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Fiscal Federalism and Economic Performance New Evidence from Switzerland

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Abstract

The link between federalism and economic performance is still ambiguous. Aiming at clarification, we improve on a widespread shortcoming by measuring federalism not just by one variable but by various institutions that constitute it. To this end, Switzerland provides for a laboratory as its 26 cantons share a common framework, while the extent of federalism varies between the cantons and across time. By exploiting this setting, the paper provides evidence for the expected heterogeneity: The impact of federalism on economic performance differs conditional on the federal instrument considered. Overall, instruments of competitive federalism appear to improve economic performance of the cantons, while adverse effects are reported for cooperative elements.

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1 Introduction

The relevance of institutions for a country's economic performance has been broadly acknowledged in the literature (e.g., Acemoglu and Robinson 2012, Acemoglu et al. 2005, North and Thomas 1973). However, the role of fiscal federalism is still disputed. Theoretical arguments highlight that federalism may be both a resource and a threat for economic performance. Given this ambiguity, a bulk of studies aimed at investigating the issue empirically. While the literature has failed to provide a clear picture to date, recent contributions suggest that the measurement of federalism matters for the (divergent) results (see, e.g., Baskaran et al. 2016). In particular, the common approach of measuring federalism by just one variable (usually fiscal decentralization) or simply differentiating between unitary and federal states is insufficient. For Swiss federalism, the empirical evidence is remarkably scarce (but see Feld et al. 2005). This comes as a surprise given that Switzerland is a prime example of a federal country.

This paper improves on a widespread shortcoming of previous research by taking into account the various institutions that constitute federalism, allowing for uncovering heterogeneous effects. To this end, Switzerland provides for a laboratory, as its 26 cantons share a common framework while the extent of federalism varies between the cantons. The paper exploits this setting by investigating the effects of seven distinct instruments of federalism on cantonal economic performance and GDP growth during the years 1980 − 2013. The findings differ conditional on the measurement of the dependent variable and on the federal instrument under consideration. Overall, the paper suggests that instruments of competitive federalism improve economic performance of the cantons, while adverse effects are reported for cooperative elements. This particularly holds if the dependent variable maps cantonal economic performance as measured by real GDP per employee.

The remainder of the paper is organized as follows: Section 2 briefly summarizes the main transmission channels of fiscal federalism; Section 3 reviews the empirical literature; Section 4 identifies the federal institutions in the Swiss cantons; Section 5 presents the empirical strategy and the model; Section 6 shows the baseline results; Section 7 discusses the robustness of the results and Section 8 concludes.

2 Transmission Channels of Fiscal Federalism

The theoretical advantages and disadvantages of fiscal federalism for regional economic performance have already been discussed extensively, identifying several transmission channels (e.g., Baskaran et al. 2017, 2016, Feld et al. 2017, 2005, 2003, Wilson and Wildasin 2004, Oates 1999, Inman and Rubinfeld 1997). One of the most prominent characteristics of federalism is fiscal decentralization. It is widely assumed to bring political actors closer to the people, thereby facilitating information flows between governments and the local population and reducing information asymmetry. This mechanism should raise voters' political awareness, simplify their control over subnational governments and increase their willingness to pay for public goods. Thereby, the local governments should be less corruptive and better informed about local preferences vis-a-vis the central government. As a result, the political responsiveness to the heterogeneous local needs and the efficiency of resource allocation is increased (Oates 1972). By adhering to the local preferences and supplying the appropriate form and level of public goods regional economic performance is eventually supported. However, the positive effects of fiscal decentralization hinge critically on whether political and fiscal autonomy is granted to the local governments or whether they just act on behalf of the upper-level government.

The incentives to satisfy the local preferences and provide public goods efficiently are commonly assumed to be intensified by a competitive setting. Competition among the federal jurisdictions provides – in analogy to the market – the possibility of choice as it allows different bundles of public goods and taxes to be produced. As a result, the individuals can choose the location that best fits their interests, i.e., moving to the jurisdiction that offers the bundle they like best (Tiebout 1956). The threat of exit is particularly credible if many jurisdictions are close-by (i.e., the fragmentation is high) and the costs to leave are thus low. The advantages of a competitive setting would even be valid in a world without any mobility: If voters base their election decisions on the performance of their region vis-à-vis other regions, the governments are exposed to a yardstick competition (Besley and Case 1995). The mechanism of "voice and exit" (Hirschman 1970) reveals the taxpayers' preferences and creates incentives for the subnational governments to satisfy local preferences, provide public goods efficiently and conduct business-friendly policies. Thereby federal competition supports regional economic performance.

In addition, federal competition is frequently considered to be a check on the power to tax of revenue-maximizing Leviathans (Brennan and Buchanan 1980), to reduce the attractiveness of market interventions (Weingast 1995) and to support reforms, innovation and structural change (Oates 1999). Regarding the latter, federal competition provides incentives to take more risk and experiment with new policy solutions in order to generate a competitive advantage. In a process of imitation, successful policies can spread across jurisdictions, while unsuccessful ones do not harm the whole economy. Moreover, tax competition can serve as a tool to compensate for economic disadvantages of peripheral jurisdictions vis-à-vis agglomerations (Baldwin and Krugman 2004).

However, federal competition may have its drawbacks. Instead of compensating for economic disadvantages, tax competition could reinforce economic differences and amplify the rural exodus if poorer regions are forced to levy higher taxes than richer regions in order to finance their public goods. Cai and Treisman (2005) even show that the worse-endowed regions tend towards predatory policies as they already anticipate that they will lose in the competition, while the better-endowed regions improve their business climate and can, thus, attract more capital. In a related line of argument, opponents of federal competition emphasize that the fear of capital outflows would result in a degradation of the welfare state and of public finances since tax adjustments are in one direction only, i.e., downwards (see Feld 2000a, 2009 for surveys on this literature). However, the incentives to engage in such a race to the bottom should be strongly limited if the fiscal framework assigns the main distributive mechanisms to the federal level and strengthens fiscal responsibility and fiscal discipline at the subnational level.

A common tool to cushion potential drawbacks of competitive federalism are fiscal equalization transfers. Since they are commonly distributed conditional on the fiscal strength of receiving jurisdictions, they provide some levelling of the playing field. Poorer regions are enabled to levy lower taxes without jeopardizing fiscal solidity, thereby gaining attractiveness and strengthening economic performance. However, the fiscal equalization system provides for a soft budget constraint with adverse incentives. If transfers relax liability for own policies, subnational governments could be tempted to impede structural change and use tax and debt strategically in order to get more transfers (Feld, Schnellenbach and Baskaran 2012). Subsequently, incentives to satisfy local preferences and expand the tax base by conducting business-friendly policies erode. This particularly

holds if the marginal rates of contribution to the equalization scheme are large, i.e., the rates at which additional revenues are skimmed via larger contributions or lower transfer receipts. Besides fiscal equalization, federal transfers are often justified on the basis of externalities.[1]

Aside from providing a greater proximity between government and the people, decentralization brings governments closer to local interest groups and individual citizens. As a result, subnational governments might be captured more easily by special interests, increasing corruption and retarding economic performance (Rodden and Rose-Ackerman 1997). Incentives to engage in such "unethical activities" are weaker, the better citizens' control the government (and vice versa). To this end, public tasks should be clearly assigned to the governments such that voters can easily match the policy outcomes to the responsible government. However, the transparency is lowered by fiscal equalization systems and by common fiscal resources: If subnational governments tax the same base as the upper-level governments, the costs of taxation, i.e., the erosion of the tax base, are shared among the different government layers and tax rates are thus set too high.

Moreover, opponents of decentralization often argue that subnational governments can hardly satisfy the local needs, even if they liked to, as they lack an adequate capacity, referring to missing local competencies and financial and human resources. A related argument assumes that the co-existence of multiple governments in federal nations harms economic performance as it results in duplicate bureaucracy and increased red tape. In addition, fragmentation into many small jurisdictions may have an adverse effect on the economic performance if economies of scale in the production of the local public goods exist. The "costs of smallness" are often used as an argument in favour of municipal amalgamations (Eichenberger 2014, Fritz and Feld 2015).

To sum up, fiscal federalism may affect economic performance via multiple transmission channels. While the direction of the impact of fiscal federalism is unclear, the theoretical literature allows for three main conclusions: First, federalism is not homogenous but is constituted of various institutions with heterogeneous effects. Second, the arguments in favour of growth-enhancing effects are stronger for competitive than cooperative instruments. Third, the effects of federal institutions depend on their design and the underlying fiscal framework.

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[1] GDP of receiving jurisdictions is increased in an amount equal to the volume of transfers due to accounting systems.

3 Literature Review

Empirical research on the link between federalism and economic performance can broadly be divided into two strands of literature. The first line of research focuses on *foreign direct investment* (FDI) as FDI and the technological advances contained therein are essential determinants of a country's economic performance. Based on the identified transmission channels (Section 2), the effects of federalism on FDI could run in both directions: On the one side, federalism could deter potential investors as they have to cope with multiple government layers and to screen different local regulations. On the other side, competition among the jurisdictions should imply incentives to adopt business-friendly policies and, thus, stimulate FDI.

Given this, several studies attempt to investigate the relation between federalism and FDI empirically – with mixed results, however. While multi-country-studies by Herger et al. (2007) and Jensen (2003) offer ambiguous results for the influence of decentralization on FDI, Kalamova (2011) and Kessing et al. (2007) report a negative effect of decentralization. In addition, Kalamova (2011) and Kessing et al. (2007) find a deterring effect of the number of government layers. On the contrary, Jensen and McGillivray (2005) suggest a positive impact of federalism (as measured by an index) on FDI that is particularly strong in less democratic countries. They explain their findings by noting that federalism lowers the risk that "the host government will expropriate the profits and assets of the foreign investor." This risk is lower in democratic countries as they are relatively trustworthy. The positive relation between federalism and FDI is supported by recent studies for China (e.g., Wu and Teng 2012, Canfei 2006), which are robust to the application of different decentralization measure (He and Sun 2014). However, Malesky (2008) suggests that causality could also run in the opposite direction. He finds a positive effect of FDI on decentralization in the form of autonomous reform experiments by subnational leaders in Vietnam.[2]

The second line of empirical research contains a rich literature that focuses directly on the *relation between federalism and the economic performance*. Given the large number of studies, we refrain from discussing each study but provide a review in Table 1. Overall, most studies measure federalism simply by the share of subnational spending (revenue) from total public spending (revenue).

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[2] A related body of literature investigates the relation between decentralization and the ease of doing business. The findings are also ambiguous (Abdullatif et al. 2013, Sobel et al. 2013).

However, this approach is problematic since measuring federalism by just one variable omits important aspects of federalism. In addition, theory suggests that not decentralization per se is important for economic performance but the decentralization of fiscal autonomy to the subnational level. Among others, Stegarescu (2005) and Ebel and Yilmaz (2003) propose to map fiscal decentralization by the extent of subnational tax autonomy, i.e., to take into account only those revenues over which subnational governments can decide autonomously. The meta-study by Baskaran et al. (2016) confirms the crucial role of the decentralization measure for the results.

However, the multi-country studies provide mixed findings – irrespective of how federalism is measured (Table 1). In support of this conclusion Asatryan and Feld (2015) and Baskaran et al. (2016) show that the specification of the empirical models and the sample used to estimate them affect the results significantly. Among others, the findings are not robust to the inclusion of Switzerland in the sample. The divergent results could be explained by institutional heterogeneity within the international samples and the difficulties of cross-country studies in isolating the effect of federalism from other determinants of economic performance. In line with this conclusion, several multi-country studies reveal that the effects of decentralization are non-linear (e.g., Buser 2011, Akai et al. 2007, Eller 2004, Thiessen 2000), conditional on sample and period (e.g., Martinez-Vazquez and McNab 2006, Yilmaz 1999, Davoodi and Zou 1998) and the underlying institutions (e.g., Enikolopov and Zhuravskaya 2007, Davoodi and Zou 1998).

The problems associated with the heterogeneity within international samples are largely evaded by single-country studies as they are based on a common institutional framework. Thus, it is not surprising that the results for single countries are somewhat less ambiguous (Table 1). Most single-country studies tend to suggest at least no harmful effect of (competitive) fiscal federalism on economic performance. In line with theory, an adverse effect is reported for federal transfers. The role of fragmentation and tax competition has yet to be investigated thoroughly.[3]

The relation between federalism and economic performance in *Switzerland* has, to the best of our knowledge, only been investigated by Feld et al. (2005) so far. The authors analyze the effect of

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[3] The effects of the EU structural funds on regional growth are ambiguous (e.g., Becker et al. 2010, 2012 for growth-enhancing effects and Checcherita et al. 2009, Breidenbach et al. 2016, Eggert et al. 2007 for growth-inhibiting effects). A related field of research studies the impact of development aid on economic growth (a broad literature review is provided by the meta-study of Doucouliagos and Paldam 2008).

various federal institutions on cantonal GDP per capita for the years 1980 to 1998. According to their results, cantonal economic performance is supported by tax competition and largely unaffected by cantonal fragmentation and fiscal decentralization. While fiscal transfers tend to be relevant for cantonal GDP, the results suffer from endogeneity problems.

Table 1   *Review of Studies on the Link between Fiscal Federalism and Economic Performance*

	Measure of federalism	Positive effect	No or ambiguous effect*	Negative effect
Multi-country studies	Exp. decentralization	Iimi (2005)	Asatryan and Feld (2015), Baskaran and Feld (2013), Buser (2011), Feld (2008), Akai et al. (2007), Enikolopov and Zhuravskaya (2007), Martinez-Vazquez and McNab (2006), Eller (2004), Thiessen (2000), Yilmaz (1999), Davoodi and Zou (1998), Woller and Philipps (1998)	Gemmel et al. (2013), Rodriguez-Pose and Ezcurra (2011)
	Rev. decentralization	Gemmel et al. (2013)	Asatryan and Feld (2015), Baskaran and Feld (2013), Bodman (2011), Buser (2011), Akai et al. (2007), Enikolopov and Zhuravskaya (2007), Martinez-Vazquez and McNab (2006), Eller (2004), Woller and Philipps (1998)	Rodriguez-Pose and Ezcurra (2011)
	Tax revenue autonomy / Tax decentralization	Gemmel et al. (2013), Buser (2011)	Asatryan and Feld (2015), Bodman (2011), Feld (2008), Thornton (2007)	Baskaran and Feld (2013)
Single-country studies	Exp. decentralization	Akai and Sakata (2002)	Qiao et al. (2008), Feld et al. (2005), Jin and Zou (2005), Xie et al. (1999)	Rodríguez-Pose and Krøijer (2009), Stegarescu et al. (2002) Zhang and Zou (2001, 1998)
	Rev. decentralization	Berthold and Fricke (2007, 2006), Zhang and Zou (2001)	Gil-Serrate and Lopez-Laborda (2006), Akai and Sakata (2002)	
	Tax revenue autonomy / Tax decentralization	Gil-Serrate and Lopez-Laborda (2006), Desai et al. (2005), Ebel and Yilmaz (2003), Zhang and Zou (2001), Lin and Liu (2000)	Rodríguez-Pose and Krøijer (2009), Feld et al. (2005), Jin and Zou (2005), Akai and Sakata (2002)	
	Fragmentation	Hatfield and Kosec (2013), Stansel (2005)	Feld et al. (2005)	
	Transfers		Kaufman et al. (2003), Ebel and Yilmaz (2003)	Baskaran et al. (2017), Rodríguez-Pose and Krøijer (2009), Berthold and Fricke (2007, 2006), Desai et al. (2005), Feld et al. (2005), Berthold et al. (2001)
	Tax competition	Feld et al. (2005)		

* The results of several studies are classified as ambiguous since the effect is not straightforward but depends on additional factors (e.g., underlying institutions, sample, period, model). Source: Own research.

A comprehensive literature review on the status of economic research into federalism has recently been provided by Feld et al. (2017). The authors conclude that federal structures can generally be assumed to have a positive influence on various indicators of competitiveness. Of particular importance for the relation between federalism and economic performance are their findings that federalism tends to support sound government finances, the quality of public (health) services, life satisfaction and tax compliance on the one side and to curb corruption and the shadow economy on the other side.

To sum up, the empirical evidence on the relation between fiscal federalism and economic performance reaffirms and extends the theoretical results: First, single-country studies tend to be less ambiguous than multi-country studies. Second, federalism is constituted by various institutions that have heterogeneous effects, invalidating the common approach to measure federalism by just one variable or simply differentiating between unitary and federal states. Third, the measurement of the decentralization indicator matters for the results. Fourth, the elements of competitive federalism tend to support economic performance, while transfers have the opposite effect.

4   Federal Institutions in the Swiss Cantons

The Swiss federation is made up of three layers of governments, i.e., the federal level, the 26 cantons (states) and the roughly 2.200 municipalities. This indicates a substantial fragmentation of the subnational level as Switzerland covers just around 15,940 square miles (the 50 US states cover an area that is over 230 times larger). While the cantons differ in several aspects such as culture, population, geography, industrialization and urbanization, all cantons share a similar fiscal framework that is shaped by a strong tradition of fiscal autonomy and responsibility. In particular, the subnational level enjoys substantial tax autonomy. To finance their activities, the cantons and municipalities rely first and foremost on own taxes which rates (surcharges) can be chosen autonomously (tax bases are largely harmonized). While tax revenues on the subnational level are primarily derived from taxing individual and corporate income, the federal level generates most revenues from the value added tax and the direct federal income tax. Several studies show that the taxpayers in Switzerland reside where income taxes are low (e.g., Liebig et al. 2007, Schmidheiny 2006, Feld and Kirchgässner 2001, Feld 2000a, 2000b, Kirchgässner and Pommerehne 1996 for personal in-

come tax and Brülhart et al. 2012, Feld and Kirchgässner 2003 for cooperate income tax). The resulting tax competition does at least not seem to be harmful for the welfare state and the provision of public services, contradicting widespread concerns. The absence of such a race to the bottom could be explained by the federal framework of Switzerland as it assigns the main distributive mechanisms to the federal level and emphasizes fiscal responsibility at the subnational level. In addition, the incentives to decrease taxes and rely on debt are alleviated since the cantons are frequently restricted by strong fiscal rules and cannot assume a bailout in case of excessive public debt (Burret and Feld 2018a, 2018b).

Figure 1   Institutions of Fiscal Federalism
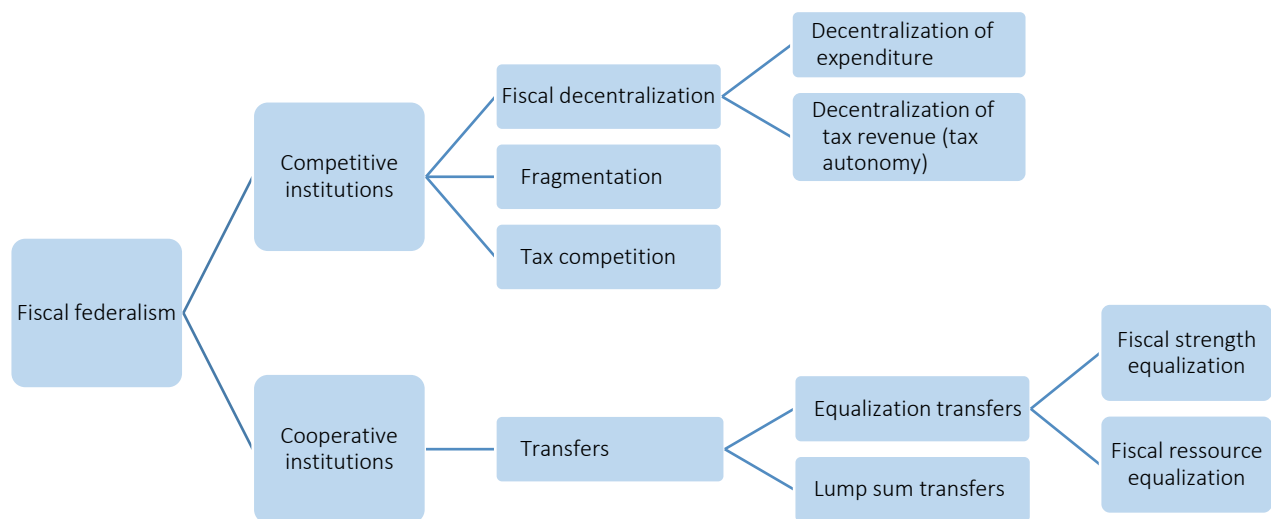
Own illustration.

As research suggests to view federalism not as a homogenous structure but to take into account the various institutions that constitute it, we distinguish different federal institutions in the Swiss cantons (Figure 1). The most prominent element of federalism is *fiscal decentralization*. In Switzerland, the cantons (municipalities) account for approximately 40% (22%) of total public expenditure and revenue. Thus, around two out of three Swiss Francs are spend and collected by the subnational governments, indicating a relatively high extent of fiscal decentralization. The main areas of spending are public security, education and healthcare on the cantonal level and environment as well as culture and recreation on the municipal level. While all cantons award fiscal competencies to their municipalities, fiscal decentralization of the cantons differs substantially (Figures 2 and 3). In 2013, one of the highest (lowest) level of expenditure and tax decentralization was recorded in

Zurich (Geneva) with almost 56% (21%) and 51% (23%), respectively. An exception is Basel City showing an extraordinarily low level of fiscal decentralization (around 3%) due to its special status as a "city-canton".

Figure 2   Cantonal Expenditure Decentralization in %
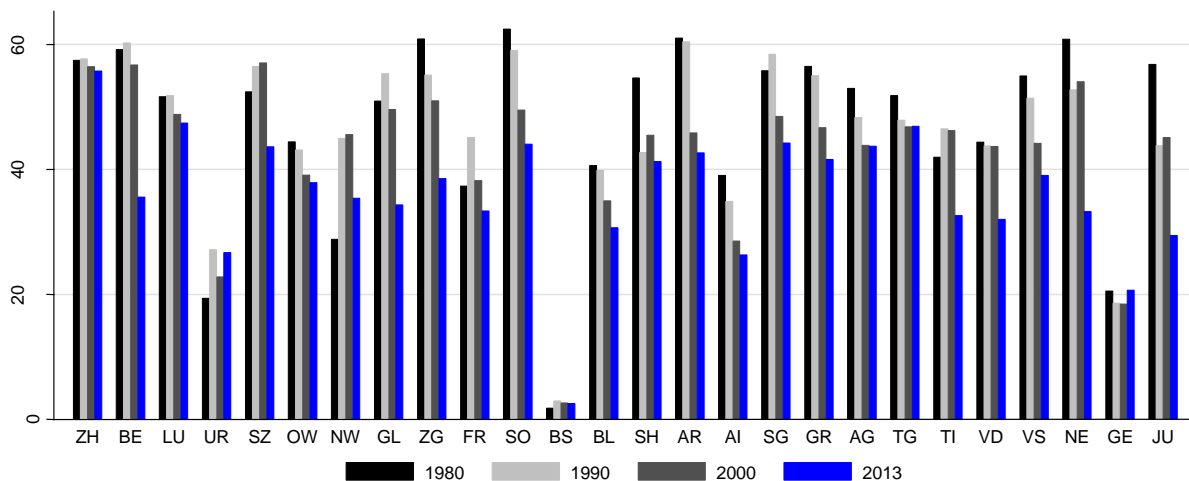
Expenditure decentralization is measured by the share of total municipal spending from the sum of cantonal and municipal spending. Abbreviations: ZH Zurich, BE Bern, LU Lucerne, UR Uri, SZ Schwyz, OW Obwalden, NW Nidwalden, GL Glarus, ZG Zug, FR Fribourg, SO Solothurn, BS Basel City, BL Basel County, SH Schaffhausen, AR Appenzell Outer-Rhodes, AI Appenzell Inner-Rhodes, SG Sankt Gall, GR Grisons, AG Aargau, TG Thurgau, TI Ticino, VD Vaud, VS Valais, NE Neuchâtel, GE Geneva, JU Jura. Source: Own calculation and illustration.

Figure 3   Cantonal Revenue Decentralization in %
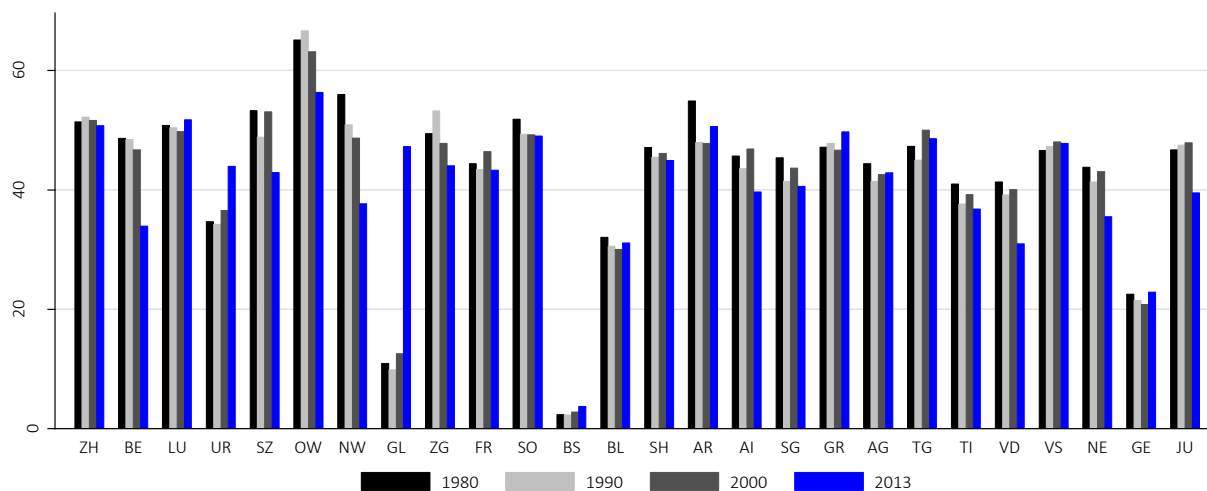
Revenue decentralization is measured by the share of total municipal tax revenue from the sum of cantonal and municipal tax revenue. Abbreviations refer to Figure 2. Source: Own calculation and illustration.

Cantonal expenditures are typically decentralized to a greater extent than tax revenue, although the difference is not substantial in most cases (Figures 2 and 3).[4] The divergent degrees of expenditure and revenue decentralization within the cantons are hardly surprising given the distinct meaning and measurement of the two variables. The expenditure criterion may only capture the extent of administrative federalism, i.e., the distribution of expenditure between the canton and its municipalities independently of whether municipal spending is based on autonomous decisions or mandates from the upper-level governments. Instead, revenue decentralization rather measures the degree of subnational tax autonomy as it primarily includes revenue from own taxes which tax rates or bases are actually controlled by the municipalities. Theoretically, a high (low) degree of expenditure decentralization and a low (high) degree of tax revenue decentralization could be present at the same time. Those extreme cases could occur if a canton devolves the financing of public goods to its municipalities without granting them any tax autonomy and vice versa. Due to their distinct meaning and the complexity of federal fiscal relations, both measures should be taken into account in order to provide for a full picture (Asatryan and Feld 2015, Stegarescu 2005).

A second element of federalism is the *fragmentation* into multiple governments. As in most federations, the number of municipalities per capita has a negative trend in almost all cantons, reflecting municipal amalgamations on the one side and population growth on the other side (Figure 4). Between 1980 and 2013 the residential population of Switzerland increased by almost one third, whereas cantonal population growth varies between + 61% in Fribourg and - 7% in Basel City. Due to amalgamations, the number of municipalities in Switzerland decreased from 3,029 in 1980 to 2,396 in 2013.[5] The largest reductions during this period have been recorded in Ticino (- 112 municipalities), Fribourg (- 102 municipalities) and Thurgau (- 101 municipalities). A particularly profound reform reduced the number of municipalities in the canton of Glarus from 29 in 2009 by almost 90% to three in 2011.[6] Still, ten cantons experienced no variation and Basel County recorded an increase of 13 municipalities between 1980 and 2013. Despite amalgamations, most cantons are still divided into many municipalities – particularly in the Swiss Northwest (Figure A.4).

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[4] For the years 1980 – 2013, the mean of cantonal expenditure decentralization is 43.1% and the mean of tax revenue decentralization is 41.9%, whereas the maximum difference between the two variables amounts to 45.5 percentage points (Glarus in 1990) and the minimum difference to -28.4 percentage points (Obwalden in 1996).
[5] It further decreased to 2,222 as of January 2018.
[6] This reform explains the substantial change of fiscal decentralization in Glarus after 2009 (Figure 2 and 3).

Figure 4   *Cantonal Fragmentation*
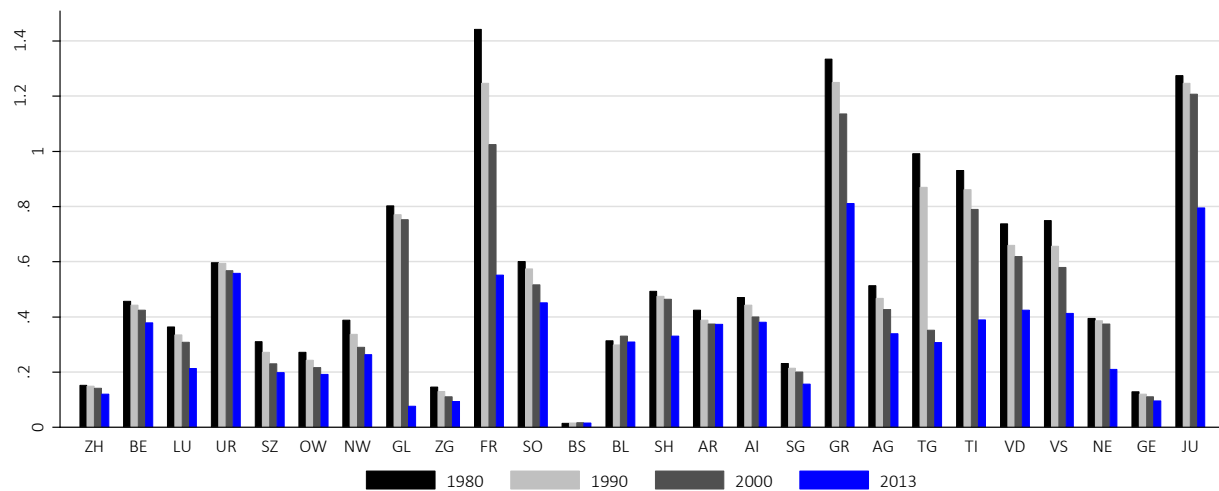
Fragmentation is measured by the number of municipalities per 1,000 inhabitants. Abbreviations refer to Figure 2. Source: Own calculation and illustration.

As literature suggests that taxpayers in Switzerland reside where taxes are low, cantons are likely to exploit their fiscal autonomy and engage in *tax competition*. To measure the degree of tax competition, the absolute differences between the tax burden in one canton and the average tax burden of all bordering cantons is calculated.[7] Supposedly competition in the market for mobile factors of production is more intense, the larger the difference is. The rationale behind this assumption is best explained by considering the case of a small (large) difference: If the tax burden of a canton and its neighbours are similar (differ substantially), the taxpayers' incentives to compare the bundles of public goods and taxes offered by bordering cantons are reduced (increased). As a result, governments face a lower (larger) risk that they are voted out of office or that their tax base erodes due to factor movements. This decreases (increases) the pressure to engage in tax competition and, thus, to satisfy the taxpayers' preferences, provide public goods efficiently and adopt business-friendly policies.

The large variation of tax competition is not surprising given that the tax policies of the canton (and its municipalities) and of all its neighbouring cantons (and their municipalities) enter the calculation of the indicator (Figure 5). For instance, in 1980 the reported tax difference for Uri is 9.3 as it has had a considerably lower tax burden than its neighbours. Just one year later the tax burden of Uri

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[7] The calculation is based on the average tax rates for incomes of CHF 500,000, as high income earners are particularly mobile and average tax rates are supposed to be a key indicator for the choice of residence.

had strongly increased, while its neighbours' tax burden continuously decreased, resulting in a minimum difference of around 0.2 in 2000. Shortly thereafter, the tax burden of Uri started to decrease, re-raising the tax competition indicator to 4.2 in 2013. Over the period 1980 – 2013, tax competition was on average relatively weak for Thurgau, Vaud and Valais (due to similar tax burdens of these cantons and their neighbours) and relatively strong in the cases of Schwyz, Nidwalden and Zug (due to comparatively low own tax burdens) as well as in Bern, Lucerne and Ticino (due to comparatively high own tax burdens).

Figure 5   Cantonal Tax Competition
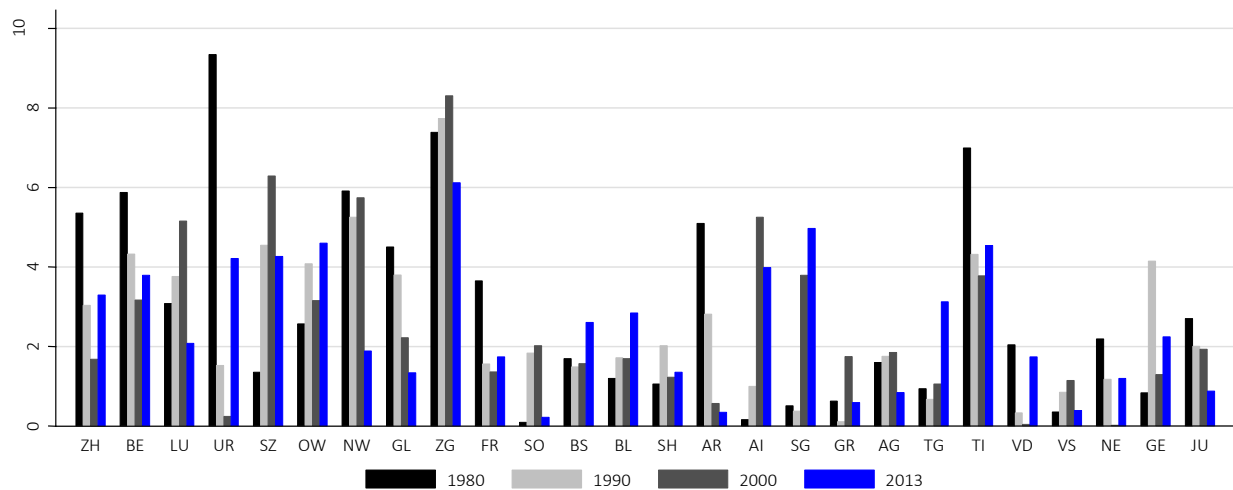
Tax competition as measured by the absolute differences between the tax burden in a canton (in percentage) and the average tax burden in the bordering cantons (in percentage). A larger value indicates a more intense tax competition. Abbreviations refer to Figure 2. Source: Own calculation and illustration.

Even though the Swiss cantons rely mainly on own revenue, an *interjurisdictional fiscal transfer system* exists. Among the transfers, the fiscal equalization payments and the cantonal shares of the federal tax revenues are quantitatively most important. The cantonal tax funds consist mainly of the statutory share of the direct federal income tax of 17% most recently. As this share is allocated among the cantons on a tax origin base, it constitutes a kind of *lump sum transfer*. Due to their allocation mechanism, the lump sum transfers tend to be larger in cantons that are fiscally stronger (and visa versa). Therefore, it is not surprising that lump sum transfers are particularly important for the relative rich cantons of Zug and Schwyz, while the transfers cover only a minor amount of cantonal spending (typically less than 5%) in all other cantons (Figure 6).

Figure 6   *Lump Sum Transfers in % of Cantonal Spending*
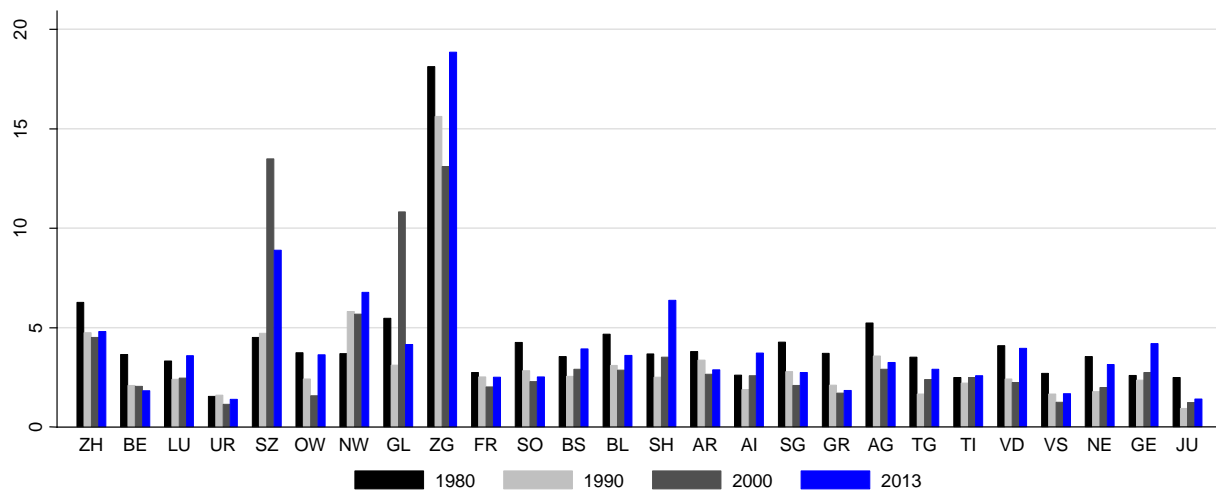
Lump sum transfers are measured by the cantonal shares of direct federal tax revenue. Abbreviations refer to Figure 2. Source: Own calculation and illustration.

The allocation mechanism of the lump sum transfers remained largely unaffected by the reform of the fiscal equalization system and the distribution of tasks between the federal government and the cantons in 2008 (Neugestaltung des Finanzausgleichs und der Aufgabenteilung, thereafter NFA). However, the NFA reform has considerably modified the *fiscal equalization transfers*, while their primary aim, i.e., offsetting differences in the cantonal capacity to generate public revenue persisted. Until the end of 2007 the system was almost exclusively based on earmarked matching grants from the federal level to the cantons. Horizontal equalization proceeded only indirectly as the canton's fiscal strength determined the volume of transfers it received. The fiscal strength was made up of cantonal tax revenue, GDP and tax efforts as well as by the special expenditure require-ments of the Alpine cantons (the first and second factors are weighted higher). As cantonal gov-ernments can easily influence their tax revenue, the allocation mechanism created incentives to use fiscal policy strategically in order to decrease fiscal strength and obtain higher transfers. Thus, it is reasonable to assume that the old equalization system promotes inefficiencies in the public sector with adverse effects on cantonal economic performance.

The old equalization system was substantially reformed by the NFA. Since 2008 the system consists primarily of freely disposable transfers (non-matching grants) that are granted under the resource equalization and cost compensation schemes. The resource equalization transfers are financed by

the federal level (vertical equalization) and the resource-rich cantons (horizontal equalization), creating contributor and recipient cantons for the first time. In analogy to the old system, the federal equalization transfers are still financed by 13% of direct federal tax revenue. However, additional transfers arise from the newly established horizontal equalization scheme. To meet the (dis-)incentives incorporated in the old equalization system, the vertical and horizontal equalization transfers are now determined by the canton's resource potential. It is measured by the theoretically taxable income and assets of natural persons and companies and should, thus, be much less susceptible for political manipulation than the cantons' fiscal strength. However, the marginal rates of contribution to the equalization scheme are still high. In 2018, the marginal rates of contribution have amounted to between 8% and 96% in the financially weak cantons and between 14% and 21% in the financially rich cantons (Leisibach and Schaltegger 2018).Thus, the NFA reform has – at least in the recipient cantons – failed to substantially improve the incentives to expand their tax base and engage in cantonal competition (Brülhart and Schmidheiny 2014).[8]

Besides resource equalization, the new system includes a vertical compensation scheme for excessive costs associated with socio-demographic and geographic-topographic factors. For instance, Alpine cantons frequently face higher costs for operation and maintenance of infrastructure, while centrally situated cantons often face higher costs due to a larger share of the elderly. However, transfer volumes of the cost compensation remain relatively small. In 2018, around 15% of the transfers are distributed under the cost compensation and 85% under resource equalization.

Figure 7 shows the old and the new equalization transfers as shares of cantonal spending. The graph highlights that the reform in 2008 had no substantial influence on the amount of transfers in the recipient cantons. An exception might be Uri, Glarus and Thurgau receiving noticeably higher transfers under the resource equalization scheme. In all other recipient cantons, the reform shows no clear pattern. As expected, the cantons that have received relatively few transfers in the old system are the ones mainly financing the horizontal equalization in the new system (e.g., Basel City, Geneva, Nidwalden, Schwyz, Zug and Zurich). The main contributor by far is Zug, the transfers of which amounted to more than 21% of its total spending in 2013.

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[8] However, the marginal rates of contribution of the Swiss equalization system are still low compared to their German counterparts (Burret et al. 2018).

To provide a meaningful picture of the variation of the federal institutions, Figure A.1 – Figure A.3 illustrate the development of the cantonal instruments between 1980 and 2013 separately for each canton. The figures reveal that the federal instruments fluctuate substantially across the cantons while their variation across time remains fairly limited. An exception are the transfer and the tax competition variables, showing at least some variation across time.

Figure 7   Equalization Transfers in % of Cantonal Spending
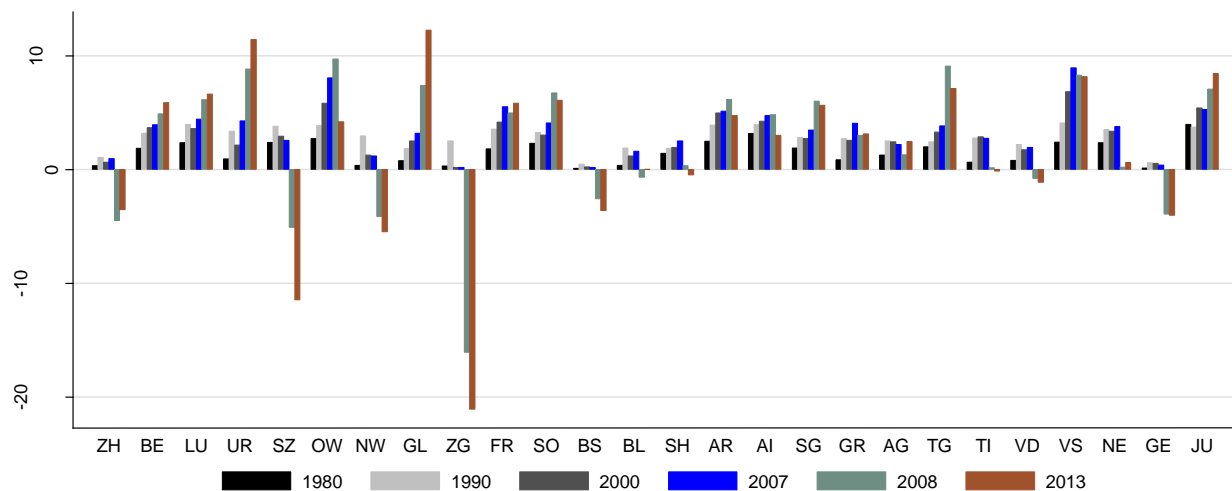
For 1980 – 2007, the fiscal equalization transfers of the old system and for 2008 – 2013, the resource equalization transfers of the new system are depicted. Abbreviations refer to Figure 2. Source: Own calculation and illustration.

5   Data and Economic Model

To investigate the link between federalism and economic performance, we collected panel data covering the 26 Swiss cantons from 1980 to 2013. The decisive advantage of analysing a single country rather than multiple economies resides in the common political, cultural and institutional framework. Despite having a common framework, the cantonal federal institutions differ across cantons. This variation is exploited in the econometric analysis that is based on a neoclassical growth model (Mankiw et al. 1992, Solow 1956). The model explains economic growth by a country's endowment with the production factors labour, physical capital and human capital. In addition, the production function includes technological change as a residual. As it is reasonable to assume that technological change is shaped by underlying institutions, the growth model allows fiscal federalism and economic performance to be linked (the transmission channels are discussed

in Section 2). To investigate this link, we estimate the following two models based on a Cobb-Douglas production function:

Model 1: Economic performance

$$\log(\text{GDP}_{it}/\text{Labor force}_{it}) = \beta_1 \log(\text{Labor force}_{it}) + \beta_2 \log(\text{Education}_{it}) + \beta_3 \log(\text{Investment}_{it})$$
$$+ \beta_4 \text{ Fiscal decentralization}_{it} + \beta_5 \text{ Fragmentation}_{it} + \beta_6 \text{ Lump sum transfers}_{it}/\text{Spending}_{it}$$
$$+ \beta_7 \text{ Old transfers}_{it}/\text{Spending}_{it} + \beta_8 \text{ New transfers}_{it}/\text{Spending}_{it} + \beta_9 \text{ Tax competition}_{it}$$
$$+ \beta_{10} \text{ Urbanization}_{it} + \beta_{11} \log(\text{Population}_{it}) + \beta_{12} \text{ Language}_{it} + \tau_t + \varepsilon_{it}$$

Model 2: Economic growth

$$\text{GDP-Growth}_{it} = \beta_1 \text{ Labor force}_{it}/\text{Population}_{it} + \beta_2 \text{ Education}_{it}/\text{Population}_{it}$$
$$+ \beta_3 \text{ Investment}_{it}/\text{Spending}_{it} + \beta_4 \text{ Fiscal decentralization}_{it} + \beta_5 \text{ Fragmentation}_{it}$$
$$+ \beta_6 \text{ Lump sum transfers}_{it}/\text{Spending}_{it} + \beta_7 \text{ Old transfers}_{it}/\text{Spending}_{it}$$
$$+ \beta_8 \text{ New transfers}_{it}/\text{Spending}_{it} + \beta_9 \text{ Tax competition}_{it} + \beta_{10} \text{ Urbanization}_{it}$$
$$+ \beta_{11} \text{ Population growth}_{it} + \beta_{12} \text{ Language}_{it} + \tau_t + \varepsilon_{it}$$

The subscript i indicates the canton and t the year. The dependent variable in model 1 is the cantonal labour productivity as measured by real GDP per employee (logarithm). Model 2 maps cantonal economic prosperity by the growth rate of the real GDP.

Our main interest is on the variables that capture federal institutions in the Swiss cantons (see Section 4). Following recent literature, we differentiate between expenditure decentralization, tax revenue decentralization (i.e., tax autonomy), fragmentation, tax competition, federal lump sum transfers, old fiscal equalization transfers (1980 – 2007) and new resource equalization transfers (2008 – 2013). The three transfer variables are measured as share of cantonal spending.

Further explanatory variables cover the three production factors: labour is approximated by the cantons' working population (logarithm in model 1, per capita in model 2), physical capital by the cantonal investment spending (logarithm in model 1, expenditure share in model 2) and human capital by the cantonal population with a higher educational qualification (logarithm in model 1, per capita in model 2). In addition, the cantonal population (logarithm in model 1, growth rate in model 2) and the degree of urbanization (measured by the share of urban population from the total cantonal population) are used in order to capture the (dis-)advantages of agglomerations. The share of German speaking citizens is used to map cultural differences across the cantons. Further information and descriptive statistics for all variables are provided in Table A.1 and A.2.

The models are estimated using OLS with time fixed effects (τ_t) to control for unobserved time-specific factors affecting all cantons. Canton fixed effects are not included in the baseline specifications as those would somewhat camouflage the influence of federal institutions with a low variation across time. This concern is supported by the robustness test using two-way fixed effects.

Problems associated with outliers and error terms that are not independent and identically distributed (i.i.d.) are mitigated by our large sample and the log transformation. In addition, a dummy variable controls for the special status of Basel City. Still, outliers are likely to be of relevance in our case due to federal asymmetries and cantonal differences in areas such as geography, industrialization and population. To tackle these issues, a robustness test estimates the 0.5 quantile of the dependent variable rather than the mean in ordinary regressions. Thereby, the median regression minimizes the sum of the absolute residuals and is thus more robust to outliers.

Endogeneity is primarily an issue regarding the transfer variables, whereas the old equalization transfers that are based on the cantons' fiscal strength seem particularly problematic as they are triggered by fiscal strength, while the new equalization scheme refers to potential fiscal resources. Due to the allocation mechanism of the former, it is likely that the amount of equalization transfers is larger (smaller) the weaker (stronger) the cantonal economy is. Similarly, the lump sum transfers should be larger (smaller) the stronger (weaker) the cantonal economy is. In this case, a negative (positive) relation between equalization transfers (lump sum transfers) and economic performance would be expected. The conclusion of a growth-inhibiting or growth-enhancing effect of the transfers can, however, only be derived if reverse causality is addressed. To this end, we replace the transfer variables by their lagged values in an alternative specification. While this specification cannot totally rule out endogeneity concerns, it is harder to argue that the condition of the cantonal economy in year t has an influence on the (lagged) transfers in the years prior to t, in particular as the fiscal strength index underlying the transfers before 2008 was based on values dating back four to six years. The fiscal resources index of the new fiscal equalization system is calculated based on a three-year average, starting six years prior to the current year.

Panel data frequently results in biased standard errors due to autocorrelation and cross-sectional dependence of the error terms that arise from common shocks and unobserved components. To overcome this problem, we follow a common procedure using Newey-West corrected standard

errors (with three lags). In addition, three alternative correction methods are reported. First, the errors are clustered at the cantonal level in order to allow the observations to be correlated within each canton. Second, we follow Cameron et al. (2011) allowing for correlations among the cantons in the same year and among different years in the same canton using non-nested two-way clustering at the cantonal and year levels. The omission of canton fixed effects does not conflict with clustering (Arceneaux and Nickers 2009). However, clustering yields unreliable inferences, i.e., overstating statistical significance when the number of clusters is small (Cameron et al. 2008) or the number of observations per cluster varies too much (Carter et al. 2017, MacKinnon and Webb 2017). We follow Luechinger and Schaltegger (2013) who analyse a data set similar to ours and conclude to have enough clusters (namely 26) with reference to simulations by Bertrand et al. (2004) and Cameron et al. (2008). To dispel doubts on the matter, a third specification reports p-values based on the wild-cluster bootstrap-t procedure. The resampling method has the advantages of working well in cases with few clusters and unbalanced cluster sizes (Cameron and Miller 2015, Cameron et al. 2008) and of producing results quite robust to variations in the number of observations per cluster (Carter et al. 2017, MacKinnon and Webb 2017). The bootstrapped p-values are the most unfriendly to our analysis and, thus, a hard sensitivity test. The reported standard errors are all robust to heteroscedasticity.

6   Results[9]

6.1   Replication of Feld et al. (2005)

Replication of scientific research has gained attention lately as it helps to improve the credibility of science. However, the replication rates in economics are relatively low (Duvendack et al. 2017, Hamermesh 2007). Thus, a first step aims at replicating the study by Feld et al. (2005) before extending and refining it. The replication allows for determining the validity of the previous results on the one side and to cross-check our dataset on the other side. This holds particularly since we employ revised GDP data based on ESA 2010 (rather than ESA 1995) and measure some variables differently. Based on Feld et al. (2005), the following model is estimated for the years 1980 – 1998:

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[9] For all estimations we used Stata 13.

$$\log(\text{GDP}_{it}/\text{Population}_{it}) = \beta_1 \log(\text{Labor force}_{it}) + \beta_2 \log(\text{Education spending}_{it}/\text{Population}_{it}) +$$
$$\beta_3 \log(\text{Investment spending}_{it}) + \beta_4 \text{Decentralisation}_{it} + \beta_5 \text{Fragmentation}_{it} +$$
$$\beta_6 \log(\text{Old transfers}_{it}) + \beta_7 \log(\text{Population}_{it}) + \beta_8 \text{Basel City dummy}_i +$$
$$\beta_9 \text{Language dummy}_i + \tau_t + \varepsilon_{it}.$$

Table 2   *Replication of Feld et al. (2005), 1980 – 1998*

	Original	Replication	Original	Replication	Original	Replication
Investment	0.127***	0.108***	0.128***	0.087***	0.172***	0.083***
	(6.75)	(5.70)	(6.74)	(5.31)	(8.73)	(5.11)
Education spending	0.201***	0.145***	0.202***	0.100**	0.103***	0.060
	(5.01)	(3.29)	(5.02)	(2.10)	(3.07)	(1.43)
Labour force	0.477***	1.649***	0.478***	1.756***	0.307**	1.000***
	(3.27)	(6.21)	(3.27)	(6.35)	(2.41)	(3.84)
Population	-0.465***	-1.619***	-0.466***	-1.735***	-0.306**	-0.942***
	(-3.14)	(-5.88)	(-3.14)	(-6.22)	(-2.40)	(-3.30)
Decentralisation of expenditure	0.011	0.441***				
	(0.61)	(2.86)				
Decentralisation of revenue			0.013	0.121	0.017	0.069
			(0.72)	(1.19)	(1.45)	(0.81)
Fragmentation					-0.016*	0.088**
					(-1.92)	(2.52)
Tax competition					0.004**	0.029***
					(2.50)	(5.49)
Old transfers					-0.051***	-0.074***
					(-4.88)	(-3.37)
Urbanization					0.019	0.093*
					(0.50)	(1.66)
R2	0.787	0.505	0.788	0.485	0.840	0.636
Obs	494	494	494	494	494	494

The columns labelled "Original" are taken from the columns 2, 3 and 4 of Table 3 in Feld et al. (2005). The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method with 1 lag. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language dummy.

The original results of Feld et al. (2005) and the replicated results largely coincide (Table 2). The remaining variation in the estimated coefficients probably originates in differences in the data given their revision. As expected, the results suggest that the factors of the neoclassical growth model are highly significant. In addition, federal institutions matter: While the cantons' economic performance is positively associated with tax competition and (expenditure) decentralization, it is negatively associated with the old fiscal equalization transfers.

Table 3　　　*Federalism and Economic Performance, 1980 – 2013*

	I	II	III	IV	V	VI	VII
Investment	0.034**	0.059***	0.034**	0.065***	0.057***	0.045***	0.048***
	(2.01)	(3.32)	(2.01)	(3.63)	(3.36)	(2.78)	(2.92)
	[1.25]	[1.84]	[1.25]	[2.05]	[1.87]	[1.51]	[1.58]
	{1.25}	{1.81}	{1.25}	{2.03}	{1.86}	{1.50}	{1.57}
Education	0.545***	0.717***	0.526***	0.689***	0.670***	0.535***	0.495***
	(5.99)	(7.73)	(5.65)	(7.28)	(6.62)	(5.53)	(5.15)
	[2.96]	[3.78]	[2.77]	[3.55]	[3.22]	[2.60]	[2.41]
	{2.81}	{3.56}	{2.66}	{3.37}	{3.07}	{2.53}	{2.37}
Labour force	-0.958***	-1.304***	-0.935***	-1.302***	-1.346***	-1.388***	-1.441***
	(-3.02)	(-4.50)	(-2.94)	(-4.44)	(-4.63)	(-5.24)	(-5.48)
	[-1.41]	[-2.44]	[-1.39]	[-2.37]	[-2.45]	[-2.91]	[-3.07]
	{-1.41}	{-2.43}	{-1.39}	{-2.38}	{-2.47}	{-2.96}	{-3.13}
Population	0.362	0.495*	0.359	0.512**	0.596**	0.797***	0.902***
	(1.25)	(1.89)	(1.23)	(1.97)	(2.42)	(3.53)	(4.04)
	[0.56]	[0.95]	[0.55]	[0.98]	[1.25]	[2.04]	[2.48]
	{0.56}	{0.96}	{0.56}	{0.99}	{1.26}	{2.08}	{2.54}
Decentralization of expenditure		0.606***		0.736***	0.635***	0.626***	0.519***
		(3.85)		(5.06)	(4.90)	(5.51)	(4.47)
		[1.78]		[2.41]	[2.55]	[2.76]	[2.41]
		{1.82}		{2.48}	{2.63}	{2.84}	{2.50}
Decentralization of revenue			-0.087	-0.291***	-0.301***	-0.015	-0.009
			(-0.76)	(-3.72)	(-3.85)	(-0.16)	(-0.10)
			[-0.31]	[-1.86]	[-1.94]	[-0.09]	[-0.05]
			{-0.32}	{-1.89}	{-1.97}	{-0.09}	{-0.05}
Lump sum transfers							1.089***
							(2.73)
							[2.29]
							{2.27}
Old transfers						-4.960***	-4.597***
						(-4.37)	(-4.36)
						[-3.95]	[-3.57]
						{-3.85}	{-3.43}
New transfers						-1.915***	-1.545***
						(-4.07)	(-3.30)
						[-3.38]	[-3.03]
						{-3.63}	{-3.18}
Tax competition					0.022***	0.019***	0.013**
					(4.01)	(3.51)	(2.47)
					[1.90]	[1.72]	[1.45]
					{1.81}	{1.54}	{1.38}
Fragmentation					0.067	0.031	0.033
					(1.59)	(0.83)	(0.90)
					[0.71]	[0.37]	[0.39]
					{0.72}	{0.37}	{0.39}
Urbanization	0.040	-0.050	0.053	-0.027	-0.033	-0.147***	-0.159***
	(0.68)	(-0.92)	(0.89)	(-0.49)	(-0.57)	(-2.62)	(-2.89)
	[0.31]	[-0.44]	[0.43]	[-0.24]	[-0.28]	[-1.22]	[-1.34]
	{0.31}	{-0.43}	{0.43}	{-0.24}	{-0.28}	{-1.22}	{-1.34}
Adj. R2	0.59	0.62	0.59	0.63	0.65	0.71	0.72
Obs.	884	884	884	884	884	884	884

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). The numbers in square brackets indicate the estimated t-statistics for standard errors that are adjusted for clustering at the cantonal level and corrected for heteroscedasticity. The numbers in braces indicate the estimated p-values that are adjusted for non-nested clustering at the cantonal and year level. Each regression includes time fixed effects, a dummy for Basel City and a language variable.

6.2 Model 1: Federalism and Economic Performance

The first model (1) investigates the relation between federalism and economic performance. As the analysed period covers 34 years between 1980 and 2013, the role of the new and old fiscal equalization schemes can be assessed. The baseline estimation in *column I* explains almost 60% of the total variance of the data (Table 3). In line with the neoclassical growth model, the three production factors are highly significant for cantonal economic performance. While the negative coefficient of labour seems odd at first glance, it has to be recalled that the dependent variable is measured by the logarithm of the relation between GDP and labour. Urbanization is negatively associated with economic performance but the estimated effects are not statistically significant.

The explanatory power of the model increases once federal institutions are included. This modification does basically not alter the impact of the three production factors. In a first specification, the decentralization of expenditure and revenue are gradually added to the model (*columns II – IV*). The results suggest a significant negative effect of tax revenue decentralization and a significant positive effect of expenditure decentralization. This ostensibly paradox effects resolve once the meaning and context of the two variables is taken into account: While the decentralization of expenditure largely measures the extent of administrative federalism, i.e., the distribution of expenditure between the canton and its municipalities, the decentralization of tax revenue maps the fiscal autonomy of the municipalities. As subnational tax autonomy is a prerequisite for tax competition, the effect of revenue decentralization cannot be interpreted independently of tax competition. Adding the tax competition indicator to the model (*column V*) rejects the common claim that tax competition hurts economic performance. Finally, the fragmentation variable suggests that the costs of smallness are at least not harmful for cantonal economic performance.

The findings are robust to the inclusion of fiscal transfers (*column VI and VII*). Notable changes relate to the significance of revenue decentralization and urbanization. Regarding the transfers, the results suggest a significant negative relation between the (old and new) equalization transfers and economic capacity. This could be expected given the high rates of contribution to the systems on the one side and the allocation mechanism of the transfers on the other side. As the coefficient of the new transfers is significantly smaller, the results point towards an efficiency enhancing effect

of the NFA reform.[10] Lump sum transfers show the expected positive sign. Yet, these findings have to be interpreted with caution as transfers might be endogenous. To address this issue, we replace the transfers with their lagged values (Table A.3). While this modification confirms our findings, the validity of the results for the new equalization transfers is still limited since the observations are restricted to only a few years (i.e., 2008 − 2013). The specification in *column V* (omitting the transfers) is taken as benchmark estimation since it contains all federal institutions that are not subject to these endogeneity concerns.

Besides the Newey-West corrected standard errors, we report robust standard errors clustered at the cantonal level (Table 3 square brackets) and at the level of the cantons and years (Table 3 braces). The significant impact of education, labour, expenditure decentralization, tax competition and transfers basically continues to exist if the alternative standard errors are considered. While the results are largely confirmed if standard errors are corrected according to the wild-cluster bootstrap procedure, no significant effect obtains for tax competition (available upon request).

6.3   Model 2: Federalism and Economic Growth[11]

The second model analyses the link between federalism and GDP growth for the years 1980 − 2013. The baseline estimation (*column I*) explains around 77% of the total variance of the data (Table 4). While cantonal economic growth is positively associated with labour and population, an adverse effect is reported for investment. The negative impact is not surprising as it commonly takes some time for investments to complete and deliver benefits. Accordingly, the effect becomes insignificant if lagged values of investment spending are employed (results available upon request). Finally, the effects of education and urbanization are positive but statistically not different from zero.

Including federal institutions confirms the impact of the classical production factors at large (*columns II-VII*). As expected, the relation between economic growth and federalism variables is significant in most equations. The results suggest significant negative effects of expenditure decentralization and fragmentation which might be related to the costs of smallness and match previous findings that the number of government layers deter FDI (e.g., Kalamova 2011, Kessing et al. 2007). Instead, a significant growth-enhancing effect is reported for tax autonomy and tax competition.

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[10] A Wald test rejects equality of the two transfer coefficients (p-value 0.003).
[11] Similar results obtain if we employ the growth rate of GDP per capita instead of GDP growth (Table A.4).

Table 4   *Federalism and Economic Growth, 1981 – 2013*

	I	II	III	IV	V	VI	VII
Investment	-0.035**	-0.042**	-0.037**	-0.048***	-0.050***	-0.053***	-0.053***
	(-2.13)	(-2.56)	(-2.21)	(-2.89)	(-3.05)	(-3.26)	(-3.50)
	[-1.47]	[-1.64]	[-1.55]	[-1.88]	[-2.14]	[-2.25]	[-2.52]
	{-1.49}	{-1.66}	{-1.57}	{-1.90}	{-2.17}	{-2.31}	{-2.52}
Education	0.022	-0.020	0.040	0.000	-0.066	-0.091	-0.115**
	(0.47)	(-0.34)	(0.80)	(0.00)	(-1.18)	(-1.51)	(-2.08)
	[0.30]	[-0.20]	[0.50]	[0.00]	[-0.78]	[-1.18]	[-1.85]
	{0.31}	{-0.20}	{0.52}	{-0.00}	{-0.81}	{-1.16}	{-1.80}
Labour force	0.113***	0.131***	0.108***	0.129***	0.126***	0.113**	0.104**
	(2.77)	(3.08)	(2.64)	(3.09)	(3.06)	(2.57)	(2.40)
	[1.87]	[2.15]	[1.72]	[2.09]	[2.15]	[1.88]	[1.71]
	{1.90}	{2.17}	{1.74}	{2.08}	{2.13}	{1.84}	{1.69}
Population	0.299***	0.314***	0.258**	0.241**	0.181*	0.181*	0.101
	(2.74)	(2.87)	(2.38)	(2.17)	(1.77)	(1.79)	(0.96)
	[2.14]	[2.12]	[1.99]	[1.67]	[1.76]	[1.86]	[1.07]
	{2.12}	{2.14}	{1.93}	{1.62}	{1.51}	{1.58}	{0.85}
Decentralisation of expenditure		-0.020**		-0.027***	-0.024**	-0.022**	-0.030***
		(-1.97)		(-2.71)	(-2.45)	(-2.26)	(-3.12)
		[-1.13]		[-1.55]	[-1.48]	[-1.41]	[-2.05]
		{-1.17}		{-1.59}	{-1.52}	{-1.45}	{-2.07}
Decentralisation of Revenue			0.009	0.018***	0.013**	0.019***	0.020***
			(1.34)	(2.98)	(2.26)	(3.18)	(3.54)
			[0.83]	[2.29]	[1.66]	[2.19]	[2.30]
			{0.88}	{2.34.}	{1.74}	{2.25}	{2.20}
Lump sum trans-fers							0.126***
							(3.95)
							[4.19]
							{4.46}
Old transfers						-0.126*	-0.085
						(-1.95)	(-1.47)
						[-2.46]	[-1.68]
						{-2.56}	{-1.74}
New transfers						-0.009	0.035
						(-0.24)	(1.04)
						[-0.27]	[1.19]
						{-0.26}	{1.10}
Tax competition					0.001***	0.001**	0.000
					(2.69)	(2.51)	(0.43)
					[1.50]	[1.43]	[0.31]
					{1.25}	{1.16}	{0.27}
Fragmentation					-0.009***	-0.010***	-0.010***
					(-3.41)	(-3.67)	(-3.73)
					[-2.25]	[-2.49]	[-2.53]
					{-2.36}	{-2.60}	{-2.62}
Urbanization	0.007	0.010**	0.005	0.009*	0.008*	0.006	0.007
	(1.62)	(2.20)	(1.26)	(1.96)	(1.82)	(1.40)	(1.61)
	[0.92]	[1.33]	[0.78]	[1.29]	[1.23]	[1.01]	[1.22]
	{0.93}	{1.35}	{0.79}	{1.32}	{1.26}	{1.01}	{1.17}
Adj. R2	0.77	0.77	0.77	0.77	0.78	0.78	0.79
Obs.	858	858	858	858	858	858	858

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). The numbers in square brackets indicate the estimated t-statistics for standard errors that are adjusted for clustering at the cantonal level and corrected for heteroscedasticity. The numbers in braces indicate the estimated p-values that are adjusted for non-nested clustering at the cantonal and year level. Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Adding the transfer variables to the regressions does not substantially alter our findings. While lump sum transfers are relevant for the cantonal GDP growth, the equalization transfers are not. Given the endogeneity concerns, we refrain from discussing the transfer results any further. As before, the specification in *column V* is taken as benchmark estimation since it contains all federal institutions that are not subject to these endogeneity concerns.

The findings largely hold irrespective of whether we base statistical inference on Newey-West standard errors (corresponding t-statistic in parentheses), cantonal clustered standard errors (p-values in square brackets) or on two-way clustered standard errors (in braces). However, the alternative standard errors question the statistical significance of the impacts of expenditure decentralization and tax competition. In addition, most other variables are statistically irrelevant once inference is based on the more conservative bootstrapped p-values (available upon request).

7 Robustness Tests

In the interest of clarity, the subsequent robustness tests are summarized in Table 5 and the full regression bodies are reported in the appendix. In a first step, possible distortions due to the **NFA reform** in 2008 are addressed by restricting the analysis to the pre-reform years (i.e., 1980-2007). The results confirm our previous findings to a large extent. Interestingly, the negative influence of expenditure decentralization on GDP growth is not significant anymore. This supports our conclusion of no harmful effects of federalism on economic performance.

Table 5   Summary of the Robustness Tests

	Baseline regression		Period before the NFA reform		Median regression		Canton fixed effects	
	Econ. perfor-mance	GDP growth	Econ. perfor-mance	GDP growth	Econ. perfor-mance	GDP growth	Econ. perfor-mance	GDP growth
Decentr. of expenditure	+***	-***	✓	☒	✓	✓	☒	✓
Decentr. of revenue	-***	+***	✓	✓	✓	✓	☒	☒
Lump sum transfers	+***	+***	✓	✓	☒	✓	☒	✓
Old transfers	-***	-	✓	✓	✓	✓	✓	✓
New transfers	-***	+/-	n/a	n/a	✓	✓	✓	☒
Tax competition	+***	+***	✓	✓	✓	✓	✓	☒
Fragmentation	+	-***	✓	✓	✓	✓	✓	☒
For details refer to	Table 3	Table 4	Table A.5	Table A.6	Table A.7	Table A.8	Table A.9	Table A.10

"✓" indicates that the robustness test confirms the baseline estimates. The opposite case is reported by „☒". The table shows only a selection of controls, all variables are reported in the full regression tables.

In a second step, the influence of outliers is tested by estimating a **median regression**. The robust results suggest that outliers are a minor issue as the baseline findings are confirmed for all but one federal institutions (i.e., the lump sum transfers). As expected, the results are sensitive to the inclusion of **canton fixed effects**. Since most federal instruments vary only little across time, the influence of the federal institutions is rather camouflaged by fixed effects. Still, tax competition and transfers keep their effects on economic performance even in two-way fixed effects models.

8   Conclusions

The relation between federalism and the economic performance is still ambiguous. It is reasonable to assume that the diverse findings of previous research are, at least partly, related to the measurement for federalism. While most studies map federalism by just one variable (e.g., fiscal decentralization), the recent literature suggests to consider the various institutions that make up federalism separately. This particularly holds as heterogeneous effects of the federal institutions are likely to exist. Even the same type of federal institution could have different effects across countries, depending on the institution's design and the underlying federal framework. For instance, the impact of tax competition is likely to be conditional on the decentralized tax type and the country's allocation of distributive tasks among government layers. Thus, it is not surprising that robust findings rather prevail in single-country studies vis-à-vis multi-country studies.

Following these insights, the paper investigates the impact of various federal institutions on economic performance in just one country. To this end, Switzerland provides for a laboratory as its 26 cantons share a common framework, while the extent of federalism varies between the cantons. The paper exploits this setting by investigating the effects of various instruments of federalism on cantonal economic performance and GDP growth during the years 1980 – 2013. So far, the empirical evidence on the link between federalism and cantonal economic performance has been scarce.

In line with a neoclassical growth model, the results suggest that the factors of production, i.e., investments, education and labour are relevant for economic performance. This finding is largely confirmed if we control for the influence of federalism. As expected, we find that the impact of federalism differs conditional on the instrument considered. While federalism appears to be of less relevance for cantonal GDP growth, it has a robust impact on cantonal economic performance.

The results show that cantonal economic performance is positively associated with expenditure decentralization and negatively related with revenue decentralization. This ostensibly paradox effect resolves once the meaning and context of the two variables is taken into account: The expenditure criterion largely maps the extent of administrative federalism, i.e., the distribution of expenditure between the canton and its municipalities independently of whether municipal spending is based on autonomous decisions or mandates of the cantonal or federal level. Instead, revenue decentralization rather measures the extent of subnational tax autonomy as it primarily includes revenue from own taxes that are actually controlled by the municipalities. As tax autonomy is a prerequisite for tax competition, the effect of revenue decentralization cannot be interpreted independently of tax competition. Contrary to popular fears, cantonal economic performance is not impaired but rather supported by tax competition.

As expected, lump sum transfers are positively and equalization transfers negatively associated with economic performance. While the findings have to be interpreted with caution due to possible endogeneity problems, the results still indicate that the fiscal equalization scheme is at least not conducive to economic performance. This holds irrespectively of the NFA reform. However, the adverse influence of the transfers is somewhat weaker under the new equalization system as compared to the old system, pointing towards an efficiency enhancing effect of the reform.

In sum, we find no conclusive evidence for the alleged negative effects of the competitive instruments of federalism on economic performance. Instead, cantonal economic performance is enhanced if the subnational governments are subject to pressure from tax competition. However, adverse effects are reported for cooperative instruments, i.e., the equalization transfers. It is left to future research to address potential endogeneity issues regarding fiscal transfers and to validate the role of the new equalization system once a sufficient number of observations on the new equalization scheme is available.

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Appendix

Table A.1   *Data*

Variable	Source	Description
GDP	BAK Basel	Real gross domestic product according to ESA 2010 (model 1: per employed person, logarithm; model 2: growth rate of real gross domestic product).
Labor force	SECO	Number of employees (model 1: logarithm; model 2: per capita). Own calculation: (1 - unemployment rate) * working-age population. Data on working-age population is available for 1980, 1990 and 2010, remaining data points are derived by interpolation and extrapolation, respectively.
Education	BFS	Individuals with higher education or university degree (model 1: logarithm, model 2: per capita). Data available for 1980, 1990 and 2010, remaining data points are derived by interpolation and extrapolation, respectively.
Investment	FFA	Investment spending (model 1: logarithm; model 2: share from total expenditure).
Decentralization of tax revenue	FFA	Share of municipal tax revenue from the sum of cantonal and municipal tax revenue. As the variable primarily includes revenue from own taxes that are actually controlled by the municipalities, it maps the degree of subnational tax autonomy.
Decentralization of expenditure	FFA	Share of municipal spending from the sum from cantonal and municipal spending.
Fragmentation	BFS	Number of political municipalities per 1,000 cantonal inhabitants.
Lump sum transfers	FFA	Cantonal share of direct federal tax revenue (22.5% and since 1985 17%) that is allocated on a tax origin base among the cantons (share from total expenditure).
Old transfers (1980-2007)	FFA	Cantonal share of direct federal tax (7.5% and since 1985 13%) that is allocated according to cantonal fiscal strength (share from total expenditure). Values for 2008 – 2013 are set to zero.
New transfers (2008-2013)	FFA	Equalization transfers that are allocated according to cantonal resource potential (share from total expenditure). While transfer receipts are indicated by a positive sign, transfer contributions are indicated by a negative sign. Values for 1980 – 2007 are set to zero.
Tax competition	FFA	Tax competition as measured by the absolute differences between the tax burden in a canton (in percentage) and the average tax burden in the bordering cantons (in percentage) based on the average tax rate for incomes as of CHF 500,000. The tax burden encompasses the cantonal and municipal taxes. The larger the value of the variable, the more intense is the tax competition.
Population	BFS	Permanent resident population (model 1: logarithm; model 2: growth rate).
Urbanization	BFS	Share of permanent resident population in urban areas.
German-speaking	BFS	Share of German-speaking inhabitants from the cantonal population. Data available for 1980, 1990, 2000 and 2010, remaining data points are derived by interpolation and extrapolation, respectively.

All variables cover the cantonal level. Monetary variables have been deflated to the year 2005 using the Swiss Consumer Price Index. Abbreviations: BAK Basel = BAK Basel Economics AG, BFS = Federal Statistical Office, FFA = Federal Finance Administration, SECO = State Secretariat for Economic Affairs.

Table A.2   *Descriptive Statistics*

		Obs.	Mean	Standard deviation	Min	Max
GDP/Labor force (log)	Model 1	884	11.681	0.244	11.215	12.725
GDP growth (per capita)	Model 2	858	0.005	0.031	-0.123	0.094
GDP growth	Model 2	858	0.013	0.031	-0.123	0.077
Investment (log)	Model 1	884	18.580	1.126	15.317	20.786
Investment (share on total expenditure)	Model 2	858	0.106	0.067	0.018	0.539
Education (log)	Model 1	884	9.711	1.344	5.606	12.732
Education (per capita)	Model 2	858	0.114	0.045	0.025	0.253
Labor force (log)	Model 1	884	11.313	1.130	8.722	13.573
Labor force (per capita)	Model 2	858	0.515	0.031	0.434	0.587
Decentralization of tax revenue	Model 1/2*	884	0.419	0.126	0.021	0.690
Decentralization of expenditure	Model 1/2*	884	0.432	0.130	0.016	0.730
Fragmentation	Model 1/2*	884	0.470	0.317	0.015	1.442
Tax competition	Model 1/2*	884	2.541	1.912	0.000	9.341
Lump sum transfer (share on total expenditure)	Model 1/2*	884	0.035	0.032	0.007	0.267
Old transfers (share on total expenditure)	Model 1/2*	884	0.021	0.018	0.000	0.106
New transfers (share on total expenditure)	Model 1/2*	884	0.004	0.028	-0.211	0.123
Population (log)	Model 1	884	11.980	1.118	9.454	14.170
Population (growth rate)	Model 2	858	0.007	0.007	-0.016	0.053
Urbanization	Model 1/2*	884	0.607	0.313	0.000	1.000
German-speaking	Model 1/2*	884	0.678	0.338	0.042	0.963

* The descriptive statistics cover only the period of model 1 (1980 – 2013) rather than the one of model 2 (1981 – 2013).

Figure A.1   Cantonal Decentralisation and Lump Sum Transfers
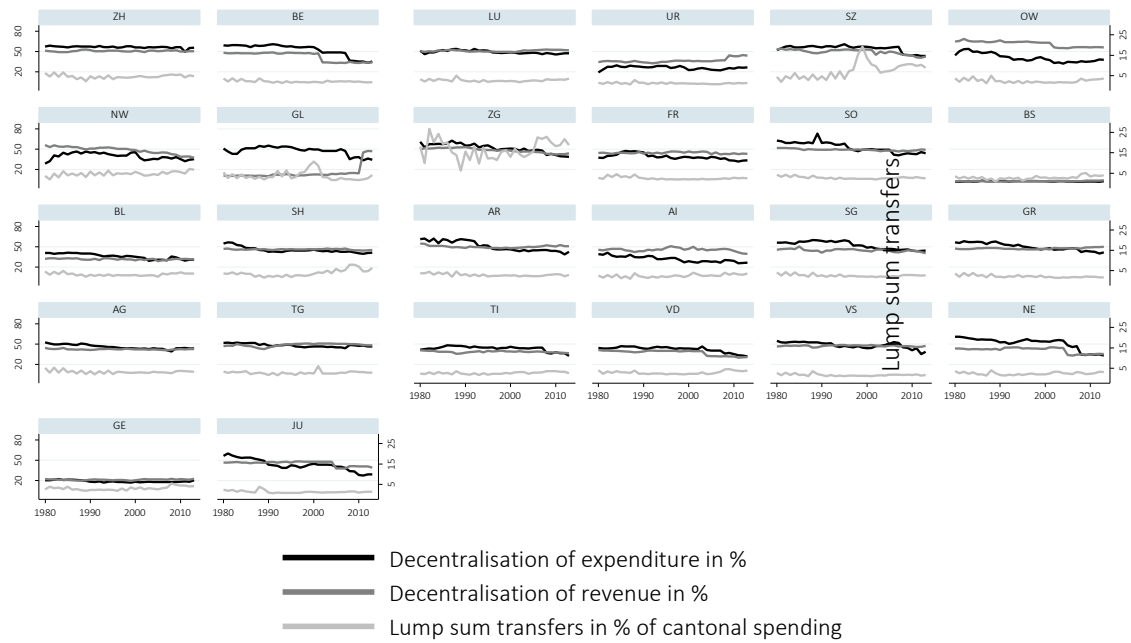
— Decentralisation of expenditure in %

— Decentralisation of revenue in %

— Lump sum transfers in % of cantonal spending

For the abbreviations of the cantons refer to Figure 2. Source: Own calculation and illustration.

Figure A.2   Cantonal Fragmentation and Tax Competition
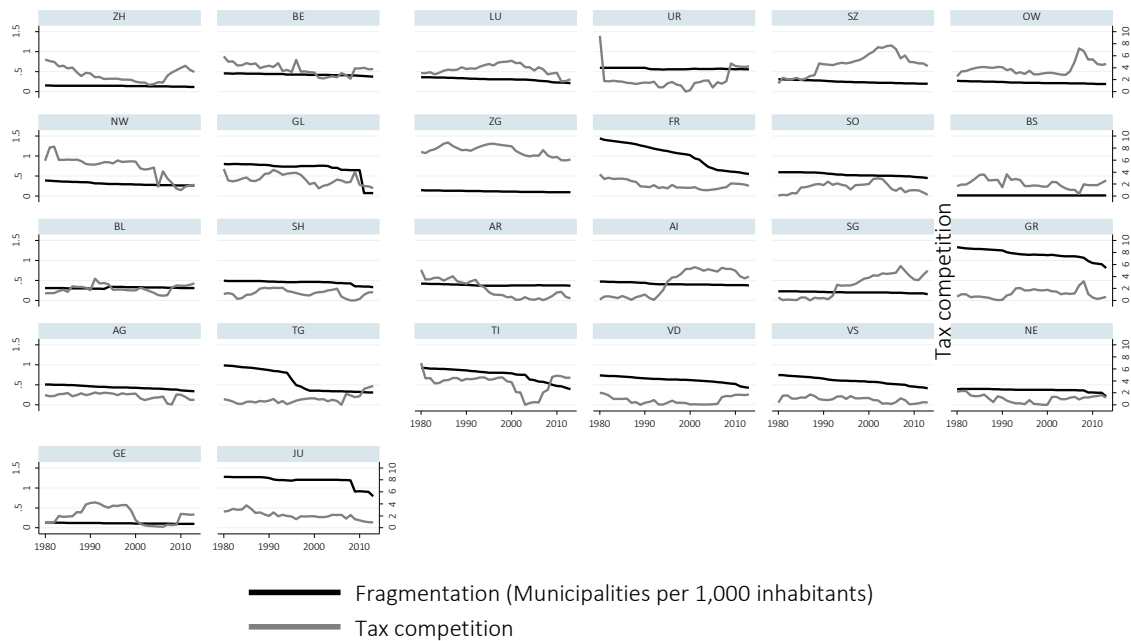
— Fragmentation (Municipalities per 1,000 inhabitants)

— Tax competition

For the abbreviations of the cantons refer to Figure 2. Source: Own calculation and illustration.

Figure A.3   *Equalization Transfers*
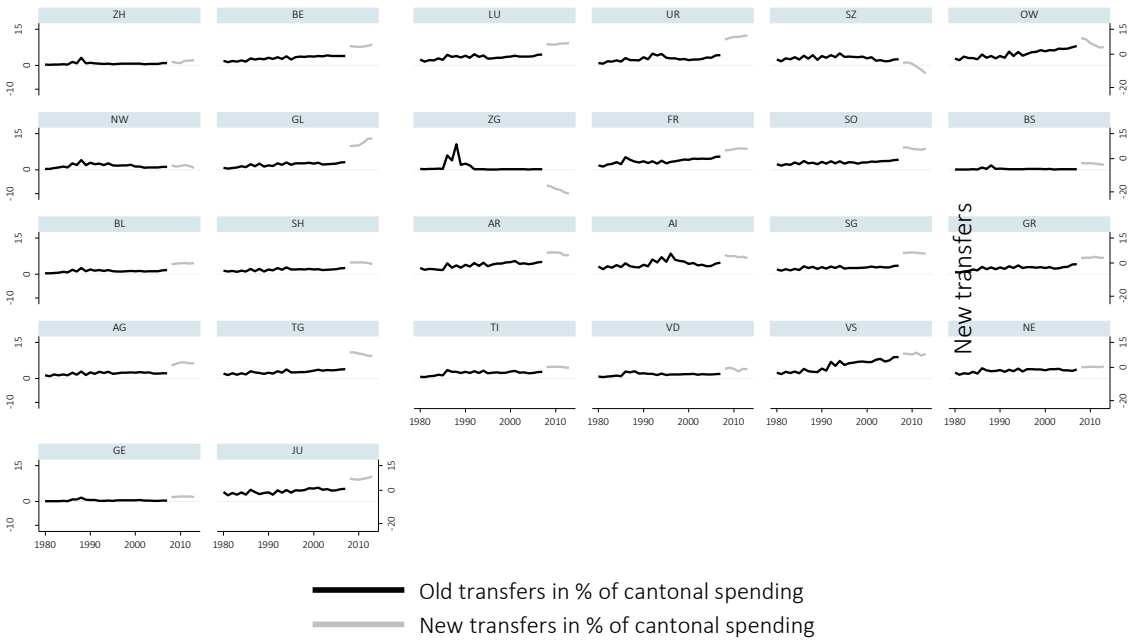
Old transfers in % of cantonal spending
New transfers in % of cantonal spending

For the abbreviations of the cantons refer to Figure 2. Source: Own calculation and illustration.

Figure A.4   *Swiss Municipalties as of January 2018*

Source: Federal Statistical Office.

Table A.3   *Federalism and Economic Performance, Lagged Transfers*

	Transfers lagged by one year	Transfers lagged by one year	Transfers lagged by two years	Transfers lagged by two years	Transfers lagged by three years	Transfers lagged by three years
Investment	0.043***	0.044***	0.044***	0.045***	0.047***	0.047***
	(2.66)	(2.71)	(2.64)	(2.68)	(2.72)	(2.75)
Education	0.581***	0.539***	0.613***	0.565***	0.639***	0.585***
	(5.72)	(5.37)	(5.76)	(5.38)	(5.72)	(5.32)
Labour force	-1.410***	-1.464***	-1.391***	-1.441***	-1.367***	-1.419***
	(-5.35)	(-5.61)	(-5.26)	(-5.53)	(-5.15)	(-5.44)
Population	0.775***	0.883***	0.722***	0.834***	0.671***	0.791***
	(3.47)	(4.00)	(3.25)	(3.82)	(3.02)	(3.64)
Decentralization of expenditure	0.645***	0.537***	0.649***	0.532***	0.651***	0.527***
	(5.70)	(4.72)	(5.85)	(4.77)	(5.92)	(4.82)
Decentralization of revenue	-0.013	-0.006	-0.010	0.000	-0.012	0.000
	(-0.14)	(-0.06)	(-0.11)	(0.00)	(-0.14)	(0.00)
Lump sum transfers		1.083***		1.132***		1.191***
		(2.69)		(2.70)		(2.77)
Old transfers (lagged)	-5.022***	-4.659***	-4.989***	-4.625***	-4.988***	-4.610***
	(-4.33)	(-4.31)	(-4.20)	(-4.20)	(-4.22)	(-4.25)
New transfers (lagged)	-1.955***	-1.568***	-1.973***	-1.585***	-1.960***	-1.534***
	(-4.06)	(-3.32)	(-3.91)	(-3.28)	(-3.79)	(-3.14)
Tax competition	0.019***	0.013**	0.020***	0.013***	0.020***	0.013***
	(3.63)	(2.57)	(3.75)	(2.64)	(3.92)	(2.72)
Fragmentation	0.032	0.033	0.032	0.031	0.030	0.029
	(0.85)	(0.89)	(0.83)	(0.84)	(0.78)	(0.76)
Urbanization	-0.162***	-0.174***	-0.166***	-0.178***	-0.166***	-0.179***
	(-2.88)	(-3.17)	(-2.88)	(-3.19)	(-2.83)	(-3.16)
Adj. R2	0.73	0.73	0.74	0.75	0.75	0.76
Obs.	858	858	832	832	806	806

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.4   *Federalism and Economic Growth per Capita, 1981 − 2013*

	I	II	III	IV	V
Investments	-0.035**	-0.048***	-0.049***	-0.053***	-0.053***
	(-2.13)	(-2.90)	(-3.06)	(-3.27)	(-3.50)
	[-1.47]	[-1.88]	[-2.15]	[-2.26]	[-2.52]
Education	0.021	-0.002	-0.067	-0.092	-0.115**
	(0.45)	(-0.03)	(-1.21)	(-1.54)	(-2.11)
	[0.28]	[-0.02]	[-0.80]	[-1.20]	[-1.88]
Labour force	0.111***	0.128***	0.124***	0.112**	0.102**
	(2.74)	(3.07)	(3.04)	(2.56)	(2.38)
	[1.86]	[2.08]	[2.14]	[1.87]	[1.71]
Population	-0.690***	-0.747***	-0.806***	-0.807***	-0.885***
	(-6.37)	(-6.77)	(-7.90)	(-8.01)	(-8.44)
	[-5.01]	[-5.24]	[-7.99]	[-8.46]	[-9.55]
Decentralization of expenditure		-0.027***	-0.024**	-0.022**	-0.030***
		(-2.73)	(-2.47)	(-2.28)	(-3.13)
		[-1.57]	[-1.49]	[-1.42]	[-2.06]
Decentralization of revenue		0.018***	0.013**	0.019***	0.020***
		(2.96)	(2.25)	(3.16)	(3.52)
		[2.29]	[1.66]	[2.19]	[2.31]
Lump sum transfers					0.124***
					(3.94)
					[4.16]
Old transfers				-0.125*	-0.085
				(-1.96)	(-1.48)
				[-2.46]	[-1.69]
New transfers				-0.009	0.034
				(-0.25)	(1.03)
				[-0.27]	[1.18]
Tax competition			0.001***	0.001**	0.000
			(2.68)	(2.50)	(0.43)
			[1.50]	[1.42]	[0.31]
Fragmentation			-0.009***	-0.010***	-0.010***
			(-3.42)	(-3.69)	(-3.74)
			[-2.27]	[-2.50]	[-2.54]
Urbanization	0.007	0.009**	0.008*	0.006	0.007
	(1.62)	(1.98)	(1.83)	(1.41)	(1.62)
	[0.92]	[1.31]	[1.24]	[1.01]	[1.23]
Adj. R2	0.77	0.78	0.79	0.79	0.79
Obs.	858	858	858	858	858

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). The numbers in square brackets indicate the estimated t-statistics for standard errors that are adjusted for clustering at the cantonal level and corrected for heteroscedasticity. Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.5   Federalism and Economic Performance, before the NFA Reform (1980 – 2007)

	I	II	III	IV	V
Investment	0.051***	0.080***	0.072***	0.056***	0.059***
	(2.69)	(4.08)	(3.80)	(3.14)	(3.25)
Education	0.424***	0.581***	0.581***	0.477***	0.437***
	(4.53)	(6.10)	(5.88)	(5.07)	(4.65)
Labour force	-0.531	-0.935***	-1.021***	-1.170***	-1.213***
	(-1.38)	(-2.67)	(-2.98)	(-4.09)	(-4.29)
Population	0.043	0.245	0.352	0.625**	0.717***
	(0.12)	(0.78)	(1.18)	(2.45)	(2.86)
Decentralization of expenditure		0.691***	0.590***	0.628***	0.525***
		(4.56)	(4.33)	(5.21)	(4.22)
Decentralization of revenue		-0.233***	-0.243***	0.064	0.074
		(-2.70)	(-2.83)	(0.62)	(0.73)
Lump sum transfers					1.024**
					(2.39)
Old transfers				-5.563***	-5.252***
				(-4.35)	(-4.37)
Tax competition			0.020***	0.019***	0.013**
			(3.61)	(3.36)	(2.38)
Fragmentation			0.070	0.031	0.032
			(1.64)	(0.78)	(0.82)
Urbanization	0.065	-0.002	-0021	-0.131**	-0.143**
	(1.01)	(-0.04)	(-0.33)	(-2.19)	(-2.43)
Adj. R2	0.55	0.60	0.62	0.68	0.69
Obs.	728	728	728	728	728

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.6   *Federalism and Economic Growth, before the NFA Reform (1980 – 2007)*

	I	II	III	IV	V
Investment	-0.045**	-0.053***	-0.056***	-0.058***	-0.059***
	(-2.51)	(-2.99)	(-3.27)	(-3.42)	(-3.72)
Education	0.081	0.059	-0.023	-0.050	-0.100
	(1.44)	(0.75)	(-0.30)	(-0.61)	(-1.31)
Labour force	0.061	0.079	0.083	0.084	0.086
	(1.22)	(1.38)	(1.45)	(1.46)	(1.52)
Population	0.358***	0.300**	0.242**	0.241**	0.158
	(3.09)	(2.49)	(2.18)	(2.18)	(1.33)
Decentralization of expenditure		-0.017	-0.016	-0.017	-0.026**
		(-1.39)	(-1.36)	(-1.40)	(-2.13)
Decentralization of revenue		0.014**	0.009	0.012**	0.015**
		(2.29)	(1.54)	(2.00)	(2.55)
Lump sum transfers					0.110***
					(3.05)
Old transfers				-0.062	-0.051
				(-0.99)	(-0.86)
Tax competition			0.001**	0.001**	0.000
			(2.37)	(2.30)	(0.39)
Fragmentation			-0.009***	-0.010***	-0.011***
			(-3.46)	(-3.62)	(-3.97)
Urbanization	0.007*	0.008*	0.008	0.007	0.008*
	(1.66)	(1.67)	(1.52)	(1.41)	(1.71)
Adj. R2	0.81	0.82	0.82	0.82	0.82
Obs.	702	702	702	702	702

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.7　　　　　　　　*Federalism and Economic Performance, Median Regression*

	I	II	III	IV	V
Investment	0.007	0.030**	0.034**	0.042**	0.051**
	(0.51)	(2.01)	(2.51)	(2.22)	(2.58)
Education	0.618***	0.709***	0.630***	0.479***	0.434***
	(8.49)	(7.37)	(4.34)	(5.33)	(4.53)
Labour force	-1.772***	-1.629***	-1.497***	-1.339***	-1.339***
	(-7.56)	(-5.78)	(-4.39)	(-4.33)	(-4.75)
Population	1.144***	0.854***	0.817***	0.813***	0.860***
	(5.75)	(3.66)	(3.78)	(3.26)	(3.82)
Decentralization of expenditure		0.744***	0.697***	0.588***	0.522***
		(5.22)	(6.11)	(5.46)	(4.52)
Decentralization of revenue		-0.314***	-0.312***	-0.011	-0.005
		(-6.13)	(-5.05)	(-0.11)	(-0.05)
Lump sum transfers					0.617
					(1.60)
Old transfers				-4.953***	-4.669***
				(-4.19)	(-5.06)
New transfers				-2.475***	-2.130***
				(-11.74)	(-6.66)
Tax competition			0.019***	0.026***	0.024***
			(3.29)	(5.39)	(4.71)
Fragmentation			0.059	0.024	0.023
			(1.56)	(0.67)	(0.57)
Urbanization	-0.050	-0.067	-0.039	-0.131*	-0.129*
	(-1.17)	(-1.25)	(-0.63)	(-1.89)	(-1.81)
Obs.	884	884	884	884	884

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.8   *Federalism and Economic Growth, Median Regression*

	I	II	III	IV	V
Investment	-0.034***	-0.036***	-0.045***	-0.046***	-0.046***
	(-2.76)	(-3.03)	(-3.86)	(-3.77)	(-3.72)
Education	0.003	-0.026	-0.088	-0.117***	-0.131***
	(0.09)	(-0.73)	(-2.49)	(-2.60)	(-2.83)
Labour force	0.065***	0.077***	0.062***	0.051**	0.050**
	(3.04)	(3.54)	(2.76)	(1.99)	(1.99)
Population	0.325***	0.284***	0.222***	0.235***	0.210**
	(4.38)	(4.21)	(3.16)	(3.12)	(2.56)
Decentralization of expenditure		-0.020***	-0.020***	-0.020***	-0.021***
		(-2.73)	(-2.72)	(-2.58)	(-2.79)
Decentralization of revenue		0.012**	0.009	0.012*	0.012**
		(2.17)	(1.47)	(1.85)	(2.14)
Lump sum transfers					0.078***
					(2.72)
Old transfers				-0.085	-0.083*
				(-1.43)	(-1.74)
New transfers				-0.018	0.017
				(-0.86)	(0.66)
Tax competition			0.001**	0.001**	0.000
			(2.32)	(1.94)	(0.90)
Fragmentation			-0.011***	-0.013***	-0.013***
			(-5.95)	(-6.21)	(-5.72)
Urbanization	0.012***	0.015***	0.013***	0.012***	0.012***
	(4.50)	(5.38)	(4.62)	(4.38)	(4.46)
Obs.	858	858	858	858	858

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.9   *Federalism and Economic Performance, Time and Canton Fixed Effects*

	I	II	III	IV	V
Investment	0.002	0.004	0.007	-0.001	-0.001
	(0.17)	(0.43)	(0.67)	(-0.12)	(-0.13)
Education	-0.187	-0.170	-0.246**	-0.225**	-0.224**
	(-1.61)	(-1.43)	(-2.20)	(-2.20)	(-2.19)
Labour force	-1.742***	-1.752***	-1.754***	-1.416***	-1.418***
	(-7.89)	(-8.04)	(-8.13)	(-7.03)	(-7.17)
Population	1.717***	1.668***	1.807***	1.156***	1.157***
	(5.46)	(5.27)	(5.45)	(3.86)	(3.88)
Decentralization of expenditure		0.147	0.100	0.142	0.144
		(0.91)	(0.60)	(1.04)	(1.05)
Decentralization of revenue		-0.242*	-0.141	0.127	0.127
		(-1.93)	(-0.85)	(0.93)	(0.93)
Lump sum transfers					-0.036
					(-0.10)
Old transfers				-3.114***	-3.122***
				(-6.95)	(-6.84)
New transfers				-1.617***	-1.622***
				(-7.35)	(-6.73)
Tax competition			0.014***	0.017***	0.017***
			(3.17)	(4.28)	(4.27)
Fragmentation			0.109	-0.014	-0.013
			(1.62)	(-0.24)	(-0.23)
Urbanization	-0.772	-0.793	-0.254	-0.832	-0.834
	(-0.75)	(-0.77)	(-0.27)	(-0.99)	(-0.99)
Adj. R2	0.51	0.52	0.54	0.63	0.63
Obs.	884	884	884	884	884

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *$p<0.1$ (significance at the 10% level), **$p<0.05$ (significance at the 5% level), and ***$p<0.01$ (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.

Table A.10   *Federalism and Economic Growth, Time and Canton Fixed Effects*

	I	II	III	IV	V
Investment	-0.031*	-0.043**	-0.044**	-0.047***	-0.046**
	(-1.69)	(-2.25)	(-2.38)	(-2.59)	(-2.57)
Education	-0.119	-0.105	-0.117	0.047	0.058
	(-1.33)	(-1.19)	(-1.31)	(0.43)	(0.54)
Labour force	0.141***	0.139***	0.145***	0.111**	0.116**
	(2.71)	(2.78)	(2.85)	(2.26)	(2.35)
Population	0.053	0.086	0.096	0.008	0.009
	(0.36)	(0.60)	(0.68)	(0.05)	(0.06)
Decentralization of expenditure		-0.034*	-0.034*	-0.036**	-0.042**
		(-1.94)	(-1.93)	(-1.97)	(-2.23)
Decentralization of revenue		-0.006	-0.004	-0.016	-0.015
		(-0.37)	(-0.24)	(-0.91)	(-0.89)
Lump sum transfers					0.071*
					(1.91)
Old transfers				-0.036	-0.019
				(-0.57)	(-0.30)
New transfers				0.087**	0.101**
				(2.23)	(2.53)
Tax competition			-0.001	-0.001	-0.001
			(-1.17)	(-1.38)	(-1.50)
Fragmentation			0.001	0.003	0.003
			(0.16)	(0.52)	(0.53)
Urbanization	0.069	0.063	0.051	0.052	0.047
	(0.49)	(0.46)	(0.38)	(0.39)	(0.36)
Adj. R2	0.80	0.80	0.80	0.80	0.80
Obs.	858	858	858	858	858

The numbers in parentheses indicate the estimated t-statistics for standard errors that are corrected using the Newey-West method. These values are used to determine statistical significance: *p<0.1 (significance at the 10% level), **p<0.05 (significance at the 5% level), and ***p<0.01 (significance at the 1% level). Each regression includes time fixed effects, a dummy for Basel City and a language variable.