



Contents lists available at ScienceDirect

Journal of Comparative Economics

journal homepage: www.elsevier.com/locate/jce

The quality-access tradeoff in decentralizing public services: Evidence from education in the OECD and Spain

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ABSTRACT

Decentralized delivery of public services should enhance constituents' ability to hold politicians accountable and improve public service outcomes, according to theory. Yet, decentralization has not consistently yielded those improvements. This paper uses a novel cross-country panel from the OECD to show that decentralization generally improves students' access to education, but in so doing, it creates congestion effects which diminish the overall quality of education that students receive. We argue that this is partially explained by the incentives of sub-central governments upon receiving their new authority. Sub-central governments are more incentivized than national ones to pursue policy improvements that are more visible and quicker to achieve, even when they are costly – like improving access – over improvements that are less visible and take longer to achieve – like increasing quality. Decentralization should therefore result in positive effects on education access and negative on quality, consistent with our findings. We directly test the impact of political incentives on responses to decentralization by exploiting the timing of education decentralization in Spain (1980–99), and variation in the political assertiveness of regional governments, using generalized difference-in-differences and synthetic controls. As predicted, the magnitude of decentralization's effects is greater for assertive regions, which are most incentivized to prioritize high visibility, costly policies.

1. Introduction and motivation

Central governments decentralize public services by empowering sub-central governments (e.g. regional or local governments) to make decisions related to public services that originally fell within the sole jurisdiction of the central government. This reform promises to improve public services by relocating decision-making authorities closer to the citizens they will affect, thereby reducing information asymmetries and better enabling citizens to hold politicians accountable to local demands.

Despite its promise, however, decentralization has been far from a panacea. Indeed, the evidence is mixed on the degree to which decentralization actually leads to improved public services outcomes (Treisman, 2007). This dynamic is especially clear in regards to two different types of public service outcomes: access and quality. More specifically, the evidence shows that decentralization leads governments to provide services to larger segments of their populations, thereby improving access. However, these improvements to access can come at the expense of the quality of the same public services. In other words, the quality of public services can deteriorate as the overall system becomes more congested.

This paper seeks to advance our understanding of decentralization's impact on public service outcomes by examining the extent to which decentralization induces adverse tradeoffs between access and quality in the education sector. Our analysis focuses on the K-12 education system specifically, and systematically explores the extent to which decentralization affects – respectively – students' access to education and the quality of the education they ultimately receive.

We begin our empirical analysis using an OECD cross-country panel, which allows us to examine the impact of decentralization on a series of outcomes across a range of countries. Specifically, we use data from the Programme for International Student Assessment

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<https://doi.org/10.1016/j.jce.2018.12.004>

Received 19 January 2017; Received in revised form 20 December 2018; Accepted 31 December 2018
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(PISA) standardized test scores and a panel survey of education officials on the locus of decision-making in the administration. The OECD data shows that decentralization has a positive effect on indicators we use to measure students' access to education, such as tertiary education enrollment. At the same time, however, we find that decentralization has a negative effect on the indicators we use to measure the quality of education that students ultimately receive, such as student performance as reflected in test scores.

The OECD data set also allows us to disaggregate the effects of decentralization in four different functional domains: organization of instruction, personnel management, planning and structures, and resource management.¹ Each functional domain encompasses a set of functions, or specific types of policy decisions. We find evidence that the effects of decentralization vary based on the type of decision that is decentralized. Specifically, most of the variation in our data is driven by personnel decisions (such as hiring and firing) and resource allocation relating to personnel.

Next, we seek to explain why decentralization in the education sector led to an adverse tradeoff between access and quality. Our analysis acknowledges that decentralization's impact on education outcomes is likely to depend on the conditions under which the reform is implemented, such as the extent to which the country has already decentralized public service delivery at the point when education decentralization begins. For instance, in a situation where education policymaking is hypercentralized to begin with, the payoffs from decentralization may be higher and present little tradeoffs between quality and access, as compared to a context that already features significant levels of decentralization. Likewise, the severity of the access-quality tradeoff may be less in cases where education access was already high upon initiation of decentralization; the converse may also be true, that the access-quality tradeoff may be more acute in contexts where access was low prior to decentralization.

Initial reform context notwithstanding, we hypothesize that decentralization's impact on the access-quality tradeoff is driven primarily by the incentives facing politicians in the sub-central governments empowered by decentralization. That is, politicians in sub-central governments should be more likely than their central counterparts to favor policies that are more visible, quicker to achieve, and more costly over ones that are less visible, take longer to achieve, and generally less costly. This dynamic should be particularly evident in cases of sub-central governments that are highly assertive, or seek greater autonomy from their respective central governments. In the education sector, this dynamic should lead sub-central governments, particularly more assertive ones, to seek to improve students' access to education first, since it is a highly-visible policy that can be enacted more quickly than improvements to quality, albeit at greater expense.

The logic underlying this hypothesis revolves around two factors. First, sub-central governments, particularly more assertive ones, may be incentivized to use newly-received education authorities to demonstrate their ability to deliver public services effectively. Doing so would not only allow them to bolster their local political alliances (i.e. with influential elites, organizations, and constituents), but also to justify further decentralization to new sectors. The policies that are most likely to satisfy these objectives would tend to be more visible and quicker to achieve, and thus easier for politicians in sub-central governments to take credit for and capitalize on. Second, in cases where the sub-central governments empowered by decentralization are not responsible for raising revenue to support their new policies, they do not have to bear the financial costs if those policies prove inefficient or unsuccessful in the long run. This reduces the anticipated costs to those politicians of investing in quick, partial solutions with higher expected political payoffs, rather than longer-term, more enduring solutions which may prove less politically beneficial in the near to medium term.

We test our hypothesis using a historical case study: the decentralization of education policymaking in Spain from 1980 to 1999. Spain offers an instructive case for three reasons. First, Spanish education policymaking was hypercentralized prior to reform initiation. Indeed, by 1979, Spain had centralized education policymaking more than any other country in the OECD sample. The hypercentralization of Spanish education policymaking prior to decentralization made it possible for us to explore the effects of decentralization when returns to decentralization would be expected to be the highest.² Second, the quality of Spanish education was relatively high prior to 1980; access to education was simultaneously low. This initial reform context suggests that the congestion effects caused by decentralization – that is, decentralization's tendency to improve access to the detriment of quality – may prove less important in the Spanish case than in the OECD sample, where access was already high.

Third – and most importantly for our analysis – Spain is composed of a heterogeneous set of regions, each with its own unique history and sociocultural background. Some regions, such as the Basque Country and Catalonia, have a long history of political assertiveness, with recurring calls for regional independence from the 19th century on through the period of decentralization. Other regions like Murcia and Cantabria, by contrast, historically exhibited and demanded far less autonomy, up to and including during the period of decentralization. Moreover, Spain's pivot toward decentralization began shortly after the passage of the country's new constitution in 1978 and was phased in over twenty years. During that timeframe, decentralization reached different regions of Spain at different times for arguably exogenous reasons.

Spain's heterogeneous regional composure, combined with the arguably exogenous timing of Spanish decentralization at the regional level, allows us to investigate how the incentives facing sub-central governments impacted those governments' response to decentralization, and how their responses, in turn, affected the access-quality tradeoff in the education sector. In particular, it allows us to investigate whether more assertive regions would seek policy improvements that were more visible, quicker to achieve, and more costly (e.g. improving students' access to education) over ones that were less visible, took longer to achieve, and generally cost less (e.g. improving education quality). It also allows us to evaluate whether non-assertive regions, particularly those administered by

¹ For a complete list of decisions included under each category, please refer to [Appendix A.1](#).

² Many countries in the world today – particularly low and middle income countries – still exhibit high levels of centralization in education policymaking. Spain's hypercentralized past thus suggests that it may be an especially useful model for comparison.

local branches of national parties, would exhibit less emphasis on more visible and quicker-to-achieve policy improvements. Ultimately, we find that the pattern of results in Spain is consistent with our hypothesis, and that after decentralization, the more politically assertive regions favored expanding access rather than improving quality.

The OECD cross-country panel and Spanish historical case study together enable a robust and complementary interrogation of the effects of decentralization in the education sector. The findings using these sources highlight the potential for decentralization to enhance student access to education, but in doing so, to also create congestion effects which undermine the overall quality of education. Previous empirical studies fully consider neither tradeoffs between access and quality in education, nor the role of political incentives therein. They are also unable to empirically establish whether particular functions are behind this phenomenon. In contrast, we analyze rich data in different decentralization contexts, including exogenous variation in the Spanish case study, in order to broaden our understanding of the nuances behind the effect of decentralization. We thus contribute to a novel research agenda that systematically considers how decentralization may lead to adverse outcomes as an unintended consequence of the political incentives guiding sub-central governments' behavior upon receipt of their new authorities. While the findings derived in this analysis are specific to the education sector, they should inform our understanding of the potential tradeoffs inherent to decentralization in other sectors of public service delivery. More broadly, they should inform our understanding of the ways in which decentralization might lead sub-central governmental authorities to act on incentives that differ from the central government's original purpose or expectations.

2. Literature and open questions: the allure of decentralization and its measurement challenges

For many countries with traditionally centralized systems of government, the allure of decentralizing public services lies in part in the proposition that, by giving sub-central (e.g. regional or local) governments more discretion over decision-making, decentralization can directly and positively affect the interaction between the sub-central government and the end user. According to this logic, decentralization promotes better outcomes by improving the flow and quality of information, both by facilitating the transmission of specific community demands to policymakers, and by making it easier for citizens to monitor policymakers' decisions and hold them accountable for the results (Grindle, 2007).

Greater government accountability was particularly attractive in the context of global disappointment with more centralized forms of government that followed the collapse of communism in the former Soviet Union, the failure of corporatist reforms in Western Europe, and the demise of the developmental state in Latin America (Faletti, 2010). While policymakers and researchers worldwide recognize that decentralization is not a magic bullet, they often place considerable emphasis on its potential benefits (World Bank 2003, World Bank 1992, World Bank 2004; Bahl and Linn, 1992). This optimism stems mostly from the economics literature, and in particular, the literature on fiscal federalism. Economists argue that fiscal decentralization increases allocative efficiency because local communities possess heterogeneous preferences, and information asymmetries between those communities and more centralized decision-making bodies often prevent the latter from providing services that are effectively tailored to the preferences of the former (Tiebout, 1956; Oates, 1972). According to this argument, public service distribution should be operationalized at the lowest possible level of government in order to optimize decision-makers' responsiveness to – and accountability for meeting – the actual preferences of their constituents (Oates, 1999).

The political science literature is more agnostic about the merits of decentralization. This literature takes greater account of the political constraints that central and sub-central governments face as a result of this fundamental change in government structure. On one hand, the literature elaborates on the different forms of political accountability (e.g. vertical and horizontal) that can occur in decentralized contexts, and the range of incentives that can influence how those forms of political accountability are operationalized (O'Donnell, 1998; Fearon, 1999). On the other hand, the literature also discusses the perils of decentralization. For instance, federalism can be difficult to implement in many contexts, such as instances in which sub-central governments possess ample opportunity to free ride; heterogeneous regions display separatist tendencies; a federalist distribution of authorities across different levels of government is unclear and poorly articulated; and a central government is both unable to enforce budgetary discipline on the part of its sub-central counterparts and responsible for bearing the costs of their excesses (Riker, 1964; Weingast, 1995; Rodden and Rose-Ackerman, 1997; Rodden, 2006).

The public policy literature has tried to advance this debate by conceptualizing the conditions under which different reforms are more likely to succeed. For instance, Pritchett and Pande argue that a governmental function – a particular type of policy decision – should be decentralized if it satisfies three criteria: first, if a function is discretionary and requires local knowledge in order to be implemented successfully; second, if the function is transaction-intensive and therefore requires frequent interactions at the local level; and third, if the implementation of a particular function is best evaluated and corrected at the local level (Pritchett and Pande, 2006; Pritchett, 2014). The last criterion combines the ability to observe service delivery with the ability to evaluate whether the delivery was technically adequate. Pritchett and Pande argue that functions meeting these criteria require local input to enhance accountability between the provider and the end user and should thus be decentralized. Indeed, this hypothesis is consistent with a broader literature that argues that decentralization should be used to exploit both local knowledge and the ability to observe performance at the local level (Oates, 1999; Shah 1994; Grindle, 2007). For instance, setting quality standards or goals is a minimally-discretionary and transaction-intensive activity that requires significant observational expertise; this would suggest that it is ill-suited for decentralization. By contrast, hiring teachers is highly-discretionary, transaction-intensive, and locally observable, suggesting that it should be decentralized.

These criteria provide a framework for evaluating how different functions might fare under a more centralized or decentralized decision-making regime. But that framework focuses almost exclusively on the technical and practical requirements of the

administrative functions, and how differing levels of decentralization might or might not meet those requirements. Neither this framework nor the broader literature consider the political aspect of decentralization's impact on different functions. That is, the degree to which different functions will be made effectively (i.e. in a manner that leads to improved outcomes) depends significantly on the incentives possessed by the political agents on the receiving end of newly-decentralized authorities.

Thus, we know that under the right conditions, decentralization can positively contribute to improving policy outcomes. But the precise nature of those conditions – especially the *political* conditions – is still a subject of debate. In the education sector, specifically, questions remain. For instance, under what conditions can decentralization lead to positive outcomes in the education system? What political conditions will lead decentralization to favor improved access to education, rather than improved quality of education, or vice versa? And what do different sets of political conditions mean for the effective – or ineffective – making and execution of different types of education policy decisions, with follow-in implications for different types of education outcomes?

Even leaving the theoretical complications aside, several factors make these questions hard to answer empirically. Decentralization is typically a multi-faceted process that takes place along many dimensions, including the political, fiscal, and administrative, and countries can choose to decentralize in any one or all of these dimensions at different paces and in different sequences. For instance, a government might simultaneously decentralize decision-making for a particular functional domain (e.g. personnel management), while centralizing or keeping centralized the responsibility for funding activities captured within that domain (e.g. hiring and dismissal of teachers).

In addition, decentralization often occurs as part of a set of parallel organizational reforms. It may also be the natural evolution of a high-performing system that can afford the luxury of changing its governance structure to focus on concerns beyond basic good performance (Mourshed et al., 2010). Thus, it can be difficult to disentangle causality linking decentralization with any particular policy outcomes or even indicators for said outcomes. Indeed, it has proven particularly hard to find a set of conditions under which the empirical effects of decentralization are unambiguously strong beyond unique circumstances (Treisman, 2007).

Likewise, decentralization efforts are often influenced by country conditions. State, regional, or local bureaucratic capacity, resource levels, and economic circumstances differ across countries and regions within countries, thus complicating any prediction of reform outcomes. Decentralization reform likewise takes place in dynamic and variegated political contexts: differences in political incentives for central and sub-central governments in different countries can influence the effect of decentralization on outcomes. Ultimately, the multi-faceted nature of the reform, coupled with measurement difficulties related to the intricacies of the organizational and political contexts, makes it difficult to quantify the effect of decentralization on outcomes.

3. Data

We help to fill some of the empirical gaps discussed in the previous section through the complementary use of two novel datasets: a cross-country panel from high-income countries and the case of decentralization in Spain from 1980 to 1999. Our analysis focuses on the education sector, and in particular, on the impact of decentralization on students' access to education and the quality of the education provided, respectively. Our analysis further accounts for decentralization's impact on specific types of education policy decisions, which are grouped by organization of instruction, personnel management, planning and structures, and resource management.

In particular, we first use a cross-country panel of OECD countries that allows us to examine the effect of the same type of reform across different fiscal and administrative contexts. We estimate the average effects of decentralization using within-country variation over time in a panel model with year and country fixed effects. This model nets out other common time and country-invariant characteristics. However, it does not eliminate the empirical challenge. For instance, we cannot be assured that observed changes in decentralization levels are not driven endogenously. We can imagine an upwards or downwards trajectory in outcomes that policymakers react to in order to be seen as effecting a visible reform, thereby complicating efforts to disentangle causality. Another empirical challenge is the fact that the level of variation within a country over a relatively short period of time (i.e. less than 10 years) will tend to be small.

The Spanish case study, in turn, allows us to analyze the impact of decentralization in a stable national, administrative, and fiscal context, in which change in decentralization over time is arguably exogenous. That is, the phased, idiosyncratic process of decentralization serves to isolate the effect of decentralization and distinguish it from other changes that may be occurring in any given year. It allows us to exploit variation in the political characteristics of different regions within that common national context. The within-country analysis might prompt concerns over the external validity beyond the particularities of Spain. Ultimately, however, the combined evidence is more compelling than any of the individual pieces.

3.1. OECD education decision-making data

We exploit a cross-country panel of 36 countries, mostly within the OECD, with data for 2000, 2003, 2007, and 2012.³ We assemble and code these measures of administrative decision-making based on the *OECD Education at a Glance* annual reports (OECD, 2004, 2008), which have been compiled since 1998. They are based on the *OECD-INES Survey on Locus of Decision Making*, which consists of a questionnaire completed by a panel of three national officials on lower secondary education in each country. The three

³ Due to inconsistencies in the definition of the education decisions used in the 2000 OECD survey wave as compared with the others, we drop the 2000 survey from our empirical analysis.

officials represent different levels of government and answer by consensus.⁴ The cross-country panel data is drawn from a sample of countries, thereby allowing for a larger N longitudinal study of the impact of decentralization.⁵

The cross-country panel focuses on the administrative dimension of education and provides data on which education functions have been decentralized to which levels of government. This data is unique because it provides granular evidence of *de facto* decentralization – that is, not what is written in the legislation as to how education should be managed, but rather how agents actually implement their functions in practice. The administrative functions in the data include responsibilities falling under the four functional domains previously listed: organization of instruction, personnel management, planning and structures, and resource management.

The survey questions gather perception-based data from administrative officials charged with executing 46 key education functions, each of which falls under one of the functional domains previously stipulated. This survey thus allows for a comprehensive and nuanced picture of the complexity of decentralization, in contrast with the literature's use of a reform dummy (Bruns et al., 2011). Responses to survey questions capture the degree of decentralization among the following levels of government:

- Central government
- State governments
- Provincial and regional authorities or governments
- Sub-regional or inter-municipal authorities or governments
- Local authorities or governments
- Individual schools or school boards or committees

Our basic measure of decentralization is the percent of the 46 functions that were made at the provincial and regional level or below.⁶ We measure access and quality outcomes using a series of indicators. Our indicator for access is tertiary enrollment rates (university and post-secondary vocational education). Tertiary education is the main, non-mandatory level education beyond primary and secondary school that is sizable and comparable across all countries.⁷ Our indicators for quality are mean PISA country scores for math, reading, and science.

Summary statistics for the OECD data are shown on Table 1. Fig. 1 shows the variation on the decentralization variable for the three PISA waves covered by our data in 2003, 2007, and 2012 (the main source of identification), and on one of the indicator variables (PISA reading scores).⁸ As expected, they show fairly high levels of decentralization. Appendix A2 includes descriptions of the variables used in the cross-country panel and their respective sources.

3.2. The Spanish decentralization reform and data

We analyze the case of Spanish decentralization of education policymaking as a complement to our analysis of the OECD cross-country panel. The Spanish government implemented this reform between 1980 and 1999. It was the first of a series of liberalization reforms implemented in response to the 1978 constitution, which itself marked the end of General Franco's authoritarian rule. The

⁴ The panel of officials had members from three decision-making levels: highest level (central government), middle levels (state governments; provincial/regional authorities or governments; sub-regional or inter-municipal authorities or governments; and local authorities or governments), and lowest level (school). The officials completed the questionnaire and reached consensus on all questions. The INES NESLI Representative then reviewed the results of the survey in consultation with the national coordinator (OECD 2012, Annex 3).

⁵ A related but less detailed dataset from the OECD as part of the PISA analyses has been used to establish the effect of school autonomy on outcomes by Hanushek et al 2013. This measure is based on interviews with school principals about six types of decisions they are required to make. (Our data, by contrast, focuses on 46 different education decisions.) They find the effect of decision-making in schools has different effects depending on the level of development of the school system, as proxied by GDP per capita. We have much more detailed data, but we lack the school level variation in autonomy that (Hanushek and Woessman, 2013) exploit in their sample. However, we think that the data we use is likely to be more reliable, as it should capture policy variations rather than implementation variation and measurement error from variations in the reporting of school principals.

⁶ The multi-level distinction detailed here allows for a comparison between federal and non-federal countries, since province or region would be the first territorial unit below the national level in non-federal countries, whereas state governments would be the comparable unit in federal countries.

⁷ There is wide variation in the sample in the availability of data on preschool education provision, which we use in our analysis of the Spanish case study. Tertiary education is defined as any form of education in International Standard Classification of Education (ISCED) 2011's levels 5–8. Level 5 is “Short-cycle tertiary education: Short first tertiary programmes that are typically practically-based, occupationally-specific, and prepare for labour market entry. These programmes may also provide a pathway to other tertiary programmes.” Level 8 is “Doctoral or equivalent: Programmes designed primarily to lead to an advanced research qualification, usually concluding with the submission and defense of a substantive dissertation of publishable quality based on original research.”

⁸ Note that throughout this paper we use enrollment rates calculated using the standard methodology exhibited in the broader education literature. This methodology may yield values in excess 100%. This is primarily a result of grade retention. That is, while the denominator include all members of the population that fit the age cohort corresponding to the age of instruction, the numerator includes all members of the population that are effectively receiving the instruction. Suppose, for instance, primary education in a given education system is meant to end at age 12. If there is full enrollment of students up to the age of 12 and some older students have been retained for remedial instruction, then enrollment figures will exceed 100%. That is because the numerator will include the students age 13 and above that were held back, but the denominator will not.

Table 1

Summary statistics for cross-country panel (2003, 2007, and 2012 waves).

| Variable name | Mean | Std. Dev. | Min | Max | No. of Obs. |
|--|--------|-----------|--------|--------|-------------|
| Decisions not at the central level | 75.37 | 25.04 | 0 | 87 | 105 |
| Decisions not at the central level (organization of instruction) | 90.39 | 12.73 | 0 | 56 | 105 |
| Decisions not at the central level (personnel management) | 71.89 | 33.27 | 0 | 100 | 105 |
| Decisions not at the central level (planning and structures) | 57.66 | 37.01 | 0 | 100 | 105 |
| Decisions not at the central level (resource management) | 81.62 | 30.07 | 0 | 100 | 105 |
| Primary enrollment, % | 102.94 | 4.87 | 96.06 | 116.98 | 61 |
| Secondary enrollment, % | 103.09 | 15.03 | 59.51 | 155.91 | 62 |
| Tertiary enrollment, % | 60.13 | 19.69 | 12.19 | 101.8 | 59 |
| Math score (PISA) | 487.49 | 42.85 | 360.16 | 553.77 | 91 |
| Reading score (PISA) | 486.93 | 35.39 | 381.59 | 556.02 | 90 |
| Science score (PISA) | 492.57 | 39.3 | 381.92 | 567.64 | 64 |
| GDP per capita (2003 USD) | 31,643 | 14,069 | 2796 | 89,417 | 98 |

Note: For enrollment variables, we report the share of the age cohort enrolled. When students retake grades and are required to stay in school, this may result in them being enrolled in an education period despite not being in the corresponding age cohort, yielding an enrollment rate over 100%. This is in line with how OECD reports enrollment.

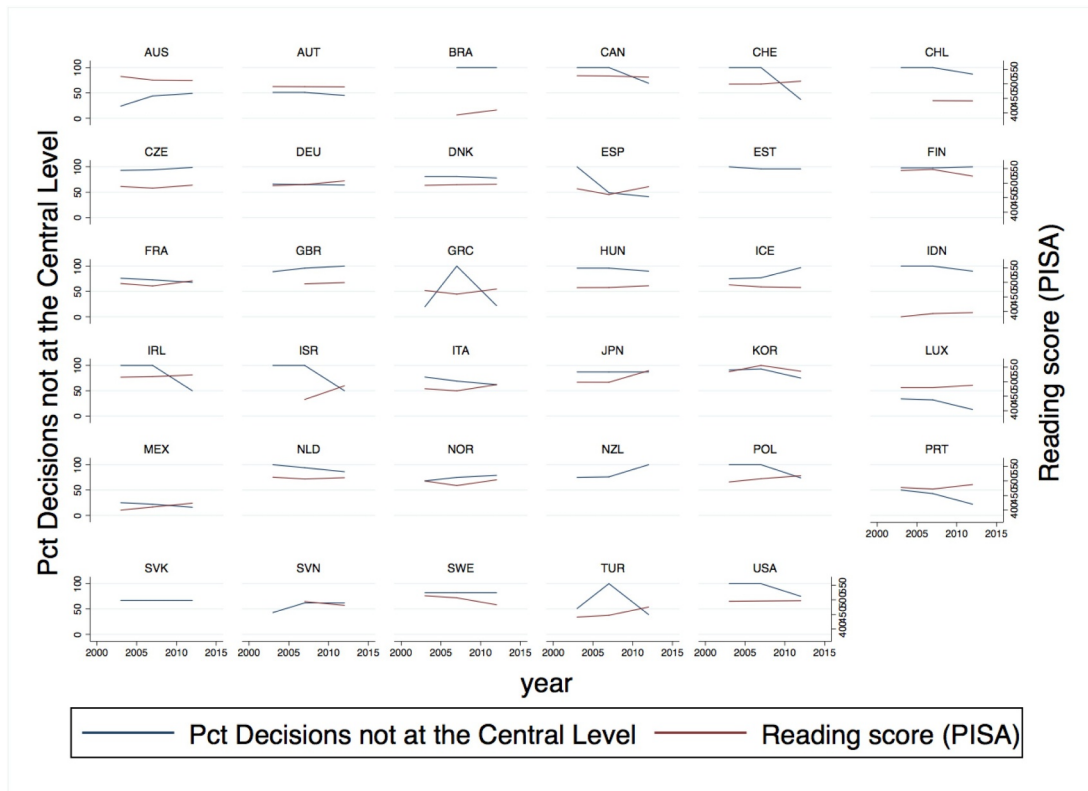
**Fig. 1.** Variation in decentralization levels and test scores, cross country (2003, 2007, and 2012).

Figure plots OECD-INES Survey on Locus of Decision Making survey year in the X-axis. The left Y-axis denotes the percentage of decisions not taken centrally by a central or state government. The right Y-axis shows average reading PISA test scores in the country (which averages 500 in each wave by design), plotted by country. Centralization rather than decentralization is represented for visual ease. Decision definitions are not consistent between 2000 wave and later ones, so we drop the earliest wave in our empirical analysis.

decentralization of education policymaking targeted grades K-12. Per the reform, the central government transferred policymaking authorities for grades K-12 to the regional governments (called “Autonomous Communities”, for timing of the reform see [CEOE, 2012](#)). [Fig. 2](#) shows the structure of the education system and population participation at each stage, pre- and post-reform.

A distinct feature of this process was the staggered sequencing of the implementation of decentralization for different regions. The first wave of reform happened during the period of 1980–82 when six of the 17 regions decentralized. The second wave occurred during the period of 1997–99 when the remaining 11 regions decentralized. [Fig. 3](#) shows the phased timing of this decentralization process. The reform led to a division of authorities between the national and regional or local governments. The central government

Basic structure of 1970–2000 education system in Spain

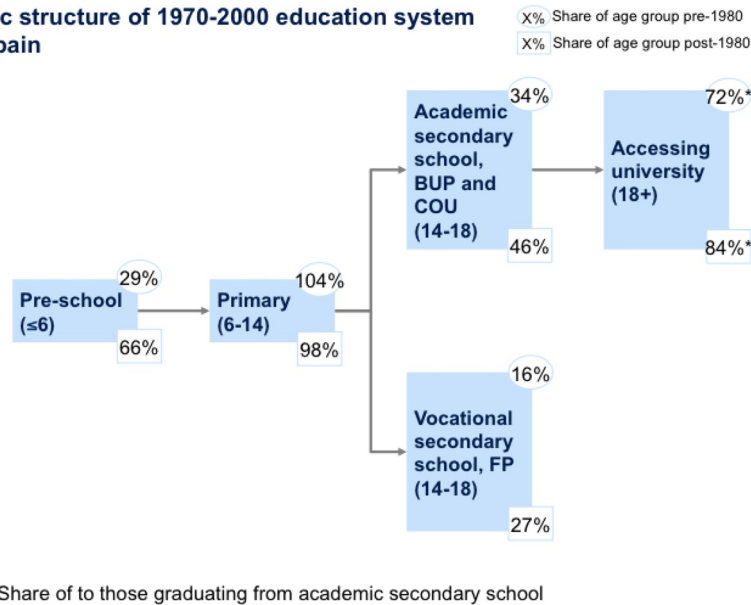


Fig. 2. Spanish education system structure in the period 1970–2000.

We report the share of the age cohort enrolled that corresponds to the part of the education system assuming yearly progression by grade. When students retake grades and are retained in school, this may result on them being enrolled in an education period despite not being in the corresponding age cohort, yielding enrollment rates over 100%. This is in line with how OECD reports enrollment. Source: Ministerio de Educación y Ciencia (Multiple Years), series coded by the authors.

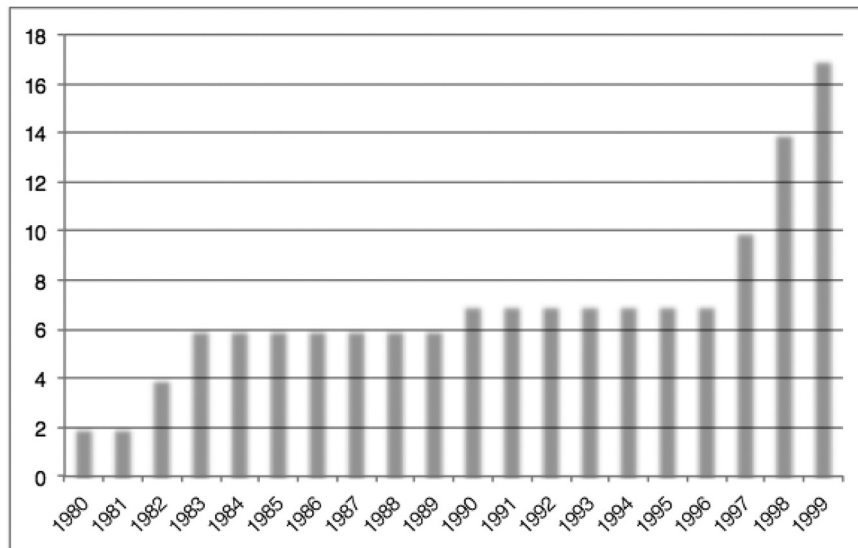


Fig. 3. Number of regions in Spain with decentralized primary and secondary education by year

Number of regions to which education policy was decentralized by end of the year. Date of decentralization refers to the date that the decentralization royal decree was published in the official state gazette (CEOE, 2012).

retained control over the structure of and basic legal requirements for the education system (e.g. extension of compulsory education to age 16 in 1990) as well as basic human resources (e.g. the pay-scale and pensioning system for teachers). The central government also retained regulatory authority over minimum graduation requirements and some contents of the curriculum. Nearly all other decisions were transferred to the regions, including budgeting, human resources (such as appointing and managing personnel), school and other infrastructure management, planning, financial aid, and the inspection of schools.⁹

⁹ However, even after this initial decentralization of decision-making, some decisions related to the K-12 education system continued to be regulated centrally by the Ley Orgánica General de Educación of 1970. To take an example, the curriculum was fully centrally determined until the

Following the transfers of authority, the central government initially financed the regional education systems via a block grant based on the cost of the education system prior to decentralization. The block grant was adjusted for inflation and transferred as a lump sum from the central government's tax pool to the subordinate authorities; it expanded in proportion to the growth in national tax revenues.¹⁰

We use the staggered timing of decentralization as a source of variation. In doing so, we assume that the timing of decentralization is related to neither the socioeconomic characteristics of the regions at hand nor their education outcomes, as reflected by the fact that both early and late decentralizers included different types of regions. To evaluate the effects of varying political incentives across regions, we also exploit a sharp distinction between two groups of regions that underwent decentralization reform concurrently in the early 1980s. The first group includes four regions – Catalonia, Basque Country, Galicia, and Navarre – which have a tradition of self-rule and were designated as “historic regions” on the basis of the level of autonomy they achieved in 1936.¹¹ The second group of regions includes three – Andalusia, Canary Islands, and Valencian Community – that pursued self-rule at the same time as historic regions but more opportunistically and only in discrete policy sectors, such as education.¹²

Unlike the OECD cross-country panel, the Spanish case study does not allow us to investigate the effects of decentralization on particular types of decisions. This is a result of the fact that the Spanish reform led to uniform levels of decentralization across functional domains. Instead, we examine the aggregate effect of decentralization on education decision-making overall, with a particular eye toward its impact on quality and access specifically, using the process described above. To measure quality, we use the following as indicators: graduation rates in secondary education and passing rates in standardized university entrance exams. To measure access, we use enrollment rates in state-provided preschool programs.¹³

Summary statistics for the data from Spain are presented in Table 2. We obtained data on graduation rates, enrollment numbers, and students passing university entrance examinations by digitizing the historic series of yearly Spanish official education statistics presented in *Estadística de la Enseñanza en España* for the period 1977–2002 (Ministerio de Educación y Ciencia, Multiple Years), which was edited by the National Statistics Institute. In addition, we coded data on decentralization status from CEOE (2012), and checked decree dates against the official state bulletin, *Boletín Oficial del Estado*. We gathered additional historic socio-demographic statistics for each region from Carreras and Tafunell (2005).

4. Methodology

To investigate the extent to which decentralization induces adverse tradeoffs between access and quality in the education sector, this paper draws on two methodologies: panel analysis and synthetic control methods. This section discusses each of those strategies.

4.1. Panel analysis

For both sets of data, our main specification uses panel data with fixed effects at the country (i.e. OECD data) or regional level (i.e. data from the Spanish case study), as well as year fixed effects. We therefore estimate the effect of marginal changes on decentralization levels in the countries in our data using a generalized difference-in-differences method. We examine this effect for the range of values that are close to the initial conditions of high decentralization levels (as captured in the cross-country panel by the country fixed effects). The addition of fixed effects ensures that our results are not confounded by time-invariant characteristics of our units of analysis (countries and regions, depending on whether we use cross-country or data from the Spanish case study) or common time trends. It has the downside of limiting the analysis to using within-unit variation over time. Another downside is that a causal

(footnote continued)

second wave of decentralization, which began in 1990 with passage of the Ley de Ordenación General del Sistema Educativo. After this law, 45% or 55% percent of the content of the curricular time was determined by the regional governments (depending on whether the region had its own language).

¹⁰ After 1986, this system was revised to include adjustments based on different needs of each region, such as population changes, population density, and special island status (Laborda et al., 2006).

¹¹ “Historic region” is a technical term defined by the “Disposicion Transitoria Segunda” of the 1978 Constitution. This definition includes regions that voted in a referendum in favor of “autonomy statute” or regional constitution project during the 1931–1936 republic regime. Pursuant to Article 151 of the 1978 Constitution, “historic regions” were intended to assume greater autonomy – and to do so more quickly – than their non-designated regional counterparts. In this manner, “historic regions” sat at the heart of the asymmetric decentralization regime characteristic of the current Constitutional regime. The historic regions of this type are Catalonia, Basque Country, and Galicia. In addition, Navarre has a separate special historic status embedded in the Constitution that can be traced back to the 16th century.

¹² For greater detail on these regions’ opportunistic motivations, please see Azaola (1995)

¹³ Decentralization of university decision-making, including the university entrance exams, did not occur until 1985 for an early set of regions (Basque Country, Valencian Community, Catalonia, Canary Islands, Navarre and Galicia), and then between 1997 and 2000 for the remaining regions (CEOE, 2012). This makes university entrance exams a credible measure of outcomes that regional governments cannot manipulate. In terms of the dynamic composition of the sample, whereas 24% of 18 year olds graduated from traditional academic high school at the very start of the period, 90% of those graduating from high school took university entrance examinations, and 72% of those passed those exams. By 1995, 36% of 18 year olds graduated from high school, and 92% of them sat university entrance examinations. The traditional academic high school track expanded nationwide by the early 2000 s, at which point every student was mandated to attend an academic high school until age 16, whereas previously they could have left school at age 14. This transition occurred outside the temporal scope of the current study. However, we discuss below some of the challenges to the identification of effects that this may present.

Table 2
Summary statistics for Spanish data.

| Variable | Pre-1980 | | | Post-1980 | | |
|---|----------|-----------|-----|-----------|-----------|-----|
| | Mean | Std. Dev. | N | Mean | Std. Dev. | N |
| % passing university entrance exams | 0.73 | 0.1 | 54 | 0.87 | 0.07 | 450 |
| % graduating from secondary school | 0.74 | 0.22 | 132 | 0.65 | 0.06 | 302 |
| % enrolled in preschool programs | 0.29 | 0.16 | 133 | 0.66 | 0.17 | 529 |
| % enrolled in primary education | 1.04 | 0.08 | 133 | 0.98 | 0.19 | 342 |
| % Decentralized | 0 | 0 | 133 | 0.49 | 0.5 | 570 |
| GDP per capita (10 ⁹ . pesetas 2000) | 5.57 | 1.27 | 119 | 7.15 | 1.83 | 306 |
| Share adults with HE | 0.01 | 0.01 | 125 | 0.03 | 0.02 | 410 |
| Industrialization index | 0.99 | 0.46 | 119 | 1.04 | 0.57 | 425 |

Note: Observations are region-years. For enrollment variables, we report the share of the age cohort enrolled that corresponds to the part of the education system assuming yearly progression by grade. When students retake grades and are required to stay in school, this may result in them being enrolled in an education period despite not being in the corresponding age cohort, yielding an enrollment rate over 100%. This is in line with how OECD reports enrollment.

interpretation would require that changes in decentralization levels over time be exogenous. The specifications we use are as follows:

$$Y_{it} = \beta \text{Decent}_{it} + \mathbf{X}_{it} + \text{Geography}_i + \text{year}_t + \varepsilon_{it} \quad (1)$$

$$Y_{it} = \beta \text{Decent}_{it} + \gamma \text{Decent}_{it} \times \text{Pol}_{it} + \delta \text{Pol}_{it} \mathbf{X}_{it} + \text{Geography}_i + \text{year}_t + \varepsilon_{it} \quad (2)$$

In both specifications, Y is the education outcome of interest, *Decent* is the measure of decentralization, and *Pol* is a measure of regional political assertiveness that we hypothesize influences the effect of decentralization (such as the historic character of the region). *Geography* represents country (i.e. in cross-country regressions) or regional (i.e. in the Spanish case study regressions) fixed effects. It represents countries in the cross-country analyses and regions in the Spanish case. Additionally, \mathbf{X} represents time-variant inputs. The coefficient of interest is β , the effect of changes in decentralization. Finally, in the second equation (only available for the Spanish case study regressions), γ is the additional effect of decentralization for politically assertive regions.

The measures vary between the cross-country panel and the Spanish decentralization reform data. In the cross-country panel (specification 1), the availability of granular data allowed us to analyze *Decent* as a continuous variable that measures the share of the 46 decisions relating to education policy taken at a sub-central level at time t for country i . The *geography* fixed effects correspond to countries. In the case of the Spanish decentralization reform data, *Decent* is a categorical variable that takes the value 1 starting in the year after the decentralization decree is published in the official state gazette (coded from [CEOE, 2012](#); [Boletín Oficial del Estado, 1980](#), and subsequent decrees) and 0 before. *Geography* indicates regions. Specification 2, only available for the Spanish case study, draws on the interaction of a measure of the political incentives at the regional level in Spain, which we will proxy by using an indicator for historic regions.

In every case, standard errors are clustered at the geographic unit of variation (i.e. the country in the cross-country data and regions in the Spanish case study) that we exploit to account for the correlation among observations from the same country over a given time period.¹⁴ Given our small sample, we do not add time-variant country-level covariates to the geographic fixed effects in our main country specification. Instead, we are able to control for such characteristics below using synthetic controls.

In addition, we draw on the cross-country panel data to examine the impact of decentralization on specific policies. We look especially at the predictive power of Pritchett and Pande's characterization of functions that ought to be decentralized, analyzing the effect of these changes on a series of outcomes. First, we use panel regression analysis with the decision-making groupings, or functional domains, determined by the OECD. We complement this method with a factor analysis, allowing the variation in the decision-making actor to define the groupings of decisions that vary together.

4.2. Synthetic controls

For the Spanish case study, we use synthetic controls to obtain individual treatment effects for each region. In small-N studies, synthetic control methods compare our unit of interest (in this case, regions) to other units in our sample that can serve as a counterfactual control. This allows us to capture the nuanced effects of decentralization on individual units, which may be different from average effect estimates.

Specifically, we compare each region with a synthetic region that is created as a convex combination of other untreated regions (which we define as non-historic regions that receive decentralized powers after five years or more, since all regions eventually receive those powers). The weights of other regions in the combination are based on the covariates during the pre-treatment period.

¹⁴ We have a relatively small number of clusters where asymptotic properties may not have kicked, and as a result, conventional cluster standard errors may be an underestimation in the case of Spain. We have 36 country clusters and 17 regional clusters in Spain. The latter are close to the minimum threshold number of clusters where the size of standard errors for the 5% level is underestimated using conventional methods, according to [Cameron et al. \(2008\)](#). Our results in Spain, however, are also estimated using synthetic controls, which do not require as many donor units for inference ([Hahn and Shi, 2017](#)). As we will show below our results are very similar.

Table 3
Decentralization level and quality and access measures in a cross-country panel, with country- and year fixed effects.

| Variable | Math score | | | Reading score | | | Science score | | | Tertiary enrollment | | |
|--|-------------------|---------------|--|---------------------|------------|--|-------------------|---------------|--|---------------------|---------------|--|
| | Coeff. (SE) | Adj R2 [N] | | Coeff. (SE) | Adj R2 [N] | | Coeff. (SE) | Adj R2 [N] | | Coeff. (SE) | Adj R2 [N] | |
| Decisions not at central level % | –0.141 (0.096) | 0.049 [88] | | –0.225** (0.072) | 0.128 [87] | | –0.141 (0.151) | 0.018 [61] | | 0.113* (0.047) | 0.365 [58] | |
| Decisions not at central level (organization) | –0.255 (0.186) | 0.045 [88] | | –0.383** (0.081) | 0.107 [87] | | –0.174 (0.249) | –0.005 [61] | | 0.246** (0.082) | 0.368 [58] | |
| Decisions not at central level (personnel) % | –0.0445 (0.057) | –0.003 [88] | | –0.130* (0.051) | 0.062 [87] | | –0.146 (0.150) | 0.032 [61] | | 0.0682+ (0.037) | 0.351 [58] | |
| Decisions not at central level (planning) % | –0.067 (0.047) | 0.029 [88] | | –0.0908+ (0.047) | 0.062 [87] | | –0.0431 (0.061) | –0.019 [61] | | 0.0665 (0.043) | 0.345 [58] | |
| Decisions not at central level (resources) % | –0.171+ (0.088) | 0.101 [88] | | –0.260** (0.062) | 0.219 [87] | | –0.128 (0.105) | 0.028 [61] | | 0.142** (0.034) | 0.373 [58] | |

Note. Each cell value is derived from a different regression that implements a version of Eq. (1), with the left column variable indicating the main independent variable, and the top row indicating the main dependent variable. Scores are averaged at 500 – with SD 100 in 2000 – and enrollment percentages are coded from 0 to 100. The value in the cell is the coefficient of the variable in the left column. For example, the first value at the top of the left column indicates that, in the regression of PISA scores on share of decisions taken at the central level, the coefficient is –0.141. All models include country fixed effects and year fixed effects. Standard errors, clustered by state, in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

This method differs from regression analysis by preventing extrapolation, which in turn, is done by ensuring that the weights of all units in the synthetic control are between 0 and 1 (Abadie and Gardeazabal, 2003; Abadie et al., 2010; Abadie et al., 2015). The method is also distinct from the generalized difference-in-difference model approach we use in our specifications 1 and 2 in that it selects the counterfactual systematically, using a linear combination of control units whose weights are developed in a non-arbitrary way. In a difference-in-difference study, by contrast, either one unit or an equally-weighted simple average of several units is used as a control.

5. Results: estimating the effects of decentralization reform on access and quality outcomes

To establish the relationship between decentralization, on one hand, and students' access to education and its quality, on the other, we first explore the effects of decentralization by analyzing all administrative functions together. We then look at the effect of decentralization in terms of the functional domains under which those functions fall.

5.1. Aggregate effects of decentralization

The cross-country panel shows that the share of decentralized decisions is negatively associated with quality indicators and positively associated with access indicators. Fig. 1 showed a plot of these relations. Table 3 implements specification 1 and shows the estimates of these effects. For quality indicators, using standardized cross-country PISA scores, the share of decentralized decisions (i.e. percentage of decisions not made at the central level) has a largely negative effect and is statistically significant with respect to reading scores. The effects themselves are relatively small, but not negligible. As a smaller share of decisions are taken centrally (i.e. as a result of greater decentralization), PISA scores get worse: in the fourth column, the negative 0.225 coefficient in reading scores suggests that decentralizing an additional 10 percent of decisions is associated with approximately 1 less year of schooling over the 10 years students spend in school.¹⁵ In terms of access indicators, decentralizing by the same amount is associated with a 1 percentage point increase in tertiary enrollment (column 8), or about a 2 percent increase compared to the average tertiary enrollment level in the sample.¹⁶

The data from the Spanish case study shows the same patterns of results: negative on quality indicators and positive on access indicators. A consistent picture emerges in Table 4, where decentralization exhibits a negative relation with quality as measured by passing rates in university entrance exams (Panel A) as well as completion levels of secondary school (Panel B). Column 2 in Table 4 provides the preferred models, two years after decentralization and with geography controls.¹⁷ The negative effect of decentralization on quality indicators holds both one year after decentralization and two years after decentralization, with the effects being stronger after two years (contrast columns 2 and 3). This negative relation between decentralization and quality outcomes is also observable using the alternative synthetic controls approach. Fig. 4 illustrates the relation by comparing the pre- and post-decentralization evolution of the difference in passing rates in university entrance exams between regions and their corresponding synthetic controls. For most regions, the gap between the decentralizing region and the synthetic control region that replicates it stays largely unchanged or becomes slightly narrower, demonstrating that the neutral or negative effect is consistent across regions.

A similarly consistent pattern emerges in the case of access indicators. The analysis in Table 4, Panel C, shows that decentralization is weakly associated with higher enrollment rates in (non-mandatory) preschool education. Fig. 5 compares the evolution of the difference in preschool enrollment of each region with their synthetic control rates. Decentralizing regions increased their share of students in preschool enrollment relative to their synthetic controls, with the difference growing more positive across the board.

Recall that we find opposite effects of decentralization on quality and access indicators in both the cross-country panel dataset and the data from the Spanish case study. We hypothesize that, much like a substitution effect, the pull of limited resources and administrative time towards service expansion due to decentralization takes resources and administrative focus away from preserving or enhancing service quality. We can rule out the explanation that diminished education quality may be due to the fact that new students accessing the system as a result of decentralization have lower test scores (our indicator for quality). This is clear in the data from Spain. The students who only entered the education system due to the expansion of preschool enrollment did not register in our measures of quality, which were attainment at the end of primary and secondary education for 10 years (primary school graduation) or 14 years (secondary school graduation). On average, our data is censored after 10 years of the decentralization reform (depending on the region) due to the changes in the data collection system in Spain. The post-reform effects on quality therefore almost exclusively depend (on average, for 90% of primary school graduation and 100% for secondary school) on the effect on cohorts already in the education system during the reforms, rather than those whose composition is affected by the expansion of preschool programs.

¹⁵ This interpretation of the substantive effect of changes in the reform on test scores is based on the methodology employed by Hanushek (1997). It follows directly from the general finding in the literature that one year of schooling results in about .25 standard deviations in reading scores (or 25 points in PISA scores, as it is scaled so that the reading score is 500 and its standard deviation is 100), and that any effects should be assumed to be cumulative.

¹⁶ Separately, we add country covariates to the models in Table A1 of the Appendix. These covariates reflect such country-specific indicators as the meritocratic nature of the public sector, the capacity of its staff (through compensation levels), and the levels of trust in the country. None of these additional covariates change the directions of the effect in the cross-sectional data. The effects of the contemporary degree of decentralization on quality and access indicators are unaltered from the basic specification, and to the extent that they change at all, grow stronger.

¹⁷ Only a small number of regional-level controls are available in the case of Spain prior to the 1980s.

Table 4
Decentralization and school outcomes in Spain.

| Variable | (1) | (2) | (3) |
|--|---------------------|---------------------|---------------------|
| Panel A: Percent passing university entrance exams | | | |
| Decentralized (after 2 years) | –0.0052 (0.0072) | –0.031* (0.0011) | |
| Decentralized (immediately afterwards) | | | –0.0093 (0.0072) |
| GDP per capita | | –0.0016 (0.024) | |
| Industrialization index | | 0.023 (0.041) | |
| Share adults with HE | | 0.52 (0.66) | |
| Observations | 504 | 504 | 504 |
| Adjusted R ² | 0.750 | 0.742 | 0.751 |
| Panel B: Percent graduating from secondary school | | | |
| Decentralized (after 2 years) | –0.0039 (0.015) | –0.010 (0.011) | |
| Decentralized (immediately afterwards) | | | –0.0050 (0.018) |
| GDP per capita | | –0.023 (0.0077) | |
| Industrialization index | | 0.080** (0.010) | |
| Share adults with HE | | 0.45 (0.97) | |
| Observations | 434 | 434 | 434 |
| Adjusted R ² | 0.170 | 0.589 | 0.170 |
| Panel C: Percent enrolling in preschool education | | | |
| Decentralized (after 2 years) | –0.0048 (0.016) | 0.0053 (0.020) | |
| Decentralized (immediately afterwards) | | | –0.0059 (0.016) |
| GDP per capita | | –0.019 (0.018) | |
| Industrialization index | | –0.050* (0.022) | |
| Share adults with HE | | 1.02 (0.89) | |
| Observations | 662 | 662 | 662 |
| Adjusted R ² | 0.948 | 0.941 | 0.948 |

Note: Specifications regress outcome measures (percent coded 0–1) on binary measures of decentralization (Eq. 1). All specifications include region and year fixed effects. Standard errors, clustered by region, in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

In the case of the OECD data, the changing composition of the cohorts tested is also unlikely to affect outcomes. PISA's target population includes every fifteen-year-old student in the country, so the average performance of fifteen year olds before and after decentralization is independent from enrollment in tertiary education, which typically occurs at or after 16 years of age.¹⁸ In both cases, we find negative congestion effects on the quality of education for those who were already in the system. It is not simply that a broader mix of students is being examined and so the average test results automatically decrease. In essence, in both tests we use (PISA in the OECD sample and university entrance exam in the Spanish case study) the groups tested do not change. Instead, the decentralization reform, puts more pressure on the administration of the education system as a whole, as it has to serve more students through a newly-layered organization that likely spreads the budget thin and taxes the limited cadre of bureaucrats, which in turn, do

¹⁸ For OECD data, the tertiary enrollment measurement does occur close to the testing of 15-year-olds as part of the PISA exam, which would theoretically raise concerns about the non-comparability of quality outcomes over time due to compositional changes of the later cohorts. However, the expansion of educational opportunities through vocational and higher education (i.e. tertiary education) should be unrelated to the performance of students age fifteen, since PISA is intended as a test of all students in educational institutions (regardless of their track), and by 2003, all countries included in PISA had mandatory education until age sixteen. Hence, the expansion of tertiary education should not affect composition by age fifteen, although the expansion could conceivably have an effect on the motivation of students. Even then, however, short of decreasing the likelihood that they would participate in the PISA testing by not attending, expansion in a given year would not alter the educational history and performance of those in the age cohorts that are in the age range to enter tertiary education. PISA is a low stakes test that measures competencies and skills accumulated over many years of education. Therefore, changing incentives for high performance need not be reflected shortly after the change in this type of exam.

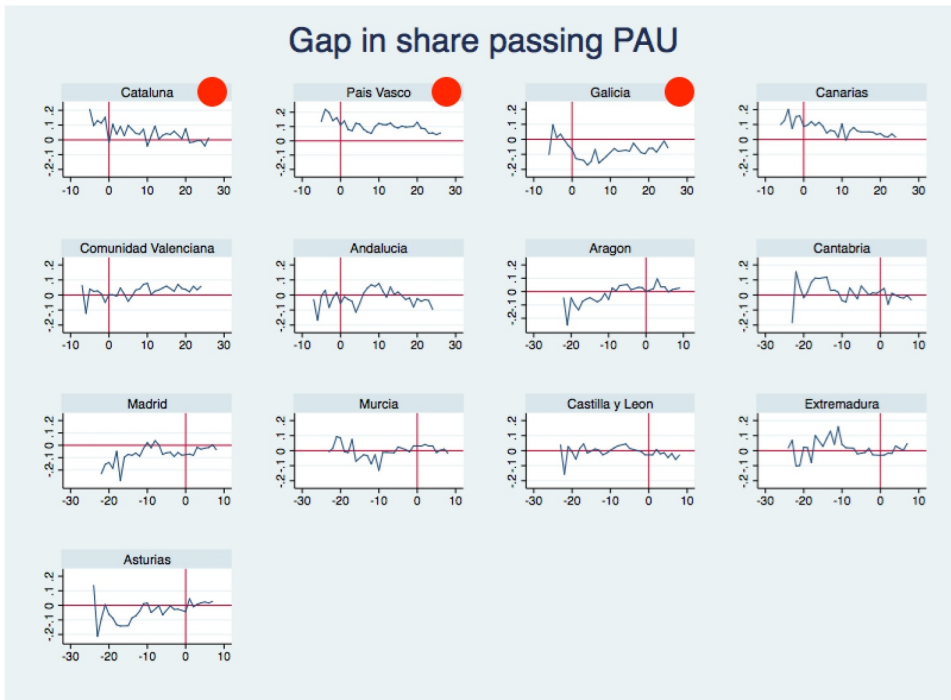


Fig. 4. Evolution in the share passing university entrance examinations – difference between each Spanish region and the region's corresponding synthetic control.

The Y-axis represents the difference in the share passing university entrance examinations in each region as compared to that region's synthetic control, which tries to mimic the region in the pre-treatment period. X-axis is years from the treatment. The vertical red bar denotes the treatment year. La Rioja, Balearic Islands, and Navarre are excluded from this analysis as they do not have a sufficiently long pre- or post-treatment period with data to build synthetic control methods. Red dots indicate historic regions. Regions are shown in the sequence in which they decentralize, from left to right and top to bottom.

not grow in proportion to the overall system expansion.

In concluding this analysis, we should address the main reason why our panel models may not adequately identify a causal effect of decentralization. As noted, decentralization may be an epiphenomenon of a successful system, not its cause. This is often observed in the observe: badly-performing systems are taken over by the central government. In England and Wales, schools deemed underperforming can be taken over by a combination of the local authorities and the central government's inspection service, thereby effectively centralizing education policymaking for the affected schools. Similarly, in the United States, the federal government requires states to take control over struggling schools; [Schueler et al. \(2017\)](#) have documented the positive effects of such takeovers. This is less of a concern in the Spanish case study, however, where decentralization was both as-random in its sequencing and implemented rigorously.

5.2. Decentralization effects by functional domain

The OECD cross-country panel dataset allows us to analyze the decentralization on different government functions. To frame the expectations of the effect of decentralization in its various forms, we draw on a theory developed in [Pritchett and Pande \(2006\)](#). As discussed previously, the authors assert that three criteria determine the government level at which different functions ought to be decentralized in the education sector. Functions that are discretionary, transaction-intensive, and locally observable should be decentralized to lower levels of government because the public service providers are then relatively better positioned to ensure adequate service delivery. In other words, Pritchett and Pande expect that decentralization should yield service improvements for functions that are “highly” discretionary, “highly” transaction-intensive, and have “local” observability.

We exploit the granularity of the decisions collected in the OECD dataset to examine this theory more closely. We do so by first using the OECD's pre-defined categorization of education decisions in four functional domains: organization of instruction, personnel management, planning and structures, and resource management. We find that the correlation between outcomes and the decentralization level in each group of decisions is more consistent than Pritchett and Pande's argument would suggest. Rows 2 to 5 in [Table 3](#) show that all four subgroups of decisions have a positive correlation with access indicators and a negative one with quality indicators.

One concern is that this consistent pattern of results across functional domains may be driven by the OECD's grouping of functions into the stipulated domains. Consequently, the OECD's groupings may not match as closely with Pritchett and Pande's characterization of conceptually important divides between functions. When disaggregating the functions within each functional domain, we

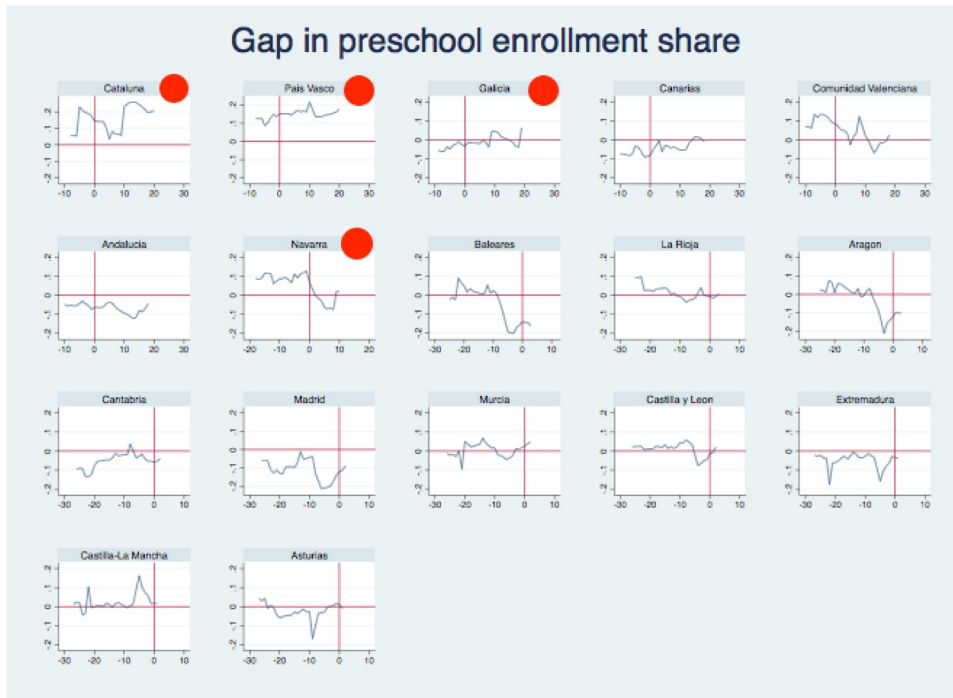


Fig. 5. Difference between share of population enrolled in preschool programs between Spanish regions and their synthetic controls. Y-axis represents the difference in the preschool enrollment share in each region as compared with its synthetic control, which tries to mimic that region in the pre-treatment period. X-axis is years from treatment. The vertical red bar denotes the treatment year. Red dots indicate historic regions. Regions are shown in the sequence in which they decentralize, from left to right and top to bottom.

find discrepancies between the two groupings. For instance, in the OECD classification, both the hiring and firing of personnel and the definition of teacher roles are classified under the personnel management domain. Yet, according to Pritchett and Pande, the functional domains stipulated by the OECD would not capture the differences between these functions: while hiring and firing of personnel may be highly discretionary, the definition of teacher roles may not.

To address this concern, we test our results further by grouping decisions differently from the OECD-stipulated functional domains. We take the correlated variation among the 46 functions' decentralization status in our data through a factor analysis. Two principal factors, each of which represents a subset of decisions relating to personnel and resources, emerge from this factor analysis. Factor 1 consists largely of personnel policies. The top seven decisions with the strongest association with Factor 1 – as measured by their individual loadings into Factor 1¹⁹ – correspond broadly to non-financial personnel decisions (e.g. hiring and firing of teachers and principals or the specification of teacher duties). Factor 2 includes a broader array of activities which tend to focus on personnel-related resource management, such as the determination of teacher salaries or the allocation of resources to teachers and staff. Decisions about long-term planning, curricula, textbooks, or criteria for enrollment in schools, to name a few, do not seem to be as strongly grouped together in factors in our OECD panel of decision-making. Indeed, Table 5 shows that Factor 1 and Factor 2 capture most of the variation in the data, as they each capture a quarter of the variation explained by all decisions. The remaining factors capture far smaller proportions of the variation in the data.

Drawing on the factor analysis, we again find a similar pattern of effects on education outcomes for Factors 1 and 2 in Table 6: positive effects of decentralization on tertiary enrollment, but negative effects on exam performance levels. In addition, the analysis suggests that these two main factors, which involve decisions relating to personnel management and personnel-related resource management, have a larger effect on outcomes than the remaining decisions as grouped in other factors. This suggests that the overall effects in Table 3 are likely driven by the decisions grouped into these two factors.²⁰ In the Appendix, Table A3 lists the decisions surveyed and shows each decision's loadings into each of the two main factors.²¹

¹⁹ In brief, factor loadings measure the correlation level between a particular variable and the factor.

²⁰ Appendix Table A2 shows that the results are robust to additional specifications which include in the factor analysis decisions that have lower loadings, thus capturing less of the variation in the factor. Put differently, whether we take more or less expansive definitions of the decisions included in the factor does not seem to change the magnitude of the effects.

²¹ In contrast with the OECD cross-country panel data, the Spanish reform is homogenous and entails a fairly radical set of decentralization reforms across domains. As an example, only about a third of the curriculum is common today across the country. This does not allow us to have enough variation on the functions that were decentralized to conduct a similar analysis and understand the effect that each of those functions may have had on quality and access.

Table 5

Factor analysis grouping policy decisions in cross country data and relative variance explained.

| Factor | Eigenvalue | Difference in eigenvalues | Proportion of variance explained by factor | Cumulative proportion |
|----------|------------|---------------------------|--|-----------------------|
| Factor 1 | 12.36 | | 0.27 | 0.27 |
| Factor 2 | 10.61 | 1.75 | 0.23 | 0.50 |
| Factor 3 | 4.46 | 6.15 | 0.10 | 0.60 |

Table 6

Decentralization of policy decisions grouped in factors and outcomes in cross-country data.

| Variable | Math | Math | Reading | Reading | Science | Science | Tertiary enr. | Tertiary enr. |
|-------------------------|--------------------|-------------------|-------------------|-------------------|--------------------|-------------------|-------------------|-------------------|
| Index factor 1 | −6.467+ (3.609) | −5.875 (4.329) | −4.821 (3.015) | −4.367 (3.843) | −7.852* (3.584) | −7.350 (4.390) | 5.348* (2.178) | 5.239* (2.147) |
| Index factor 2 | | −0.99 (3.188) | | −0.76 (2.853) | | −0.84 (3.076) | | −0.190 (1.514) |
| Number of obs | 31 | 31 | 31 | 31 | 31 | 31 | 28 | 28 |
| Adjusted R ² | 0.046 | 0.014 | 0.033 | 0.001 | 0.097 | 0.067 | 0.198 | 0.198 |

Note: Regressions of outcome indicator (column head) on factor indices are composed of simple average of decisions with loadings above 0.8 in the factor. The first model for each subject and cutoff includes only Factor 1, while the second model for each subject and cutoff includes both models. Standard errors, clustered by country, in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

These findings are consistent with Pritchett and Pande's claim that certain functions are more consequential than others. According to their argument, there should be differences in the effects of decentralization on particular functions, depending on whether they satisfy the criteria for effective decentralization. Indeed, while we found homogeneous effects for all the functional domains defined by the OECD in Table 3, we did find some evidence for their argument when we examine the variation in the data after grouping decisions using factor analysis. In this data-driven grouping, much of the variation in decentralization is driven by a relatively narrow set of decisions related to personnel and resources that are more discretionary, transaction-intensive, and locally-observable than other functional domains.

6. The role of political incentives

Decentralization's impact on education quality and students' access to education is consistent in the two datasets and methodologies used in this paper. The reform is not associated with improvements in quality. It is, however, associated with service expansion and thus higher levels of enrollment in less traditional parts of the education system, such as pre-school education. The effects of decentralization on educational outcomes are similar in the cross-country panel data as well as data from the Spanish case study. We also find the same pattern of results when examining different groupings of decisions that have been decentralized.

What, then, might explain this surprising pattern of heterogeneous results between access and quality indicators? Our hypothesis focuses on the incentives driving policymaking in sub-central governments after decentralization occurs. We hypothesize that once politicians in sub-central governments are empowered through decentralization, they are likely to favor policies that are highly visible and quicker to achieve over policies that are less visible and take longer to achieve. They are also likely to discount cost considerations when choosing between the former and latter types of policy options, so long as the central government retains responsibility for funding whichever policy is chosen.

Translated to the education sector, in the aftermath of decentralization, we hypothesize that the ambition to retain political power, combined with the typical lack of fiscal decentralization, motivates assertive sub-central governments to pursue a combination of policies that are more visible and costly in education. In other words, politicians in sub-central governments would prioritize increasing students' access to schooling, since doing so would tend to enlarge their political support, and since, from their point of view, the policy would be relatively inexpensive because it would be paid for from a common national tax pool. These short-term moves for electoral gain, however, unless designed carefully, are likely to overburden the education system and perversely affect quality. This ultimately contributes to a congestion effect in the education system, consistent with the pattern of results that we see in the data.

Spain's experience with education decentralization provides a useful case through which to test whether variation in political incentives for sub-central political actors can influence the effects of decentralization reform on education outcomes. Importantly, in Spain there is significant variation in political incentives between assertive and non-assertive regions, and thus on the degrees to which regional priorities are aligned with national interests and regions themselves are ruled by national parties. In general, variation in regional assertiveness may be due to different regional politics (e.g. whether regional governments are affiliated with national parties) or historically-motivated differences in the public's perceptions of the region's relationship with the state (e.g. a history of independence as a state).

In the case of Spain, to avoid defining assertiveness on the basis of the post-decentralization behavior of regions, we use as a source of variation in the degree of assertiveness whether the region is "historic" or not. This technical term refers to regions that voted to have regional constitutions during the 1931–1936 republic regime (see footnote 11). Those regions' votes, in turn, can be

Table 7
Length of non-national party rule for each region in Spain post-1978.

| Region type | Region | Share of years of non-national party rule |
|--------------|---------------------|---|
| Historic | Basque Country | 90% |
| | Catalonia | 81% |
| | Galicia | 0% |
| | Navarre | 58% |
| Non-historic | Andalusia | 0% |
| | Aragon | 15% |
| | Asturias | 3% |
| | Balearic Islands | 0% |
| | Canary Islands | 71% |
| | Cantabria | 54% |
| | Castile y León | 0% |
| | Castile-La Mancha | 0% |
| | Valencian Community | 0% |
| | Extremadura | 0% |
| | La Rioja | 0% |
| | Madrid | 0% |
| | Murcia | 0% |

Note: Share of years of non-national party rule indicates the percentage of years since regional governments were established in which non-national parties hold the presidency of the government. These include nationalist parties, regionalist parties, and independent candidates.

traced back to long-standing regional parties and different allegiances during the Spanish War of Succession in the 18th century. For our purposes, the historic designation indicates a long established variation between regions that is plausibly linked to the degree of regional assertiveness in the post-1978 regime.

Indeed, the Spanish historic regions differ from non-historic ones in important ways in the post-1978 period. For instance, politicians in historic regions frequently belong to regionalist parties that are ideologically committed to state-building, or the steady accumulation of power and resources in pursuit of regional independence, autonomy, or ultimately, statehood. Table 7 shows that historic regions tended to be ruled by regional parties rather than national ones after 1978.²² Table 7 also shows a clear pattern of difference between historic and non-historic regions in the amount of time that regional parties have held power. Overwhelmingly, national parties ruled the regional governments in non-assertive regions, and indeed, 9 of the 12 non-assertive regions have been ruled exclusively by national parties since 1978. A Wilcoxon sum-rank test shows that both region-types are indeed different (the hypothesis of both groups being the same is rejected with a p-value of less than <0.00001).

Connecting the Spanish case back to our theory of political incentives, based on our analysis of regional political incentives, we expect the effects of decentralization to vary depending on the type of region. In non-historic regions, rulers are more likely to come from a national party. As a result, those rulers will be more likely adopt a national perspective on the optimal number of educational seats per region and consider national economic needs. In contrast, politicians in historic regions will tend to belong to regionalist parties, whose agendas deviate from those set by the central government. Politicians with such regionalist tendencies are therefore more likely to pursue highly visible and more costly policies – such as expanding enrollment – that diverge from the national interest.

Two additional characteristics of the Spanish decentralization process drove further differences in decentralization's effects in historic and non-historic regions, respectively. First, Spain's push toward decentralization in the early 1980s began with the education sector. (Health and other policy sectors were decentralized afterward.) This meant that the education sector was the first one ripe for visible and electorate-friendly policy reforms, the precise types of changes that politicians in more assertive sub-central governments are likely to try to exploit in order to advance their own political ends. Indeed, the urgency with which regionalist politicians sought to capitalize politically on decentralization in the education sector was motivated by a desire to justify further decentralization in other functional domains by achieving timely, desirable results in education.

Second, throughout this reform process, changes to administrative decentralization were not accompanied by changes in fiscal decentralization. For regions whose priorities' aligned less with the national interest, fiscal centralization incentivized an increase in spending in programs with high visibility. Whereas the central government was in charge of all of the country's taxes (including issuing debt and controlling the fiscal balance), historic regions at the time of decentralization would be primarily interested in negotiating more substantial transfers to fund larger and more visible social programs. In historic regions, then, governments were incentivized to expand their programs substantially to garner larger budgets from a common national fiscal pool.

Turning to our empirical findings, we hypothesize that historic regions will behave differently in how their access-quality profiles change upon decentralizing. Upon decentralizing, historic regions are likely to pursue highly visible and costly policies like expanding enrollment, which, implemented in isolation from other quality-enhancing policies, can lead to a congestion effect. In contrast, non-historic regions are likely to experience more muted effects of decentralization. We find results that support our

²² However, this is not always the case, as Galicia shows. This deviation shows that we are not just delimiting regions into groups on the basis of post-treatment characteristics, such as the types of parties that rule them, as doing so may have biased our estimates.

Table 8

Decentralization by type of region and student outcomes.

| Variable | (1) | (2) | (3) |
|--|----------------------|----------------------|---------------------|
| Panel A: Dependent variables is percent passing university entrance examinations | | | |
| Decentralized (two years after) | 0.0062 (0.0070) | 0.000087 (0.014) | −0.0011 (0.014) |
| Historic × Decentralized | −0.050** (0.015) | −0.057** (0.018) | −0.056** (0.018) |
| Historic | −0.043* (0.017) | 0.016 (0.037) | −0.034 (0.064) |
| GDP per capita | | 0.0051 (0.011) | 0.0037 (0.012) |
| Share adults with HE | | 1.02 (0.70) | 0.97 (0.70) |
| Industrialization index | | | 0.013 (0.025) |
| Observations | 504 | 334 | 334 |
| Adjusted R ² | 0.760 | 0.752 | 0.751 |
| Panel B: Dependent variables is percent enrolling in preschool education | | | |
| Decentralized (two years after) | −0.020** (0.0076) | −0.013 (0.011) | −0.011 (0.011) |
| Historic × decentralized | 0.053** (0.011) | 0.035* (0.015) | 0.030* (0.015) |
| Historic | 0.13** (0.013) | −0.0095 (0.015) | −0.0034 (0.015) |
| GDP per capita | | −0.034** (0.0084) | −0.022* (0.011) |
| Share adults with HE | | 0.49 (0.54) | 0.76 (0.53) |
| Industrialization index | | | −0.048** (0.015) |
| Observations | 662 | 405 | 405 |
| Adjusted R ² | 0.950 | 0.940 | 0.941 |

Note: Specifications regress outcome measures (with percent coded 0–1) on binary measures of decentralization and the historic character of regions (Eq. (2)). All models include regional and year fixed effects. Standard errors, clustered by region, in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

hypothesis. In Table 8, we separate the results of Table 4 by historic and non-historic regions by interacting the variable for decentralization with a dummy variable for whether a region is historic. When focusing on the heterogeneity between types of regions, we find that the average results are indeed stronger in historic regions (Catalonia, Basque Country, Navarre, and Galicia). Looking at the main coefficient on the decentralization variable and the interaction term of whether it is a historic region in columns 1–3 of Panel A, decentralizing reduces passing rates by 6 percentage points in historic regions. In contrast, the difference for non-historic regions is small and insignificant. Table 8, Panel B, finds a *positive* association between being a historic region and decentralizing for preschool enrollment, while that relationship is not present for non-historic regions. In both cases, being a historic region amplifies and largely drives the average associations we found between decentralization and students' access to education and the quality of the same: positive for access and negative for quality.

In addition, we employed synthetic controls to estimate individual effects using systematically-derived explicit counterfactual units for each region based on pre-decentralization characteristics. These individual effect estimates further allow us to test whether certain historic regions are driving our results. We find that the effects are overall similar. Table 9 shows the individual effects comparing the evolution of each unit post-treatment. Fig. 6 shows the effect of decentralization on preschool enrollment and passing rates for university entrance exams, with individual regions grouped by whether they are historic or non-historic. A Wilcoxon sum-rank test is consistent with the hypothesis that the effect of decentralization is different between historic and non-historic regions: we reject the null that there is no difference in effects between historic and non-historic regions with a z-score of 2.54 (p value = 0.006). Among the historic regions, Basque Country, Galicia, and Catalonia all have similar effects, while the effects in Navarre are more muted.

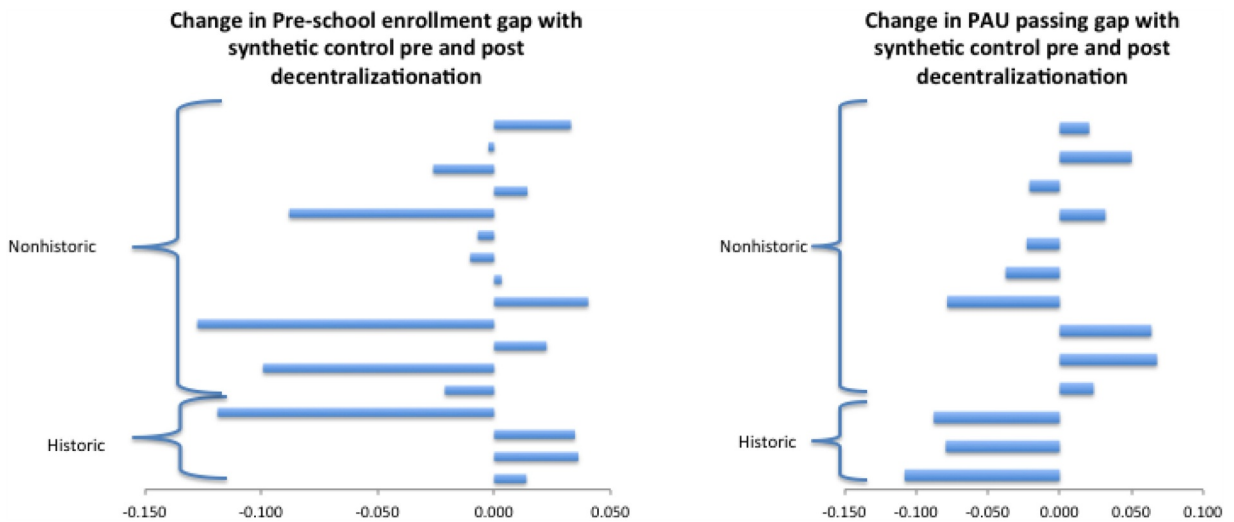
Ultimately, the evidence from the Spanish case study supports the hypothesis that decentralization enabled regional political leaders to pursue more costly and visible education policies (like expanding access) to the detriment of other more long-term policies (like enhancing quality). This trade-off, in turn, can explain the evidently heterogeneous effect of decentralization on access and quality. Our evidence shows that when political incentives vary across regions in a given country, the effects of decentralization will be more prominent in assertive regions where regional policymakers seek to exploit decentralization to advance regionalist political agendas. The effects of decentralization will simultaneously be small or even negligible in non-assertive regions where politicians are more strongly incentivized to pursue policies that align with the central government's interests.

Table 9

Individual decentralization effects by region in Spain estimated using synthetic control and grouped by type of region.

| Region type | Region | Enrollment percent of 4–6 year olds in preschool in 2001 | Average effect of decentralization on preschool enrollment |
|----------------|---------------------|--|--|
| Historic | Basque Country | 0.95 | 0.04 |
| | Catalonia | 0.98 | 0.01 |
| | Galicia | 0.78 | 0.04 |
| | Navarre | 0.88 | −0.12 |
| Non – historic | Andalusia | 0.68 | −0.02 |
| | Aragon | 0.76 | −0.10 |
| | Asturias | 0.73 | 0.02 |
| | Balearic Islands | 0.79 | −0.13 |
| | Canary Islands | 0.72 | 0.05 |
| | Cantabria | 0.74 | 0.00 |
| | Castile y León | 0.78 | −0.01 |
| | Castile – La Mancha | 0.75 | −0.01 |
| | Valencian Community | 0.77 | −0.09 |
| | Extremadura | 0.71 | 0.01 |
| | La Rioja | 0.80 | −0.03 |
| | Madrid | 0.88 | 0.00 |
| | Murcia | 0.81 | 0.03 |

Note: Average effect of decentralization is measured as the mean of the differences between the region and its synthetic control counterfactual in every year post-decentralization. Counterfactuals are calculated as a weighted average of other regions on the basis of pre-1978 characteristics. For historic regions, counterfactuals draw on non-historic regions alone.

**Fig. 6.** Estimates of effects of decentralization on Spanish regions, grouped by region type.

Plots the estimated individual effects of decentralization (calculated as the multi-year average against synthetic control) for each of the regions, for historic and non-historic regions. Navarre PAU passing data is not available.

7. Conclusion

The education sector is often one of the first targeted when a country undertakes to decentralize some portion of its public services. Unlike the administration of car registries or the handling of mail, education does not have as fixed a set of rules or protocols for how it should be delivered at the local level. Instead, successful delivery of education services requires substantial discretion on the part of the service providers – at whichever level of government they may fall – in order to meet the needs of diverse populations with varied and changing demands. Put differently, education policymakers are often required to tailor interventions at the local level to meet the demands of particular groups of students, rather than adhering to a script dictated by a bureaucrat in a distant capital.

Given the locally-driven features of education policymaking – features present in other public sector domains, as well, such as public healthcare or policing – it seems intuitive that decisions pertaining to service delivery ought to be made as locally as possible. Yet, the literature shows mixed results about the effects of decentralization on education outcomes. Scholars have questioned whether there are any consequences of decentralization that are not conditional on the specifics of the reform and its political and institutional context. To advance our understanding about the effects of decentralization, we argue that the politics of decentralization in the case of education lead sub-central government actors to prioritize expanding access, resulting in a classic congestion effect whereby quality is compromised. To test this argument, we draw on two unique datasets and examine decentralization reform through

different approaches, including by disaggregating education decisions into functional domains and assessing their effect on two types of education outcomes.

We find that for the relatively high-income countries in our sample, decentralizing education has a largely negative effect on quality indicators and a positive effect on students' access to the education system. This is true for both highly-decentralized countries (like most of the OECD sample) and for Spain, which had a highly centralized education system at the beginning of the period under study. The evidence is consistent with greater congestion effects post-decentralization, as politicians and bureaucracies are pushed to divide scarce resources across an expanding set of education services.

We also find some evidence to support existing hypotheses that single out certain types of education decisions that, if decentralized, are likely to have a differential effect on outcomes. We find that decisions related to personnel – decisions which are inherently highly discretionary, transaction intensive, and locally observable – are associated with the strongest effects on decentralization. Personnel-related decisions made in a decentralized format negatively impact the quality of education, even as they positively impact students' access to the same. These results, consistent throughout our specifications, add more nuance to the literature's emphasis on the value of local knowledge in improving the quality of education through decentralization.

We further test whether the trade-off between access and quality can be explained by different incentives between national and regional politicians, using the case of exogenously-motivated reform in Spain. We exploit variation in the influence of those political incentives across two types of regions in Spain: historic regions that were more likely to be politically assertive and, importantly, tended to be ruled by regionally-aligned parties and politicians in the aftermath of decentralization; and non-historic regions, which tended to be governed by politicians affiliated with national parties. We find that historic regions experience stronger effects of decentralization. That is, regional assertiveness exacerbates the tendency for politicians in decentralized contexts to prioritize short-term, costly outcomes, such as policies to expand access to public services.

In sum, our analysis embraces the political and institutional complexity of decentralization reform. It examines the role of political incentives in explaining the congestion effects that can result from such reforms. In addition, it does so through the use of a novel cross-country panel data and case study. It also provides empirical support for theories that emphasize differences in the effects of decentralization in various functional domains. Although it is beyond the scope of this paper, more detailed analysis of the bureaucratic organizations and political incentives with respect to the cross-country data would help to elucidate whether the mechanisms suggested for Spain are generalizable to sectors besides education or non-high income countries.

From a policy perspective, these findings highlight the complexity in the next generation of reforms meant to improve the quality of service delivery in bureaucracies for which we often have no scripts or established procedures. Unlike past development challenges that started from a low quality base and required reforms that were mostly logistical in nature (e.g. expanding access to primary education), frontier organizational challenges involve improvements in quality that are more difficult to achieve and have no silver bullet (Pritchett, 2014). This paper's results highlight the layered challenge inherent in improving educational outcomes. Pursuing goals of increased access (as regional governments will tend to do post-decentralization) is likely to result in a congestion effect where there is a positive effect on access and a negative effect on quality. Furthermore, these effects will be influenced by the strength of the political incentives to which regional governments are subjected. Generally, stronger incentives for regions to assert themselves will result in positive effects for the salient, short-term outcomes, such as access. This is particularly true if no parallel fiscal decentralization of revenue-raising responsibilities accompanies administrative decentralization.

Policymakers should consider those political incentives and their likely effects when undertaking decentralization reforms. Initial conditions of the outcomes – in particular, quality levels and access levels – must inform the normative question about whether and how to decentralize. Systems at different levels of development may benefit from further decentralization: a system with high quality levels but low access (such as Spain in the 1970s) may derive increased welfare through decentralization, as it is likely to result in the expansion of access and the detrimental effect on quality may be limited. However, if improving quality is the primary reform objective, then relying solely on decentralization is unlikely to achieve this goal in the short term.

Acknowledgments

We thank Timur Kuran (the editor), Alberto Abadie, David Evans, Danny Hidalgo, Torben Iversen, Paul Peterson, Michael Piore, James Robinson, Jonathan Rodden, Martin West and seminar participants at Harvard's Inequality and Social Policy Seminar, MIT, Universidad Carlos III, Instituto Nacional de Evaluación Educativa, and the Tobin Project for valuable feedback on this paper. We thank Alex Velez-Green for invaluable research assistance. We also thank Ismael Sanz Labrador and Jesús Ibáñez Milla for facilitating access to the Spanish data at the Ministry of Education archives. We are grateful for generous funding for this research from Fundación Ramón Areces (Lastra-Anadón).

Appendix

A.1. List of decisions across functional domains

| Functional domain | Examples of specific decisions |
|-----------------------------|--|
| Organization of instruction | Student admissions; student careers; instruction time; choice of textbooks; choice of software/learningware; grouping of students; additional support for students; teaching methods; day-to-day student assessment. |

| | |
|-------------------------|---|
| Personnel management | Hiring and dismissal of principals, teaching, and non-teaching staff; duties and conditions of service of staff; salary scales of staff; influence over careers of staff. |
| Planning and structures | Opening and closure of schools; creation or abolition of a grade level; design of programs of study; selection of programs of study taught in a particular school; definition of course content; setting of qualifying examinations for a certificate or diploma; accreditation (examination content, marking, and administration). |
| Resource management | Allocation and use of resources for teaching and non-teaching staff; capital and operating expenditure; professional development of principals and teachers. |

Source: OECD Education at a Glance (2012).

A.2. Description of the variables used in the OECD cross-country panel

| Variable | Definition |
|---|--|
| Decisions not at the central level | Percentage of education functional decisions that is not made by the government at the central level. Source: <i>OECD Education at a Glance 2000–2012</i> |
| Decisions not at the central level (- organization) | Percentage of education functional decisions related to organization of instruction that is not made by the government at the central level. Source: <i>OECD Education at a Glance 2003–2012</i> |
| Decisions not at the central level (- personnel) | Percentage of education functional decisions related to personnel management that is not made by the government at the central level. Source: <i>OECD Education at a Glance 2003–2012</i> |
| Decisions not at the central level (- planning) | Percentage of education functional decisions related to planning and structures that is not made by the government at the central level. Source: <i>OECD Education at a Glance 2003–2012</i> |
| Decisions not at the central level (- resources) | Percentage of education functional decisions related to resource management that is made by the government at the central level. Source: <i>OECD Education at a Glance 2003–2012</i> |
| Tertiary Enrollment | Gross enrollment rate for tertiary education for the total population. Source: <i>UNESCO Institute of Statistics 2003–2012</i> . |
| Math Score | 15-year-old students' scores on the math portion of the PISA. Source: <i>OECD Education at a Glance 2003–2012</i> |
| Reading Score | 15-year-old students' scores on the reading portion of the PISA. Source: <i>OECD Education at a Glance 2003–2012</i> |
| Science Score | 15-year-old students' scores on the science portion of the PISA. Source: <i>OECD Education at a Glance 2003–2012</i> |
| GDP per capita | GDP per capita expressed in US dollars, current prices and PPP. Source: <i>OECD Education at a Glance 2003–2012</i> . |

Source: OECD Education at a Glance (2012).

A.3. Appendix tables

Tables A1–A3.

Table A1

Cross-country panel with fixed effects and country controls.

| | (1) | (2) | (3) | (4) |
|--------------------------------|----------------------|--------------------|----------------------|----------------------|
| Variable | Math score | Reading score | Science score | Tertiary enrollment |
| Decisions not at central level | − 0.73* (0.27) | − 0.62 + (0.30) | − 0.14 (0.16) | 0.32* (0.13) |
| GDP per capita | 0.0052** (0.0013) | 0.0030 (0.0017) | 0.0057** (0.0012) | 0.00087 (0.00061) |
| Career opportunities | 221.0* (68.7) | 77.8 (75.9) | 56.5 (57.2) | − 139.5** (25.1) |
| Meritocratic recruitment | − 75.5 (110.6) | 76.3 (131.0) | − 59.6 (90.2) | 245.4** (50.7) |
| Compensation in bureaucracies | 96.0 (116.5) | 177.8 (142.5) | − 6.57 (91.4) | 262.3** (54.7) |
| Trust | 175.4 (101.9) | 231.8 + (120.4) | 112.9 (61.5) | 188.5** (39.5) |
| Observations | 22 | 22 | 16 | 16 |
| Adjusted R ² | 0.736 | 0.509 | 0.504 | 0.817 |

Note: Specifications regress outcome measures on the share of centralized decisions (Eq. 1), with country controls. Standard errors, clustered by region, in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table A2

Sensitivity of factor loadings cutoff on the relation with quality measures in cross-country data.

| | | | Math | Math | Reading | Reading | Science | Science |
|-----|----------------|-------------|----------|----------|----------|----------|----------|---------|
| 0.9 | Index factor 1 | Coefficient | −6.088 | | −4.771 | | −7.835 + | |
| | | SE | (4.141) | | (3.558) | | (4.076) | |
| 0.8 | Index factor 1 | Coefficient | −6.467 + | −5.875 | −4.821 | −4.367 | −7.35 | −7.35 |
| | | SE | (3.609) | (4.329) | (3.015) | (3.843) | (4.39) | (4.39) |
| | Index factor 2 | Coefficient | | −0.99 | | −0.76 | | −0.84 |
| | | SE | | (3.188) | | (2.853) | | (3.076) |
| 0.7 | Index factor 1 | Coefficient | −6.012 + | −8.781 + | −4.719 + | −7.134 | −7.545* | −9.740* |
| | | SE | (2.96) | (4.854) | (2.453) | (4.257) | (2.934) | (4.67) |
| 0.6 | Index factor 1 | Coefficient | −7.322* | −13.77* | −5.292* | −10.31 + | −8.569** | −13.86* |
| | | SE | (2.746) | (6.028) | (2.279) | (5.373) | (2.737) | (5.59) |
| | Index factor 2 | Coefficient | | 8.41 | | 6.547 | | 6.899 |
| | | SE | | (6.453) | | (5.593) | | (5.792) |
| 0.5 | Index factor 1 | Coefficient | −7.078* | −12.54 + | −5.247* | −11.17* | −8.307** | −13.74* |
| | | SE | (2.725) | (6.425) | (2.23) | (5.26) | (2.71) | (5.772) |
| | Index factor 2 | Coefficient | | +6.293 | | +6.836 | | 6.269 |
| | | SE | | (6.478) | | (5.127) | | (5.617) |

Note: Replicates Table 6 for different cutoffs for inclusion in the index factor. For the 0.9 cutoff there are no entries for factor 2. The first model for each subject and cutoff includes only factor 1, while the second model for each subject and cutoff includes both models. Standard errors, clustered by country, in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table A3

Policy decisions loadings into each of the main two factors in the cross-country analysis.

| Education Function | Factor 1 Loading | Education Function | Factor 2 Loading |
|--|------------------|--|------------------|
| Principal Hiring | 0.9319 | Resource Allocation Non-Teaching Staff | 0.8446 |
| Teacher Dismissal | 0.9244 | Resource Allocation Teaching Staff | 0.8221 |
| Principal Dismissal | 0.9157 | Non-Teaching Staff Fixing of Salary Scales | 0.8141 |
| Teacher Hiring | 0.8516 | Principal Conditions of Service | 0.7959 |
| Resource Use Staff | 0.8112 | Principal Fixing of Salary Scales | 0.7756 |
| Teacher Duties | 0.7934 | Teacher Fixing of Salary Scales | 0.7654 |
| Resource Use Principals | 0.7671 | Resource Allocation Operating Expenditure | 0.7381 |
| Teacher Influence over Career | 0.7614 | Choice of Software/Learning ware | 0.7218 |
| Non-teaching Staff Duties | 0.7271 | Resource Allocation Capital Expenditure | 0.6783 |
| Resource Use Capital Expenditure | 0.676 | Creation of Abolition of Grade Level | 0.6421 |
| Non-teaching Staff Dismissal | 0.6627 | Non-teaching Staff Conditions of Service | 0.5994 |
| Resource Use Teacher Development | 0.6603 | Principal Duties | 0.5358 |
| Non-teaching Staff Hiring | 0.6455 | Non-teaching Staff Dismissal | 0.5167 |
| Non-teaching Staff Influence over Career | 0.6398 | Teacher Conditions of Service | 0.5142 |
| Resource Allocation Principal Development | 0.6258 | Non-teaching Staff Hiring | 0.5033 |
| Resource Allocation Teacher Development | 0.6063 | Resource Allocation Principal Development | 0.4847 |
| Principal Duties | 0.5822 | Non-teaching Staff Influence over Career | 0.4823 |
| Principal Influence over Career | 0.5232 | Resource Allocation Teacher Development | 0.4739 |
| Non-teaching Staff Conditions of Service | 0.5048 | Principal Influence over Career | 0.4716 |
| Resource Use Operating Expenditure | 0.4567 | Design of Programs of Study | 0.4326 |
| Teacher Conditions of Service | 0.4373 | Creation or Closure of School | 0.4288 |
| Resource Allocation Teaching Staff | 0.4137 | Definition of Course Content | 0.4209 |
| Selection of Subjects | 0.4133 | Selection of Programs of Study | 0.4098 |
| Principal Fixing of Salary Scales | 0.4085 | Non-teaching Staff Duties | 0.4039 |
| Choice of Textbooks | 0.377 | Teacher Influence over Career | 0.4017 |
| Design of Programs of Study | 0.3768 | Teacher Duties | 0.3982 |
| Non-Teaching Staff Fixing of Salary Scales | 0.367 | Teacher Hiring | 0.3815 |
| Teacher Fixing of Salary Scales | 0.3628 | School Choice | 0.3779 |
| Creation or Closure of School | 0.3511 | Resource Use Capital Expenditure | 0.3539 |
| Principal Conditions of Service | 0.3179 | Grouping of Pupils | 0.3468 |
| Teaching Methods | 0.2945 | Selection of Programs of Study | 0.3129 |
| Creation of Abolition of Grade Level | 0.2911 | Instruction Time | 0.3093 |
| Definition of Course Content | 0.2872 | Resource Allocation Principal Development | 0.2948 |

(continued on next page)

Table A3 (continued)

| Education Function | Factor 1 Loading | Education Function | Factor 2 Loading |
|---|------------------|------------------------------------|------------------|
| Choice of Software/Learningware | 0.2843 | Resource Use Teacher Development | 0.2436 |
| Resource Allocation Non-Teaching Staff | 0.2689 | Teacher Dismissal | 0.1828 |
| Resource Allocation Capital Expenditure | 0.2247 | Choice of Textbooks | 0.1794 |
| Resource Allocation Operating Expenditure | 0.1745 | Resource Use Operating Expenditure | 0.1765 |
| Selection of Programs of Study | 0.1716 | Principal Dismissal | 0.1636 |
| Grouping of Pupils | 0.1608 | Principal Hiring | 0.1287 |
| Credentialing | 0.1282 | Resource Use Staff | 0.1233 |
| Instruction Time | 0.1256 | Teaching Methods | 0.1065 |
| Setting of Qualifying Exams | 0.1188 | Pupils' School Careers | 0.0729 |
| Assessment of Pupils' Regular Work | 0.1105 | Assessment of Pupils' Regular Work | – 0.0199 |
| School Choice | – 0.012 | School Attended | – 0.2195 |
| Pupils' School Careers | – 0.0294 | Credentialing | – 0.2639 |
| School Attended | – 0.1231 | Setting of Qualifying Exams | – 0.3025 |

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