumed negative correlation between *free-market ideology* and the support of the government intervention, *yes*, seems not to exist.

As a measure for partisanship, we use party membership of the four government parties. Therefore, we introduce four dummies, *SP*, *CVP*, *FDP* and *SVP*. 172 out of 199 MPs belong to one of these four parties.

To control for the electoral margin and thus the political strength of individual MPs, we create the variable *margin*. *Margin* is the number of votes an MP received in the 1999 election divided by the number of votes the first non-elected candidate of the same party received. A value close to one stands for a very close election. The values range from 0.63 to 11.28 with an average value of 1.55.[28]

To control for constituency characteristics such as political participation and preferences, we use the cantonal *turnout* and the *vote share* of the MP's cantonal party in the 1999 election (both variables expressed as proportions).

Furthermore, we include the following control variables. *French* takes the value of 1 (and 0 otherwise) if the mother tongue of an MP is French. This accounts for a possible divergence of preferences between the main language regions in Switzerland. *Aviation jobs* is the ratio of cantonal employment in the aviation industry to total cantonal employment in 2000. In addition to the federal government and to the private investors, several cantons also pledged to contribute to the Swissair bailout. In the debate preceding the vote in the national parliament, concerns were raised about the extra weight that such expenditures would place on the public budgets. Therefore, *debt* stands for cantonal per-capita public debt (in CHF 1 mn) in 1999.

5 Results

In our baseline regressions, we estimate the impact of the *connection* and *network effect* on the probability that an MP votes "yes", using a probit model.[29] We estimate the probability that the variable *yes* equals 1 as:

$$\Pr\left(yes_i = 1 \mid \mathbf{x}_i, \boldsymbol{\theta}\right) = \Phi\left(\begin{array}{c} \alpha_0 + \beta_1 connected_i + \boldsymbol{\gamma}'\mathbf{network\ effect}_i \\ +\boldsymbol{\delta}'\mathbf{political\ controls}_i + \boldsymbol{\zeta}'\mathbf{other\ controls}_i \end{array}\right)$$

[28] Fabio Abate (FDP) was third of the non-elected candidates in the canton of Ticino in 1999 which explains his margin of 0.63. He acceeded to the National Counciel in 2000.

[29] Using a logit model, we obtain very similar results both in terms of statistical significance and quantitative effects. Therefore, we only report the probit results.

where $\Phi(.)$ is the standard normal cdf, *connected* corresponds to the variable defined above, **network effect** is a vector of the individual *network effects* (a) to (d), **political controls** is a vector of the variables *free-market ideology* to *vote share* and **other controls** is a vector of the variables *french* to *debt*.

5.1 Main findings

The results of our first two baseline regression (columns (1) and (2) of Table 7) confirm that the *connection effect* and the *network effect* play a role in explaining the MPs' voting behaviour on the government bailout of Swissair. Being connected to Swissair or to one of its private investors, has a positive and statistically highly significant impact on the probability that an MP supports the bailout. The overall *network effect* also has the expected positive sign and is statistically significant. This supports the hypothesis that the direct *connection effect* is leveraged through the indirect *network effect*.

Columns (3) and (4) of Table 7 show the results of two other baseline regressions where we estimate the impact and significance of the four different links that constitute the *network effect* seperately. As in the first two regressions, the *connection effect* is positive and statistically highly significant. The *connection effect* is leveraged through two channels of the networks of connected politicians: *board link* and *party-canton link*. *Board link* has the expected positive sign and is statistically significant. A possible explanation is that MPs that are on the same board of a firm regularly meet elsewhere than in parliament and have strong common interests. Thus, they develop social ties going beyond simple political acquaintance. Strong social ties can then explain why non-connected MPs are willing to help a connected colleague by supporting the bailout. Common origin and party affiliation with a connected MP, characterised by the *party-canton link*, also has a positive and statistically significant impact on the probability to support the Swissair bailout. In contrast, the *committee link* has the expected positive sign but is not statistically significant. A possible explanation is that (social) ties between committee members are less intensive than between MPs from the same party and canton or MPs belonging to the same board of directors. The *seat link* does not have a statistically significant impact on voting behaviour, either.

The control for general political preferences, *political ideology*, is not statistically significant. However, columns (2) and (4) of Table 7 show that *political ideology (deviation)* has a negative sign and is statistically highly significant. This results confirms the intuition gained from Figure 2, namely that the Swissair vote did not follow a left-right scheme, but rather a government-opposition scheme, where the MPs at the very left and the very right of the left-right scale had a much lower probability to support the Swissair bailout.

Using *political ideology (devation)* instead of *political ideology* increases both the overall explanatory power of our model (the pseudo R^2) and the statistical significance of our estimates. For this reason, we use the variable *political ideology (deviation)* instead of *political ideology* in our subsequent analysis and consequently denote the regressions from columns (2) and (4) as our baseline regressions 1 and 2.

Free-market ideology has the expected negative sign, but is not statistically significant, which confirms the intuition gained from Figure 3.

The coefficients on three of the four government party dummies (*SP*, *CVP* and *FDP*) have a positive sign and are highly statistically significant. However, the positive signs on the *FDP* and *CVP* dummies are rather unexpected. The FDP has the highest median value of *free-market ideology* (median: 0.843, mean: 0.816) of all parties. In addition, the government intervention runs counter to their slogan "More freedom - less government intervention". The CVP (median: 0.720, mean: 0.680) also supported the bailout, even though their MPs are on average more in favour of free markets than the average parliamentarian. We conjecture that connected MPs not only influenced peers from their network, but they also influenced the parties' voting recommendations. We test this hypothesis by regressing the party's voting recommendation (equal to 1 if the recommendation is "yes" and 0 otherwise) on the percentage of connected MPs in the party, the party mean of *political ideology (devation)* and the party mean of the *free-market ideology*. We include the last two variables to control for parties' political preferences. Table 9 shows that the *party mean of political ideology* and the *party mean of free-market ideology* have no explanatory power, whereas the *percentage of connected MPs in party* has a positive impact on the party's voting recommendation and is statistically significant at the 10% level at least, despite the small sample size. It seems that connected MPs not only influenced their colleagues, but also, to some extent, the parties' voting recommendations.

Margin and *vote share* do not have a statistically significant impact. *Turnout*, a proxy for electoral accountability, has a positive impact and is statistically significant at the 10% level. A possible explanation for this finding is that the electorate was in favour of a government intervention. Indeed, a representative survey from October 20, 2001 - four weeks before the Swissair vote took place in parliament - found that 62% of the Swiss population were in favour of a government bailout.[30] Public opinion, together with a higher voter turnout, might have prevented MPs to vote against the Swissair bailout.

The other controls have the expected signs. *French* is statistically significant at the 5%

[30] The national survey from the polling firm Isopublic found that 39% of the respondents favoured a government bailout "without reservation", a further 23% supported a government bailout provided that private investors also contributed to it, 33% were against it, and 5% had no opinion. Source: http://www.sf.tv/sf1/tagesschau/index.php?docid=20011020.

level and has a negative sign. Apparently, MPs of the French-speaking parts of Switzerland were less keen on supporting the bailout of the Zurich-based airline company.[31]

Not surprisingly, per-capita employment in the aviation industry, *aviation jobs*, has a positive and statistically highly significant effect on the probability of an MP supporting the bailout. In contrast, the cantonal per-capita *debt* has no significant impact on politicians' decisions.

5.2 Quantitative effects

The magnitudes of the probit coefficients reported in our baseline regressions 1 and 2 (columns (2) and (4) of Table 7) do not correspond to the marginal effects of the regressors. To evaluate and compare the magnitudes of the various determinants of the decision to support the Swissair bailout, we calculate the quantitative effects for each variable in the baseline regressions (at their sample medians). They are reported in columns (2') and (4') of Table 7. For continuous explanatory variables, the quantitative effects represent semi-elasticities (the effect of a one-per-cent change in the explanatory variable on the dependent variable). For discrete explanatory variables and dummy variables, the coefficients represent the change in the dependent variable for a unit change in the explanatory variable.

In both regressions, party affiliation (with the exception of the SVP) has a large impact on voting behaviour. Being a member of either CVP, FDP or SP increases the probability of supporting the Swissair bailout between 49 and 81 percentage points. Interestingly, the *connection effect* also has a quantitatively strong impact: being connected increases the probability of supporting the government bailout by roughly 50 percentage points, *ceteris paribus*. Column (2') shows that the impact of the combined network effect, *network*, is clearly smaller than the *connection effect* : being linked to a connected MP through an additional type of link increases the probability to support the bailout by 6 percentage points.

However, two of the separate types of the *network effect* have a strong quantitative impact: sharing a common geographical and political origin with a connected MP, the *party-canton link*, increases the probability of voting "yes" by 45 percentage points. The *board link* increases the probability of voting "yes" by 17 percentage points, which makes this effect somewhat less important than the effect of the *party-canton link*. It seems that common origin and party membership create stronger bonds between MPs than common board membership.

Political ideology (deviation) has a substantial negative impact. A 1% increase in the

[31] Zurich is in the German speaking part of Switzerland.

deviation from median political preferences reduces the probabilty of voting "yes" by more than 21 percentage points.

Surprisingly, voter *turnout* appears as having an important impact on the probability to support the Swissair bailout.[32] According to these estimates, an increase in turnout of 1%, increases the probability of voting "yes" by almost 27 percentage points (in the baseline regression 2). This result very likely reflects the fact that *turnout* correlates with certain relevant but unobserved canton-specific features without fully internalising them. To circumvent the problem of omitted variables at the cantonal level, we run variants of our second baseline regression including cantonal fixed effects as a robustness check (columns (4) and (5) of Table 8). We find that controlling for canton fixed-effects does not affect the results with respect to our main variables of interest, the *connecetion* and *network effects*.

Compared to the magnitudes of the other statistically significant explanatory variables, *aviation jobs* has a rather modest impact: a 1% increase in the ratio of employment in the aviation industry to total cantonal employment increases the probability of supporting the Swissair bailout by less than 3 percentage points.

To sum up, the results of the quantitative analyses reveal a clear hierarchy in the impacts of different determinants on the probability that an MP supports the Swissair bailout. Party membership, being connected to Swissair (or its investors) and being from the same party and canton as a connected MP, have the strongest effect on the decision of individual MPs to support the bailout.

5.3 Robustness checks

In columns (1) to (3) of Table 8 we subsequently drop several categories of control variables to control for the robustness of our baseline regression 2. In all three specifications, the results are remarkably robust.

In column (1) of Table 8 we drop all control variables other than political controls. The results of this specification are almost identical to our baseline regression 2 both in terms of goodness-of-fit (pseudo R^2) and signs and statistical significance of the coefficients.

In the next specification (column (2) of Table 8), we only keep *connected*, the *network effects* and the controls for MPs' ideology and party membership. Again, the results are very similar to the baseline regression 2.

Even when we drop all variables but *connected* and the *network effects* (column (3) of Table 8), the signs of the coefficients still correspond to the ones of our baseline regression 2

[32] This finding is not affected if the observations for the canton of Schaffhausen (two observations) are dropped from the sample. The canton of Schaffhausen is the only Swiss canton where voting is mandatory.

(with the exception of *seat link*). Furthermore, *connected* and *party-canton link* are highly significant. However, the overall fit of the model, the pseudo R^2, drops considerably to a mere 10%.

The robustness of our results across different specification of the second baseline regression shows that our results are not driven by the specification of our empirical model. At the same time, the results of column (3) of Table 8 show the importance of controlling for party membership and MPs' ideology. Failing to do so, results in a drop of explanatory power of the model from 51% to 10%.

The large quantitative impact of *turnout* suggests that we should check for the effect of omitted canton-specific variables on the results our main variables of interest, the *connection* and *network effects*. Therefore, we rerun the regression of the most restrictive robustness check (column (3) of Table 8), this time including cantonal fixed effects. Unfortunately, non-linear fixed effects models, such as the probit fixed effect model, suffer from the incidential parameters problem, which leads to statistically inconsistent maximum likelihood estimators. To circumvent this problem, the usual solution is to use the conditional logit model (equivalent to a fixed-effects logit) as proposed by, e.g., Baltagi (2008). Column (5) of Table 8 shows the results for this estimation. They are similar to the ones of a probit model with cantonal dummies (column (4) of Table 8), which suggests that we can compare the conditional logit results to the results of the probit model obtained so far (column (3) of Table 8).[33] Then, comparing columns (3) and (5) of Table 8, shows that the results of the *connection* and *network effects* are not significantly affected when controlling for cantonal fixed effect.[34] Therefore, we conclude that *turnout* probably captures some unobserved canton-specific effects without fully internalising them. However this does affect neither the sign, statistical significance nor the impact of our main variables of interest, namely the *connecetion* and *network effects*.

5.4 Counterfactual analysis

Our results show that the *connection* and *network effects* have - on average - a positive and rather large quantitative effect on MPs' probability to support the Swissair bailout. However, the quantitative effects of these variables say nothing about how effective the *connection* and *network effects* were in changing the vote on the Swissair bailout. Indeed, if

[33] The coefficients of the conditional logit model and probit model with cantonal dummies are similar in terms of statistical significance, sign and size (when corrected by a factor of approximately 1.6, as suggested by the applied econometrics literature).

[34] This finding also holds when we estimate the baseline regression 2 (column (4) of Table 7) with cantonal fixed effects. The results of the conditional logit estimations of the *connection* and *network effects* are qualitatively similar to the ones of the second baseline regression. However, due to a smaller number of degrees of freedom, the coefficients are statistically less significant.

a connected or linked MP would have supported the bailout even without being connected or linked, the two effects would have had no decisive impact despite being significant and large. Therefore, we further analyse how the two effects affected the vote by asking the counterfactual question: "what would have happened without connections and networks?". We use the following steps to calculate the results of this counterfactual exercise (shown in Table 10):

1. We use the coefficients of our second baseline regression to calculate the predicted probability that an MP votes "yes".[35]

2. Then, we set the coefficients of the four network effects (*board link* to *seat link*) equal to 0 and use the other coefficients to predict the probability of voting "yes". If a linked MP, with a predicted probability of more than 50% to vote "yes" in the first step now falls below a predicted probability of 50%, we say that he would have voted "no" without the *network effects*. The second row of Table 10 shows that if no MPs had been linked to the connected MPs, 5 out of 110 legislators that supported the bailout would not have done so. This brings the acceptance rate from 66% down to 63%.

3. In a third step, we also set the coefficient of the *connection effect* equal to 0 and repeat the exercise of the previous step. We find that if no MPs had been connected to Swissair or its private investors, two more legislators would not have supported the government intervention, and the acceptance rate would have fallen to 62%.

The 12 connected MPs achieved to change the opinion of at least 5 other, non-connected MPs, which corresponds to a leverage ratio of 42%. In other words, every connected MP brings with him/her another 42% of a non-connected MP, which can be quite substantial, especially in situations where the outcome of the floor vote promises to be narrower than it was in the case of the Swissair bailout.

This simple counterfactual exercise shows that the Swissair bailout almost certainly would have been accepted without any connected or linked MPs. However, the margin of acceptance would have been narrower than it was in the actual vote. We interpret this counterfactual result as a further piece of evidence that the effect of connections between private investors and MPs, leveraged through intra-parliamentary networks, is far from negligible, even though in the case of the Swissair bailout it was not the determinant element.

[35] We interpret a predicted probability of supporting the bailout above 50% as a "yes".

6 Conclusion

Political connections can be important to firms. The networks of politicians can facilitate access to political actors, politicians can provide firms with information at an early stage of policy-making or lend their reputation to firms. Moreover, political connections can help firms to exert influence on policy decisions. We analyse the impact of personal connections between firms and politicians through board memberships on legislators' voting behaviour. Our study contributes to the literature in two main ways. First, despite an abundant literature on the impact of campaign contributions, we are not aware of any systematic analysis of the impact of board memberships on legislators's voting behaviour. Second we test whether the direct effect of board memberships is leveraged through connected legislators lobbying on their firm's behalf among their non-connected colleagues in parliament. We test our hypotheses using a vote in the Swiss parliament on a government bailout of the national airline, Swissair, in October 2001. This vote serves as a natural experiment since it was both unexpected and urgent, and several private investors publicly committed to contributing to the bailout if the Swiss parliament accepted it in the first place. This allows us to avoid endogeneity concerns and to unambiguously identify the firms having an interest in a positive outcome of the vote in parliament.

We find that both politicians connected directly to Swissair or its private investors (the *connection effect*) and politicians belonging to the social network of connected politicians (the *network effect*) had a statistically and quantitatively significantly higher propensity to support the government bailout. Moreover, we find that the percentage of connected MPs had a significant impact on the probability that the party recommended to support the Swissair bailout. Furthermore, a counterfactual analysis shows that without the *connection* and *network effects*, at least 7 MPs would have voted "no" instead of "yes" and the acceptance rate of the bailout would have dropped from 66% to 62%. According to our counterfactual analysis, the 12 MPs connected to either Swissair or one of its investors, achieved to convince at least another 5 MPs to support the bailout which corresponds to a leverage ratio of more than 40%. While the counterfactual results show that the *connection* and *network effect* were not decisive for the Swissair bailout, they also show that they are far from being negligible.

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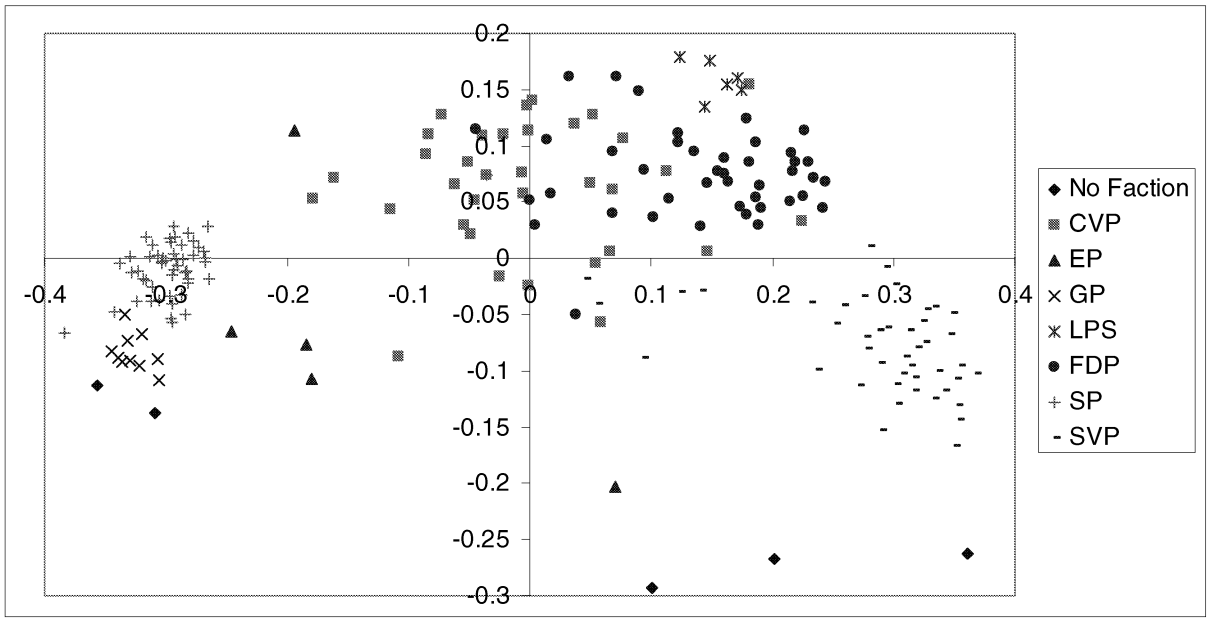
Appendix

A Figures and tables

Figure 1: Relative political position of Members of Parliament

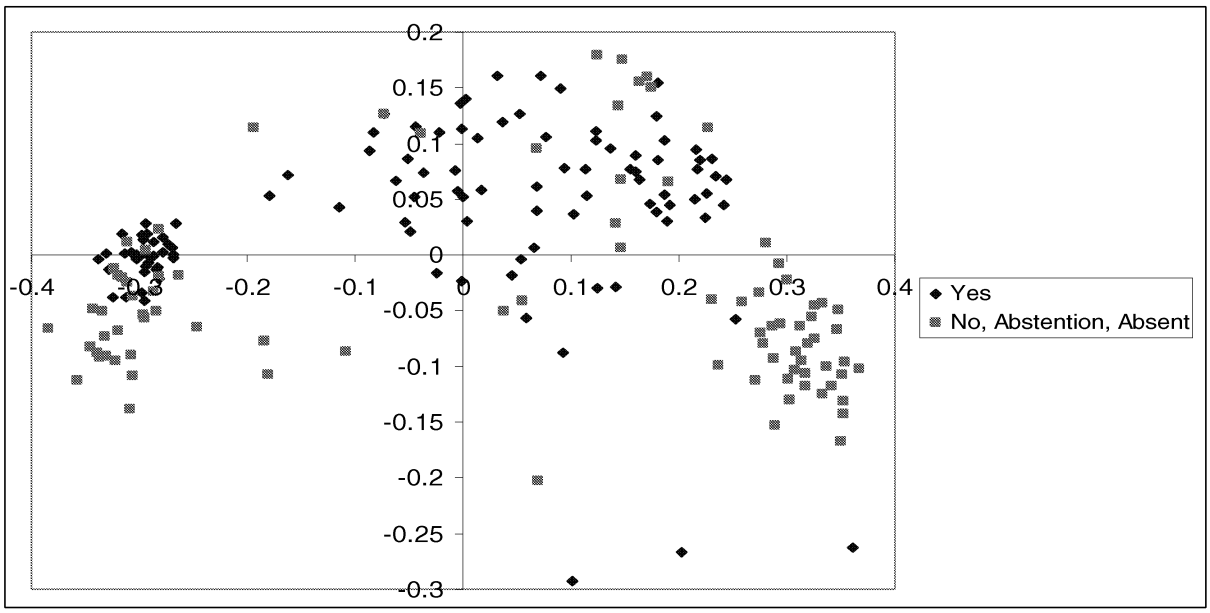


Every dot represents the relative position of an individual MP of the National Council for the legislative period 1999 to 2003. Dots of the same form represent MPs of the same party. A small distance between two dots represents a similar voting behaviour in parliament, a large distance represents a dissimilar voting behaviour.

The graph is based on a "multidimensional scaling" method, which maps pairwise differences in voting behaviour (for every pair of MPs) into pairwise geometric differences. The values of the pairwise differences in voting behaviour range from 0 (no difference in voting behaviour) to 1 (exact opposite in terms of voting behaviour). The multidimensional scaling method is based on an iterative algorithm: in an initial step, all MPs are randomly distributed in a two-dimensional geometric space. MPs are then iteratively displaced in the geometric space such as to minimise the error between the sum of ideological and geometric differences. The axes have no labels, the distribution along the x-axis is, however, broadly consistent with the left-right position of individual MPs. The distribution along the y-axis is broadly consistent with the (social and economic) liberalism of individual MPs (with more liberal MPs having higher values along the y-axis).
Additional information on the multidimensional scaling method can be found under:
www.parlamentsspiegel.ch/MDS.pdf (in German).

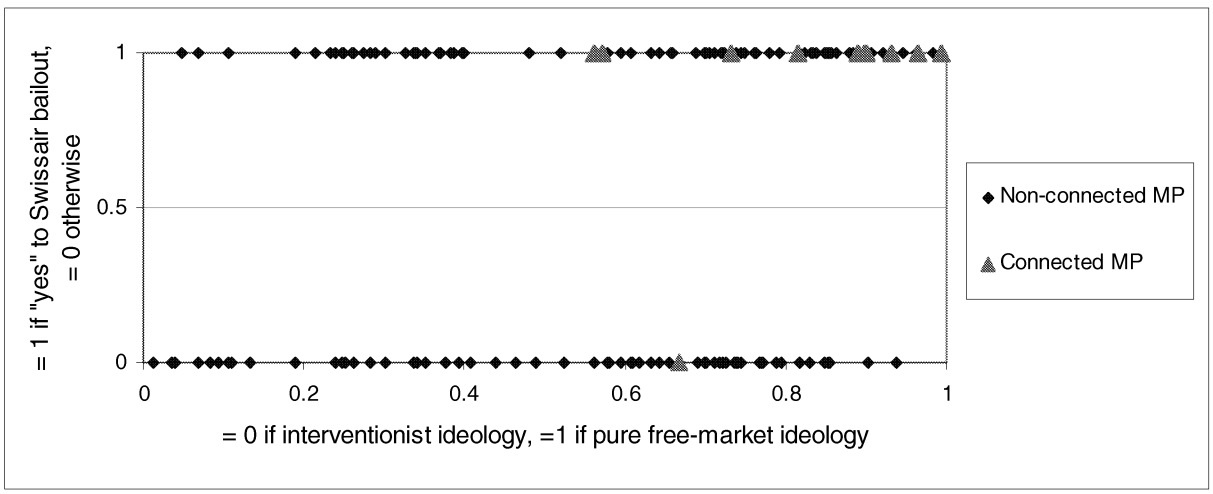
Source: Sotomo (University of Zurich).

Figure 2: Distribution of votes along the relative political position



Source: Sotomo (University of Zurich).

Figure 3: Voting behaviour as a function of *free-market ideology*



Own source.

Table 1: Major Swiss political parties

Acronym	Political party (German)	Poltical party (English)
SP	Sozialdemokratische Partei	Social Democrats
CVP	Christlichdemokratische Volkspartei	Christian Democrats
FDP	Freisinnig-demokratische Partei	Radical-Liberal Party
SVP	Schweizerische Volkspartei	Swiss People's Party
LPS	Liberale Partei Schweiz	Liberal Party
GPS	Grüne Partei Schweiz	Green Party
EP	Evang. Volkspartei / Eidg. demokratische Union	Evangelic Party

Table 2: Private investors

Private Investor	Amount investet (CHF)
Walter Haefner/Amag	200 mn
UBS	178 mn
Credit Suisse Group	172 mn
Nestlé	100 mn
Novartis	100 mn
Roche	100 mn
Swisscom	100 mn
Swiss Re	100 mn
Zürich Financial Services	100 mn
Holcim	50 mn
Rentenanstalt Swiss Life	50 mn
Thomas Schmidheiny	30 mn
Bertarelli & Cie.	25 mn
Raiffeisenbanken	25 mn
Serono	25 mn
Zürcher Kantonalbank	25 mn
Ciba Spezialitätenchemie	10 mn
Kudelski	10 mn
Schindler Holding	10 mn
Edipresse	approx. 1 mn
Anonymous investors	279 mn
Total of disclosed private investments	**CHF 1690 mn**
Other private investors (amount invested not disclosed)	
Famille Ammann	n.a.
Deutsche Bank	n.a
Givaudan	n.a.
Sika	n.a.
Other banks	n.a.

Source: List published by the Federal Finance Department on October 22, 2001.

Table 3: Data sources

Dependent variable	
yes	Parliamentary Services: Record of the National Council, 2001
Explanatory variables	
network	Own calculations
connected	Federal Finance Department: List of private investors published on October 22, 2001 and Parliamentary Services: Declaration of Interests (National Council), 2001
board link	Parliamentary Services: Declaration of Interests (National Council), 2001
party-canton link	Parliamentary Services: Directory of Members of Parliament (National Council and Council of States), 2001
committee link	Parliamentary Services: Directory of committee members (National Council and Council of States), 2001
seat link	Parliamentary Services: Seating plan (National Council), 2001
Political controls	
political ideology	Hohl and Jeitziner (2001)
pol. ideol. (deviation)	Hohl and Jeitziner (2001), own calcuations
free-market ideology	Research institute *Sotomo*, University of Zurich
SP	Parliamentary Services: Directory of Members of Parliament (National Council and Council of States), 2001
CVP	Parliamentary Services: Directory of Members of Parliament (National Council and Council of States), 2001
FDP	Parliamentary Services: Directory of Members of Parliament (National Council and Council of States), 2001
SVP	Parliamentary Services: Directory of Members of Parliament (National Council and Council of States), 2001
margin	Federal Council: Election results to the National Council 1999, accessible under: http://www.admin.ch/ch/d/pore/nrw99/indexkt.html
turnout	Federal Statistical Office: statweb
vote share	Parliamentary Services: Election results to the National Council 1999, accessible under: www.parlament.ch
Other controls	
french	Own calcuations
aviation jobs	Federal Statistical Office: Federal Population Census 2000
debt	Federal Statistical Office: statweb

Table 4: Summary statistics

	Obs	Mean	S.D.	Min	Max
Dependent variable					
yes	199	0.553	0.498	0	1
Explanatory variables					
network	199	0.382	0.670	0	4
connected	199	0.060	0.239	0	1
board link	199	0.075	0.265	0	1
party-canton link	199	0.090	0.288	0	1
committee link	199	0.116	0.321	0	1
seat link	199	0.101	0.301	0	1
Political controls					
political ideology	199	-0.001	0.077	-0.100	0.100
pol. ideol. (deviation)	199	0.070	0.035	0	0.111
free-market ideology	198	0.554	0.262	0.012	0.993
SP	199	0.261	0.440	0	1
CVP	199	0.171	0.377	0	1
FDP	199	0.211	0.409	0	1
SVP	199	0.226	0.419	0	1
margin	199	1.550	1.011	0.627	11.284
turnout	199	0.431	0.061	0.282	0.619
vote share	199	0.240	0.135	0.019	1
Other controls					
french	199	0.226	0.419	0	1
aviation jobs	199	0.005	0.004	0.000	0.014
debt	199	0.008	0.004	0.003	0.027

Table 5: Detailed summary statistics

	SP	SVP	FDP	CVP	GP	LPS	EP	Others	Total
# of MPs in the group	52	45	42	34	10	6	5	5	199
of which:									
Supported the bill	36	5	36	30	0	0	0	3	110
Rejected the bill	6	29	0	0	10	4	5	2	56
Abstained	7	3	4	3	0	1	0	0	18
Absent at the vote	3	8	2	1	0	1	0	0	15
Connected	0	2	7	3	0	0	0	0	12
Board linked	2	3	6	3	1	0	0	0	15
Party+Canton linked	0	1	12	5	0	0	0	0	18
Committee linked	6	4	8	3	0	1	0	1	23
Seat linked	0	4	11	5	0	0	0	0	20

Table 6: Correlation matrix

	yes	*connected*	*network*	*board link*	*party-canton link*	*committee link*	*seat link*	*free-market ideology*	*political ideology*	*pol. ideol. (deviation)*	*SP*	*CVP*	*FDP*	*SVP*	*margin*	*turnout*	*vote share*	*french*	*aviation jobs*	*debt*
yes	1.000																			
connected	0.187	1.000																		
network	0.215	-0.146	1.000																	
board link	0.105	-0.073	0.548	1.000																
party-canton link	0.250	-0.080	0.579	0.175	1.000															
committee link	0.074	-0.092	0.545	0.075	-0.005	1.000														
seat link	0.067	-0.085	0.609	0.094	0.186	0.088	1.000													
political ideology	-0.159	0.155	0.222	0.087	0.162	0.043	0.217	1.000												
pol. ideol. (deviation)	-0.235	-0.205	-0.242	-0.087	-0.302	0.011	-0.186	-0.491	1.000											
free-market ideology	0.126	0.257	0.311	0.151	0.247	0.080	0.239	0.806	-0.697	1.000										
SP	0.170	-0.152	-0.205	-0.084	-0.189	-0.001	-0.200	-0.748	0.670	-0.697	1.000									
CVP	0.304	0.053	0.059	0.022	0.089	-0.040	0.070	-0.017	-0.503	0.219	-0.272	1.000								
FDP	0.320	0.231	0.385	0.132	0.352	0.120	0.277	0.365	-0.363	0.520	-0.310	-0.236	1.000							
SVP	-0.479	-0.037	-0.095	-0.019	-0.130	-0.046	-0.022	0.602	0.051	0.198	-0.324	-0.247	-0.281	1.000						
margin	0.032	-0.021	0.057	0.007	-0.034	0.093	0.052	-0.019	0.054	-0.017	-0.055	-0.101	0.125	-0.066	1.000					
turnout	0.218	0.026	-0.056	0.057	-0.119	-0.023	-0.036	0.122	0.008	0.158	-0.058	0.163	0.014	0.055	-0.104	1.000				
vote share	0.174	-0.035	0.038	-0.027	-0.060	0.080	0.081	0.169	-0.044	0.108	0.046	0.151	-0.015	0.158	0.365	0.151	1.000			
french	-0.164	-0.037	-0.005	-0.064	0.038	-0.009	0.018	-0.195	-0.100	-0.206	0.032	0.009	0.013	-0.208	-0.035	-0.582	-0.137	1.000		
aviation jobs	0.002	0.085	-0.141	-0.040	0.003	-0.156	-0.116	0.025	0.168	-0.015	0.034	-0.155	-0.023	0.125	-0.060	0.052	-0.073	-0.099	1.000	
debt	-0.038	-0.049	-0.002	-0.099	0.021	0.074	-0.017	-0.085	0.109	-0.075	0.129	-0.157	-0.010	-0.034	-0.074	-0.051	-0.038	0.104	0.073	1.000

Table 7: Baseline regressions

	Dependent variable = 1 if MP voted "yes", 0 otherwise					
	Probit	Probit	Probit	Probit	Quant. effects[1)]	Quant. effects[1)]
	(1)	(2)	(3)	(4)	(2')	(4')
connected [(†)]	2.017**	1.700***	2.108**	1.728***	0.507	0.523
	(0.80)	(0.49)	(0.83)	(0.50)		
network [(†)]	0.413*	0.481**			0.060	
	(0.23)	(0.22)				
board link [(†)]			0.760**	0.794**		0.174
			(0.37)	(0.33)		
party-canton link [(†)]			1.742**	1.555**		0.445
			(0.84)	(0.69)		
committee link [(†)]			0.300	0.463		0.083
			(0.34)	(0.37)		
seat link [(†)]			-0.371	-0.250		-0.027
			(0.36)	(0.37)		
political ideology	-0.00518		1.824			
	(6.11)		(6.28)			
political ideology (deviation)		-24.69***		-23.03***	-0.226	-0.218
		(6.91)		(7.11)		
free-market ideology	-0.0836	-0.753	-0.292	-0.744	-0.060	-0.061
	(1.12)	(0.89)	(1.10)	(0.90)		
SP [(†)]	1.689***	2.736***	1.802***	2.657***	0.824	0.810
	(0.45)	(0.57)	(0.47)	(0.55)		
CVP [(†)]	2.244***	1.708***	2.285***	1.776***	0.510	0.542
	(0.58)	(0.62)	(0.57)	(0.63)		
FDP [(†)]	1.950***	1.670***	1.841***	1.647***	0.495	0.492
	(0.72)	(0.59)	(0.71)	(0.59)		
SVP [(†)]	-0.664	-0.541	-0.839	-0.550	-0.044	-0.047
	(0.95)	(0.59)	(0.97)	(0.58)		
margin	0.117	0.287	0.136	0.274	0.046	0.046
	(0.17)	(0.24)	(0.16)	(0.20)		
turnout	3.444	4.182*	4.645*	4.937*	0.220	0.269
	(2.34)	(2.53)	(2.54)	(2.63)		
vote share	1.740	1.607	1.805	1.569	0.049	0.049
	(1.15)	(1.17)	(1.10)	(1.08)		
french [(†)]	-0.698*	-0.967**	-0.683*	-0.952**	-0.058	-0.060
	(0.36)	(0.38)	(0.36)	(0.39)		
aviation jobs	52.83**	74.30***	52.27**	70.61***	0.028	0.028
	(24.7)	(23.9)	(25.9)	(24.9)		
debt	0.579	-0.417	-4.725	-5.449	-0.000	-0.006
	(29.9)	(31.0)	(28.4)	(29.1)		
constant	-3.291**	-1.979	-3.669**	-2.326		
	(1.57)	(1.54)	(1.59)	(1.63)		
Pseudo R-squared	0.48	0.53	0.51	0.55		
Observations	198	198	198	198		

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

[(†)] Discrete explanatory variables and dummy variables.

[1)] For continuous explanatory variables, the coefficients represent semi-elasticities (the effect of a one-per-cent change in the explanatory variable on the dependent variable). For discrete explanatory variables and dummy variables [(†)], the coefficients represent the change in the dependent variable for a unit change in the explanatory variable. All quantitative effects are calculated at the median value for each variable.

Table 8: Robustness tests

	Dependent variable = 1 if MP voted "yes", 0 otherwise				
	Probit	Probit	Probit	Probit	Logit
	(1)	(2)	(3)	(4)	(5)
connected	1.734***	1.493***	1.501***	1.640***	2.624**
	(0.50)	(0.53)	(0.53)	(0.49)	(1.08)
board link	0.780***	0.711***	0.428	0.376	0.558
	(0.30)	(0.27)	(0.38)	(0.45)	(0.75)
party-canton link	1.595**	1.171*	1.594***	2.057***	3.374***
	(0.65)	(0.68)	(0.47)	(0.51)	(1.08)
committee link	0.255	0.314	0.384	0.378	0.515
	(0.34)	(0.31)	(0.29)	(0.35)	(0.56)
seat link	-0.249	-0.349	0.0742	0.0887	0.142
	(0.35)	(0.35)	(0.33)	(0.38)	(0.56)
political ideology (deviation)	-17.37**	-11.04*			
	(7.04)	(6.02)			
free-market ideology	0.226	0.571			
	(0.83)	(0.78)			
SP	2.668***	2.548***			
	(0.58)	(0.55)			
CVP	1.664***	2.115***			
	(0.57)	(0.53)			
FDP	1.393**	1.753***			
	(0.57)	(0.54)			
SVP	-0.333	-0.0306			
	(0.54)	(0.52)			
margin	0.293*				
	(0.15)				
turnout	8.725***				
	(2.46)				
vote share	1.157				
	(0.94)				
french					
aviation jobs					
debt					
cantonal dummies				Yes	
cantonal FE					Yes
constant	-4.722***	-1.031	-0.118	-0.459	No
	(1.23)	(0.80)	(0.11)	(0.37)	
Pseudo R-squared	0.51	0.44	0.10	0.21	0.17
Observations	198	198	199	177	177

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Influence of connected MPs on the parties' voting recommendation

	Dependent variable = 1 if party recommendation is "yes" and 0 else		
	Probit (2)	Probit (3)	Probit (4)
percentage of connected MPs in party	16.27*	16.28*	17.10**
	(8.90)	(9.38)	(8.40)
party mean of pol. ideol. (devation)	-7.282		
	(15.81)		
party mean of free-market ideology	-0.468	-0.240	
	(2.07)	(1.49)	
constant	0.073	-0.776	-0.680
	(1.89)	(0.70)	(0.42)
Observations	14	14	14
Pseudo R-squared	0.19	0.18	0.18

Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 10: Counterfactual analysis

Number of MPs that would not have voted "yes" (and acceptance of Swissair bailout in %) if [1]:	#	Acceptance in %
... no effect was removed (actual data)	0	66.27
... all links were 0	5	63.25
... connected and all links were 0	7	62.05

[1] Based on the baseline regression 2 (column (4) of Table 7).