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Essays in public service co-production: navigating participatory and involvement pathways in education governance

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Executive Summary

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This dissertation aims to contribute to the scholarly discourse on how citizen co-production matters for a wide variety of social outcomes and public values. At the theoretical level, co-production is approaching conceptual clarity, and its adoption as a novel way of framing normative views about public services offers a plethora of opportunities to address a wide variety of social challenges. Co-production, as a form of active and direct involvement by citizens, can develop countless avenues by which we can improve and design social services. Our work offers the perspective that co-production is more than just a new lens of exploring how services can create value or enhance outcomes; instead, it is also an innovative knowledge pathway of understanding that involvement and participation are also just as crucial as inputs and outputs of the service delivery process. Moreover, we aim to strike a chord that co-production fits well among the issues of a broader social policy agenda and the challenges which public sectors, especially schools across the world face.

Essay 1 revisits the conceptual evolution of co-production and how scholars have delineated it. We revisit its antecedents and drivers, more importantly, historicizing why the clashing paradigms in public administration and management matter in the discourse. The fallout and failure of New Public Management vis-à-vis the ascent of New Public Governance herald the advancement of collaborative and participatory approaches.

Essay 2 responds to the need of coproduction to meaningfully with outcomes which we can integrate in public service designs such as in the education sector. In this empirical work, we investigate the role of parental involvement in cultivating an environment which is conducive for learning, using the lens of school leadership. We find that specific dimensions of parental involvement, along with principal leadership, matter for the enhancing learning climate and educational inclusion.

Essay 3 contextualizes parental co-production and how varieties of involvement with the school is associated with reading, mathematics and science scores. With parent-student pairs as our unit of observation, we find that the negative relationship of test scores with parental involvement indicate that academic performance is likely activating the parental involvement as a response to address learning challenges.

Essay 4 investigates how parental involvement and engagement matters for educational retention in the case of India—the world's largest education system fraught by challenges of quality, efficiency and equity. Our analytical strategy traces through a temporal mechanism by which parental involvement and engagement is associated with school outcomes, considering child, schooling and other social characteristics. We utilize the India Human Development Survey (IHDS), a unique longitudinal household survey which allowed us look at how the interaction of household-level and schooling characteristics may shape future educational outcomes.

Table of Contents

Essay 1: Navigating citizens' involvement and participation in the pathways to public service and value co-production process

Abstract

The active and direct involvement and participation of citizens are among the most indispensable elements in the co-production of public services. As one of the most fashionable and most promising themes relating to public service delivery across economies, co-production research is slowly yet accomplishing conceptual unpacking, coalescence, and clarity. The collaborative arrangements between various types of actors and the government, its activation, management, and evaluation should attract the attention of scholars from various fields. The relational features of public service construal is an emerging field worth undertaking.

In this chapter, we revisit the literature on citizen coproduction, an umbrella concept defined as when citizens (or service users, lay-actors, or service communities) actively and directly contribute their time, resources, or knowledge in the design and delivery of public services. The private sector context is full of coproduction examples (i.e., service co-creation and co-production), but it has not received substantial practical attention in the public sector until recently. Moreover, the historical persistence and inertia of public management traditions across countries also inevitably spell the extent, scope, and depth of adoption of collaborative or participatory approaches, such as service coproduction.

Related keywords: coproduction, involvement, education coproduction, public services

INTRODUCTION

The co-production of public services necessitates the direct and active involvement of citizens (or lay actors, groups of citizens, and service communities); the latter contributes time, resources, and experiences/knowledge at any stage of public service. An essential feature of co-production is its relational aspect—a requirement that these actors work together with professionals to generate value.

Participation and involvement among citizens also constitute among the modern foundations of understanding modern state and citizen relations; involvement has become one of the most sweeping and crucial components of public discourse about citizenship, and it has been

instrumental in bringing about a notion of bringing back the "publicness" in public services. Co-production, while not a new concept, has been recently studied to be related to several outcomes. It has been noted to improve user satisfaction (Pestoff, 2013; Verschuere et al., 2012), foster self-efficacy and the creation of trust networks (Fledderus, 2015; Fledderus et al., 2014), the enhancement social capital (Scott, 1997), altruistic/community-centered motivations (Van Eijk & Steen, 2016). It has also been shown to have the potential to aid in migrant integration (Jakobsen, 2012); and in the light of security issues, enhance university campus security and crime control (Williams et al., 2016). Since it is promising to shape social outcomes that could have been otherwise difficult to do using other public management approaches, co-production is not without its potential weaknesses. Steen, Brandsen, & Verschuere (2018) enumerate its potential evils, i.e. the "deliberate rejection of responsibility, failing accountability, rising transaction costs, loss of democracy, reinforced inequalities, implicit demands and value co-destruction (p.284)". Despite these, the scholarly community remains optimistic that co-production research will continue growth and it will solicit the interest of a wide variety of both academic and policy attention.

The practical understanding of the concept requires the explanation of its primary conceptual elements, as well as its boundaries. We begin by unpacking its "co-" and "production" components. Despite being commonly heard and examined in the public choice theory literature, the recent re-emergence of co-production in the public administration and management literature owes a lot to two revolutions: first, the failure (or inattention, at best) of the New Public Management (NPM) paradigm to capture and integrate citizenship values in many of its fundamental principles, and rightfully the emergence of New Public Governance (NPG). This emerging paradigm has the potential to accommodate and integrate other actors, which can generate further value in the service delivery process. Moreover, coproduction's ascent to the scholarly community and interest among governments goes with

the framing of global and societal challenges which can be conceivably be addressed by co-productive approaches.

Furthermore, the normalcy of austerity and fiscal gaps in publicly financing social services across the world warrant cost-effective delivery approaches. Also, the return to institutionalism and the rise of active citizenship across the world renders the interaction by the citizen with governments to renew such a relationship. Among these include re-framing of the public service delivery process, our ability to transform and re-design public services into something more impactful, inclusive, and sustainable relationship between citizens and their governments. We develop this essay with two objectives in mind:

- Define and unpack our conceptual understanding of citizen co-production, its antecedents, and its drivers.
- Revisit the theoretical and conceptual paradigmatic shifts in the public management literature of co-production

Citizen involvement and the coproduction process: emergence, antecedents and drivers

The emergence of co-production

The discourse on the active exercise of citizenship and rights usually are within the realm of social movements in political science literature. These include concepts like citizens' involvement, empowerment, participation, and engagement; they typically associated with the practices and debates of participatory and deliberative democracy. However, scholars across the world have increasingly begun paying attention to these citizens' movements of democratic rights expression, while at the same time being on the junctures of economic globalization, the financial crises and the deepening of neoliberal policies (Della Porta, 2013; Della Porta & Kriesi, 1999).

Similarly, relating to the work of Hirschman (1970) citizens find the importance of expressing their "voice" or employing personal influence for structural changes. This conclusion is because of the frustration pointed at public sector organizations, i.e., dissatisfaction and discontentment with services. Citizens and lay actors often do not necessarily enjoy freedoms such as "exit," or to way to shift to competing providers as more often, as no such viable alternative exists. In a similar fashion, Gerda Roelvink (2016) in her book, she mentions that citizens have also found new forms of social arrangements/association of creative economies that arrange them with technologies organized around economic concerns. Accordingly, such collectives consequently lead to experimenting with inventing new forms of structures of economic life, involving citizens' in a wide variety of ways.

As a backdrop, the viability of participatory approaches paving the way for the more important exercise of citizenship is one of the fundamental values generated through co-production. While historically, the use of the term co-production in the public sector is attributed to the works of Elinor Ostrom and her colleagues at the University of Indiana Bloomington starting around the 1970s (see the definition she co-developed with Parks (1981), in the table that follows). In 1996, Ostrom further defined co-production as the "*process by which inputs used to produce a good or service are contributed by individuals who are not within the same organization*" (Ostrom, 1996).

In public administration and management, co-production[1] has become one of the most sweeping themes of research (Bovaird, 2007b; S. Osborne, 2006; S. P. Osborne, 2017). It is

[1] The Nobel prize laureate Elinor Ostrom emphasized the collaborative and participatory features are necessary for the co-production process to work. In her latter work in World Development (Ostrom, 1996), she presented the institutional dimensions of co-production within the context of developing countries using cases of Nigeria and Brazil. This work consequently underscores the role and the relations between government officials and citizens, as well as the interactions which matter with respect to economic development. However, in these seminal works, the different typologies of the co-production processes, as well as the type of agents involved in co-production, are not fully defined. The contextual variance among co-productive activities have not yet been addressed. Nevertheless, her work discusses that co-production signals joint creation of value between the service consumers and the service producers.

very well associated with social innovation in the light of social challenges faced by many developed economies (Voorberg et al., 2015). It re-surfaced to re-examine the role of citizens in the service delivery process, mainly views citizens not as mere *passive recipients* of public services but instead as *active participants.* Co-production, with its related concept, co-creation, has also been primarily discussed in the service marketing literature, which meant that customers collaborate with firms to produce the service. The evolution of the concept's definition is presented in table 1, below. Nevertheless, the service co-production among lay actors still captures the essence of personal exercise of citizenship, through involvement and participation.

As such, the two words "collaboration" and "production" form the critical elements of this construct (Vargo & Lusch, 2008). At present, citizen co-production's definition lies within the contexts of public service delivery and the values associated with it. While the closely related concept of collaborative governance applies broadly to a multi-actor involvement, citizen co-production illustrates some transfer of roles and responsibility from the public sector provider to that of the citizen. It is on this perspective that a lot of tensions and potential conflicts (definitions, demarcation, and boundaries) arise, nonetheless potentially undermining its benefits (or its costs). However, why is this so?

Previous public management paradigms have failed to embody this concept in the context of citizen-users in many years before its resurgence (Osborne, 2006, 2010; Voorberg, Bekkers, & Tummers, 2015a), as well as the lack of conceptual and theoretical clarity. In its primary sense, citizen co-production may refer to the simple involvement of citizens in the provision of public services (Pestoff, 2014); earlier works have also used the term citizen *co-creation or* have even interchanged both terms. Some works have also utilized terminologies such as *co-implementers, co-designers, and co-initiators* with the same intent. The policy literature mainly drove the development of these concepts, hence the confusion. However, the

interchangeability in their usage in the literature is because concepts have not delineated.

Now, there is a strong motivation to adopt the term *"citizen co-production"* as the term to describe direct and active citizen engagement in service delivery, as there is already a general and emerging consensus about this (Pestoff, Osborne & Brandsen, 2006). Jakobsen (2012) also asserts definition unequivocally that co-production should require the *"contribution and mixing of inputs from citizens and public employees through coordinated efforts or indirectly through independent yet related efforts."* A more encompassing definition, the recent paper by Nabatchi et al. (2017) defines co-production as:

> *"an umbrella concept that captures a wide variety of activities that can occur in any phase of the public service cycle and in which state actors and lay actors work together to produce benefits.* (Nabatchi et al., 2017)*"*

The last definition allows us to embrace and return to the original features of collaborative governance, as individual citizens are not the only potential participants in the co-production process. A large variety of actors and community members can also be thus considered potential members of the co-production process. Private companies, non-profits, associations, neighborhoods, and individuals who share and provide inputs can all together act as co-producers with citizens (Alford, 2014). Citizen co-production is also distinct in terms of the type of service developed and delivered within each sector contexts. Thus, this explains why co-production is inherently a citizen-centric feature, as social and personal benefits, such as values, should be directly tied to them. Any other actors engaged in the service delivery cycle, such as civil society organizations, voluntary organizations, just as with public actors, must have this view in mind.

However, how do specific actors, such as those mentioned above, take part in the co-

production process? Furthermore, how do these collaborative practices transpire within social/political spaces? What are its drivers and antecedents?

Table 1. The evolution and emergence of definitions of co-production across fields.

Author/s	Verbatim definitions of coproduction	Key findings (or typologies) about coproduction featured
Jeffrey L Brudney & England, 1983: Published in *Public Administration Review*	"*Coproduction is considered the critical mix of activities that service agents and citizens contribute to the provision of public services*. The involvement of the former consists of their work as professionals, or "regular producers," in the service process. Citizen co-productive activities, or *"consumer production," are voluntary efforts of individuals or groups to enhance the quality and quantity of services they receive*." p.59	*Individual co-production*, with which whose benefits accrues privately to the person*; joint co-production* whose "collaborative effort in which citizens act in concert with a specific, identifiable, government program to produce goods or services" … "whereas the latter [*parallel co-production*] is an activity undertaken by citizens on a parallel track with government but without any identifiable, direct connection"
Parks et al., 1981 in the *Policy Studies Journal*	"Coproduction involves a mixing of the productive efforts of regular and consumer producers. This mixing may occur directly, involving coordinated efforts in the same production process, or indirectly through independent, yet related efforts of regular producers and consumer producers. Coproduction, if it occurs, occurs as a result of technological, economic, and institutional influences" p1002	No typologies introduced but discussed difficulties of the market and non-market institutional arrangements of co-producing public services.
J L Brudney, 1983: in *Policy Studies Journal*	Coproduction is "understood as an activity beyond the ancillary production on the output or "delivery" side of services intended to raise the level of the quality of their provision" p. 378	One of the earliest papers to lay out the costs and benefits of introducing coproduction programs in several aspects of local governance. These include tax savings, service effectiveness, citizen participation, motivating service directed behavior, training, and coordination, service equity.

Ostrom, 1996: as published in the *World Development*	"the process through which inputs used to produce a good or service which is contributed by individuals who are not "in" the same organization", p. 1073.	Used economic production theory to explain the complementarity of government inputs and citizen inputs. p1080
Pestoff, (2006a) as published in the *Public Management Review*	"co-production refers to an arrangement where citizens produce their own services or at least in part. The latter could also refer to autonomous service delivery by citizens without direct state involvement, but with public financing and regulation". P. 592-593.	He distinguished co-production from co-governance and co-management (in the case of third sector involvement).
Bovaird, (2007a): as published in *Public Administration Review*	"User and community co-production as the provision of services through regular, long-term relationships between professionalized service providers (in any sector) and service users or other members of the community, where all parties make substantial resource contributions	Case studies were used to illustrate various types of co-productive activities, i.e., service co-delivery, co-designing, co-implementation, etc. and contrasting them with self-help groups/communities.
Pestoff, (2009): as published in *Annals of Public and Cooperative Economics*	"Co-production is the mix of activities that both public service agents and citizens contribute to the provision of public services. The former is involved as professionals or 'regular producers', while 'citizen production' is based on voluntary efforts by individuals or groups to enhance the quality and/or quantity of services they use."	Citizen participation was shown to involve several different dimensions: economic, social, political and the type of service. They presented the third sector (non-profit, non-government and civil society) roles in coproduction.
(Jakobsen, 2012: as published in the *Journal of Public Administration*	"citizen coproduction is defined as citizens' participation in, and contribution of input to, the production of public services. The mixing of input from citizens and public employees can	One of the first empirical papers adopting a field experiment approach to explore the possibility of whether governments can nudge citizens to become active co-producers.

Research and Theory	occur through coordinated efforts or indirectly through independent yet related efforts." P. 30	
Brandsen & Honingh (2016) as published in *Public Administration Review*	"co-production focuses on the direct input of citizens in the individual design and delivery of service during the production phase. "Direct" here means that the input by a citizen affects the service individually provided to her or him…" P.428; "coproduction is a relationship between a paid employee of an organization and (groups of) individual citizens that require a direct and active contribution from these citizens to the work of the organization," p. 431	Emphasized that coproduction needs to have direct and active participation by citizens. CP may be necessary not face-to-face (i.e., the case of e-government). They presented a two-by-two typology: complementary (and non-complementary) co-production in service design and design implementation. (Loeffler, 2016) writes in a rejoinder article that coproduction does not include inter-organizational collaboration; but counters differentiating coproduction from concepts such as public participation and consultation, as "voice" as just as an essential component as the conduct of coproduction.
(S. P. Osborne et al., 2016) as published in *Public Management Review*	"Co-production as the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services"	One of the papers (and authors) to develop a public service-dominant logic in public management, as discussed in later papers (S. P. Osborne, 2018; S. P. Osborne et al., 2015).
(Nabatchi et al., 2017) as published in the *Public Administration Review*	"We define coproduction as an umbrella concept that captures a wide variety of activities that can occur in any phase of the public service cycle and in which state actors and lay actors work together to produce benefits… the definition is [made] sufficiently broad to maintain the generalizability of the concept and ensure its usefulness to a range of scholars and	Offered conceptual clarification about co-production as well as its temporal dimensions. There are three levels of co-production: individual, group, and collective; four phases of the service cycle where co-production may take place: co-commissioning (prospective), co-design (prospective or concurrent), co-delivery (concurrent) and co-assessment (retrospective with prospective elements).

	situations but also allows for the specificity scholars need to categorize activities, position and compare findings, and ultimately improve research validity" p. 769	

The antecedents of co-production emergence

The confluence of several factors has driven the relatively recent intensification of scholarly and policy interest in coproduction. Even though the concept is not new among scholars in the political sciences, its fast growth is triggered in public management by relatively recent events. Citizen co-production, as a collaborative arrangement, found little relevance in public management until the associated failure of the new public management regime (discussed in the third section). The following events have backdropped some of the known antecedents which lead to the emergence of co-production:

The 2009 Global Financial Crisis. The global financial crises in Europe and elsewhere have exposed many of the vulnerabilities and structural weaknesses of governments in terms of delivering essential public services. Confronted with a reduction in tax revenues, public managers approached service delivery with the principles of austerity, cost-cutting means, and even privatization/outsourcing. This practice, however, does not necessarily fall within the best interests of the public, who continue to demand and expect a high quality of services routinely. Hence, the emergence of shifting the costs of service production (or parts of it) towards laypersons or the community of service users became one of the initial drivers of coproduction. Austerity has also driven the push towards the adoption of socially innovative practices in the public sector (Voorberg et al., 2015), alongside other pervasive societal challenges of demographic change and urban renewal.

While citizens have begun bearing and sharing such costs, it implied that a portion of the service delivery cycle divided between users and the service providers. Such instance does not yet constitute co-production in its strictest sense of its modern definition, but by implying the idea that service users can assume new roles above and beyond as service recipients, users' resources assume an essential and indispensable part of the service. Hence, the personal

dimensions of the service is cultivated; these situations were replicated across varieties of public service provision, a general yet critical and evaluative approach is thus necessary to understand whether such modality improves service quality (Brandsen et al., 2018). Moreover, whether coproduction should constitute an integral part of reforms should pay close attention to how public value will be generated for citizen users (S. P. Osborne et al., 2016).

The framing of many policies and political challenges as a "wicked problem." With the term's usage in the academic literature spreading post-crisis, most of the public policy problems have been described as "complex, intractable, unpredictable, open-ended and 'wicked' " (Brown et al., 2010; Head, 2008). Though the usage of "wicked social problems" has been known since 1973, they have initially referred to the challenges faced by bureaucrats and political leaders in adopting technical approaches in confronting social problems, as elaborated in the context of policy planning by Rittel & Webber (1973). Broadly speaking, nowadays, they are challenges that cannot entirely be ascribed to a single sector and they do not recognize jurisdictional boundaries. Prime examples of such wicked issues include the coordinated global response to the climate and environmental change: trans-national coordination of solving social issues coming from the refugee crises and the recent forest fires. The late public management scholar Christopher Politt (Pollitt, 2015, 2016) has argued that wicked problems [climate change in particular] present multiple coordination challenges across and within academic fields, and with public management research, in particular, appear to be very slow in responding to such.

Torfing & Ansell (2017) have also underscored how such "wicked and unruly" challenges are imposed to the public sector and the general public. Thus, politicians are in a weak position and civil servants are entirely locked out in critical policy networks (silos), which underscores the need for adequate collaborative arrangements. Many scholars thus call for the need for a redefinition of the roles of public officials and servants (Roberts, 2004), the enhancement of

organizational trust working in these contexts to manage networks effectively (Cristofoli et al., 2017). With collaborative approaches within the helm of making public sector organizations respond to such challenges, coproduction is now primarily a potential vehicle of collaboration among networks.

Renewed interest in citizen involvement. The renewal of public organizations to cope with new societal challenges has also been associated with a renewed relationship of citizens its government, hence bringing forth an agenda of active citizen involvement in various matters of governance (Jochum et al., 2005). However, as Marinetto (2003) notes, while there has been a rise of citizen and community involvement (in the case of Britain), the acceptance of active citizenship by governments is yet to grapple with the distribution of political power between governments and citizens. Also, given the rise of the attention towards global social movements across the broad spectrum of the social sciences, a micro-level (lay-actor or citizen-level) exploration of its dynamics concerning state and governmental relations has provided a steady stream of scholarly attention.

It is getting recognized that there are benefits to granting citizens the voice in decision making. Governance, such as strengthening democratic values, citizen participation, and involvement, has not been customarily sought (Callahan, 2007). Many works in the top theory journals in public administration and management have shown that citizen involvement does have pathways towards valuable contributions of generating public value. Several examples show that citizen involvement in the public budgeting process matter for organizational performance of public organizations (Guo & Neshkova, 2013; Neshkova & Guo, 2012); Involvement through co-productive processes in welfare states have pathways of enhancing democracy and citizenship values (Pestoff, 2006b). At the local level, participation is associated with higher public engagement, the exercise of democratic yet localized values, which enhances the legitimacy of decisions and the decision making the process (Michels & de Graaf, 2010).

The emergence of a public service-dominant (PSD) tradition?

While coproduction is ignored in the public sector until quite recently, it is a well-developed field of research and practice in the private sector. As discussed earlier, while it is mostly not a new concept, coproduction's theoretical foundations have been developed in disciplinal silos of disparate fields and thus were not fully conceptually elaborated. The Old Public administration (as will be discussed in section 3) and consequently, New Public Management, neither did not deem citizens as equal partners nor considered citizen partnerships altogether as part of its core principles. Thus, co-production advancement in the public sector languished, even dubbed as a "'woolly-words' in public policy" (S. P. Osborne et al., 2016). This resulted in little or no precision among the lay actors who can be recognized for involvement and identified for the type of involvement needed. There was also confusion and confounding with the levels and units of observation, i.e., citizens have a wide variety of engagement with public offices and interactions with the level of government (federal, state, regional, local, etc.). Given that many of the potential (citizen) co-production participants may have different motivations or incentives to engage as van Eijk & Steen (2014) indicate, the public and private values accruing from co-production are not fully elaborated in its early conception.

Alford (2014) and several others who have noted that as Ostrom discussed earlier (who first used co-production) and her colleagues have aimed for the "intellectual parsimony" in conceptualizing the concept; she and her colleagues did not distinguish nor demarcate the distinction of co-production activities between goods and services, making it unmindful to the separability of the idea of a *product/goods logic* (pertaining to tangibles) and a *service logic* (on the non-tangibles). Osborne et al. (2013) reference this discrepancy to the old practice of public administration, the "*business of the government is, by and large, not about delivering*

premanufactured products." As Mclaughlin et al. (2009 Osborne et al. (2013) explain, the relationship between public service users and public service organizations has also not characterized by a transactional or discrete nature, as it is in the case of discrete products. Accordingly, it, therefore, helps to recognize public goods are, in fact, not "*public products"* but are mainly "*public services."*

Osborne et al. (2013) present a holistic and systemic approach to public services must be taken, focusing more on service users' expectations and overall experience. This philosophy is a response to the inter-organizational reality of public management, as service fragmentation persists, and the organizational interface between related and associated services may not be very well defined. In this case of a "public services dominant" approach, there is an aim for the *processual and systemic* character of public services delivery involving the users. In such a public service-dominant approach, co-production also becomes an objective. This belief embraces the viewpoint from the services marketing literature that service users (i.e., individual citizens or groups) can also be active resource integrators in the value co-creation process (Arnould, 2008).

Moreover, in the service marketing literature, one way which can explain how the public service-dominant approach may transpire, is to situate service production in terms of shifting the view away from the hierarchical service organizations (in our case the public sector) towards their disaggregation into smaller yet networked forms of organization (Achrol & Kotler, 1999). Moreover, such a move should foster the creation of "customer communities," where critical values of which such as transparency, self-regulation, and users' social interactions were known to be are not well cultivated in vertical/horizontal organizations. Satisfaction, as one of the critical values, can be enhanced by participating with the "information- and experience-rich exchanges with the company [or public service organizations in our case]" and among other members of the user community. Hence, the user

or citizen experience can be richly characterized as involved, conscious and relational, and also potentially personalized.

Such service activities are also interconnected in a network chain fashion with each activity leading to the next (Etgar, 2008). Such a view allows us to potentially identify the possible stage(s) where users' participation (the citizens, in this case) is actionable, i.e., open to participation and involvement. These activities range from planning, designing, resource aggregating, and the processing activities up to until service is delivered; co-production arises when the service consumers participate within any of various activities in one or more of these stages (Etgar, 2008). The extent by which users can participate in these stages of activities may depend on the nature of the and as well as the recipient of the service. Hence in this respect, many public services can have entry points for user participation and involvement.

To what extent which the coproduction literature benefit from the marketing science literature, i.e., deepening the public service-dominant logic? For one, Dong & Sivakumar (2017) outline three different types of customer participation in private contexts. Customers' involvement and participation show us as to where the service exchange activities and the different types of resource integration activities do occur (Lusch & Vargo, 2014). In their case, their typology looks at the nature of resource integration, which based on two dimensions: the *actors* and *the nature of the task to contribute.* The former refers to whether only the customer (or the user) can perform the task or if the firm can do it on his behalf. The latter, on the other hand, looks at whether the task is mandatory or optional for service provision (Dong & Sivakumar, 2017). In this sense, they propose three customer participation typologies: *mandatory,* where only the customer can do the activity, and this activity is needed to ensure service occurrence; *replaceable,* where the customer or the firm can do the activity, and this activity is also needed to ensure service occurrence; and third, *voluntary,* where the activity is not needed for service occurrence but can enhance the user experience.

While this typology does not explicitly adopt a citizen-centric perspective, it guides us to design which types of citizen co-production can be adapted specially for each purpose.

To cite several contextualized examples in public management, with the corresponding value, a *mandatory citizen co-production* could be in a form compulsory attendance of refugees/migrants to participate in language classes to hasten their social integration and thus accomplish the deepening of civic identity. A *replaceable citizen co-production* might apply when citizens need to apply for public documents, and they proceed directly to public offices to obtain it themselves rather than employees delivering it to them directly or perform the process online instead of offline. While this is strictly not coproduction in a strict sense because shifting costs, public values such as efficiency and environmental are also generated as such. A *voluntary co-production* example will usually involve other roles, but it is performed at the citizens' own volition like active researching, intervening, and quality enhancement. They are illustrated in the case of citizens personally filling out and returning service improvement forms at public offices and talking to service providers to actively providing regular inputs towards service improvement, which are otherwise tricky in standard feedback mechanisms. As Dong & Sivakumar (2017) discuss, these types can co-exist depending on the service context.

From hierarchies to relations in the public sector

If co-production is nothing new yet fashionable in the field, what were the field developments the lead to its recent rise? Why were basic participatory approaches like involvement and engagement have taken for granted? In this section, we present the current two main competing paradigms of public management and how their respective theoretical bases have influenced the conceptual logics of service delivery. We explain that this inattention and inaction on the part of the older public management paradigm have diminished the potential and raised doubts towards integrating participatory and collaborative approaches.

Unearthing collaboration among the models of public sector reform

Three main models are public sector reform known. These are New Public Management (NPM), the old Public Administration and the New Public Governance [NPG] (Pollitt & Bouckaert, 2011). These reform movements exploit specific coordination mechanisms, as their theoretical foundations contrast significantly from each other. These may include, among others, the method by which public management principles the public bureaucracy is developed and emphasized. Such a process ultimately shapes the configurations of organizations involved in public service delivery.

While there is to some extent of commonality in terms of their end-goals, i.e., an aspiration of that of an improved overall public sector performance, they differ in terms of the means of emphasizing goals, structure, and relations among government units. Each paradigm favors specific management styles as well as corresponding performance management orientation (Hood, 1995); this offers a critical point as to how collaborative governance in a broad social sense is framed, interpreted and viewed as necessarily deemed by the public sector to improve service quality. The next two subsections discuss the divergence of these two movements:

NPM and the inattention towards participatory approaches

Historical events have strongly influenced public management practice. Issues of trust in civil servants, incompetence of politicians, the prevalence of corruption, and the high costs of public financing have surfaced for many years. There was a more significant public pressure to reduce the public sector and create markets for public sector organizations. Some works (Speklé & Verbeeten, 2014; F. H. M. Verbeeten, 2008) note the annotation of “new,” “better,” and “improved” in how performance management has been introduced into a new paradigm called New Public Management. As a new paradigm of thinking about the public administration, it

is anchored on rational/public choice theory and neoclassical economics (Osborne, 2006b). Within the NPM, the trust mechanism has shifted from the civil servant towards that of private-sector methods. Market-based coordination mechanisms, as well as private-sector inspired performance management systems, were introduced into the public administration domain. Gordon, in a talk at the lecture at the University of Bologna[2] (2016) notes some of the checklists in the NPM principles:

- Government to be cost-effective
- The government should be small
- Competitive
- Entrepreneurial
- Customer-citizen oriented
- Possess cost controls
- Fiscal transparency
- Market mechanism
- Have a contract culture; and Strong accountability to the public

(F. H. Verbeeten & Speklé, 2015) further note that NPM yielded shifts in structural perspectives, summarized in the table

[2] Guest lecture on New Public Management class in the MSc Arts and Heritage Management Program

	"OLD" public management (PPA)	**New public management** (NPM)
Goals	Vague, unmeasurable	Clear, measurable
Structure	Centralized, hierarchical structure	Decentralized, corporatized units per product
Relations among units	Non-specified	Contracts
Management style	Ethics, public interest	Private sector tools
Emphasis on budgeting	Negotiations, stable	Performance, reductions
Management profile	Political, knowledge, rules	Hands-on, visible
Performance orientation	Qualitative, explicit	Quantitative, explicit
Focus of controls	Behavior, cultural	Output and results

Table 2. Differences between Old Public Management and New Public Management.

Source: *Speklé & Verbeeten (2014)* from *Hood (1995)*

One of the key distinguishing features of NPM is the adoption of private sector-designed tools. There is also the emergence of quantitative tools and reporting schemes for solidifying performance management into the public management domain. Organizationally, decentralization policies were known to have resulted in the reduction in the size public sector, most notably that of expenditures (Alonso et al., 2015). In response to the public's higher call for transparency and accountability among the politicians, NPM's performance measurement and reporting have occupied a fundamental role in managing the public sector at each level of the government. These practices have inadvertently shifted the focus on quantitative performance measurement, evaluation, and assessment.

However, the incidence of technical problems, skepticism were raised on the appropriateness of transferring "putative" private sector competencies into the realm of public administration

(Kouzmin et al., 1999). Recent studies show the need to manage a substantial number of vulnerabilities and associated levels of risks with NPM. Contradictions, conflicts, and problems arose on issues concerning accountability, fragmentation, and political control—the very issues NPM was supposed to contribute to reform and enhance.

While resource-optimization exercises by the NPM have been known to be very promising, Nyhan & Marlowe Jr, (1995) reported:

> *" ...agencies have not, however, always built the capacity for measurement that can highlight both progress and the need for critical investments to a range of stakeholders — citizens, businessmen, legislators, interest groups".*

Measures such as efficiency and economy, have become commonplace in NPM-inspired practices. However, it is debated whether or not if its desired goals were achieved, just in the case of its impacts (Alonso et al., 2015). Several issues surround the motive of why NPM has had questionable results: First, performance management in the public sector is, in general, practically challenging. Structurally, the design of the public sector is different. Depending on the level and type of bureaucratic administration, the design and implementation of assessment strategies do not necessarily reflect performance. The type of performance standards constructed (if not, adapted) and the legitimacy of procedures of obtaining, reporting and exploiting this information is a substantial subject to critical stakeholders. For example, as Heinric (2002) notes, administrative data do not accurately nor necessarily present reform outcomes. Caution must be vastly employed on the use of such data and in terms of usefulness or ways to improve organizational performance (Heinric, 2002).

Moreover, public sectors possess high levels of heterogeneity within and between practices of performance measurement. They also vary following the level of government and the level of

service delivery. The pressure for governments to be more responsive to decision making is unexpectedly very high. Governments are expected to report their various agencies' performance, as well as overall public responsiveness and resource productivity (Nyhan & Marlowe Jr 1995).

At the individual level, managers in the public sector are considered as risk-averse, as compared to those managers coming from the private sector. This condition is due to several factors, for example, political control, the formality of work structures, reward systems, bureaucratic structures, and the goal ambiguity differences, as differentiated between private and public sector settings (Bozeman & Kingsley, 1998).

Borrowing private sector practices and applying them in public settings undeniably can drastically distort and alter the managerial orientation of some of the public sector personnel. Ultimately, NPM does not encourage the building of a "relational bridge" between public sector employees and citizens; hence, citizen's involvement with the services that they get is minimal at best. The NPM literature treats citizens as customers and as passive consumers. As a reform theme, NPM has very little to talk about in terms of collaboration with citizens and other actors. Arrangements for collaboration have been legally and practically challenging for all government and civil servants across the world.

What has been then an emerging managerial thought in the literature? A paper by Osborne (2006a) shows that even though NPM has been a strong driving force within the scholarly discourse, and it has contributed a lot to modern public administration frameworks, NPM has become outdated. Lapsley (2009) labeled it as one of the cruel inventions in public management because of its creation of an audit culture among public organizations. Its lack of a more overarching and pluralistic view, as well as the primacy of focus on the economy and efficiency dimensions, need to be critically examined. It has also failed to account for the role

of multiple relationships between public organizations and that of individuals/groups, as well as the ability of the government agencies to work with civil society groups. The reductionist approaches that have prevailed in the performance management component of NPM were borne out of a need to simplify the complexity within organizations, and this unsurprisingly reduced individuals as passive, recipient clients.

Outside of developed countries, less evidence exists whether NPM has improved overall governance because of difficulty measuring its impacts. At best, Manning (2001) shows that public sector responsiveness is, at best, very minimal, with considerable evidence that it may even have caused harm in some settings. In France, NPM is shown to give decreased citizen involvement (Simonet, 2015).

While NPM inspired reforms have influenced public sector reform in developing countries, NPM has not been extensively studied outside of the advanced economies, where they were conceptualized (Manning, 2001). The transplantation of practices from developed countries did not necessarily complement the local institutional contexts and could best possibly explain NPM's lack of great success. Such literature coming from within these assumptions faces the possibility of recognizing the role of more localized institutions and norms and surfacing such heterogeneity in a highly original contribution. Osborne asserts that a new paradigm, called the New Public Governance (NPG) has emerged, with its emphasis on service processes and outcomes. This with a profound contrast to NPM's emphasis on service inputs and outputs. More importantly, NPG shifted the governance mechanism from market-based contracts towards trust/relational contracts. Hence, a higher call for public management towards the actual needs of citizens has been pushed (Cambra-Berdún & Cambra-Fierro, 2006).

NPG: The resurgence of networks and relational approaches to public management

In the late 1990s, public administration and management scholars came to recognize the

importance of networks, partnerships, and markets and to integrate them into public administration frameworks (Peters & Pierre, 1998). Rhodes (1996) describes it as composed of *"self-organizing inter-organizational networks complementing markets and hierarchies'* as the core governing structures of the public sector.

Osborne (2006) notes that the philosophy of NPG has far more enormous potential to tap into modern management theories (see table below). The promise contrasts with the output and intra-organizational focus of NPM, which was the predominant movement sweeping public sector reform in the 1990s (Hood, 1991). While the latter is rooted in rational and public choice theory, as well as neoclassical economics and management studies; the former is embedded in organizational sociology and network theory. It also integrates some of the values, leadership, and management and governance concepts that can address gaps and limitations which were previously pointed out in NPM.

Table 2 Distinctions of foci of NPM, PAM, and NPG from (Osborne, 2006b)

Paradigm/key elements	Theoretical roots	Nature of the state	Focus	Emphasis	Relationship to external (nonpublic) organizational partners	Governance mechanism	Value base
Public Administration	Political science and public policy	Unitary	The policy system	Policy implementation	Potential elements of the policy system	Hierarchy	Public sector ethos
New Public Management	Rational/public choice theory and management studies	Disaggregated	Intra-organizational management	Service inputs and outputs	Independent contractors within a competitive market-place	The market and classical or neo-classical contracts	Efficacy of competition and the market-place
New Public Governance	Organizational sociology and network theory	Plural and pluralist	Inter-organizational governance	Service processes and outcomes	Preferred suppliers, and often inter-dependent agents within ongoing relationships	Trustor relational contracts	Neo-corporatist

Such fundamental differences spell out how public service performance and delivery is

construed, as the underlying performance regimes have distinctive theoretical foundations. Moreover, these reform movements are further shaped by the political and bureaucratic structures across countries adopting them, posing potential applicability/replicability in a wide variety of contexts (Bao et al., 2012). There is a robust potential stream of scholarly work stemming from its theoretical roots of organizational sociology and network theory. Many NPG principles surface during the scholarly and professional discourse of public policies using combinations of annotations such as "engagement," "effectiveness," "governance," "networks," "collaboration," "relationships," and "stakeholders." With its key influences, public organizations are considered relational organizations, and they conceive the state as both "plural and pluralist, making them highly inter-dependent actors who participate to the delivery of public services (Osborne, 2006b). Osborne furthers that NPG's focus on the inter-organizational relationships and the governance of service processes, in addition to its effectiveness and outcomes. As network governance shapes the overall network effectiveness (Provan & Kenis, 2007), and with the rise of this new management paradigm in the public sector, coproduction is seen as one of the best citizen involvement-infused frameworks to encompass the effective delivery of services.

The implication for a future research agenda: literature gaps and actionable insights

In this literature review , we find that the emergence of citizen co-production will continue to generate a high degree of scholarly attention across a wide variety of fields; scholars from public management and administration, sociology, education, services marketing, organizational behavior, network theory, political science, and economics, will significantly benefit from enriching the interdisciplinarity approaches in addressing the gaps and tensions in this field of research. The concept also resonates strongly towards policy and generates substantial managerial practice implications, not just in the public sector. As Osborne (2006) notes, the emergence of New Public Governance paradigm and the emergence of service-

oriented view in public services (S. P. Osborne, Radnor, Kinder, & Vidal, 2015; S. P. Osborne et al., 2013) are bound to challenge the way public services are framed. The move towards the public is becoming active partners in co-production links to the idea of public value co-production (Bovaird et al., 2014; Loeffler & Bovaird, 2016). Hence, the overall idea of citizen participation will be unpacked utilizing identifying specific service designs that can be activated for co-production to generate public value. We enumerate (some) some of the critical areas of contribution to developing the field.

At the *theoretical level*, there is a need for further distinctions. As Brandsen & Pestoff (2006) observe, one of the first features of citizen co-production is its evident individual focus. Initially, individual lay actors or specific user groups are the primary units of observation. A potential research area is an opportunity to look at the coproduction at group and community levels, i.e., to groups of citizens' service communities. Moreover, it will be interesting how specificities of co-production arrangements like getting citizens involved, engaged and partners relate to the public or social values of broader national interest. The literature also does not talk about so much about the sustainability of co-productive relations, and the differences it makes if we also involve third sector entities in some arrangements. Furthermore, as a relational feature of governance, it remains to be seen how intensive co-production should be in order to relate meaningfully to outcomes. Involvement and engagement are certainly not new concepts but understanding them in the light of new theoretical developments can shed light on how we can integrate them in public service designs. Co-production's dark sides must also be acknowledged, especially in the theoretical development process. Steen et al. (2018) showed the risks associated when lay actors go about the co-production and co-creation: governments may shed responsibility and the citizens may also face the lack of clear responsibility. Other downsides include increase in transaction costs, loss of democratic values, reinforced inequalities and co-destruction of public value.

At the *methodological level,* while traditional bias for case studies persist in public administration and management studies, many of the previous studies were designed, conducted were in highly specific and well-defined contexts (S. Osborne, 2006; S. P. Osborne, 2018). Scalability and generalizability are often one of their limitations. The specific and localized political conditions in other systems, as well as the political and resource boundaries, can also influence the choice of research settings. Co-production research utilizing large scale quantitative and multilevel surveys in developing country settings are already scarce, to begin with, and so the explanation for the lack of systemic reviews of co-production in these contexts.

At the *policy and context level,* unlike previous studies on co-production, which have inspected case studies, the generalizability of these studies towards a nationalized and broadened public policy design remains an issue that needs to be further clarified both in policy and academic sense. A more nationally representative analysis brings out cross-sectional heterogeneity, which may not be otherwise possible through specific approaches in case studies. While most quantitative studies are set in developed countries, results coming from non-Western contexts remain rare. One challenge is that collaborative approaches are still a big challenge in many public administration systems in these places. Lessons on co-production which are focused on developing country settings also remain limited. Most of the existing works are largely qualitative case studies and therefore have limitations in terms of generalizability and scalability. Developing country settings also offer challenges which are otherwise not given attention in previous works. We also do not know how economic preconditions shape the levels and quality of co-production, as many developing countries do not have institutional frameworks that are as developed as many industrialized economies, which may accommodate a different type of co-productive activity. High levels of informality are common among developing regions, where improvisations or informal markets for public services have replaced or even displaced the main ones.

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An introductory note to the empirical chapters

Education is an essential public service involving the participation of multiple actors, such as principals, teachers and students. In this short section of the dissertation we introduce the motivation and background of the succeeding three papers. Essentially, the succeeding essays are empirical surveys of educational co-production of parents with schools. The essays are our responses to most of the gaps in the literature which we posed in the literature review section of the dissertation. The following themes and issues helped us to organize the signpost empirical chapters:

Framing coproduction in education settings: "with whom", "for whom" and "what for". We refer to an earlier definition of coproduction: that it is a joint production of public value which includes lay actors (in this case, the parents and students) having an interaction and joint effort with teachers (or other professionals). Though there earlier definitions of co-production, such as parallel coproduction by parents, like reading bedtime stories, preparing breakfast, and the similar, but they do not necessarily involve the direct and active participation with teachers (Honingh et al., 2018). These activities directly count towards private benefits and this would be unclear how this may link with existing education activities. Moreover, we believe that purely shifting costs and inducing personal resource takeout from schools to parents (i.e., self-directed study) without the direct involvement of professionals does not constitute coproduction, as there is no joint effort involved.

Parents as coproducers with schools. Parental involvement in education settings is widely documented and tracked, both in the academic and policy circles. Within the domain of educational management, the entirety of education policy and service delivery discourse is exposed to debates and tensions. Even though policy-wise, this cuts across levels of education governance, many parents are still typically relegated to passive (and mostly home-based) roles

in school functions. With the teachers and principals on the frontline education provision, the extent of appraising how parental involvement matters to education outcomes is unquestionably an important part.

Challenges of schools as public sector organizations. Among many countries, the education sector is typically the biggest employer. It is also the recipient of the most significant public expenditures and notoriously one of the most imperiled to a gamut of multi-level reforms and experiments. While the challenges of the education system have remained "wicked,"; the sector also contends with issues of austerity, autonomy, and fiscal cuts. Moreover, parents (as well as other entities) have historically exercised varying degrees of involvement in school affairs. Developing countries further face issues of resource constraints, teacher shortage, and congestion. The economics of education literature explain these in detail in these developing contexts, such as how Glewwe (2002) and Glewwe & Kremer (2006) point out. Many of these constraints and gaps are issues that remain as developmental barriers in these contexts. Above and beyond these challenges, careful consideration is essential when looking at the interaction of specific school-based management with the local context. Hence, it is relatively crucial to look at the factors which hinder the involvement of parents and its likely implications.

Learning issues in managing public schools . The public education sector in many European countries, for instance, are among those to have significantly undergone many NPM-inspired reforms (Tolofari, 2005; A Verger, Parcerisa, & Fontdevila, 2019; Verger & Curran, 2014) with the likes of policies on enhancing school autonomy, the professionalization of school leadership, teachers' accountability in the classroom and the presence of system-wide standardized evaluation and tests. The OECD, for instance, has championed and lead such wide-spread educational benchmarking approaches, through the conduct of tests such the annual Program for International Student Assessment (PISA); the International Educational Assessment's (IEA) Trends in International Mathematics and Science Study (TIMSS) are

among the most common examples of cross-national examinations which benchmark educational performance. Both are admittedly biased towards achievement test scores. Every year, the PISA ranking on science, mathematics and reading test scores always figure quite controversially with the policymakers and the general public. Policy and press coverage has been consistently extensive across all countries, frequently politicized and polarizing (J. Baird et al., 2011; J.-A. Baird et al., 2016). They are often used as jump-off points for setting an agenda for reforming schools. Bulle (2011) notes that PISA has unleashed rhetoric among the public of comparing education systems across Europe without appraising or even referencing the relative strengths of some of the educational systems. Hence, comparing education performances or the usage of "league tables" should be taken with a grain of salt, as these reports do not have the necessary informative and evaluative values for all stakeholders. Moreover, it is also very important to extend analyses of outcomes beyond achievement scores (i.e. learning climates) as there are also many other valuable learning indicators which are on the interest of policy and academic managers.

Issues on NPM's-related practices on schools. NPM reforms induce corporatist attitudes even in public school systems and thereby diminishing the collegiality of the academia (Tolofari, 2005). Some studies show that NPM had led to a "de-professionalization" of the education civil servants in Sweden, as it led to a dependency on the leadership of the local managers. In Singapore, NPM is known to have influenced the behavior of principals and teachers towards meeting performance targets (Aoki, 2015). Because many education reforms across countries have not necessarily accelerated the outcome improvements expected within these systems, a broadening set of education agenda is struggling to broadly tackle issues equity, efficiency, and quality and even educational inclusion. This theme is also important among developing countries, where it remains a significant policy issue. An implication with the research agenda is to look at how the relational aspects between schools (through principals and teachers) and

the parents contribute to the educational outcomes, alongside with the school inputs and managerial factors.

Parental involvement and its relationship with values and outcomes of public interest. Our broad interest is to find new ways of understanding the linkages between parental involvement and educational outcomes. This has been well investigated strand of educational management and administration literature (Castro et al., 2015; Fan & Chen, 2001; Wilder, 2014); but it is still very much open for further conceptual, empirical and methodological unpacking. Parental involvement and participation as a practice and the whole idea of involving them in certain school management practices do not necessarily interface quite smoothly. The focus on the context of basic education (primary and secondary) in developing countries or systems are also limited. In response to the research gaps mentioned in prior literature review, we organize and present the three empirical essays as follows:

Chapter 2 is entitled ***"The school's learning climate in the lens of parental involvement and school leadership"***. In this chapter we respond to the need of coproduction, as a relational feature of governance, to relate meaningfully with outcomes which we can integrate in public service designs such as education. In this empirical work, we investigate the role of parental involvement in schools in cultivating an environment which is conducive for learning, using the lens of school leadership. The dependent variable, the learning climate of schools, is the channel which academic achievement and performance is enhanced. We performed our analyses in a broad multi-level framework using principals' responses in the PISA survey.

Chapter 3 is entitled **"*Does weak academic performance activate parental involvement in schools? A cross-country perspective*"**. This chapter investigates the links between academic achievement and parental involvement within school settings. Most of the literature on parental involvement have focused on home-based involvement (i.e. parallel co-production by parents) and in this chapter we look at how varieties of involvement with the school is associated with

reading, mathematics and science scores. With parent-student pairs as our unit of observation, the negative relationship of test scores with parental involvement indicate that academic performance is likely activating parental involvement as a response to address learning challenges.

With Chapters 2 and 3, we underscore how quantitative analyses of large-scale datasets can yield insights about the generalizability of education co-production by parents with teachers and principals, focusing on organizational and individual outcome levels, respectively. By focusing on parents' participation and involvement in schools, it will help us to understand involvement concerning education public services and as how a community of lay actors co-produce outcomes.

Lastly, Chapter 4 is entitled ***"Pathways of educational co-production: The relationship between parental involvement and children's school participation in India"***. This chapter uses a longitudinal dataset to trace links between co-production and educational outcomes between two time periods. The study utilizes a nationally representative longitudinal survey from India allowing for comparison, generalizability and drawing policy-relevant conclusions. The chapter specifically responds to the call for more empirical works applying coproduction frameworks in a developing country setting (Cepiku & Giordano, 2014; Osborne, 2017).

Each chapter ends with discussion and suggestions for future related work.

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Essay 2: The school's learning climate in the lens of parental involvement and school leadership

Abstract

Schools' teaching and learning environments shape how individual learners meet their educational objectives. It comes as no surprise that school reforms fixate on findings measures to improve the principal's managerial skills. A school's learning climate, as prior literature states, is shaped by a wide variety of actors and social relations which go beyond schools. In this paper, we focus on one of these relational aspects between schools and the learning community. Using the school principals' responses on the 2015 PISA survey, we analyzed the links between parental involvement in schools and the school's hindrance in enhancing the learning climate in the multi-level hierarchical modeling framework. We find certain forms of parental involvement, such as welcoming and accepting environment for parents in schools, are robustly associated with a reduction in barriers to improving the learning climate. Lastly, we show that public schools can improve their learning environments substantially by activating specific parental involvement mechanisms, most notably for schools facing challenges of social inclusion. Among the domains of principal leadership, we find that framing and communicating school goals by principals is positively associated with improving learning. We contribute to the field by identifying precisely how parental involvement in schools works hand-in-hand with enhancing the learning climate, which can be actioned upon by principals.

Keywords: PISA, parental involvement, test scores, learning climate

Introduction

Despite more than a hundred years of examination on the learning climate of schools, substantial gaps and tensions between research findings and the practice of school improvement persist (Cohen et al., 2009). A steady stream on the literature from the educational administration and leadership fields have stressed the importance of fostering of an environment among teachers, principal, and the immediate community which encourages a positive learning atmosphere (Thapa et al., 2013). In this paper, we examine one of the most challenging and relevant connections between schools' relationship with its immediate community and the school's environment to foster learning. We investigate how parental involvement in schools is related to the extent that learning is hindered by within the school.

We measure and test this construct of the learning climate at the level of the school, capturing a potentially robust organizational-level outcome.

On the other hand, as we are embarking on a school-level analysis, we used the more than 16,000 principals' responses on their management and leadership facets. We approach this challenge by the adoption of the 2015 available datasets from the Program for International Student Assessment (PISA), which permits us to perform quantitative analyses on large-scale multi-country perspectives.

Theoretical background

What exactly is the learning climate within school settings? Why does it matter in contemporary education governance and management? Furthermore, what is the scholarly impact of understanding its dimensions through the lens of parental involvement within schools? While the research on these themes is certainly not new, it has always been a serious concern of the academic community for more than a century (Freiberg, 2005) and professionals have recognized the practical challenge of improving the school climate (Brookover, 1982). In its' simplest definition, it refers to the 'quality and character of school life' (Cohen et al., 2009); or the 'social characteristics of a school among its stakeholders' (Maxwell et al., 2017). Primarily, we can characterize learning climate as a collective and shared experience, which are bound by interdependent social relations, group norms, shared approaches and practices, with an emphasis on learning (Cohen et al., 2009; Maxwell et al., 2017; Thapa et al., 2013). In the report by the National School Climate Council (2007) to define school climate, Thapa et al., p. 2, (2013) cite an elaborated definition:

> *"School climate is based on patterns of people's experiences of school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures…*
>
> *A sustainable, positive school climate fosters youth development and learning necessary for a productive, contributive, and satisfying life in a*

> *democratic society…Students, families, and educators work together to develop, live, and contribute to a shared school vision. Educators model and nurture an attitude that emphasizes the benefits and satisfaction from learning. Each person contributes to the operations of the school as well as the care of the physical environment*." (Thapa et al., 2013)

Research work on the theoretical conceptualization and empirical operationalization of learning climate in schools have been growing in recent years. The interest stems from the growing body of work, which underscores how conducive learning environments are associated with outcomes that go beyond improvements in student learning achievement, i.e., a positive learning climate has been associated with being among the leading indicators of a well-managed school. Hence, the discourse has substantially intersected with critical streams of the education management and administration literature focusing on the various roles of education stakeholders. These have included, principals' professionalism and school leadership (Cherkowski, 2016; Hughes & Pickeral, 2013), teachers' job satisfaction, commitment and well-being (Gray et al., 2017; Shoshani & Eldor, 2016) or their job burnout (Grayson & Alvarez, 2008). The dialogue and debates on learning climate have spanned the academic, policy and professional domains, all of which convey a strong need to attain conceptual unpacking.

Thapa et al. (2013), in a comprehensive review, point out that schools' learning climate matter considerably for almost anything that education policy observers and scholars have a substantial interest in. While they show that it significantly matters for increased student graduation rates and teacher retention, it is also vital for child and youth development, the practical risk prevention and health promotion efforts, enhanced student learning and academic achievement. Despite being mentioned more than a century ago (Cohen et al., 2009), the empirical research approaches on the school climate did not emerge until the 1960s. However, these were considered by researchers to be overly simplistic in terms of how it was related to

student learning and development (M.-T. Wang & Degol, 2016). Now, the most recent works have highlighted that the school climate is a multi-dimensional concept; however, practical difficulties and the challenges of actual operationalization remain obscured.

Despite the challenges, the learning climate matter largely beyond outcomes which are mostly academic performance related. Recent research show that a positive learning climate figures in students' resilience (Domitrovich et al., 2017), students' improved health behaviors and choices (Michael et al., 2015), the reduction of socioeconomic and racial gaps (Berkowitz et al., 2017; Sanders et al., 2018; Voight et al., 2015), the reduction in alcohol and marijuana use (Cornell & Huang, 2016), and a substantial reduction in peer bullying, aggression, teasing, and general victimization (Cornell et al., 2015; Gage et al., 2014; Konishi et al., 2017; Konold et al., 2014; W. Wang et al., 2014). It is also known to induce a student's potential political participation (Castillo et al., 2015), prosocial behavior (Luengo Kanacri et al., 2014, 2017) and the likelihood not to drop-out of school (Jia et al., 2016).

In most of these works, researchers have recognized the multidimensional and a multi-domain construct of learning climate. Authors such as Wang & Degol (2016) mention that these dimensions of the school climate fall into four main domains: academic, community, safety, and institutional environments. This finding complements an earlier review performed by Thapa et al. (2013) which included teaching and learning, school improvement processes and school relationships. Altogether, these dimensions capture almost every aspect of the school environment for learning, reinforcing drivers of students' cognitive, behavioral and psychological development (M.-T. Wang & Degol, 2016).

Unpacking the mechanism of school climate improvement process

School climate is essentially a dynamic and complex social construction, where a variety of actors and structures characterize its relational features. Given the present literature on the various outcomes which are reinforced with a positive or improved learning climate, attractive policy and practice questions arise about which question dimensions of school management and contextual characteristics directly relate to the learning climate. Sebastian et al. (2014) and Sebastian & Allensworth (2012), building on Bryk (2010) provide a conceptualization of such mechanism: school leadership works through three mediating processes to influence teaching and learning in schools. These include school staff professional capacity, the learning climate and the parent-community ties. The interplay of these processes within a school's context directly influences student learning through the classroom instruction and indirectly through the school context. Professional capacity captures teachers' professional qualifications, the schools' quality assurance coordination programs and the general professional community.

Some of the earlier works, such as that of Hallinger, Bickman, & Davis (1996), found no direct impact of the principal's instructional leadership on student achievement but they find substantial evidence to point out that principals can have an indirect effect through the schools' learning climate. This relationship underscores the role of school leaders' role in overseeing school effectiveness. This conceptualization implies that studying the school's learning climate, one cannot isolate it with variables such as the principal's leadership, teachers' roles in school management and the institutional setup of the school. The school's learning environment is also shaped by the school's institutional or organizational features (M.-T. Wang & Degol, 2016). Most schools across the world are principally managed by the public sector, implying the predominance of government financing and administration, though multiple

modalities certainly exist. In this sense, teachers, principals, and other school staff are by and large, public sector employees accountable to the demands and expectations of their profession. Hence, it is apparent that the learning environment is in the interest of educational management scholars. Active and direct involvement by parents extends beyond the school, which influences several learning outcomes concerning the child/teenager.

Parental involvement and school climate improvement

In this section, we focus on the links between parents and school, which are among the most critical relationships between school managers and staff. For a long time, parental involvement has is known to be one of the predictors of students' academic achievement (Barge & Loges, 2003). It comes as no surprise why parental involvement in education settings remains one of the most critical areas of educational policy research. In varying levels of attention, parental involvement is one of the critical pillars of comprehensive education reform programs across the world.

However, how does parental involvement figure in the context of the school's learning climate? In a critical study in 2004, Barton et al. (2004) characterize parental involvement as virtually a co-productive and interactive process by parents with schools:

> *"as a dynamic, interactive process in which parents draw on multiple experiences and resources to define their interactions with schools and among school actors*" (p. 3; (Barton et al., 2004)).

The authors also discuss that while in general, most of the literature focuses on the "what" part of parental involvement, little attention has been paid to its dimensions such as "its why's and its how's." In particular, most of the research attention on parental involvement has mostly focused on the "visibility of parents" in schools as a determinant of academic achievement

(Kim, 2009), while on the other hand, there is also scarcity of research focusing on engaging parents as equal partners and decision-makers within education communities (Barton et al., 2004) . How certain typologies of parental involvement relates to a specific domain or pillar of the school's learning climate is less well-known. This quite surprising as the literature on the school climate has underscored the importance of interpersonal relationships between school personnel and other school actors (Sebastian & Allensworth, 2012). Previous studies have also called for coordinated action results in an improvement in outcomes measured at the student-level outcomes, much expectedly less so for organizational-level indicators such as the learning climate. To infer, the empirical literature remains scant when it comes to an understanding of the mechanisms through which specific or contextual varieties of parental involvement relate to schools' learning climate.

Parental involvement in schools is a vital component of the design of intervention programs such as anti-bullying and victimization (Georgiou, 2008). Also to address issues of mental health and treatment of OCD among teenagers (Derisley et al., 2005); the design of programs to share direct and indirect responsibilities in diabetes management among youth (Young et al., 2014), as well as the long term involvement by parents to enhance diabetes management efficacy among the adolescents (King et al., 2014). Health outcomes of children may also improve through engaging parents, such as in case of early intervention programs with kids facing hearing loss (Ingber & Dromi, 2009), reducing the likelihood of developing smoking addiction (Kestilä et al., 2006). While these results are remarkable for youth and adolescent outcomes, the literature faces the gap on how parental involvement may also relate with a school (or organizational) level indicator such as the learning climate.

However, attitudes towards parental involvement within schools vary. Empirical studies such as Addi-Raccah & Ainhoren (2009) discussed Israel, where teacher attitudes were mostly

negative and resistant in schools where parents are empowered. Even in cases where teachers favor involvement, teachers felt they are susceptible to expanding the influence of parents who "scrutinize their work and encroach their professional domains" (Addi-Raccah & Arviv-Elyashiv, 2008). In a similar instance, Bæck (2010) also found that in Norway's case, parents can potentially undermine teachers' autonomy in the classroom. Teachers sought restricting parental involvement, especially among well-educated parents. The teaching staff is known to emphasize their own professional identity in the classrooms. Teacher reports of parental responsibility to influence student outcomes are stronger than that of parental statements implying that "stereotyping" of parents by teachers can affect academic results (Bakker et al., 2007).

Method

Data used

As a cross-national education assessment program, the Program for International Student Assessment (PISA) possesses the most extensive and generalizable cross-country survey on education outcomes and parental involvement. In this study, we are adopting the year 2015 edition of the survey containing the school module, covering responses of principals from about 16,000 schools across all 62 PISA participating countries.

Use of latent indicators. Some essential indicators, like the learning climate of schools, are not explicitly computed nor singlehandedly represented by a number but rather by series of items.

In order for us to robustly understand the underlying factor structure of some of the latent factors of interest, we follow a two-step approach, as argued by Anderson & Gerbing (1988), in some of our variables of interest. We both conducted preliminary tests such as exploratory factor analysis (EFA) and confirmatory factor analyses (CFA). We performed this by randomly dividing the dataset into two parts and then performing an EFA in the first part to show which

variables are grouped (the "training set"). We subsequently examined whether the same structure applies to the other half by performing a CFA. This approach will be advantageous in our successive regression analyses to reduce the possibility that the variables comprising a latent structure were determined by chance. And then, finally, to generate the composite indicator for the latent variable, we followed this by performing confirmatory factor analyses for the full sample. We also conducted Bartlett's test and computed for the KMO measure. We begin the empirical section of this chapter by assessing how principals and school heads perceive parental involvement.

Estimation Strategy

As a cross country study of schools in a single period, we have a hierarchical data structure where the unit of observations (schools) is nested within countries. We specify a two-level model where it allows us to simultaneously investigate the relationship of the school learning climate and several variables measured at the school level, as well as having the ability to compare measurements between levels, i.e., variation between countries. The model takes the simple form,

$$\mathrm{Y_{ij}} = \beta_{\mathrm{oj}} + \beta_{1\mathrm{j}}(\mathbf{PI}_{\mathrm{ij}}) + \beta_{\mathrm{ij}}\mathrm{X_{ij}} + \gamma_{\mathrm{ij}}$$

Where Y_{ij} is measure of a learning climate in school *i* nested within the country *j*. The vector $\boldsymbol{X}_{ij}$ contains the control variables discussed above; **PI** are the indicators of parental involvement observed at the level of the school, the coefficient β_{oj} is the expected level of learning climate when all other explanatory variables are equal to zero. β_{1j} and β_{ij} are the respective beta coefficients. and γ_{ij} is a random error associated with the level of schools nested within the country.

The dependent variable

The school's learning climate. There are many ways to assess the learning climate in schools and assessments depend on the scope of the respondent's perspective. As we are concerned with an organizational level feature, we consider principals' assessments to be a potential vantage point to assess such. In the PISA survey, principals were asked ten questions, "In your school, to what extent is the learning of students hindered by the following phenomena?" and may respond with any of the four choices in an ordinal scale, i.e., *1-Not at all ; 2- Very little; 3- To some extent; 4- A lot*. Table 5 in the appendices shows us the summary statistics of these ten variables, where two potential constructs seem to emerge. The first measure captures *the extent that learning is hindered by student-related issues*, while the second measure is confirmed to be *scope by which learning is hindered by teacher management issues*, as perceived by the principal. We clarify at this point that our approach in measuring the learning climate takes only the perspective of the school principal as we believe that school head is in a good position to assess an organizational-level outcome.

We performed Anderson and Gerbing's approach to testing the compositeness of our outcome variables of interest. Initially, the ten items were expected to arrive with two measures of the learning climate at the school level neatly. However, with the principle that the operationalization of the dependent variable(s) must be consistent across all responses, the second measure of is a more statistically robust and consistent measure of the learning climate. The first measure has shown that the underlying construct is not always consistently viewed as homogeneous in our broad sample of countries. It has a RMSEA of 0.230 as compared to the RMSEA of the second measure at 0.052. As constructed indices, we concentrate our analysis of the learning climate on the second factor (designated as TEACHHIN) or the extent that teacher-related issues hinder the learning climate. The composite index is a simple average of the five items on teacher management/behaviors. The subdimensions take into account teachers' ability to meet the needs of students, teacher absenteeism, staff resistance, teachers

being too strict, teacher unpreparedness). The average inter-item correlation for these items is 0.4685 and the Cronbach's α is 0.82. For brevity, this is explained in appendices, Table 1.

Explanatory variable/s and controls

Parental Involvement. These are parental involvement dimensions as perceived by the school principal, found in the SC063 of the principal's survey. Principals answer statements about how much parental involvement apply in their school. In contrast to the student-parent questionnaire, the responses on this module of the survey are dichotomous (Yes/No)[3]. Preliminary correlation matrices of these six items show very low to low correlation (min 0.08, max 0.26); thus, we do not expect this to cause multicollinearity. Moreover, in succeeding regression analyses, we test for the VIF contributions, and they have remained low throughout.

Principal leadership. The module on the school principal's leadership contains 13 items, in section SC009. We followed the similar technique of randomly dividing the dataset into two parts and testing whether the EFA is congruent with the CFA. The exploratory factor analysis on the training dataset yielded two possible factors. However, upon conducting the CFA, the groupings did not indicate a good fit based on the two-factor model of principal leadership. The RMSEA showed 0.106, and the CFI and TLI measures are below 0.90. These results likely indicate unfitness to drastically reduce the number of dimensions from 13 to just two. Furthermore, while reducing the factors into just two may theoretically lower the likelihood of multicollinearity, but the interpretation and separability of which specific dimensions of principal leadership influence school outcomes becomes a practical challenge to interpret.

[3] We conducted EFA using our earlier technique on these items, and we yielded two possible factors. However, the corresponding factor loadings of the items are quite low; altogether, their Cronbach alphas are also very low, as well as the values of average inter-item correlations. Proceeding with the CFA, our test shows that while the RMSEA and CFI indices are acceptable, but the TLI is quite low. Moreover, while performing such tests, we found valuable insights concerning data reduction and reduce the likelihood of multicollinearity. In several iterations, one item shifts its loading into either factor. For this purpose, we propose to integrate these parental involvement items individually.

Fortunately, for this round of the PISA, OECD has pre-determined the item parameters to adequately capture distinct types of principal leadership based on the prior rounds of PISA, a four-factor model of school leadership. These four factors were computed and derived by the OECD based on the item-response theory (IRT) scaling. These leadership dimensions included curriculum development (denoted by LEADCOM), instructional leadership (LEADINST), professional development (LEADPD), and teachers' participation (LEADTCH). We also tested these combinations of items in the CFA four-factor framework, and we obtained a reasonably well-fitted model. For our regression analyses, we integrated these dimensions in our estimates. The summary statistics of these variables is shown in Appendix Table 2.

Student assessment and evaluation. Principals were also asked about their usage of tools to monitor the practice of teachers in the school, i.e., whether they use of tests or assessments of student achievement, teacher peer review, internal classroom observations, and classroom evaluations by persons external to the school (SC032). Moreover, our models included the frequency of deployment of student assessments. These are on mandatory and non-mandatory tests, teacher-developed tests, and teachers' judgmental ratings. If respondents showed that there is more than one occurrence of these tests, principals were also asked to differentiate how are standardized, and teacher-developed tests are used (i.e., "to guide students' learning, to inform parents about their child's progress among other things", from the OECD 2015 Questionnaires.). In general, we find that the usage of standardized tests is more unidimensional across principals, as evidence by Cronbach's alpha equal to 0.8829. The average inter-item correlation is 0.4072. Teacher developed tests have a reasonable internal consistency, with α equal to 0.7209 and inter-item correlation equal to 0.1901. These are in section SC035 of the survey. Using these preliminary indicators, we developed two measures based on how these tests is by the schools based on the EFA-CFA checks.

For standardized tests, two purposes generally emerged: one indicating information for decision making (i.e., “inform parents about their child’s progress, “to make decisions about students’ retention,” to make judgments about teachers’ effectiveness,” “to guide students' learning” and “ to award certificates to students.” The other dimension described practices of comparison, i.e., “compare the school to the district, state, or national performance,” “monitor the school’s progress from year to year,” and “to compare the school with other schools.” The fit indices yielded a reasonable fit for the full sample. We label these two factors, STANTEST1 and STANTEST2 respectively, in our succeeding analyses. For teacher-developed tests, we did not find reasonable uni-dimensionality with regards to purpose. This finding is expected as there is high variability with teacher-developed tests. These vary within schools, too.

Table 1 Summary statistics of the item components of parental involvement in the principal questionnaire

CODE	Full					Private Independent			Private Government-dependent			Public		
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
SC063Q02NA	16,096	0.97	0.17	0	1	1,362	0.98	0.14	1,479	0.99	0.12	12,279	0.97	0.16
SC063Q03NA	16,089	0.92	0.27	0	1	1,362	0.95	0.22	1,482	0.95	0.22	12,268	0.90	0.29
SC063Q04NA	16,044	0.78	0.41	0	1	1,352	0.63	0.48	1,480	0.71	0.45	12,239	0.80	0.40
SC063Q06NA	16,046	0.90	0.30	0	1	1,358	0.93	0.25	1,479	0.91	0.29	12,239	0.90	0.30
SC063Q07NA	16,011	0.76	0.43	0	1	1,356	0.75	0.43	1,472	0.78	0.42	12,222	0.76	0.43
SC063Q09NA	16,000	0.70	0.46	0	1	1,356	0.54	0.50	1,476	0.55	0.50	12,216	0.74	0.44

Note: Definition of items (taken from the PISA 2015 questionnaire) are supplied below. Note that the items are recoded in a such a way that 0 implies NO, and 1 imply YES. The means automatically generalize the proportion of involvement in percentage terms.

SC063Q02NA Our school provides a welcoming and accepting atmosphere for parents to get involved.

SC063Q03NA Our school designs effective forms of school-to-home and home-to-school communications about school programs and students' progress.

SC063Q04NA Our school includes parents in school decisions.

SC063Q06NA Our school provides information and ideas to families about how to help students at home with homework and other curriculum-related activities, decisions, and planning.

SC063Q07NA Our school identifies and integrates resources and services from the community to strengthen school programs, family practices, and student learning and development.

SC063Q09NA There is federal, state, or district legislation on including parents in school activities.

Source: *http://www.oecd.org/pisa/data/CY6_QST_MS_SCQ_CBA_Final.pdf*.

School Autonomy. School autonomy is assessed in the survey through 12 items. Principals are asked who has considerable authority for hiring teachers, setting salaries, formulating the budget, managing resources and designing the curriculum, among others. Four derived indicators were taken from these 12 items, RESPCUR, the responsibility of the school staff with issues relating to curriculum and assessment, and RESPRES, an index of relative responsibility of staff in managing school resources. Both indices were standardized with a mean of 0 and a standard deviation of 1. The overall index school autonomy, SCHAUT, was computed as the percentage of the items for which school staff, teachers or the school governing board have the most responsibility (in Annex A of the PISA Technical Background). On the other hand, TEACHPART, teacher participation is a simple sum of the number of items where teachers have the most authority.

We also performed analyses of distinguishing internal and external evaluation practices of schools, defined below:

Internal and external evaluation results[4]. Sections SC040 and SC041 ask if and how schools implemented internal and external evaluation results. The former asks whether the most recent internal evaluation results yielded any program implementation in various areas such as educational staffing, curricular implementation, quality of teaching and learning, parental engagement, teachers' professional development, student co-curricular actives, and school equity among others. Aside from responding "yes," principals may respond "no" if they declare that they did not choose to implement measures if the results are already satisfactory or due to some other reason. While we found a high level of uni-dimensionality in terms of response

[4]PISA 2015 definitions as further explained in the survey instrument:
"Internal school evaluation: Evaluation as part of a process controlled by a school in which the school defines which areas are judged; the evaluation may be conducted by members of the school or by persons/institutions commissioned by the school."
"External school evaluation: Evaluation as part of a process controlled and headed by an external body. *The school does not define the areas which are judged*." (emphasis added).

(α=0.78) and the possibility to reduce it to a single principal component, we chose not to, as to tease out which specific internal evaluation measure relates to the school level-outcomes. The correlation among these components is also low.

The latter, on the other hand, explores how schools used external evaluation information to trigger changes in various areas. These included changes in school policies, planning for specific action in school policies, planning specific activities for improving teaching. Principals responded with yes/no as to report if actions arose from the external evaluation. For our analyses, we ran models, including these components individually.

Other controls. We included the following controls for our analyses: EDUSHORT, to capture the shortage of educational materials. STAFFSHORT, an index to capture the shortage of instructional staff. To capture teacher quality, we include PROATCE, an index to capture the proportion of teachers in a school who are fully certified with teaching qualifications.

Moreover, we distinguish between different types of schools, SCHLTYPE. PISA reports whether a school is privately independent, private, but government-dependent or a public school. The student-teacher ratio is reported through the variable STRATIO.

Analysis

Basic descriptives. Table 1 at the appendices displays the summary statistics. In general, we do not find strong correlations among our explanatory variables. There are, however, moderate associations among the four dimensions of school leadership. Principal leadership's correlation values ranged from moderate to strong, but our subsequent regression analyses yielded highly reasonable values of variance inflation factors ranging between 2.2 to 2.8, hence further excluding the likelihood that multicollinearity is going to be a problem in our models. Thus,

we believe that these associations discount the presence of very strong multicollinearity across our estimates.

We also computed for the mean values of the components of the learning climate across all countries, as shown in Table 2 (in the appendices), which we performed by disaggregating its components and using the appropriate survey sampling weights. Among the components of the learning climate attributable to teacher management, teachers' resistance to change is the highest (μ=1.98; σ=0.84), while teacher absenteeism is the least (μ=1.79, σ =0.78). Peculiar characteristics of teacher management in each country also emerge. Principals in China reported the most areas of concern, in three out of five areas. These included teachers not meeting individual needs of students (μ=2.59, σ =0.83), staff resistance to change (μ=2.59, σ =1.04), and teachers' strictness (μ=2.6, σ =1.06). It is only in China that teachers' strictness was reported to be among the main hindrance in the learning climate. Teacher absenteeism is also perceived to be hindering the learning climate in Trinidad and Tobago (μ=2.65, σ =0.76), Tunisia (μ=2.57, σ =0.78) and Uruguay (μ=2.56, σ =0.82), as well as in Lithuania (μ=2.59, σ =0.39). It does not seem to be a problem at all in Korea (μ=1.08, σ =0.35). Likewise, Lithuanian principals have the least hindrance to the learning climate among all countries surveyed. In terms of staff resistance, Italian teachers are also perceived to be among the most resistant to change (μ=2.52, σ =0.68), along with China; while teachers in Indonesia have the lowest perceived resistance (μ=1.09, σ =0.31).

Regression Results

Before estimating the HLM models, we tested several econometric specifications with OLS, to check the stability of signs and the magnitude of the beta coefficients and to verify the overall model fit. Owing to the nested nature of schools within countries, we computed for the intraclass correlation coefficients after all the HLM estimates. This technique enabled us to

account for the proportion of variation in the school climate, which is explained by the clustering. Our ICC values across the HLM models ranged from 0.11 to 0.18, implying that principals' observations about the learning climate within their schools are not so much different from those observations of principals in other countries. Moreover, a low ICC implies that there is little variability between the clusters and that a more straightforward random effects estimation will suffice as an estimation strategy.

For purposes of empirical and presentational clarity, we report the estimates from HLM specifications. All calculations were computed with robust standard errors; tests for the variance inflation factor (VIF) yielded values between 2.2 and 2.8 across all specifications. This value indicates a low likelihood of a high correlation among our chosen predictor variables. The adjusted R-squared of our random-effects models also shows a reasonable explanatory variation of the learning climate, which can be accounted for by the explanatory variables ranged from 11.3% to 23.9%. The F-tests also indicate a good fit of the model across all specifications, with p-values below 0.01.

While we generally find somewhat very similar and consistent results among our random-effects models and HLM estimates, we choose to use the HLM to draw our analyses and discussion. Moreover, their many non-responses in some of the individual sections of the questionnaires, and some modules are not available in other countries. This situation led to a slight decrease in the number of school-principal reports from more than 15,000 total schools to about 10,900 in the most restrictive sample included in the full regression analyses.

The role of parental involvement in improving the learning climate:

We find that public schools, in general, have the worst learning climate across more than 60 countries, which we have included in our final sample. In response to this finding, our estimates

show that how parental involvement is a pathway to improve schools' learning environments. We find that four out of the six components captured in the PISA survey are consistent and are robustly associated with the reduction in hindrances in improving the learning climate. We emphasize that our dependent variable across all our specification runs is the extent that learning is hindered due to teacher behavior/management issues, as perceived by the principal.

We begin by analyzing how these individual components of parental involvement relate to the school's learning climate. Our initial HLM results are in Table 2 below. We formulated various specifications where we include other controls one by one pooling all observations where we have complete information. This way, we get to see how magnitude changes among coefficients of parental involvement. We find that the signs are consistent and show no drastic change in terms of their magnitude. We also replicated the full specification model for subsets of public and private schools.

We find that when schools provide a welcoming and accepting environment for parental involvement, it is positively associated with the improvement of the learning climate. Our preliminary analyses show that the average reduction in the worsening of the learning climate associated with a welcoming environment for parents ranges from -0.16 to -0.22 ($\beta_{SC063Q02NA}$). The effect of improving the learning climate is consistent and robust across school types. Adjusting the environment conducive for parental involvement can potentially remedy the worst learning climates due to teacher behavior in most public schools.

Moreover, if the school designs effective communication channels about school programs and students' progress (SC063Q03NA), there are also associated with improvements ranging from -0.15 to 0.20 in the hindrances of the learning climate. The marginal effects computed from specification 5 are shown in Figures 1 and 2 for illustration.

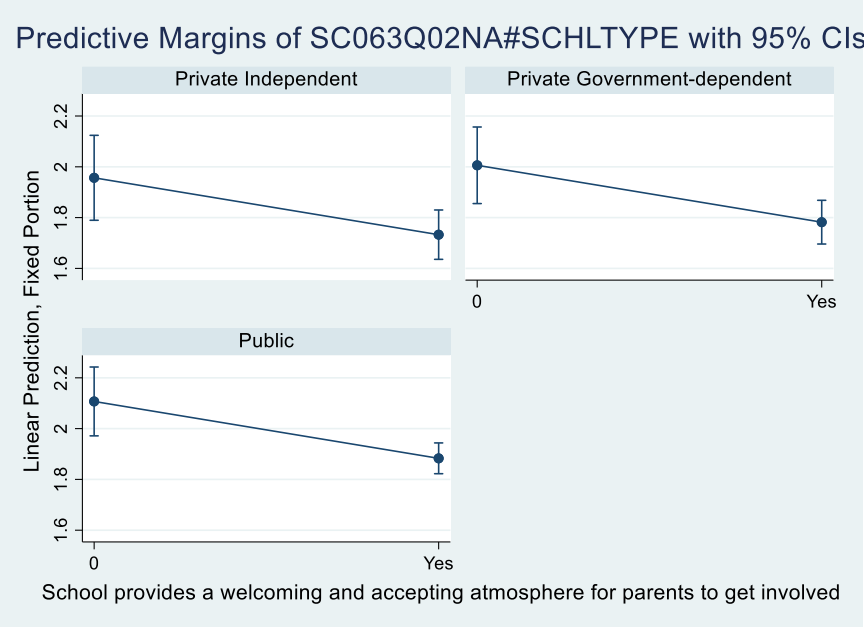

Figure 1 Marginal effects of providing a welcoming and accepting atmosphere to reducing learning hindrances due to teacher behavior and management issues, n=10,505.

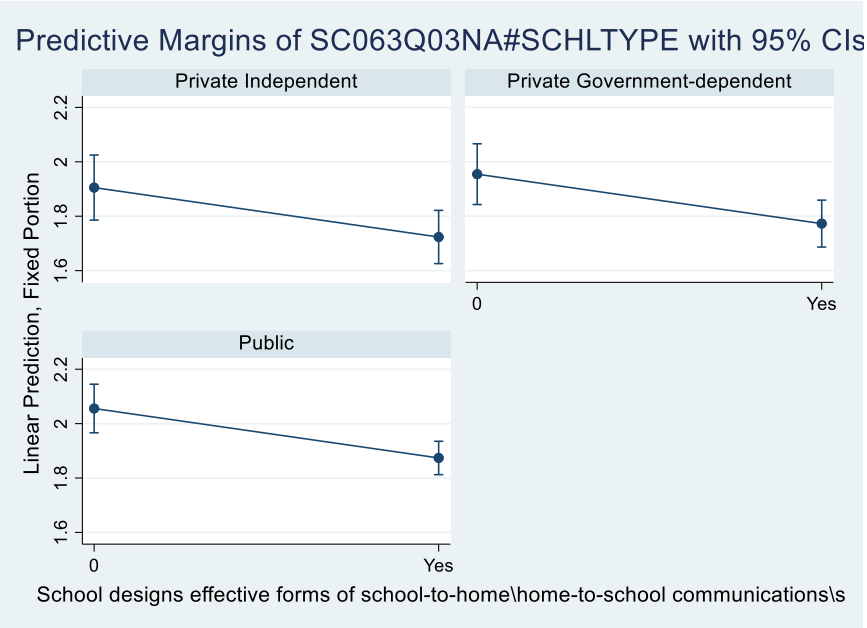

Figure 2 Marginal effects of designs effective forms of school-to-home and home-to-school communications in reducing learning hindrances due to teacher behavior and management issues, n=10,505.

Other parental involvement indicators, however, are not significant. Including parents in school decisions (SC063Q04NA) does not relate to the school climate across all specifications of the

HLM models. The school's provision of information and ideas about how families can help with the child's homework and other curriculum-activities (SC063Q06NA) relates positively to improving the learning climate.

There are also stark observations which we can interpret from the regression estimates. While many of the parental involvement indicators are significant for the pooled models (specifications 1 to 5) and the public schools, only one parental indicator is significant among the private schools, i.e., the school resource integration to strengthen school programs. The rest of the other parental involvement indicators matter mostly for public schools, and the magnitudes are more significant.

Among school leadership indicators, only LEADCOM (the principal's leadership in framing and communicating school goals and curricular development) relates to the reduction in the hindrances in the learning climate, although its magnitude is lower than those of parental involvement.

The divide between private and public schools is evident. The adoption of standardized tests for practices of comparison (STANTEST2) is associated with lower hindrances in the learning climate among private schools, twice as much as in public schools. Moreover, large class sizes (CLSIZE) in private schools do not significantly relate to the learning climate hindrance.

Table 2 Hierarchical Linear Modeling (HLM) estimates of that the extent that learning is hindered due to teacher behavior/management issues.

Variables	Pooled 1	Pooled 2	Pooled 3	Pooled 4	Pooled 5	Public Schools Only	Private Schools Only
1.SC063Q02NA	-0.158***	-0.199***	-0.195***	-0.224***	-0.224***	-0.231***	-0.165
	(0.0498)	(0.0549)	(0.0550)	(0.0603)	(0.0605)	(0.0715)	(0.107)
1.SC063Q03NA	-0.197***	-0.176***	-0.154***	-0.180***	-0.182***	-0.204***	-0.0347
	(0.0254)	(0.0277)	(0.0304)	(0.0380)	(0.0380)	(0.0398)	(0.0854)
1.SC063Q04NA	-0.0132	-0.0224	-0.0229	-0.00646	-0.00486	-0.0329	0.0478
	(0.0168)	(0.0150)	(0.0153)	(0.0187)	(0.0192)	(0.0229)	(0.0480)
1.SC063Q06NA	-0.106***	-0.101***	-0.0906***	-0.0886**	-0.0872**	-0.0988***	0.00243
	(0.0245)	(0.0283)	(0.0294)	(0.0356)	(0.0356)	(0.0372)	(0.0806)
1.SC063Q07NA	-0.0730***	-0.0819***	-0.0728***	-0.0773***	-0.0767***	-0.0621***	-0.0942***
	(0.0141)	(0.0158)	(0.0169)	(0.0183)	(0.0182)	(0.0198)	(0.0333)
1.SC063Q09NA	0.0555***	0.0174	0.0239	0.0211	0.0195	0.0241	-0.0175
	(0.0194)	(0.0181)	(0.0184)	(0.0201)	(0.0202)	(0.0223)	(0.0396)
LEADCOM			-0.0624***	-0.0681***	-0.0680***	-0.0491***	-0.107**
			(0.0162)	(0.0161)	(0.0161)	(0.0145)	(0.0495)
LEADINST			0.00974	0.0120	0.0117	0.0100	-0.0114
			(0.0128)	(0.0128)	(0.0129)	(0.0137)	(0.0251)
LEADPD			-0.00133	-0.00393	-0.00402	-0.00917	0.0140
			(0.0111)	(0.0120)	(0.0120)	(0.0117)	(0.0193)
LEADTCH			0.00249	0.00638	0.00658	-0.00401	0.0430
			(0.0121)	(0.0110)	(0.0109)	(0.0120)	(0.0317)
xstantest1				0.0379	0.0387	0.0455	0.0145
				(0.0282)	(0.0281)	(0.0304)	(0.0478)
xstantest2				-0.0728***	-0.0725***	-0.0640**	-0.120***
				(0.0230)	(0.0230)	(0.0264)	(0.0394)
RESPCUR					-0.0139	-0.0100	-0.0351*
					(0.0102)	(0.0123)	(0.0200)
RESPRES					0.00562	0.00690	0.0136
					(0.0146)	(0.0112)	(0.0308)
SCHAUT		-0.0162	-0.0164	-0.0214	-0.0153	0.0693	-0.137
		(0.0595)	(0.0623)	(0.0643)	(0.0705)	(0.0663)	(0.188)
TEACHPART		0.00424	0.00395	0.00305	0.00385	-0.00631	0.0186*
		(0.00481)	(0.00457)	(0.00458)	(0.00481)	(0.00545)	(0.00965)
EDUSHORT		0.111***	0.111***	0.107***	0.107***	0.100***	0.121***
		(0.0121)	(0.0123)	(0.0139)	(0.0139)	(0.0155)	(0.0213)
PROATCE		-0.0313	-0.0163	0.00128	0.000525	-0.0135	0.0808
		(0.0317)	(0.0325)	(0.0337)	(0.0337)	(0.0401)	(0.0546)
2.SCHLTYPE		0.0569	0.0407	0.0487	0.0493		0.0553
		(0.0490)	(0.0512)	(0.0460)	(0.0441)		(0.0426)
3.SCHLTYPE		0.177***	0.157***	0.148***	0.150***		
		(0.0433)	(0.0453)	(0.0429)	(0.0449)		
CLSIZE		0.00412***	0.00451***	0.00519***	0.00529***	0.00594***	0.00197
		(0.00133)	(0.00125)	(0.00144)	(0.00142)	(0.00134)	(0.00394)
STRATIO		0.00234**	0.00242**	0.00264**	0.00264**	0.00197	0.00141
		(0.00115)	(0.00114)	(0.00128)	(0.00126)	(0.00135)	(0.00203)
Constant	2.325***	2.112***	2.070***	2.099***	2.085***	2.264***	1.906***
	(0.0703)	(0.106)	(0.102)	(0.110)	(0.108)	(0.102)	(0.213)
Observations	15,708	12,572	12,109	10,516	10,505	8,520	1,985
Number of countries	69	64	64	63	63	63	63

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

The role of parental involvement in fostering socially inclusive learning environments.

In the previous section, our results show that public schools experience the gravest hindrances in improving the learning climate-related to teacher issues. In this section, we extend our analyses within a subset of public schools where learning difficulties are likely to be more noticeable. PISA asked principals the percentage of students in their school (1) whose heritage language is different from the test language, (2) who have special needs, and (3) who come from economically disadvantaged homes.

One study has indicated that language barriers contribute to challenges in adjusting to the school environment, as in the case of a different language spoken at home (Verwiebe & Riederer, 2013). PISA also has limited information about students in schools with special education needs (SEN) and there are also limited guidelines for each country on the extent SEN students can participate based on the OECD's exclusion criteria (LeRoy et al., 2018). Not all schools have the same level of preparation of students with SEN's. As such, discussions on equity and educational inclusion make it difficult. In this section, we attempt to illustrate how such a share of student enrollment relates to the learning climate. We are also interested in the learning climate among schools with students coming socioeconomically disadvantaged homes, so we also included this in our estimates.

Below we present six HLM estimates performed within a subset of public schools across our sample countries whose share of the student enrollment exceeds 20% and 50% in the categories mentioned earlier. The ICC values remain below 0.30 in most of the specifications, indicating

that principals in these subsets of public schools do not perceive their schools to be very different from observations of principals in other countries.

We start with understanding the principal role leadership in these instances, in Table 3. We find that the principal's leadership in framing and communicating school goals and curricular development to the school (LEADCOM) is associated with a reduction in the extent that learning is hindered by teacher behavior and management issues. In other words, this aspect of principal leadership is significant among principals whose school has a large proportion of students speaking a different language from the language of instruction, as well as schools with students with a high proportion of students coming from socioeconomically disadvantaged homes. We also find principals' promotion of instructional improvements and professional development among teachers (LEADPD) to be significantly associated with a decrease in the learning hindrances among the public schools with more than 20 percent of students with SEN's. Above 50 percent, however, the effect goes away. Coincidentally, in this level, schools providing a welcoming and accepting atmosphere for parents to get involved (SC063Q02NA) substantially reduced the barriers to learning among public schools with more than 50 percent of students with SEN's. The relative level of responsibility of school staff in issues relating to curriculum and assessment (RESPCUR) is positively associated with the decrease in the hindrance in the learning climate among public schools with a high proportion of non-native language speakers, implying that RESPCUR is a possible mechanism to improve the learning climate. Consistent with our expectations, we find larger class sizes (CLSIZE) and shortage of educational materials (EDUSHORT) both exacerbate the hindrance of productive learning environment. They are consistent across all our specifications. We also find similar patterns about parental involvement in its role in enhancing the learning climate among these schools who are likely to be facing social inclusion challenges. The inclusion of parents in decision making (SC063Q04NA) is particularly vital for the learning climate in public schools with

many students from economically disadvantaged homes, as well as schools' identification and integration of community resources (SC063Q07NA).

Table 3 HLM estimates on subsets of schools grouped by the proportion of students coming from different social groups

VARIABLES	Public with proportion of different language >20%	Public with proportion of different language >50%	Public with students with special needs >20%	Public with students with special needs >50%	Public with students from socioeconomically disadvantaged homes >20%	Public with students from socioeconomically disadvantaged homes >50%
1.SC063Q02NA	-0.242***	-0.271**	-0.265	-0.401***	-0.217***	-0.275***
	(0.0795)	(0.114)	(0.180)	(0.146)	(0.0528)	(0.0988)
1.SC063Q03NA	-0.170***	-0.179***	-0.242***	-0.124*	-0.147***	-0.182***
	(0.0461)	(0.0478)	(0.0596)	(0.0696)	(0.0388)	(0.0519)
1.SC063Q04NA	-0.0580*	-0.0561	-0.0259	-0.0308	-0.0851***	-0.0883**
	(0.0337)	(0.0407)	(0.0491)	(0.0529)	(0.0265)	(0.0387)
1.SC063Q06NA	-0.0648	-0.0852	-0.181**	-0.116	-0.0749**	-0.0846
	(0.0475)	(0.0575)	(0.0846)	(0.0717)	(0.0327)	(0.0616)
1.SC063Q07NA	-0.0538*	-0.0543	-0.0967***	-0.0811*	-0.0574***	-0.0606*
	(0.0310)	(0.0350)	(0.0323)	(0.0449)	(0.0216)	(0.0312)
1.SC063Q09NA	0.0772***	0.0789***	0.0517	0.0654	0.0652**	0.0627*
	(0.0293)	(0.0253)	(0.0440)	(0.0490)	(0.0294)	(0.0362)
LEADCOM	-0.0636***	-0.0489*	-0.0467	-0.0602	-0.0424**	-0.0545*
	(0.0221)	(0.0274)	(0.0290)	(0.0396)	(0.0207)	(0.0299)
LEADINST	-0.00163	-0.0202	0.0114	0.000366	0.00733	0.0217
	(0.0243)	(0.0269)	(0.0276)	(0.0335)	(0.0160)	(0.0240)
LEADPD	-0.0253	-0.0187	-0.0519*	-0.0253	-0.0133	-0.00109
	(0.0199)	(0.0211)	(0.0267)	(0.0313)	(0.0172)	(0.0226)
LEADTCH	0.00409	0.0189	-0.00203	-0.0213	-0.0101	-0.00430
	(0.0171)	(0.0187)	(0.0243)	(0.0357)	(0.0156)	(0.0188)
XSTANTEST1	0.0889	0.119*	0.0911	0.108	0.0102	0.0378
	(0.0568)	(0.0628)	(0.0587)	(0.0700)	(0.0391)	(0.0572)
XSTANTEST2	-0.0510	-0.0832*	-0.0303	0.0478	-0.0557	-0.0193
	(0.0491)	(0.0466)	(0.0697)	(0.0986)	(0.0354)	(0.0435)
RESPCUR	-0.0321**	-0.0279*	-0.0123	0.0333	-0.0249	-0.0177
	(0.0160)	(0.0163)	(0.0243)	(0.0323)	(0.0188)	(0.0259)
RESPRES	0.0201	0.0200	0.0188	0.0429	0.0119	0.0352
	(0.0211)	(0.0172)	(0.0197)	(0.0265)	(0.0147)	(0.0247)
SCHAUT	0.135	0.219*	-0.0429	-0.0666	0.111	-0.0783
	(0.117)	(0.131)	(0.163)	(0.207)	(0.0917)	(0.121)
TEACHPART	-0.00623	-0.00744	-0.000916	0.00717	-0.00851	-0.00885
	(0.00877)	(0.00863)	(0.0135)	(0.0165)	(0.00754)	(0.00984)
EDUSHORT	0.0967***	0.0963***	0.119***	0.127***	0.0745***	0.0665***
	(0.0204)	(0.0216)	(0.0270)	(0.0382)	(0.0151)	(0.0179)
PROATCE	-0.0441	-0.0368	-0.0102	-0.0660	-0.0157	-0.0509
	(0.0431)	(0.0524)	(0.0731)	(0.0930)	(0.0523)	(0.0681)
CLSIZE	0.00640***	0.00608***	0.00759***	0.00345	0.00550***	0.00676***
	(0.00153)	(0.00156)	(0.00178)	(0.00210)	(0.00145)	(0.00173)
STRATIO	0.00115	0.000798	0.00264	0.00623*	0.00225	0.00173
	(0.00178)	(0.00217)	(0.00272)	(0.00337)	(0.00153)	(0.00187)
Constant	2.142***	2.137***	2.383***	2.333***	2.211***	2.380***
	(0.126)	(0.156)	(0.169)	(0.214)	(0.132)	(0.183)

Observations	3,338	2,629	2,052	1,130	4,816	2,348
Number of groups	62	62	61	60	63	62

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

Involvement and leadership across various schools' quality assurance mechanisms

We extended our models to understand how parental involvement changes across schools with different quality assurance orientation and different levels of autonomy. The OECD recognizes that schools in some countries have different levels of autonomy which may depend on the level of government decentralization (Hanushek et al., 2013) which likely shapes the impact of school leadership and parental involvement with the learning climate.

PISA has a composite indicator of school autonomy (SCHAUT) computed based on the number of responsibilities a school can express direct authority. We divided schools into low (SCHAUT<0.40), medium (between 0.40 and 060) and high (above 0.60) levels of autonomy and performed HLM regressions. Moreover, we also have extensions of the model based on the school's internal and external quality assurance accountability adoption. Schools have reported whether they are required by law or if they have initiated their own external and/or internal school evaluation programs.

The full results are reported in Table 4 below.

We find that LEADCOM is significant for schools with low and medium levels of school autonomy, as well as for schools with mandatory and self-initiated internal and external accountability reporting. Its magnitude is also the highest among schools with no external evaluation, implying that principals' leadership in communicating school goals and curricular development have a central role in building the capacity for school improvement through self-evaluation (Paletta et al., 2020). Another important finding is that school autonomy (SCHAUT

is highly significant in enhancing the learning climate for schools with self-initiated external evaluation, as well as those with both self-initiated external and internal evaluation. This result can possibly imply that the conduct of mandatory or external accountability mechanisms in schools may have insufficient mechanisms to take into account improvements in the school's learning environment, such as failing to recognize internal accountability mechanisms (Newmann et al., 1997), or principals facing pressure or conflicts with other stakeholders (Gonzalez & Firestone, 2013).

As for parental involvement, the presence of state and district legislation to include parents in decision making (SC063Q07NA) is negatively influencing the learning climate in schools with high levels of autonomy. This is somehow related to an earlier finding that teachers feel that their professional roles are encroached by parents (Addi-Raccah & Ainhoren, 2009; Bæck, 2010), which is potentially undermining the school's learning climate.

The school's identification and integration of community resources to strengthen school programs (SC063Q07NA) is significantly associated with the decrease in the barriers to improvement in the learning climate, especially among schools with self-initiated external evaluation, as well as with self-evaluation schemes. The finding is not surprising given that this is a parental involvement dimension which is externalized and oriented towards communities. In this way, it can help principals integrate it to school management strategies (H. A. Lawson & Sailor, 2000; H. Lawson & Briar-Lawson, 1997) .

Table 4 HLM estimates on subsets of schools grouped by levels of school autonomy and the existence of internal and external accountability mechanisms.

	School autonomy levels (SCHAUT levels)			Internal Evaluation (IE)/ Self-Evaluation		External Evaluation (EE)			IE x EE	
VARIABLES	School autonomy medium	School autonomy low	School autonomy high	Schools with mandatory Internal Evaluation	School-initiated Internal evaluation	Schools with mandatory External Evaluation	Schools with self-initiated External Evaluation	Schools with no External evaluation	Schools with mandatory internal and external evaluation	Self-initiated both internal and external
1.SC063Q02NA	-0.261***	-0.387*	-0.186**	-0.176**	-0.219***	-0.257***	-0.144	-0.200*	-0.237***	-0.251*
	(0.0723)	(0.235)	(0.0900)	(0.0896)	(0.0809)	(0.0512)	(0.124)	(0.121)	(0.0748)	(0.135)
1.SC063Q03NA	-0.200***	-0.133	-0.184***	-0.167***	-0.229***	-0.177***	-0.377**	-0.133**	-0.173***	-0.226
	(0.0690)	(0.0870)	(0.0447)	(0.0448)	(0.0625)	(0.0474)	(0.157)	(0.0615)	(0.0504)	(0.227)
1.SC063Q04NA	-0.00423	-0.0207	-0.0451	0.00318	-0.0187	-0.0650***	0.157*	0.0344	-0.0346	0.154*
	(0.0498)	(0.0998)	(0.0276)	(0.0455)	(0.0295)	(0.0248)	(0.0931)	(0.0402)	(0.0492)	(0.0903)
1.SC063Q06NA	-0.251***	-0.0683	-0.0348	-0.135***	-0.0470	-0.0819**	-0.328***	0.0298	-0.122**	-0.443***
	(0.0614)	(0.0925)	(0.0337)	(0.0440)	(0.0482)	(0.0388)	(0.110)	(0.0593)	(0.0571)	(0.136)
1.SC063Q07NA	-0.0315	0.0101	-0.0928***	-0.0898***	-0.0587*	-0.0685***	-0.180***	-0.0428	-0.0683**	-0.162**
	(0.0372)	(0.0496)	(0.0296)	(0.0247)	(0.0354)	(0.0240)	(0.0657)	(0.0404)	(0.0312)	(0.0778)
1.SC063Q09NA	-0.0471	-0.0525	0.0668**	0.0257	0.0200	0.0396*	0.0174	-0.0509	0.0398	-0.0507
	(0.0498)	(0.0577)	(0.0261)	(0.0278)	(0.0353)	(0.0233)	(0.0487)	(0.0512)	(0.0314)	(0.0745)
LEADCOM	-0.0489**	-0.137***	-0.0223	-0.0738***	-0.0622**	-0.0503***	-0.0637**	-0.111***	-0.0552***	0.0204
	(0.0232)	(0.0320)	(0.0144)	(0.0165)	(0.0289)	(0.0177)	(0.0285)	(0.0309)	(0.0172)	(0.0343)
LEADINST	0.0258	-0.0289	0.00185	0.0272	-0.00445	0.00396	-0.0119	0.0171	0.0211	-0.0687
	(0.0271)	(0.0377)	(0.0180)	(0.0175)	(0.0191)	(0.0141)	(0.0350)	(0.0295)	(0.0184)	(0.0464)
LEADPD	-0.0218	0.0298	-0.0100	-0.0104	-0.00201	-0.00410	-0.0419	0.0208	-0.0149	-0.0741*
	(0.0160)	(0.0319)	(0.0138)	(0.0140)	(0.0173)	(0.0129)	(0.0332)	(0.0187)	(0.0135)	(0.0419)
LEADTCH	-0.0292	0.0240	0.00387	0.0131	-0.00119	0.00302	0.0228	-0.00118	0.000865	0.00774
	(0.0250)	(0.0334)	(0.0136)	(0.0134)	(0.0150)	(0.0149)	(0.0309)	(0.0206)	(0.0172)	(0.0360)
SCHAUT				0.0709	-0.0634	0.0821	-0.309*	-0.0808	0.145	-0.407**
				(0.0862)	(0.0947)	(0.0732)	(0.161)	(0.150)	(0.0990)	(0.204)
TEACHPART	-0.00828	0.00133	-0.00281	0.00452	-0.000862	-0.00348	0.0211	0.00915	0.00126	0.0101
	(0.0105)	(0.0309)	(0.00585)	(0.00512)	(0.00748)	(0.00478)	(0.0150)	(0.0119)	(0.00556)	(0.0193)
EDUSHORT	0.0840***	0.0901***	0.116***	0.107***	0.110***	0.112***	0.126***	0.0954***	0.110***	0.112***
	(0.0203)	(0.0347)	(0.0164)	(0.0138)	(0.0209)	(0.0147)	(0.0272)	(0.0236)	(0.0129)	(0.0391)

PROATCE	-0.0197	0.0945	-0.0528	0.0577	-0.0485	0.0246	-0.0327	-0.0556	0.0476	-0.0388
	(0.0737)	(0.0898)	(0.0521)	(0.0428)	(0.0443)	(0.0443)	(0.0789)	(0.0621)	(0.0555)	(0.107)
xstantest1	0.0405	0.0261	0.0564	0.0401	0.0546	-0.00238	0.143*	0.0665	0.0140	0.184**
	(0.0508)	(0.0648)	(0.0418)	(0.0372)	(0.0360)	(0.0322)	(0.0822)	(0.0702)	(0.0399)	(0.0789)
xstantest2	-0.0803	-0.134*	-0.0353	-0.0801**	-0.0428	-0.0431*	-0.134**	-0.139**	-0.0653	-0.0773
	(0.0493)	(0.0722)	(0.0355)	(0.0360)	(0.0373)	(0.0253)	(0.0598)	(0.0669)	(0.0417)	(0.0964)
2.SCHLTYPE				-0.0204	0.0966*	-0.00101	0.148*	0.101	-0.00101	0.127
				(0.0652)	(0.0538)	(0.0481)	(0.0765)	(0.134)	(0.0718)	(0.0900)
3.SCHLTYPE				0.0968	0.164***	0.109**	0.0914	0.285**	0.0721	0.0304
				(0.0697)	(0.0508)	(0.0454)	(0.0724)	(0.111)	(0.0843)	(0.0946)
CLSIZE	0.00441**	0.00759**	0.00644***	0.00484***	0.00522**	0.00559***	-0.000596	0.00490	0.00463***	-0.00830**
	(0.00198)	(0.00329)	(0.00161)	(0.00156)	(0.00218)	(0.00140)	(0.00268)	(0.00353)	(0.00172)	(0.00409)
STRATIO	0.00358**	0.00303	0.000793	0.00245**	0.00180	0.00257*	-0.000719	0.00515***	0.00219*	0.000670
	(0.00176)	(0.00316)	(0.00211)	(0.00114)	(0.00195)	(0.00131)	(0.00386)	(0.00172)	(0.00130)	(0.00720)
RESPCUR	-0.0164	-0.113	-0.00694							
	(0.0241)	(0.248)	(0.0139)							
RESPRES	-0.0985	-0.221	0.0189*							
	(0.0625)	(0.291)	(0.0112)							
Constant	2.484***	1.941***	2.194***	2.041***	2.152***	2.127***	2.747***	1.820***	2.122***	3.187***
	(0.118)	(0.470)	(0.121)	(0.170)	(0.167)	(0.117)	(0.345)	(0.241)	(0.150)	(0.416)
Observations	2,466	1,223	4,831	4,831	5,120	6,998	1,235	2,190	3,495	714
Number of groups	58	51	62	63	63	63	63	61	63	62

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

Discussion and limitations

In this study, we set out to examine how parental involvement links with the school's learning climate in a broad set of countries. From our simple conceptualization of the learning as the 'quality and character of school life' (Cohen et al., 2009) or the relational-social character of the schools with parents and the community (Maxwell et al., 2017). Our regression results from our multi-level framework further underscore the interdependencies between parental engagement and school leadership (Cohen et al., 2009; Thapa et al., 2013). Furthermore, our findings are especially relevant for schools in the public sector—they stand with the best potential to improve the learning climate though parental involvement.

We spell out our work's contribution in understanding the learning climate via two ways:

First, is methodological unpacking which determined which among the generalized forms of parental involvement are associated with improvements in the learning climate, especially those pertaining to teacher management. We extended our model to segments of schools with students coming from other social groups. Our findings about specific types of parental involvement are further reinforced: that a welcoming environment for parental involvement matter considerably for schools with SEN's and the importance legislation for including parents in school activities for schools with considerable non-native tongue speakers. Moreover, we also find evidence that parental involvement is also not always positive. Legislation on parental involvement is negatively related to the learning climate among schools with high autonomy—a likely indication that parental roles may have tensions with teachers. In general, we find consistency among the results; there are of course emergent patterns which can be further investigated at the sub-national or regional levels by other scholars in the field.

Second, we supported and revealed in our analysis that among the school leadership domains, the principal's leadership in framing and communicating school goals and curricular

development to the school is among the most commonly statistically significant in our models. It matters for educational inclusiveness. In practical terms, the measure puts together the principal's use of student performance results, the congruency of teacher professional development activities with the teaching goals, teachers' work habits and the discussion of academic objectives with teachers during faculty meetings in the exercise school management (Schulz, 2003). We think that these construct(s) about principal leadership is something that can be generalized and where policy implications can be directly drawn, most especially for practitioners.

Limitations and future research

Research on learning climate is undoubtedly going to be more relevant in the years ahead, cutting across a wide variety of themes of interest to policymakers, scholars and practitioners. Our research recognizes that our present research design has limitations which definitely provides many opportunities for further work.

First, our empirical work draws only on cross-sectional data surveyed by the OECD in 2015. This situation raises two critical issues on the study of learning climate and parental involvement on our end. One, this limits us to draw causal inferences and allows us at best to draw correlational and associations among the observable characteristics within the school. Further studies can consider experimental and/or quasi experimental approaches regarding parental involvement.

Two, as our study and related literature shows, learning climate is both complex and a dynamic character of our schools. Hence, cross-sectional designs can only afford a static and snap-shot view in a specific unit of observation. Our measure of the learning climate, at worst, is just one of the proxies of varieties of measurement of learning climate within the school which can be generalized for all PISA participants. The learning climate attributable to student behavior

definitely needs further attention. While an advantage of the PISA's sampling design is its generalizability and comparability within sub-national groups or categories (or even among education systems), it remains operationally challenging to draw causal inferences about the learning climate. Future empirical work may consider longitudinal designs, which draws on depth and changes over time. However, despite these constraints and limitations, our work has shown essential findings in the field about how the learning climate varies within education systems, along with parental involvement and school management.

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Appendices

A. Deriving the dependent variable

There were two possible factors which can represent the learning climate within schools: (1) pertaining to student behavior (LEARNHIND) and (2) pertaining to teacher behavior (TEACHIND). For these items, we performed Bartlett's test for sphericity and have also computed for the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. For both, we reject that the null hypothesis that the variables are not inter-correlated. Both measures of the learning climate, we obtained Cronbach's alpha of above 0.8, implying a good measure of internal consistency.

The average inter-item correlations are 0.48 and 0.47 for both factors. However, the comparative fit index (CFI), Tucker-Lewis Index (TLI) and the root mean square error of approximation (RMSEA) do seem to suggest that a CFA model of the first factor (LEARNHIN) is not as suitable as expected because the RMSEA is at 0.230, well above the 0.08 ideal cut-off. The CFI and TLI indices are also below 0.95, though the standardized root-mean-square residual (RSMR) is only borderline acceptable at 0.078.

As a constructed index in our work, the compositeness of the LEARNHIND may raise issues when it comes to capturing the learning hindrance, even it is still highly correlated with the IRT-based measure developed by PISA.

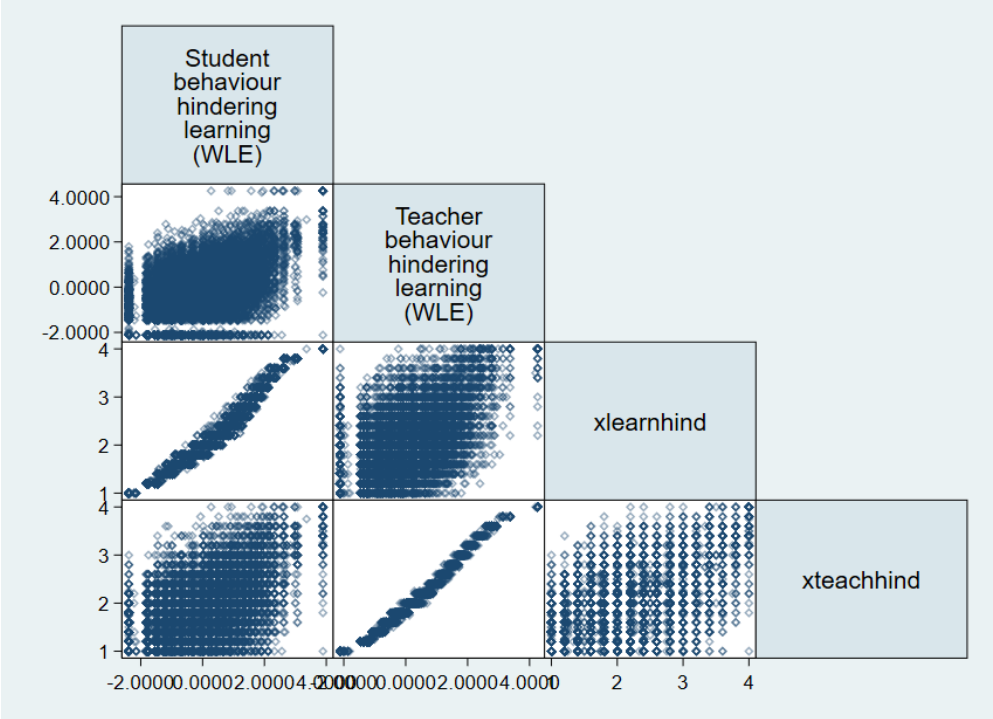

Figure 3 Correlation between our indices, XLEARNHIND and XTEACHHIND

Table 5. Summary Statistics, Interitem correlations, and confirmatory factor statistics for school-level outcomes.

Item Code	Question	Obs	Mean	Std Dev	Interitem correlations and Cronbach's alpha	CFA statistics
SC061Q01TA	Student truancy	16,319	2.28	0.85	Ave. Inter-item correlation: 0.4839 Cronbach's α: 0.8242	RMSEA: 0.230*** CFI: 0.859 TLI: 0.717 SRMR: 0.078
SC061Q02TA	Students skipping classes	16,289	2.20	0.82		
SC061Q03TA	Students lacking respect for teachers	16,278	2.02	0.76		
SC061Q04TA	Student use of alcohol or illegal drugs	16,269	1.59	0.75		
SC061Q05TA	Students intimidating or bullying other students	16,288	1.83	0.69		
SC061Q06TA	Teachers not meeting individual students' needs	16,283	1.96	0.76	Ave. Inter-item correlation: 0.4685 Cronbach's α: 0.8151	RMSEA: 0.052 CFI: 0.991 TLI: 0.982 SRMR: 0.016
SC061Q07TA	Teacher absenteeism	16,320	1.82	0.78		
SC061Q08TA	Staff resisting change	16,270	2.04	0.84		
SC061Q09TA	Teachers being too strict with students	16,278	1.84	0.69		
SC061Q10TA	Teachers not being well prepared for classes	16,284	1.82	0.74		

Note: ***p<0.01. Computed from the 2015 principal survey data for which we have data. The first five variables capture the extent that student-related behavioral issues hinder learning; the next five captures the extent that teacher management/behavior issues hinder learning

Table 6 Summary Statistics, Dimensions of Principal Leadership

Variable	Question	Obs	Mean	Std. Dev.	Min	Max
SC009Q01TA	I use student performance results to develop the school's educational goals.	16,334	2.98	1.08	1	6
SC009Q02TA	I make sure that the professional development activities of teachers are in accordance with the teaching goals of the school.	16,310	3.31	1.25	1	6
SC009Q03TA	I ensure that teachers work according to the school's educational goals.	16,302	3.98	1.31	1	6
SC009Q04TA	I promote teaching practices based on recent educational research.	16,267	3.38	1.39	1	6
SC009Q05TA	I praise teachers whose students are actively participating in learning.	16,276	4.06	1.35	1	6
SC009Q06TA	When a teacher has problems in his/her classroom, I take the initiative to discuss matters.	16,279	4.32	1.33	1	6
SC009Q07TA	I draw teachers' attention to the importance of students' development of critical and social capacities.	16,275	3.99	1.33	1	6
SC009Q08TA	I pay attention to disruptive behavior in classrooms.	16,287	4.87	1.23	1	6
SC009Q09TA	I provide staff with opportunities to participate in school decision-making.	16,261	4.24	1.22	1	6
SC009Q10TA	I engage teachers to help build a school culture of continuous improvement.	16,259	4.38	1.25	1	6
SC009Q11TA	I ask teachers to participate in reviewing management practices.	16,250	3.29	1.36	1	6
SC009Q12TA	When a teacher brings up a classroom problem, we solve the problem together.	16,252	4.62	1.25	1	6
SC009Q13TA	I discuss the school's academic goals with teachers at faculty meetings.	16,306	3.70	1.10	1	6
LEADCOM	SC009Q01TA SC009Q02TA SC009Q03TA SC009Q13TA	16,355	0.18	0.98	-4.83	3.00
LEADINST	SC009Q04TA SC009Q05TA SC009Q07TA	16,121	0.11	0.99	-3.97	2.23
LEADPD	SC009Q06TA SC009Q08TA SC009Q12TA	16,117	0.17	1.05	-3.81	1.81
LEADTCH	SC009Q09TA SC009Q10TA SC009Q11TA	16,092	0.09	1.04	-3.86	2.40

Note: Median Cronbach's alphas: Overall, 0.887; LEADCOM: 0.714; LEADINST: 0.722; LEADPD: 0.781; and LEADTCH, 0.780. Note: We arrived at an RMSEA of 0.078, CFI, and TLI levels of 0.938 and 0.917, respectively; the OECD has also computed scale reliabilities for these composite indicators for each country, and these have resulted in generally reasonable values. The variable LEADCOM has most of the number of Cronbach's alpha below 0.70 (among 13 out of 37 countries), followed by LEADINST (12 countries), LEADPD (six countries), and LEADTCH (only 3). This pattern implies that the index of teacher participation in leadership is most consistent across most countries, while how the school's goals and curricular development are framed and communicated vary the most. This an essential practical dimension of school management because principals across the world employ different managerial techniques in handling school operations.

Table 7 Summary Statistics and Correlation Matrix

Variables	Mean	S.D.	Min	Max	LEADCOM	LEADINST	LEADPD	LEADTCH	xstantest1	xstantest2	RESPCUR	RESPRES	SCHAUT	TEACHPART	SC063Q03NA	SC063Q04NA	SC063Q06NA	SC063Q07NA	SC063Q09NA	r_SC040Q02NA	r_SC040Q03NA	r_SC040Q05NA	r_SC040Q11NA	r_SC040Q12NA	r_SC040Q15NA	r_SC040Q16NA	r_SC040Q17NA	CLSIZE	STRATIO	r_SC041Q01NA	r_SC041Q03NA	r_SC041Q04NA	r_SC041Q05NA	r_SC041Q06NA	SCHLTYPE
LEADCOM	0.18	0.98	-4.83	3.00	1																														
LEADINST	0.11	0.99	-3.97	2.23	0.69	1																													
LEADPD	0.17	1.05	-3.81	1.81	0.48	0.59	1																												
LEADTCH	0.10	1.04	-3.86	2.40	0.55	0.62	0.56	1																											
xstantest1	0.53	0.35	0	1	0.21	0.18	0.14	0.13	1																										
xstantest2	0.40	0.36	0	1	0.19	0.15	0.12	0.13	0.31	1																									
RESPCUR	-0.16	0.98	-1.26	1.48	-0.02	-0.03	-0.1	-0.04	0	-0.05	1																								
RESPRES	-0.02	1.02	-0.80	2.83	0.06	0.04	-0.03	-0.02	0.05	0.01	0.43	1																							
SCHAUT	0.67	0.26	0	1	0.04	0.04	-0.08	-0.02	0.04	-0.04	0.58	0.62	1																						
TEACHPART	3.38	2.36	0	12	-0.01	0.01	-0.08	0.03	-0.04	-0.05	0.42	0.23	0.57	1																					
SC063Q03NA	0.92	0.27	0	1	0.15	0.14	0.07	0.13	0.05	0.06	0.04	0.03	0.05	0.05	1																				
SC063Q04NA	0.78	0.41	0	1	0.16	0.17	0.1	0.19	0.11	0.12	-0.02	-0.09	-0.01	0.08	0.18	1																			
SC063Q06NA	0.90	0.31	0	1	0.15	0.14	0.11	0.13	0.13	0.1	0.01	0.04	0.05	0.02	0.21	0.17	1																		
SC063Q07NA	0.76	0.43	0	1	0.19	0.2	0.12	0.17	0.19	0.14	-0.02	-0.02	0.01	0.03	0.19	0.2	0.27	1																	
SC063Q09NA	0.70	0.46	0	1	0.09	0.1	0.08	0.12	0.09	0.09	-0.13	-0.14	-0.12	-0.04	0.07	0.27	0.1	0.15	1																
r_SC040Q02NA	1.14	0.68	0	2	0.06	0.09	-0.01	0.03	0.04	0.01	0.06	0.11	0.15	0.05	0.07	0.03	0.05	0.03	-0.02	1															
r_SC040Q03NA	1.15	0.62	0	2	0.02	0.05	-0.04	0.01	0	0	0.06	0.07	0.12	0.04	0.05	0.02	0.03	0.01	-0.02	0.46	1													
r_SC040Q05NA	1.13	0.50	0	2	0.04	0.05	-0.02	0.01	-0.01	0.01	0.04	0.07	0.09	0.02	0.05	0.01	0.03	0.01	-0.02	0.41	0.48	1													
r_SC040Q11NA	1.03	0.64	0	2	0.08	0.1	0	0.05	0.04	0.03	0.08	0.08	0.11	0.06	0.14	0.13	0.09	0.08	0.03	0.32	0.31	0.34	1											
r_SC040Q12NA	1.07	0.55	0	2	0.05	0.07	-0.01	0.02	0.01	0.01	0.08	0.09	0.14	0.06	0.07	0.04	0.05	0.05	0	0.4	0.39	0.41	0.36	1										
r_SC040Q15NA	1.10	0.48	0	2	0.02	0.04	-0.03	0	-0.01	0.01	0.05	0.07	0.09	0.02	0.05	0.02	0.04	0.01	-0.01	0.37	0.39	0.48	0.35	0.43	1									
r_SC040Q16NA	1.00	0.65	0	2	0.08	0.1	0.01	0.06	0.04	0.04	0.07	0.1	0.11	0.03	0.1	0.06	0.07	0.08	0.01	0.35	0.36	0.39	0.36	0.37	0.47	1								
r_SC040Q17NA	1.19	0.69	0	2	0.05	0.07	0.01	0.03	-0.02	0	0.05	0.08	0.1	0.04	0.07	0.04	0.06	0.03	-0.02	0.37	0.39	0.36	0.37	0.38	0.4	0.47	1							
CLSIZE	27.18	9.54	13	53	0.07	0.01	0.05	0.01	0.12	0.12	-0.1	-0.09	-0.17	-0.14	0.02	0	0.02	0.05	0.01	-0.09	-0.08	-0.05	-0.02	-0.07	-0.04	-0.05	-0.06	1						
STRATIO	14.30	9.15	1	100	0.12	0.05	0.07	0.06	0.07	0.09	-0.06	-0.03	-0.09	-0.09	0.03	0.03	0	0	0.03	-0.07	-0.07	-0.04	-0.03	-0.08	-0.03	-0.03	-0.06	0.33	1					
r_SC041Q01NA	0.62	0.49	0	1	0.14	0.11	0.07	0.11	0.15	0.13	0.02	0.01	-0.01	0.03	0.06	0.09	0.04	0.09	0.05	-0.08	-0.11	-0.11	-0.05	-0.09	-0.09	-0.05	-0.1	0.09	0.1	1				
r_SC041Q03NA	0.87	0.34	0	1	0.15	0.12	0.07	0.11	0.16	0.11	0.03	0.03	0.06	0.05	0.11	0.13	0.1	0.12	0.05	0	-0.03	-0.03	0.01	-0.02	-0.02	0	-0.02	0.05	0.06	0.37	1			
r_SC041Q04NA	0.87	0.34	0	1	0.15	0.12	0.09	0.11	0.15	0.12	0.01	0.02	0.03	0.03	0.11	0.13	0.11	0.12	0.06	-0.03	-0.04	-0.06	0	-0.02	-0.05	-0.01	-0.03	0.06	0.07	0.34	0.62	1		
r_SC041Q05NA	0.74	0.44	0	1	0.21	0.17	0.12	0.14	0.19	0.15	0.02	0.04	0.03	0.01	0.1	0.11	0.1	0.15	0.04	0.02	0	-0.01	0.04	0.02	-0.03	0.03	0	0.06	0.06	0.35	0.41	0.41	1	
r_SC041Q06NA	0.19	0.40	0	1	-0.04	-0.04	-0.03	-0.04	0.02	0.06	-0.03	-0.02	-0.06	-0.05	-0.03	-0.02	-0.03	-0.03	0.04	-0.05	-0.04	-0.02	-0.05	-0.04	-0.03	-0.02	-0.05	0.02	0.01	0.02	-0.05	-0.03	-0.05	1	
SCHLTYPE	2.72	0.62	1	3	-0.06	-0.02	-0.01	0.03	-0.06	-0.04	-0.23	-0.49	-0.37	-0.07	-0.06	0.13	-0.06	-0.03	0.13	-0.06	-0.05	-0.05	-0.05	-0.04	-0.07	-0.07	-0.06	-0.03	-0.05	-0.03	-0.01	-0.02	-0.05	0	1

Note:

Table 8 Mean values of school climate indicators as computed from the PISA dataset.

Country Identifier	Mean	Mean	Mean	Mean	Mean	*Mean*	Mean	Mean	Mean	Mean	Mean	*Mean*	Sum
	SC061Q01TA	SC061Q02TA	SC061Q03TA	SC061Q04TA	SC061Q05TA	*xlearnhind*	SC061Q06TA	SC061Q07TA	SC061Q08TA	SC061Q09TA	SC061Q10TA	*xteachhind*	n
Albania	1.9	1.62	1.51	1.08	1.36	*1.5*	1.37	1.47	1.53	1.81	1.47	*1.53*	5000
Algeria	2.79	2.04	2.16	1.29	1.68	*2*	1.9	2.42	2.1	1.95	2.22	*2.12*	5000
Australia	2.09	1.97	2.02	1.71	2.05	*1.97*	2.28	1.91	2.22	1.72	1.93	*2.01*	5000
Austria	2.39	2.35	2.08	1.47	2.11	*2.08*	1.78	1.9	2.09	1.79	1.56	*1.83*	5000
Belgium	2.48	2.34	2.32	1.96	2.37	*2.29*	2.05	2.29	2.27	1.92	2.02	*2.11*	5000
Brazil	2.53	2.4	2.39	1.58	1.66	*2.11*	1.95	1.82	2.12	1.69	1.75	*1.87*	5000
Bulgaria	2.33	2.58	2.18	1.68	2.03	*2.17*	1.76	1.69	1.67	1.5	1.85	*1.69*	5000
Canada	2.47	2.25	1.97	1.97	1.91	*2.11*	2.02	1.66	2.09	1.74	1.71	*1.85*	5000
Chile	1.82	1.89	2.14	1.75	1.9	*1.9*	2.22	2.18	2.38	1.96	2.25	*2.2*	5000
Chinese Taipei	1.67	1.72	1.95	1.46	1.66	*1.69*	2.12	1.34	2.27	1.96	2.02	*1.94*	5000
Colombia	2.5	1.89	1.97	1.56	1.8	*1.94*	1.82	1.71	2.06	1.93	1.59	*1.82*	5000
Costa Rica	2.63	2.68	1.99	2.19	2.06	*2.31*	2.16	2.11	2.24	2.1	1.85	*2.09*	5000
Croatia	3.09	2.88	2.52	1.8	1.85	*2.43*	2.1	1.71	2.31	2	2.13	*2.05*	5000
Czech Republic	2.03	2.69	2.2	1.5	1.85	*2.05*	1.74	1.82	1.84	1.78	1.52	*1.74*	5000
Denmark	2.27	1.92	1.95	1.38	1.79	*1.86*	1.92	2.04	1.88	1.61	1.66	*1.82*	5000
Dominican Republic	2.15	2.05	2.1	1.26	1.91	*1.89*	1.97	1.53	1.85	1.94	1.71	*1.8*	5000
Estonia	2.36	2.34	1.94	1.34	1.93	*1.98*	1.95	1.58	1.89	1.72	1.59	*1.75*	5000
Finland	2.18	2.08	2.2	1.51	2.09	*2.01*	2.03	1.86	1.94	1.63	1.7	*1.84*	5000
France	2.41	2	2.01	1.71	1.96	*2.02*	2.03	1.91	2.31	1.99	2.01	*2.05*	5000
Georgia	2.29	2.04	1.61	1.23	1.29	*1.73*	1.51	1.69	1.46	1.32	1.73	*1.56*	5000
Germany	2.23	2.07	2.12	1.89	2.14	*2.09*	1.86	2.3	2.15	1.8	1.98	*2.02*	5000
Greece	2.09	1.91	1.84	1.32	1.63	*1.76*	1.49	1.51	1.65	1.75	1.37	*1.55*	5000
Hong Kong	1.75	1.6	2.06	1.26	1.79	*1.69*	2.26	1.8	2.28	2.02	2.01	*2.07*	5000
Hungary	1.9	1.84	2.05	1.41	1.61	*1.76*	1.74	1.42	1.53	1.61	1.31	*1.52*	5000
Iceland	1.78	1.78	1.91	1.35	1.84	*1.73*	2.07	1.75	1.89	1.51	1.81	*1.81*	5000
Indonesia	2.11	1.74	1.49	1.06	1.21	*1.52*	1.35	1.74	1.09	1.72	1.51	*1.48*	5000
Ireland	2.62	1.94	1.98	1.69	2.03	*2.05*	2	1.91	2.08	1.79	1.87	*1.93*	5000
Israel	2.57	2.31	2.08	1.41	1.44	*1.96*	2.01	2.31	1.86	1.81	1.89	*1.97*	5000
Italy	2.37	2.35	2.05	1.46	1.77	*2*	1.96	1.83	2.52	1.98	2.01	*2.06*	5000
Japan	1.94	1.79	2.07	1.27	1.73	*1.76*	2.14	1.45	2.17	2.11	2.13	*2*	5000
Jordan	2.6	2.12	2.37	1.39	1.9	*2.08*	2.05	2.22	2.2	2.02	2.1	*2.12*	5000
Korea	2.04	1.78	2.36	1.64	1.95	*1.95*	1.86	1.08	1.6	1.83	1.68	*1.61*	5000
Kosovo	2.29	1.87	1.84	1.32	1.61	*1.78*	1.79	1.86	1.91	2.05	1.93	*1.91*	5000
Lebanon	2.01	1.76	1.88	1.27	1.84	*1.76*	1.8	1.94	2.03	1.93	1.86	*1.91*	5000
Latvia	2.31	2.24	2.19	1.44	1.67	*1.97*	1.68	1.38	1.71	1.88	1.61	*1.65*	5000
Lithuania	2.12	1.94	1.93	1.36	1.92	*1.85*	1.67	1.08	1.58	1.41	1.56	*1.46*	5000

Luxembourg	2.39	2.09	2.07	1.82	1.84	*2.04*	1.98	1.86	2.16	1.8	1.82	*1.92*	5000
Macao	2.24	2.02	2.24	2	2.33	*2.17*	2.47	2.27	2.27	2.02	2.32	*2.27*	5000
Malta	1.63	1.53	2.14	1.28	2.07	*1.73*	2.19	1.72	2.11	1.84	1.74	*1.92*	5000
Mexico	2.44	2.16	1.82	1.58	1.77	*1.95*	1.82	1.68	1.79	1.97	1.62	*1.78*	5000
Moldova	2.65	2.28	2.11	1.43	1.99	*2.1*	1.63	1.56	2.04	1.78	1.92	*1.79*	5000
Montenegro	2.65	2.22	2.02	1.28	1.79	*1.99*	1.77	1.76	1.98	1.9	1.66	*1.81*	5000
Netherlands	2.18	2.3	2.18	2.02	2.32	*2.2*	2.61	2.33	2.38	2.18	2.37	*2.37*	5000
New Zealand	2.31	2.14	1.84	1.87	1.92	*2.01*	2.22	1.72	2.29	1.83	1.82	*1.98*	5000
Norway	1.85	1.87	2.2	1.38	2.05	*1.87*	2.45	2.27	2.26	1.88	2.08	*2.19*	5000
Peru	2.16	2.04	1.61	1.35	1.54	*1.75*	1.88	1.87	2.05	1.97	1.97	*1.95*	5000
Poland	2	2.38	1.82	1.39	1.61	*1.84*	1.56	1.49	1.64	1.45	1.46	*1.52*	5000
Portugal	2.22	2.38	2.13	1.55	1.69	*2*	2.02	1.83	2.31	1.66	1.72	*1.91*	5000
Qatar	1.59	1.94	1.74	1.1	1.43	*1.56*	1.58	1.7	1.61	1.55	1.5	*1.59*	5000
Romania	2.31	2.26	1.89	1.09	1.7	*1.85*	1.44	1.21	1.8	1.65	1.29	*1.48*	5000
Russian Federation	2.89	2.92	2.32	1.73	1.85	*2.35*	2.17	1.9	2.01	1.94	2.2	*2.05*	5000
Singapore	1.88	1.75	1.76	1.1	1.88	*1.67*	2.1	1.58	1.96	1.86	1.92	*1.88*	5000
Slovak Republic	2.04	2.66	2.09	1.3	1.68	*1.95*	1.6	1.32	1.69	1.86	1.48	*1.59*	5000
Vietnam	2.31	2.08	1.58	1.36	1.81	*1.83*	1.7	1.64	1.37	1.81	1.72	*1.65*	5000
Slovenia	2.35	2.45	2.15	1.62	1.8	*2.08*	1.86	2	2.02	1.68	1.73	*1.86*	5000
Spain	1.91	2	2.08	1.41	1.76	*1.83*	1.72	1.41	2.1	1.84	1.71	*1.76*	5000
Sweden	2.25	2.5	1.97	1.57	1.92	*2.04*	2.09	1.87	1.92	1.47	1.81	*1.83*	5000
Switzerland	1.96	1.97	1.92	1.89	1.92	*1.93*	1.87	1.61	2.1	1.65	1.68	*1.78*	5000
Thailand	1.97	1.88	1.8	1.51	1.57	*1.75*	1.43	1.32	1.39	1.82	1.58	*1.51*	5000
Trinidad and Tobago	2.67	2.54	2.73	2.05	2.45	*2.49*	2.58	2.65	2.48	1.93	2.37	*2.4*	5000
United Arab Emirates	2.16	1.92	1.81	1.22	1.64	*1.75*	1.91	2.02	1.86	1.89	1.7	*1.88*	5000
Tunisia	3.03	2.44	2.09	1.75	2.05	*2.27*	1.93	2.57	2.24	2.1	1.81	*2.13*	5000
Turkey	2.69	2.53	2.18	1.28	1.76	*2.09*	2.47	1.92	2.04	1.51	1.96	*1.98*	5000
FYROM	2.18	1.92	1.77	1.21	1.37	*1.69*	1.52	1.44	1.55	1.66	1.35	*1.5*	5000
United Kingdom	1.73	1.72	1.94	1.57	1.84	*1.76*	2.1	2.02	1.97	1.65	1.78	*1.9*	5000
United States	2.48	1.95	2.11	1.94	2.02	*2.1*	1.9	1.65	1.92	1.75	1.75	*1.8*	5000
Uruguay	2.38	2.15	1.92	1.6	1.76	*1.96*	1.94	2.56	2.3	1.74	2.04	*2.12*	5000
B-S-J-G (China)	2.31	2.32	2.42	2.27	2.41	*2.35*	2.59	2.2	2.59	2.19	2.6	*2.44*	5000
Spain (Regions)	2	2.1	2.06	1.46	1.74	*1.87*	1.7	1.43	2.13	1.87	1.77	*1.78*	4987
Argentina (Ciudad Autonoma de Buenos)	2.45	2.33	1.51	1.56	1.55	*1.88*	1.93	2.44	2.5	1.89	1.47	*2.05*	260
Total	**2.24**	**2.12**	**2.02**	**1.51**	**1.83**	***1.95***	**1.92**	**1.79**	**1.98**	**1.81**	**1.81**	***1.86***	**345,247**

Table 9 Countries where parental involvement is not always strong

	Countries and proportion of School where the statements on parental involvement apply		
	Less than 30 Percent	*Between 30 and 50 Percent*	*Between 50% and 80%*
SC063Q02NA *Our school provides a welcoming and accepting atmosphere for parents to get involved.*			Belgium: Flemish community (78%), French community (76%), Belgium: German-speaking community (80%); Israel (75%)
SC063Q03NA *Our school designs effective forms of school-to-home and home-to-school communications about school programs and students' progress*		Tunisia 39%	Georgia (80%), Israel (71%), Lebanon (78%), Lithuania (74%), Luxembourg (70%) Moldova (78%)
SC063Q04NA *Our school includes parents in school decisions.*	Japan (8%)	Tunisia (31%) Greece (42%), Israel (45%), Macao (40%), Singapore (48%), Switzerland (41%) Uruguay (41%), Argentina -Buenos Aires (43%)	Algeria (69%), Australia (79%), Belgium (59%), Bulgaria (80%) Chile (60%), Costa Rica (65%), Czech Republic (63%), Denmark (61%), Finland (74%), Iceland (80%), Italy (70%), Lebanon (54%), Luxembourg (68%), Malta (585), Norway (80%), Peru (71%), Qatar (75%), Spain, (77%), Trinidad and Tobago (68%), United Kingdom (77%), United States (78%), B-S-J-G (China) (59%), Spain (Regions) (77%),
SC063Q06NA *Our school provides information and ideas to families about how to help students at home with homework and other curriculum-related activities, decisions, and planning.*		Tunisia (50%)	Algeria (80%), Austria (75%), Belgium (63%), Japan (76%), Luxembourg (75%), Netherlands (71%), Switzerland (77%)
SC063Q07NA *Our school identifies and integrates resources and services from the community to strengthen school programs, family practices, and student learning and development.*	Netherlands (30%) Tunisia (25%)	Czech Republic (39%)	Algeria (75%), Austria (56%), Belgium (62%), Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Denmark ,Finland, Georgia, Germany, Greece, Hungary, Israel, Italy, Japan, Lebanon, Lithuania, Luxembourg, Macao, Malta, Mexico, Moldova, New Zealand, Norway , Peru, Slovak Republic, Vietnam, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Kingdom, Uruguay, Spain (Regions), Argentina (Ciudad AutÃ³noma de Buenos)
SC063Q09NA *There is federal, state, or district legislation on including parents in school activities.*	Japan (8%), Slovak Republic (23%), Macao (27%)	Israel (47%), Switzerland (47%), Trinidad and Tobago (48%)	Belgium Brazil Bulgaria Chile Costa Rica Denmark Georgia Greece Hungary Italy Lebanon Lithuania Luxembourg Malta Mexico New Zealand Norway Peru Slovenia Spain United Kingdom Uruguay Spain (Regions) Argentina (Ciudad AutÃ³noma de Buenos)

Notes: Levels of parental involvement are higher than 80 percent if they are not shown in the table above.

Study 3: Does weak academic performance activate parental involvement in schools? A cross-country perspective

Abstract

For years, policy professionals have observed the obsession of the general public towards comparing cross-country results of achievement examinations despite acknowledgment from the experts that education systems across the world differ significantly. One strand of the literature looks at the role of the family and parenting in ensuring there is a supportive and conducive learning climate at home. However, one interesting empirical gap is the extent to which parents' involvement and engagement with school matters for academic achievement.

In this paper, we look at parental involvement as a relational construct between schools and families and relate it with academic achievement. We performed regression analyses countries and found a correlational pattern among 12 countries that the involvement of parents seems activated by parents of lower-performing students; involvement is also activated at different score thresholds depending on the country. Moreover, consistent with the literature, we academic achievement scores to be highly reflective of gaps among students from different socioeconomic classes, gender, language, and immigration status.

Introduction

The study of parental involvement has a strong research tradition across several fields. Its research base has examined various potential pathways, as well as mechanisms, on how parental involvement interacts with a wide variety of educational outcomes ranging from students' motivation (Bempechat & Shernoff, 2012; Gonzalez-Dehass et al., 2005), to test scores and academic achievement (Jeynes, 2003; Zhan, 2006) and to music performance outcomes (Zdzinski, 1996), to cite a few. Among outcomes, academic achievement is among the most controversial and debated. Academic achievement predicts several labor-market outcomes, and underperformers face the risk of social exclusion and labor market discrimination. Consequently, grades and academic performance act as weak market signals for productivity (Heckman et al., 2006).

Most of the prior work analyzing the relationship between parental involvement and academic performance is positive. However, the question of which type of involvement matters for academic achievement and its direct contexts matters broadly for education policy and practice. Schools are now recognizing the growing role of parents in creating a learning environment that is conducive for academic achievement (as discussed in the previous chapter).

An important and a developing segment of the debate, however, is understanding how parents' involvement and their engagement within schools, and not just about inside their homes, relate to students' academic performance. Prior literature has shown that parental partnerships are critical for schools: but the question of which form of involvement and how it is initiated and triggered is less understood in a broad, comparative, and empirical sense.

Hence, this empirical work aims to establish conceptual clarity on how parental involvement in school settings matters for achievement scores. We distinguish between involvement, which takes place inside homes from involvement, which stems from interactions with the school, as these frequently are performed independently from school activities (i.e., helping with homework, personal encouragement and disciplining).

This contribution is relevant to the field of educational management in various ways. The parental involvement literature, while it has grown extensively, stays essential to the discourse of academic achievement at local, national, sub-national and international levels (Borgonovi & Montt, 2012; Hartas, 2015; Sebastian et al., 2017). Moreover, parental involvement in school is an essential pathway between school fixed effects, family characteristics, and test scores (Freeman et al., 2011; Pritchett & Viarengo, 2015).

Literature Review

Parental involvement in schools as a broad relational co-productive construct

In public management literature, parental co-production necessarily includes a joint effort with the school personnel, both of whom share resources, time, and experience (Honingh et al., 2018b, 2018a). Such a form of involvement to constitute co-production with citizens does require direct and active participation with the public staff. These co-productive activities of parents, incidentally, transpire mostly within school settings. Intrinsically, activities such as pure cost-shifting to lay actors such as parents (i.e., home-study) or role replacement (i.e., parents substituting for teachers) without the direct involvement of education professionals do not necessarily establish a co-productive work (Nabatchi et al., 2017; Sicilia et al., 2016). This idea indicates that involvement varies according to "to whom" and "with whom" lay actors such as parents work within the public sector. In the educational policy and administration literature, however, the conceptual boundaries of what constitutes educational co-production (such as that of parental involvement in schools) are less apparent. What these assertions imply for our study is that the context of the co-productive work is just as important as the nature of the value arising from any involvement work, as in the case of parents. This statement is important because the literature from the latter has a considerable body of research supporting and detailing the mechanisms by which parental involvement influences education outcomes.

Parental involvement and education outcomes

What are the reasons and what are the motivations behind parental involvement in general? The field of education and its allied discipline helps shed clarity on this issue. It has known in the field that parents have different attitudes towards getting involved in school activities.

Mothers are anecdotally and traditionally more engaged in schools as compared to fathers. Their level of engagement is also found to decrease on higher year levels, i.e., more active during the formative or early years as compared to middle/high school years (Paulson & Sputa, 1996), as the child gets more and more independent over the years. Mothers are also generally more observed to be active in parent-teacher associations (PTAs) than fathers. Nevertheless,

do these varying levels of involvement matter differently for the child? For example, fathers' academic pressures have predicted lower achievement, while mothers' encouragement and support do the opposite, though both have used more significant academic pressure with boys and greater encouragement with girls. In this study, parental involvement mediated children's academic capabilities (Rogers, Theule, et al., 2009). Furthermore, school involvement between mothers and fathers also varies accordingly, just like parental styles and roles. In a case study in Canada of investigating learning among students aged 8 to 12 with ADHD in Canada, mothers are to be more likely to be involved more than fathers; the latter employing more punitive approaches to direct student learning as compared to fathers of children without ADHD (Rogers, Wiener, et al., 2009).

Involvement among mothers is well-investigated. Among African-American children, parental involvement mediates socialization and achievement, as well as to have predictive and sustained effect overtime on reading test scores (Banerjee et al., 2011). In a longitudinal study of psychiatrically vulnerable and low-income mothers, parental involvement underscores the bi-directionality of child development and motherhood experiences. Mothers' baseline positive views about parenting resulted in long term improvements in the child's development and that mothers' well-being also depended on how the child gets to adjust socially (Barbot et al., 2014). In another work studying bullying victimization and bullying in schools, mothers' responsiveness encourages a child's adjustment, in particular on aspects of achievement and social adaptation at school (Georgiou, 2008). This finding implies the inseparability and feedback mechanism between mothering behavior and that of their children's progression. Parental pressure and support, when combined with extra-curricular activity participation of children are positively related to academic competence and the well-being of elementary school children (Lagacé-Séguin & Case, 2010); However, the literature on parental involvement in

school s have also identified some of the obstacles parents face. Such barriers potentially delimit the extent to which program impacts are maximized or sustained over time.

Parental involvement and its links to non-cognitive outcomes are also documented. In the case of a school-based diabetes prevention program for fourth-graders in the US, Garcia-Dominic et al. (2010) found barriers for parents to get involved. These included how such program has low perceived value for parents, high perceived participation costs, and how it might compete with existing family demands. Parents are also concerned with the program design and the family culture mismatch (i.e., husband and wife role expectations). Furthermore, several social exclusion themes surround parental involvement. School involvement narratives among the Latino parents in the US, for example, is constituted by experiences as an immigrant and struggles with poverty (Ceballo et al., 2012, 2014). Minorities' involvement diminishes by being hampered by an additional layer of relational factors between parents and school staff. These included teachers' perceptions about minority parents, such as their efficacy and capacity, as well as teachers' own beliefs about involving parents. Other factors stress the importance and the presence of open communication lines, as well as friendliness, school policies, and leadership (Y. Kim, 2009). In another study, E. Kim (2002) adds that parents' language skills and educational attainment levels also influence their level of involvement, on top of the traditional cultural norms which immigrant parents have brought with them. Schools in the US also grapple with sensitive issues such as race, making the race discourse inseparable from what drives parental involvement in these communities (McKay et al., 2003).

Data and Methods

In the previous chapter, we used the PISA school-level dataset representing the responses of school heads from 70 countries. However, the parental questionnaire option deployed only on a limited number of countries. These are owing to a wide variety of reasons, such as resource and time constraints and the general attention of the national educational panels on parental

participation. Students were given the module in which parents were asked to accomplish the questionnaire at home. They are requested to return to the survey team the next day.

Among the 70 countries which participated in the PISA-2015 round, a total of 18 countries have deployed the parental questionnaire modules to parents/guardians of students who sat for the assessment tests, and 16 countries have the reported parental module microdata. Response rates among parents, in general, are quite high apart from Belgium and the United Kingdom. The table below shows the number of responses vis-à-vis those who are given the option to respond.

Table 10 Distribution of parental responses

Country	Number of Responses	Parent Questionnaire Option	Response Rates
Belgium	4,653	9,651	48.2
Chile	6,196	7,053	87.8
Croatia	5,110	5,809	88.0
Dominican	3,959	4,740	83.5
France	5,267	6,108	86.2
Germany	3,068	6,504	47.2
Ireland	5,001	5,741	87.1
Italy	8,760	11,583	75.6
Korea	5,316	5,581	95.3
Luxembourg	3,191	5,299	60.2
Macao	4,018	4,476	89.8
Malta	2,872	3,634	79.0
Mexico	6,804	7,568	89.9
Portugal	6,630	7,325	90.5
Spain	4,302	6,736	63.9
United Kingdom	1,400	3,111	45.0
Total	76,547	100,919	68.4

Note: Scotland only represents the UK in this table.

From this subset of student-parent responses, we narrowed down our final sample for this leg of the study. Moreover, the United Kingdom did not have a parental questionnaire option for its region. Wales, Northern Ireland, and England did not participate with this module, leaving only Scotland in the final sample. From around half a million students who sat for the PISA 2015 exams, our final sample where has information measured at student-parent pairs stands

at 76,547. This percentage represents about 68.4 percent of parental participants in 16 countries.

Measurement of Parental Involvement. It is important to differentiate that parental involvement, as defined in the principal's questionnaire, depicts an overall, organizational-level perspective of involvement measured at the level of the school. On the other hand, parental involvement from the perspective of the parent takes a view of her/his involvement from an individualized perspective. While, in theory, it is possible to aggregate these individual assessments and compare it with principals' observations, this is not the focus of this study. We performed an initial analysis on merging student-level information with that of the school and the principal, but the analyses of linking of test scores information to the level of the school is strongly discouraged by the OECD.

The table below summarizes the levels of school-based parental engagement across countries, the gender of children, income groups, and immigration status. We observe high levels of variability in parental involvement among countries. As pointed out by previous studies, there is a possibility to group some of these indicators to form a composite indicator of parental involvement. Several approaches are possible. The simplest may involve combining these variables, which are very correlated to each other, i.e., items Q02 and Q04 are teacher-initiated parental involvement, while Q1 and Q03 are parent-initiated parental involvement. Q06 and Q07 are both parental volunteering examples, while Q09 and Q010 describe the communication exchanges between teachers and the parent. The similarities are reported in the tables and correlation matrix below.

Table 11. Participation rates of parents in various school-related activities, 2015.

	q01	q02	q03	q04	q05	q06	q07	q08	q09	q10
by Country										
BEL	33.2	36.7	35.2	46.6	5.2	4.2	3.4	78.9	39.6	24.6
CHL	64.4	63.1	65.2	62.3	26.6	18.0	13.3	85.1	73.3	55.4

DEU	62.8	37.9	53.5	28.9	17.5	16.7	11.0	90.9	45.0	28.1
DOM	74.2	65.1	75.4	66.2	57.2	32.9	36.1	93.8	83.5	69.8
ESP	70.1	54.8	74.2	59.1	17.2	10.0	8.0	80.3	65.9	56.0
FRA	41.1	28.4	40.6	30.5	7.7	3.0	3.0	67.1	34.8	18.6
GBR	14.3	11.2	25.5	26.4	6.8	6.2	6.0	86.5	68.3	19.4
HRV	71.7	28.3	64.5	30.1	19.1	13.7	9.1	98.8	51.7	46.6
IRL	30.8	19.2	35.3	28.7	9.4	7.2	6.6	83.0	52.6	25.4
ITA	55.3	35.8	62.4	39.6	17.1	12.5	6.4	58.7	40.1	31.4
KOR	45.4	66.0	39.4	59.2	14.6	28.2	14.3	55.1	29.1	40.4
LUX	54.5	34.8	55.6	40.4	8.8	7.8	6.0	71.8	47.3	26.3
MAC	35.3	57.9	33.4	54.2	34.6	18.2	17.5	59.5	46.2	43.8
MEX	55.1	44.0	56.3	44.8	46.2	18.0	11.7	82.3	63.8	37.1
MLT	62.9	46.4	53.9	46.8	4.9	7.2	6.9	78.1	56.3	41.1
PRT	75.6	51.2	73.0	56.6	11.1	7.6	5.6	71.0	61.4	58.6
Total	54.1	44.9	53.7	44.8	25.7	15.7	10.4	75.0	51.1	36.6
by Income Class										
1	56.2	48.0	57.3	48.3	16.9	16.9	12.2	78.7	6.2	39.6
2	55.9	47.9	54.5	48.1	14.4	14.4	10.0	72.2	5.4	39.9
3	52.9	46.5	50.5	45.7	13.3	13.3	9.8	71.1	4.7	36.3
4	51.2	49.0	48.5	47.5	15.5	15.5	9.0	73.4	4.4	36.5
5	50.8	45.4	47.8	41.6	18.2	18.2	9.7	75.3	4.4	34.4
6	53.4	43.1	51.3	41.6	19.4	19.4	12.2	81.2	4.4	36.2
Total	54.4	46.8	53.4	46.1	16.6	16.6	11.1	76.6	5.3	38.0
by Gender										
Male	56.9	49.8	55.5	48.8	26.8	16.7	10.9	75.1	54.0	39.4
Female	51.5	40.2	52.0	41.0	24.6	14.7	9.8	74.9	48.3	33.8
Total	54.1	44.9	53.7	44.8	25.7	15.7	10.4	75.0	51.1	36.6
by Immigration Status										
Native	54.1	44.8	53.7	44.6	26.2	15.8	10.3	75.3	51.1	36.6
Second-Generation	49.2	41.2	48.9	41.8	12.6	10.5	9.2	70.4	43.4	27.5
First-Generation	56.6	46.7	57.6	50.0	17.1	12.8	10.0	68.2	50.7	36.9
Total	54.0	44.7	53.6	44.6	25.6	15.6	10.3	75.0	50.9	36.4

Note: Proportions do not necessarily add to the same shares as some parents did not answer all questions nor revealed other personal details. Moreover, Italy did not have information in income classes of parents. Source: author's computations from PISA Parental questionnaire data. Values computed with survey weights. Legend: q01: Discussed my child's behavior with a teacher on my own initiative; q02 Discussed my child's behavior on the initiative of one of his/her teachers); q03 "Discussed my child's progress with a teacher on my own initiative"; q04 Discussed my child's progress on the initiative of one of their teachers; q05 "Participated in local school government, e.g., parent council or school management committee."; q06 "Volunteered in physical or extracurricular activities (e.g. building maintenance, carpentry, gardening or yard work, school play, sports, field trip)"q07 "Volunteered to support school activities (volunteered in the school library, media center, or canteen, assisted a teacher, appeared as a guest speaker)."; q08 "Attended a scheduled meeting or conferences for parents"; q09 "Talked about how to support learning at home and homework with my child's teachers."; q10 "Exchanged ideas on parenting, family support, or the child's development with my child's teachers."

Table 12. Spearman correlation matrix of Parental Involvement measured at the parent-level

	q01	q02	q03	q04	q05	q06	q07	q08	q09	q10
q01	1.00									
q02	0.36	1.00								
q03	**0.63**	0.28	1.00							
q04	0.28	**0.66**	0.31	1.00						
q05	0.17	0.16	0.18	0.15	1.00					
q06	0.17	0.18	0.16	0.17	0.37	1.00				
q07	0.16	0.18	0.16	0.17	0.37	**0.53**	1.00			
q08	0.15	0.03	0.16	0.06	0.17	0.12	0.11	1.00		
q09	0.32	0.25	0.35	0.29	0.20	0.18	0.19	0.26	1.00	
q10	0.33	0.31	0.33	0.32	0.22	0.23	0.24	0.20	**0.49**	1.00

Note: The response "does not apply with my school" are excluded, n=56,163. The same legend applies from the previous table. Note only four out of 45 correlations are above the 0.4 (moderate) threshold, two of which are above 0.6 (strong).

We devised a simple yet composites measure of parental involvement in schools for inclusion in our regression analyses. We generated PINVTIN, a dummy variable to indicate if a parent initiated an involvement with the teacher either to discuss progress or the behavior of her/his child (from Q01 and Q03); PINVTCIN, a dummy variable to indicate if parent involved herself/himself through a teacher's invitation to discuss behavior/progress of the child (from Q02 and Q04); PINVOLUN, if the parent performed any volunteering at the school (from Q06 and Q07). Finally, we have PINVLSG if the parent involved herself/himself in school governing boards (Q05), PINVMTNG if the parent attended a scheduled meeting with or conference with parents (Q08), and PINVCOMM (Q09 and Q10) if the parent has engaged with teachers on how to support her/his child's studying activities at home, as well as parenting and family, and child development. The variables PINVMTNG and PINVLSG are coded as factor variables, which also allows us to consider circumstances where the school does not support parent-teacher meetings and the organization of school boards, which include parental representatives.

Measures of Student Achievement. Achievement indicators are measured by a student's performance in PISA's three areas of examination, namely reading, science, and mathematics.

However, subject area performance results are not reported straightforwardly. PISA uses the concept of plausible values (PV) to report student performance (OECD, 2009). Plausible values serve the purpose of accounting for measurement errors to measure the relative performance in the tests (Avvisati & Keslair, 2017). For each subject area in 2015, PISA reported ten plausible values of proficiency scores drawn from posterior distributions. In other words, a student's performance is neither singularly reported nor represented by a single plausible value. Adams & Wu (2003) as cited in their OECD, report examines that PVs are a

> "*representation of the range abilities of the students that a student might reasonably have* (p. 96 in the OECD [2009] report)..*plausible values are random draws from this estimated distribution for a students' θ [students' ability]"*.

It also, for this reason, that PVs of test scores cannot be computed as simple averages for each student, nor should it be aggregated within each school for comparability purposes. Furthermore, each plausible value of the test score was matched with 80 balance-repeated replicated (BRR) weights. These replication weights are used to refine the calculation of the standard errors in complex sampling designs. The OECD advises that BRR weights should be used for quantitative analyses of the test scores (Avvisati & Keslair, 2017).

Controls. We include some controls, as suggested by prior literature:

- Gender of the child. There is a gender gap between boys and girls (Ababneh & Abdel Samad, 2018) in terms of performance in subject areas. Boys, in particular, are known to outperform girls in science scores (Addabbo et al., 2016), as well as mathematics (Close & Shiel, 2009; Contini et al., 2017). This challenge of gender inequity in science education is a significant problem across a broad set of countries (Buccheri et al., 2011).
- Immigration status. A small but negative effect is found between the share of immigrants in the population on the relative population performance in an earlier PISA

study (Brunello & Rocco, 2013); there is also notable gap between performance of children natives and immigrants (Zinovyeva et al., 2014), as well as inter-generational differences across immigrants (Schleicher, 2006).

- Income/socioeconomic income group. There is steady persistence in terms of how income predicts test scores. Economically disadvantaged students perform lower, for example, in Mathematics (Alivernini et al., 2017), as well as in reading (Azzolini et al., 2012).
- Language at home. The language at home can sometimes be different from the language used for instruction in schools, especially in the case of immigrant parents. Though in many instances, native-born parents can select the school of choice, especially in some autonomous regions where the language of instruction is different from the national language. In general, studies have found that language at home is relevant in explaining reading test scores (Verwiebe & Riederer, 2013).
- As an additional measure to account for student characteristics and habits, we have included dummy variables on activities which the student performed on the most recent day before going to school. We assume that these vector of variables in section ST076[5] depict the regular habits, hobbies and preoccupations of students while studying. These include regular day to day behaviors such as eating breakfast, studying for homework, watching TV/videos, reading newspapers/magazines, internet surfing/chatting, playing video games, meeting friends or talking to friends on the phone, talking to parents, household work or taking care of another family member, working for pay and

[5] The controls are as follows: **ST076Q01NA** Eat breakfast; **ST076Q02NA** Study for school or homework; **ST076Q03NA** Watch TV/<DVD>/Video**;** **ST076Q04NA** Read a book/newspaper/magazine; **ST076Q05NA** Internet/Chat/Social networks (e.g. <Facebook>, <country-specific social network>); **ST076Q06NA** Play video games ; **ST076Q07NA** Meet friends or talk to friends on the phone; **ST076Q08NA** Talk to your parents; **ST076Q09NA** Work in the household or take care of other family members; **ST076Q10NA** Work for pay; **ST076Q11NA** Exercise or practice a sport. Full questionnaire is available at https://www.oecd.org/pisa/data/CY6_QST_MS_STQ_CBA_Final.pdf, P 63.

exercising/playing a sport[6]. We did not include the age of students anymore as part of our controls as the PISA takers are between 15.25 and 16.33 years old, and the PISA study protocol has strictly done a screening.

Estimation strategy

As mentioned earlier, PISA employs a sophisticated sampling research design to capture academic performance that is generalizable at the national level. Each of the student's performance is reported in each examination with ten plausible values as described above. This statement implies that the inference about population statistics must be estimated separately through each of these plausible values. We follow this advice of the OECD throughout our regression analyses, estimating the impact of our variable of interest(s) to the academic performance by strictly following this condition. Moreover, as PVs are drawn individually from a student's posterior distribution of academic ability, we replicate these regressions 80 times for each plausible value (the BRR weights, resulting in a total of 800 regression iterations). The estimates are obtained by averaging the individual coefficients from these regressions.

Our basic model to estimate the relationship of parental involvement to academic achievement within the country is thus spelled out below, following an earlier specification by Sebastian, Moon, & Cunningham (2017):

$$Z_i = \beta_0 + \beta_{1i} * \boldsymbol{Involvement}_i + \sum_{n=2}^{N} \beta_{nj} * \boldsymbol{W}_{nj} + \varepsilon_i$$

Where Z_i represents the academic achievement of child *i* in mathematics, science, or reading. $\boldsymbol{Involvement}_i$ are our various measures of parental involvement associated with a child; $\boldsymbol{W}$ is the vector of controls and other predictors which we included in our estimation processes. Intuitively, the estimation process is computationally intensive. For this purpose, we specifically adopted the `repest` (replicate estimates) module recently developed by the OECD Education Department for Stata (Avvisati & Keslair, 2017, 2020). While it is practically possible to compute the estimates by writing similarly looped codes, the module makes it computationally efficient and expedient for external users of OECD datasets to replicate analyses across OECD surveys, such as TIMSS or PIACC. The module makes it efficient to perform and report calculations with multiple imputed values, ranging from summary statistics to regression analyses.

We performed several iterations of country-level analyses, including the gender of the student, a measure of socioeconomic class, immigration status, the similarity of the language spoken at home. We also included measures of the student's activities and habits, as discussed in the previous section. In the process of controlling the variables, we accordingly endeavor to surface out the relationship of parental behavior with academic performance within specific countries; we opted to replicate the model in each country where we have the full information available.

Results

The results are summarized in tables 4 to 6 in the appendices section below. There are three main tables reported, each showing the regression estimates of reading, math, and science test scores. As mentioned, we excluded in the main table the countries whose information did not capture the same set of variables. For example, Italy did not ask about parents' socioeconomic class, so the estimates are reported in another table without the estimates for INCLS factor

variables. It is still possible to perform individual regressions on countries by not including some of the explanatory variables, depending on availability. Thus, further reasonable inferences are still a possibility as an extension for Spain, Korea, and others.

General patterns of parental involvement in schools. In the framework of family involvement in schooling, Ma et al., (2016), reviewing Epstein (1987), distinguishes the two types of communication conduits between parents and teachers, based on the origin and the direction of the communication. First is the home-to-school connection, where parents can contact the school regarding their children's academic progress, and second is the school-to-home, where teachers inform parents about school matters and their children's academic performance. In our econometric analysis, we find that parental involvement is negatively associated with achievement scores, whether it is initiated by teachers or by the parent in science, mathematics, and reading across all the countries. However, we do not imply nor generalize that all forms of parental involvement predict lower test scores among school children; what we find is a correlational pattern that within these countries, the involvement of parents specifically relating with schools is more common among parents of lower-performing students, across all the subject areas.

Our results may appear counter-intuitive at first, but given that parental reports are our source of the data, our finding emphasizes that the respondent standpoint of respondents, such as parents, matter considerably. The other papers have shown a positive relationship of parental involvement with achievement scores, which have generally considered home-based involvement which concentrated on parental supervision and support performed within home settings (Castro et al., 2015; Jeynes, 2003; Ma et al., 2016). With school-based involvement as our interest, our results resonate with earlier findings using earlier PISA parental survey module rounds, such as that of Sebastian et al. (2017). The OECD also reports that students have better life satisfaction in schools if parents perform less involvement with schools and

more with home-based based involvement (OECD, 2017). Thus, our findings emphasize that it is imperative to distinguish types of parental involvement in school and at home (Deslandes & Bertrand, 2005).

Looking further into our results, the magnitude of the estimate of teacher-initiated involvement (PINVTCIN) is often bigger than that of the parent-initiated involvement (PINVPTIN), except for Chile. Our finding implies several potential issues about the activation of involvement in schools within the educational contexts of our sample countries. First, parents only get to be on-board the discussion and the consultation about their children's behavior and progress when the child is underperforming (PINVPTIN). Second, teachers raise "involvement flags" to parents only if low-performance issues get detected (PINVTCIN). Involvement triggered by the latter seems activated by a considerable underperformance, as compared with the former. Another crucial issue that is apparent that low-performance triggers diverge considerably across these countries. To illustrate these gaps, we examine the beta coefficients of PINVTCIN across the regression summaries in mathematics, sciences, and reading. In Germany, France, and Scotland[7], the teacher initiates an involvement with the parent when the scores are considerably more than 30 points lower. To illustrate, parents in Germany reported a teacher-initiated involvement when $\beta_{DEU,reading}$ = -37.843***, $\beta_{DEU,math}$ = -39.106*** and when $\beta_{DEU,science}$ = -42.543***. However, in Macao, these are -11.595***, -15.08***, and -11.598*** for reading, mathematics, and science, respectively. While it is true that both Germany and Macao are among the best performing countries in PISA, Macao outperforms Germany significantly in mathematics and science, while being almost at parity in reading. These differences imply that parental involvement in schools in Macao is triggered by their teachers at a lower performance threshold than most European countries in our sample. This

[7]England, Wales and Northern Ireland did not have the parental module

condition is also possibly a reflection of the education culture in these contexts. In Macao for instance, academic performance is highly valued and expected by principals, teachers, and the local community, as this determines prominence and reputation. Students, for the most part, are expected to maintain high standards and underperformance may result in a "loss of face" (de Robertis & Morrison, 2009; Van Schalkwyk, 2010, 2011). In Germany, it appears that a parent only gets involved by teachers when the student's underperformance is severe.

Moreover, the same observation also shows for parent-initiated involvement (PINVTIN). It is also prompted mainly by lower performance scores but not with a magnitude like the teacher-initiated involvement. It is only in Scotland that PINVTIN's coefficients are substantially significant, implying that parental involvement is deeply biased only to those severely underperforming students in this context. Finally, PINVTIN is not statistically significant in the Dominican Republic, Mexico, and Portugal, implying that performance does not relate to parents' involvement with the teacher.

Parental involvement in local school governments, volunteering activities, attendance in meetings, and interaction with teachers. In the psychological literature, parental volunteering is associated with implicit pro-social behavior or when they feel that students/teachers desired their involvement (Aydinli et al., 2015; Deslandes & Bertrand, 2005). In our analyses, we find that volunteer parents in schools happen to have slightly underperforming children. We also find that the involvement of parents in schools' local governments, including volunteering activities, are generally low in our sample. Luxembourgish parents who sit in the local school boards have substantially better reading scores than those children in schools where school boards do not apply.

Moreover in Italy, Dominican Republic, Macau, Mexico, and Portugal, we find volunteering activity in schools is associated mostly with the lower academic performance of children. We

also do not find a statistically significant relationship between achievement scores and attendance to meetings, such as the parent-teacher associations, except in Mexico. There is an additional score premium of 26.5 points on science, 26.6 on mathematics, and 24.6 points on reading, as compared to those children of parents who reported that schools are not supporting such engagement activity. It is also likely that parents of high performing students self-select themselves to attend in these meetings in Mexico; elsewhere, the performance of students is not associated with the parental choices of the decision to attend parental conferences in schools.

Finally, PINVCOMM, the conversation between teachers and parents about developing learning support at home is statistically significant yet negatively related to students' academic achievement. This relationship is especially true for Italy, Croatia, and Mexico; for Portugal (in reading), as well as Macao (in Math); Germany and Mexico (in science). These examples imply that communication exchanges between teachers and parents to support educational activities at home aims to help underperforming students in more specific subject areas.

Gender. The findings on gender are consistent with the literature that girls generally underperform in science and mathematics but perform better in reading. What we find in our estimates is that the close gap between boys and girl's performance differs tremendously in each country, supporting earlier findings on gender gap differences (Stoet & Geary, 2013). Girls underperform the least in Macao, where a boy relates to only five points difference in science and mathematics. Elsewhere, the gaps are wide. It is substantial in Germany and Italy (by more than 30 points in science and math), and in the rest of our sample except the Dominican Republic and Scotland, where the gap is between 23 and 29 points, as shown in Table 4 for science. In mathematics, estimates show that Macao's gender gap is not statistically significant. All the rest of other countries persistently display girls' disadvantage in mathematics achievement. In the reading examination, gender is only statistically significant

in the Dominican Republic, France, and Macau. All the rest of the sample countries, gender does not have an association on the reading score.

Immigration Status is strongly associated with academic performance in a select group of countries, as well as language usage at home. A considerable body of literature has already documented the persistence of underperformance among immigrants in achievement tests, particularly in some developed European countries (Brunello & Rocco, 2013; Marks, 2006; Rangvid, 2007, 2010). In our analysis, we find evidence where immigrant students exceed the performance of the native population, particularly with Great Britain (Scotland) and Macau. Our results imply the presence of persistent inter-generational challenges and gaps between immigrants and natives, owing mainly to former groups' social integration.

Both second (IMMIG-1) and first-generation (IMMIG-2) children of immigrants severely underperform across all subject areas among the students in Belgium and Mexico. The underperformance in Belgium, for example, is worse for the second generation; the magnitude of underperformance is the most severe in Mexico, by more than 50 points. In other countries, the effects vary according to generation. First-generation immigrant children perform the worst scores in sciences in Dominican Republic (-41 points), Croatia (-20.7 points) and in Belgium (-26.7 points); they are particularly performing much higher than the native population in science in Scotland (+36 points) and Macau (+17.3 points). Interestingly, the magnitude in the native-immigrant gap becomes more noticeable in science scores for the second-generation students, as their magnitude is broader than that of the first generation, i.e., Scotland (+50.7 points), Macau (+19.3 points) and Belgium (-33 points). Our findings of the native-immigrant gap are supported by the advantage of how the language of instruction at school is the same as the language used in schools (LANGSME). Students coming from families using a similar language at the school puts them ahead in test scores. This observation is a similar condition

but with a great range magnitude of differences across all subject areas in Belgium, Germany, Croatia, Italy and Mexico.

While our results are just correlational and describe how immigration status is associated with the academic achievement of students, we believe that our findings also converse with the broader academic discussion on broader social and immigration policies. Themes such as social integration in academic settings should be an essential part of the discourse and practice of localized education policies in order to narrow the gap between the native population and the immigrant population (H Entorf & Minoiu, 2005; Horst Entorf & Minoiu, 2004; Martin et al., 2012; Schachner et al., 2017).

Students from higher-income groups perform better across all subject areas. Students from higher-income households perform much better than students from lower-income households across all the subject areas and all countries in the sample, as indicated by factor variables INCLS. In most cases, the higher income earning households are also more educated, therefore, are in a better position to invest in education and other needs of their children. The magnitude of the test score difference/gap between a student from the highest income group compared to a student from the lowest income is as high as 86.1 points in Luxembourg to just 26 points in Macao, in the case of science. In general, we find the achievement score gap between lower and higher-income households to be very much pronounced in Europe than it is in Macao. Our results call for higher policy and research attention in Europe that achievement score at the high school level is almost becoming proxied and predicted by family wealth and socioeconomic background.

Other variables. As part of our effort to account for students' background, we also included controls on student behaviors and habits which are gaining attention recently. These are the

indicators included in the ST076 section of the module. All beta coefficients are fully reported in tables 4 to 6 in the appendices. For brevity, we report only the strikingly notable of these activities, which are actionable to parents, controllable or managed at home by parents with their children. First, watching TV/DVDs/Videos (ST076Q03NA) is associated with significantly lower achievement levels in reading similar to the findings by Zavodny (2006), with the most severe effects in science and reading scores in France, Scotland, and Belgium. The associated lower test scores account for more than 20 points in these countries and exhibits as well in other subject areas.

Social media use (ST076Q05NA) is linked to better reading scores in France, the Dominican Republic, and Macao, but it is associated negatively with lower science scores in France, Germany, and Portugal. This finding implies that children use social media differently across countries, either to complementing learning or possibly a detraction to the learning process. Further studies are, therefore, suggested to improve our understanding of how social media usage shapes academic achievement.

Moreover, working for pay (ST076Q10NA), as well as exercising or practicing a sport (ST076Q11NA) before attending school, is universally linked to lower performance on achievement tests. We find that working high school students are severely disadvantaged in academic performance across all subject areas and countries. This finding explains that working for pay has severe opportunity costs in terms of learning as it draws away time that could have been devoted to studying (McCoy & Smyth, 2007; Singh, 1998).

Discussion and conclusions

Parental involvement is a cornerstone of education policy across all countries, and parental involvement cannot be disjointed from any discussion. The primary purpose of our study is to

link how parental involvement in schools relates to achievement test scores in science, mathematics and reading. To do this, we performed regression analyses using a broad set of countries with academic achievement in the PISA subject area scores as our dependent variables; with parental involvement in schools as our primary variable of interest, accounting as well as for the child and household characteristics which are known to influence academic performance. Our findings show that the nature and initiative of involvement in school matters to relate it with academic performance, as we find that there is a negative association between academic performance and parental involvement in schools, inferring that poor academic performance is the likely trigger of parent-teacher interaction. The magnitude of our estimates also shows that different education systems have varying "thresholds" where such interaction is activated, i.e., socially differentiated parental involvement. Our results clarify and emphasize the need to distinguish the type of involvement (whether it is home-based or school-based) as these types of involvement have likely different motivators and thus will have different associations with academic achievement.

Our contribution is twofold. At the theoretical and practical level, we supply credence to recognize, delineate, and clarify the conceptualization of parental involvement as this study demonstrates. We corroborate with previous studies that parental involvement is a multifaceted characteristic. While previous studies have shown that parental involvement tends to have positive contributions to academic achievement (Castro et al., 2015; Fan & Chen, 2001; Wilder, 2014), many of these also refer to involvement within households. Despite having a correlational design, we believe that school-based involvement differs in terms of activation with the parent.

Second, our use of the PISA dataset immediately allows us to converse with the broader education policy debates concerning parental involvement in countries where PISA permeates policy and professional significance. Moreover, our work also emphasizes that no education

systems are the same, and we also need to recognize that learning outcomes such as achievement scores are shaped by prevailing social and behavioral context-specific factors.

Limitations and future directions

Our work certainly recognizes limitations, which, in our opinion, provides opportunities for future research. First is the cross-sectional design in which any PISA-related study is recognizing for years. Despite its scale, analyses are still largely correlational, implying we can only draw our analysis and inferences from a single point in time. The datasets also do not allow us to merge school level information with that of the achievement scores, which could have been useful in controlling for school fixed effects. Second, any study which investigates achievement scores and its analyses of correlates or determinants at national levels should not assume that educational systems are the same. In the same vein that scores are easily comparable and benchmarked even with similar countries. There are also several other education outcomes beyond test scores which policymakers and researchers should consider paying further attention, such as critical competencies, social skills and other future labor market challenges. A fundamental gap is the lack of information that can represent these inquiries in broad national surveys such as PISA. Another limitation with our dataset and analyses is its timeliness. The 2015 survey was released more than a year after, giving limited time to researchers to produce timely and relevant research with immediate impact on policy. The latest round 2018 microdata was released only in December 2019. Moreover, PISA researchers also face comparability issues on many questionnaire items and modules thereby limiting the potential comparisons.

The PISA metrics have long enriched policy debates, and this empirical work aimed to contribute in that aspect, by advancing our understanding of the role of parental involvement in areas where it is possible to generate further public and private value (in way elucidated by

the learning climate and the test scores, respectively). This action is particularly relevant for parents, principals, teachers and learners.

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Appendices

Table 13 Average regression estimates of science achievement scores with indicators of parental involvement

	BEL	CHL	DEU	DOM	FRA	GBR	HRV	LUX	MAC	MEX	PRT
PINVPTIN	-9.42**	-14.972***	-14.574**	1.304	-15.922***	-28.967***	-9.619***	-15.108***	-8.502***	-2.195	-8.482*
	3.747	3.328	5.695	4.026	3.589	7.401	3.654	4.194	3.231	3.125	4.347
PINVTCIN	-15.409***	-11.924***	-42.543***	-15.431***	-37.572***	-32.111***	-19.818***	-26.112***	-11.598***	-18.643***	-22.225***
	4.379	3.454	6.771	4.48	3.804	6.576	3.157	4.647	3.652	2.804	3.325
PINVLSG1	11.983	5.797	82.988	22.239	34.111*	-32.38	21.548	27.121	-3.592	-4.736	-0.448
	20.454	17.378	60.946	14.047	18.145	74.92	17.535	18.574	7.311	9.823	11.573
PINVLSG2	-0.096	3.317	79.83	20.459	36.041*	-19.492	18.016	22.47	2.589	-11.784	4.066
	20.53	18.073	60.689	13.86	19.485	73.302	17.242	21.252	7.799	10.3	13.883
PINVOLUN	2.535	3.234	7.397	-9.806***	-2.458	3.353	-1.374	5.72	-7.043**	-7.33*	-9.558**
	7.867	3.703	7.066	3.573	7.045	9.242	4.276	7.259	3.098	3.817	4.853
PINVMTNG1	-29.988	-15.79	-30.824	18.98	-23.94	-34.847	59.357	-11.109	-10.072	16.448	8.483
	34.605	12.798	65.239	22.891	18.936	25.774	55.766	18.672	9.116	12.39	12.591
PINVMTNG2	-20.914	1.102	-22.129	31.731	-11.78	2.023	77.928	-5.901	10.662	26.455**	21.721*
	33.779	12.281	63.144	20.804	19.079	26.014	55.627	18.044	9.2	12.279	12.236
PINVCOMM	-2.986	-6.195*	-13.127**	-6.256	-5.277	-4.469	-10.731***	-2.179	-7.919**	-7.727***	-16.372***
	3.497	3.406	5.605	5.344	3.34	7.17	2.894	4.837	3.51	2.839	3.338
FEMALE	-23.316***	-29.33***	-31.831***	-17.471***	-19.139***	-18.215***	-27.655***	-29.778***	-5.441**	-24.179***	-25.719***
	3.715	3.458	6.184	3.674	3.124	5.88	3.652	3.968	2.732	3.195	3.122
IMMIG	-26.694***	16.317	-13.228	-41***	-7.701	36.012*	-20.744***	-13.001**	17.265***	-54.007***	8.967
	8.975	23.695	12.531	15.485	6.915	20.272	4.977	5.399	3.454	18.811	8.701
IMMIG	-33.004***	-40.928***	-13.597	13.746	-21.5*	50.756**	-13.877	-0.076	19.293***	-54.259***	-4.649
	7.888	13.628	22.086	18.958	11.948	22.963	11.258	5.991	4.271	14.338	9.686
LANGSME	10.136**	24.424*	33.557***	9.833	12.613	8.582	5.953	29.907***	6.307	35.571***	13.739
	3.99	14.581	12.216	8.848	7.806	19.434	8.658	5.71	10.252	10.178	13.057
INCLS	15.094**	10.617	5.518	12.192***	15.159**	6.795	17.475***	7.346	-1.396	19.759***	26.605***
	6.511	6.582	10.645	4.53	5.966	8.062	5.292	9.39	4.755	3.877	3.748
INCLS	19.738***	29.534***	32.947***	32.76***	26.108***	7.098	38.646***	32.32***	6.118	28.114***	40.466***
	7.457	6.256	10.084	6.865	6.633	12.737	5	8.854	5.149	6.124	5.482

INCLS	30.996***	41.608***	39.328***	44.358***	38.35***	30.368**	58.665***	45.868***	16.853***	19.341***	44.618***
	6.987	6.077	10.825	6.479	5.652	12.029	6.097	9.601	4.925	6.305	6.068
INCLS	41.815***	54.924***	35.789***	38.48***	42.944***	32.825***	72.583***	65.46***	15.478***	29.662***	58.146***
	7.774	6.803	10.885	9.92	6.731	12.314	8.111	9.459	5.335	8.604	5.707
INCLS	65.947***	81.91***	60.716***	60.561***	67.321***	39.881***	86.314***	86.143***	26.992***	53.402***	80.498***
	7.343	5.724	8.927	7.93	6.29	8.603	6.446	9.047	4.412	8.836	4.522
ST076Q01NA	26.472***	-1.107	2.89	-4.938	9.91**	5.233	-15.917***	8.551*	2.383	-1.477	1.224
	5.285	3.546	5.533	4.605	3.871	7.553	3.827	4.984	4.185	3.317	5.455
ST076Q02NA	-6.543	-9.682***	-2.82	-10.17**	-5.849*	-6.646	1.45	-14.627***	0.882	-1.769	0.659
	4.128	3.129	6.554	4.377	3.31	6.918	3.669	4.344	3.153	3.13	3.096
ST076Q03NA	-25.573***	-4.475	-20.513**	-8.208**	-24.176***	-22.999***	-15.569***	-17.98***	-12.096***	-8.364***	-13.798***
	3.614	3.4	8.161	3.713	3.643	5.668	2.854	5.503	4.354	2.952	4.039
ST076Q04NA	20.007***	11.322***	25.631***	-12.434***	18.249***	18.658***	6.726**	20.73***	12.531***	3.913	5.164
	3.789	3.144	6.203	3.9	3.838	6.785	3.046	5.067	2.764	2.596	3.468
ST076Q05NA	-7.753*	-0.781	-14.73**	14.888***	-15.662***	-11.515	0.757	-7.842	-1.471	9.829***	-11.084***
	4.463	4.128	6.899	4.058	3.32	8.801	5.001	5.281	5.132	3.247	3.863
ST076Q06NA	-13.765***	-7.284**	-9.157	-19.481***	-3.965	-16.121**	-2.991	-12.129	-10.248***	-6.018*	-9.401***
	4.325	3.506	11.263	3.993	4.192	8.148	3.522	7.512	3.49	3.279	3.548
ST076Q07NA	-13.94***	-16.613***	-7.156	-13.32***	-8.694**	-15.401**	-10.654***	-21.938***	-16.711***	-7.427***	-11.745***
	3.493	2.756	6.937	4.123	3.642	7.292	3.13	4.742	3.773	2.772	3.97
ST076Q08NA	4.767	4.96	15.058*	5.37	7.248*	5.663	7.928*	17.674***	10.75***	5.655	9.74*
	5.773	3.541	7.878	6.524	4.146	10.434	4.492	6.375	3.464	3.784	5.623
ST076Q09NA	-2.967	-10.133***	-5.771	-2.126	3.444	-4.966	-1.321	-0.155	-3.278	0.883	-4.275
	4.269	3.174	6.374	4.14	3.698	7.923	3.273	4.705	3.66	3.136	3.027
ST076Q10NA	-43.181***	-34.578***	-39.363***	-30.223***	-51.527***	-18.886**	-44.634***	-38.072***	-44.031***	-29.442***	-49.639***
	5.166	5.288	11.625	3.807	6.862	8.943	4.814	7.997	5.524	3.74	4.697
ST076Q11NA	-7.505**	-19.241***	-18.861***	-5.141	-12.707***	-18.428**	-10.963***	-20.184***	-19.086***	-17.277***	-20.97***
	3.82	2.9	7.194	3.76	4.103	7.551	3.509	4.968	3.07	3.181	3.243
CONSTANT	546.856***	459.773***	481.306***	342.738***	505.834***	586.428***	408.928***	493.829***	546.569***	408.936***	521.475***
	37.122	25.225	89.242	27.911	27.022	85.467	57.882	25.826	13.703	20.742	21.157
ADJ R^2	0.3	0.318	0.35	0.333	0.318	0.248	0.226	0.401	0.155	0.199	0.337
N	2606	4287	1143	2221	3147	968	3839	1713	3164	4258	4844

Note: Robust standard errors below the beta coefficients. *** p<0.01, ** p<0.05, * p<0.1

Table 14. Average regression estimates of math achievement scores with indicators of parental involvement

	BEL	CHL	DEU	DOM	FRA	GBR	HRV	LUX	MAC	MEX	PRT
PINVPTIN	-12.618***	-18.576***	-19.42***	-3.601	-17.382***	-25.584***	-10.141***	-17.354***	-11.328***	-4.268	-5.914
	4.36	3.383	5.942	5.121	3.43	6.875	3.937	4.837	3.308	3.841	4.15
PINVTCIN	-9.082**	-13.448***	-39.106***	-15.346***	-34.446***	-31.679***	-19.336***	-23.201***	-15.08***	-20.418***	-26.541***
	4.54	3.637	6.835	4.24	3.462	6.61	3.472	5.393	3.462	3.105	3.287
PINVLSG1	20.206	16.886	77.615	15.705	31.118*	-38.394	24.303	13.207	2.903	-2.229	-2.362
	20.689	16.482	65.511	15.959	16.904	57.528	16.256	16.474	9.158	11.443	14.986
PINVLSG2	10.491	14.866	73.772	10.837	29.852	-20.617	19.777	10.468	5.041	-4.425	7.759
	20.743	17.27	64.541	15.136	18.457	56.594	16.67	19.277	9.104	11.482	16.065
PINVOLUN	4.379	6.116	3.253	-10.04***	-1.082	3.581	-3.8	5.705	-2.679	-6.933	-18.422***
	8.069	4.013	6.917	3.854	6.685	10.283	4.56	7.152	3.438	4.562	5.299
PINVMTNG1	-25.584	-6.964	-19.882	7.423	-2.792	-26.955	41.148	-8.119	-13.177	17.27	0.191
	36.124	15.032	48.774	24.925	17.869	22.734	69.628	18.92	10.331	12.32	18.116
PINVMTNG2	-14.925	2.792	-16.272	16.664	8.362	4.724	65.892	-2.211	6.31	26.589**	18.424
	35.681	14.071	47.741	23.219	18.027	22.659	68.356	18.182	9.578	11.554	17.154
PINVCOMM	-4.505	-7.61**	-13.411**	-0.177	-7.155*	-5.337	-12.943***	-5.332	-12.814***	-8.858***	-12.123***
	3.992	3.662	5.229	5.066	3.804	7.404	3.158	5.206	3.588	3.175	3.1
FEMALE	-27.528***	-30.982***	-33.036***	-9.808***	-22.189***	-16.64**	-31.358***	-30.024***	-4.948*	-22.701***	-24.939***
	3.803	3.625	6.256	3.502	3.292	6.591	4.496	4.283	2.974	3.125	3.721
IMMIG-1	-23.521**	24.395	-6.422	-45.461***	-2.161	58.173**	-8.624*	-5.358	15.103***	-61.905***	3.896
	9.733	20.976	10.517	16.843	6.851	25.021	4.846	6.42	4.267	18.056	9.983
IMMIG-2	-38.664***	-23.936	-7.434	14.793	-13.903	26.063	-14.067	1.465	14.476***	-50.718***	-19.302*
	9.15	15	19.753	21.615	12.23	18.968	11.609	6.617	4.85	15.425	11.315
LANGSME	8.004**	10.264	21.566*	3.275	11.211	-3.186	18.359**	10.828	-0.775	40.202***	2.431
	4.034	12.221	11.202	7.822	7.009	20.6	8.794	6.776	12.998	10.926	14.153
INCLS	16.607**	4.505	7.375	8.62**	15.454***	9.728	16.513***	8.762	-4.283	17.532***	26.36***
	7.156	6.763	9.832	4.294	5.654	8.53	4.749	9.047	4.717	4.549	4.301
INCLS	13.666*	33.15***	26.276***	28.26***	22.167***	18.155	38.045***	32.191***	11.5**	29.031***	40.823***
	7.084	6.43	10.198	6.552	6.418	11.26	5.134	7.905	4.839	6.27	6.398
INCLS	24.909***	36.015***	33.282***	34.737***	42.928***	33.684***	60.37***	41.96***	16.185***	12.007	43.9***
	7.416	6.718	10.854	7.768	6.012	11.518	6.504	9.637	5.657	7.899	5.727
INCLS	40.377***	52.231***	33.423***	36.51***	44.284***	33.35***	78.662***	64.662***	20.237***	24.936**	57.957***

	7.754	6.908	10.568	10.282	6.199	10.606	7.787	8.819	5.621	10.52	7.254
INCLS	66.413***	78.997***	51.064***	58.903***	70.847***	46.454***	92.744***	85.451***	35.291***	45.979***	86.595***
	8.365	6.249	8.809	7.567	6.377	8.358	7.077	7.912	4.113	9.177	5.179
ST076Q01NA	26.289***	-1.534	8.358	-5.796	8.619**	5.599	-14.385***	8.396	7.057	2.314	8.264
	5.359	3.753	6.285	4.702	3.467	8.197	4.019	5.346	4.493	3.336	6.523
ST076Q02NA	-3.042	-8.248**	-6.605	-6.501	-6.652*	-9.815	1.662	-16.668***	1.609	1.944	-2.522
	4.199	3.406	5.341	4.294	3.462	6.858	3.573	4.181	3.532	3.327	3.446
ST076Q03NA	-23.985***	-5.2	-19.957***	-8.582**	-23.281***	-14.32**	-15.323***	-16.304***	-12.554***	-8.263**	-16.116***
	3.769	3.702	7.585	3.85	3.833	6.012	3.304	5.092	4.349	3.334	3.501
ST076Q04NA	15.013***	8.021**	14.014**	-11.046***	12.833***	13.839**	3.801	14.765***	12.517***	-2.212	3.979
	4.011	3.824	5.642	3.394	3.892	6.236	3.329	4.967	3.162	2.791	3.78
ST076Q05NA	-4.11	-1.12	-10.212	10.05**	-8.505**	-7.113	7.973*	-3.799	-1.892	13.074***	-7.828
	4.793	4.001	6.438	4.413	3.366	7.897	4.682	4.879	5.152	3.701	4.864
ST076Q06NA	-10.84**	-9.05**	-7.765	-14.344***	-6.846	-13.389	-2.44	-9.92	-8.895**	-7.889**	-10.738***
	4.838	3.534	9.494	4.216	4.502	8.178	3.522	7.337	3.645	3.956	3.839
ST076Q07NA	-10.874***	-18.069***	-9.756	-8.78**	-10.563***	-10.941	-12.357***	-18.429***	-14.572***	-6.894**	-11.499***
	3.425	3.07	6.21	3.878	3.708	7.512	3.533	4.832	4.362	3.078	4.371
ST076Q08NA	6.248	10.013***	14.488	3.749	14.229***	8.746	7.562*	18.988***	10.275***	5.194	7.613
	5.829	3.566	8.83	5.264	4.462	10.304	4.484	5.876	3.771	4.99	6.66
ST076Q09NA	0.845	-8.532**	-5.368	-1.928	2.283	-7.323	-0.125	-0.484	-0.79	-1.664	-3.38
	4.322	3.354	5.788	4.24	3.597	7.31	3.476	4.632	3.704	3.453	3.616
ST076Q10NA	-38.386***	-25.407***	-31.554***	-27.419***	-45.454***	-12.217	-39.214***	-30.654***	-21.783***	-26.625***	-43.696***
	5.611	5.409	11.78	4.613	6.082	9.43	5.465	8.575	5.468	3.743	6.557
ST076Q11NA	-7.501*	-14.283***	-10.56	-5.422	-6.131*	-8.11	-7.225*	-11.969**	-19.825***	-17.02***	-14.169***
	3.962	3.643	6.664	4.089	3.695	7.18	3.771	4.685	3.25	3.697	3.444
CONS	533.903***	437.031***	485.297***	357.691***	476.78***	566.244***	387.568***	497.126***	557.635***	390.716***	519.794***
	39.167	27.048	77.986	29.272	25.077	69.938	70.87	24.342	14.735	18.906	26.511
ADJUSTED R^2	0.29	0.298	0.346	0.303	0.331	0.233	0.232	0.363	0.158	0.18	0.321
N	2606	4287	1143	2221	3147	968	3839	1713	3164	4258	4844

Note: Robust standard errors below the beta coefficients. *** p<0.01, ** p<0.05, * p<0.1

Table 15. Average regression estimates of reading achievement scores with indicators of parental involvement

	BEL	CHL	DEU	DOM	FRA	GBR	HRV	LUX	MAC	MEX	PRT
PINVPTIN	-8.729**	-16.083***	-11.019*	5.378	-15.562***	-25.252***	-9.3***	-15.327***	-7.061**	-1.687	-5.296
	4.1	3.67	6.21	4.947	4.194	6.367	3.566	4.489	3.291	3.479	4.634
PINVTCIN	-15.844***	-8.541**	-37.843***	-21.026***	-37.12***	-29.501***	-19.698***	-24.957***	-11.595***	-18.765***	-24.4***
	4.191	3.831	6.781	4.828	4.236	6.558	3.304	4.668	3.803	3.276	2.952
PINVLSG1	13.922	17.748	94.631	-2.823	24.234	19.574	14.777	42.813**	-5.582	-6.172	5.449
	22.459	18.471	58.921	15.787	20.047	66.627	15.718	20.021	8.098	11.271	14.619
PINVLSG2	-3.255	15.12	90.371	-6.236	25.172	31.784	11.755	37.027*	-0.766	-13.582	11.005
	23.121	19.307	59.113	15.859	21.264	67.281	15.722	22.107	7.771	11.059	15.68
PINVOLUN	3.082	0.857	5.493	-9.433**	-2.488	1.545	-3.584	1.732	-8.112**	-8.988*	-8.762
	8.096	3.694	7.523	4.469	8.056	8.613	4.174	7.635	3.472	4.652	5.65
PINVMTNG1	-25.805	4.725	-40.724	-3.367	-25.992	-33.651	41.847	2.358	-6.865	15.674	-1.547
	33.144	16.006	50.831	27.746	22.828	29.299	56.935	20.158	9.799	13.375	13.059
PINVMTNG2	-16.118	17.861	-30.687	19.543	-13.904	6.651	52.976	0.551	11.339	24.601*	7.654
	32.454	15.545	48.266	26.362	22.531	29.082	55.875	19.243	9.709	13.085	12.884
PINVCOMM	-7.224*	-7.221*	-9.475	-0.467	-4.447	-0.511	-12.435***	-4.51	-5.872	-9.381***	-16.107***
	4.045	3.692	6.436	5.464	3.55	6.951	2.815	4.857	3.649	3.177	3.639
FEMALE	4.078	-4.223	3.048	11.823***	11.167***	3.332	1.614	-1.183	18.164***	-0.62	-2.412
	4.103	3.6	7.113	3.834	3.896	5.848	3.449	4.679	2.899	3.215	2.983
IMMIG-1	-27.777***	5.07	3.22	-31.74**	6.496	18.054	-16.021***	-7.041	18.222***	-57.059***	19.718**
	9.891	24.235	12.64	12.921	8.416	22.445	5.395	6.008	4.151	20.897	8.069
IMMIG-2	-25.701***	-19.414	-19.337	23.312	-14.971	55.7***	-7.768	0.009	18.434***	-62.406***	12.497
	9.563	13.679	22.952	21.985	11.731	20.699	13.236	6.964	5.227	18.518	11.174
LANGSME	11.677***	23.769	26.755**	10.758	13.424	0.432	5.401	36.885***	9.877	40.583***	22.547
	3.97	17.122	13.435	9.104	8.902	22.259	9.097	5.603	9.816	11.904	14.354
INCLS	13.207**	10.21	-0.277	14.786***	13.12*	3.649	15.93***	1.402	2.308	21.951***	25.819***
	6.722	7.077	11.159	4.4	6.802	8.959	5.473	10.114	5.048	4.694	4.174
INCLS	15.545**	30.208***	25.261**	46.83***	22.778***	12.811	39.205***	33.184***	5.592	32.281***	33.872***
	6.994	6.845	11.23	7.254	7.393	12.142	5.075	9.01	5.109	5.793	5.781
INCLS	29.824***	43.88***	33.241**	54.438***	39.761***	28.068**	62.131***	38.54***	13.222**	25.722***	47.211***
	7.142	6.628	12.929	8.143	7.394	11.928	5.857	9.535	5.213	8.255	5.969
INCLS	39.242***	50.052***	32.082***	38.401***	39.557***	35.118***	72.792***	68.113***	13.739**	36.695***	54.448***
	8.131	7.181	11.886	11.83	7.436	11.458	8.922	10.197	6.211	12.695	6.91

INCLS	57.546***	79.271***	53.072***	70.008***	69.261***	37.439***	87.935***	80.947***	28.744***	52.21***	73.609***
	7.459	6.355	9.19	6.845	7.003	9.621	7.322	8.575	4.615	11.137	5.006
ST076Q01NA	22.674***	-3.113	-0.14	-4.769	8.945**	8.139	-15.104***	3.212	-0.382	-5.64	2.385
	5.765	3.465	6.004	5.846	4.105	7.73	4.076	5.376	4.708	3.5	7.005
ST076Q02NA	-5.019	-4.753	-1.577	-7.248	-5.437	-0.058	4.854	-13.005**	-0.128	-1.376	1.428
	4.087	3.729	7.154	4.819	3.762	6.216	3.726	5.239	3.387	3.455	3.365
ST076Q03NA	-25.392***	-3.347	-13.562*	-8.617**	-25.298***	-22.086***	-12.948***	-19.354***	-11.049**	-7.135**	-8.222**
	3.86	3.63	8	3.873	3.683	5.828	3.11	5.885	4.4	3.147	3.772
ST076Q04NA	19.081***	10.85***	17.19***	-15.6***	17.863***	15.407**	5.721*	17.405***	11.255***	1.37	6.925**
	3.671	3.524	6.301	3.775	4.088	7.014	3.216	4.906	3.143	3.271	3.529
ST076Q05NA	-0.402	5.604	3.456	15.888***	-11.765***	-13.508	7.236	2.389	3.174	17.558***	-6.653
	5.44	4.37	7.134	4.505	3.509	8.275	5.546	5.673	4.995	3.715	4.896
ST076Q06NA	-17.511***	-13.692***	-16.35	-26.043***	-10.743**	-19.525**	-9.943***	-15.875*	-14.841***	-9.786***	-16.377***
	4.944	3.512	10.173	4.513	4.939	8.084	3.441	8.195	3.663	3.639	3.998
ST076Q07NA	-10.284***	-17.464***	-4.309	-9.475**	-7.501*	-7.25	-8.621**	-23.726***	-16.23***	-6.551**	-6.495
	3.884	2.961	7.054	4.432	4.205	6.683	3.412	5.051	3.458	3.233	4.392
ST076Q08NA	6.376	12.209***	23.061***	5.554	9.486*	-1.946	13.175**	19.777***	9.025***	7.342*	6.304
	5.682	4.001	8.531	6.155	5.048	10.26	5.213	6.595	3.324	3.982	6.389
ST076Q09NA	-1.343	-9.826**	-9.492	-1.164	2.266	-12.061	-2.405	-2.766	-1.234	0.197	-4.247
	4.19	3.82	6.171	4.579	4.085	7.439	3.489	4.896	3.745	3.754	3.724
ST076Q10NA	-42.65***	-32.956***	-39.738***	-40.896***	-65.242***	-18.033**	-42.59***	-45.439***	-39.806***	-35.201***	-56.24***
	5.417	4.76	12.217	4.296	8.18	8.343	5.721	8.326	5.878	4.068	5.067
ST076Q11NA	-7.33*	-22.224***	-22.824***	-8.271**	-15.293***	-15.869**	-10.583***	-23.318***	-19.404***	-18.632***	-22.496***
	3.865	3.373	6.996	4.153	4.648	7.012	3.733	5.157	3.164	3.098	3.217
CONSTANT	520.951***	423.421***	451.389***	387.272***	506.795***	521.251***	424.388***	458.677***	513.866***	405.566***	499.716***
	38.39	27.78	76.141	31.334	28.689	76.283	58.538	27.899	15.273	22.705	25.308
ADJ R^2	0.282	0.292	0.299	0.38	0.31	0.263	0.24	0.397	0.18	0.219	0.325
N	2606	4287	1143	2221	3147	968	3839	1713	3164	4258	4844

Note: Robust standard errors below the beta coefficients. *** p<0.01, ** p<0.05, * p<0.1

Table 16 Regression Analyses for Italy. Note: Robust standard errors below the beta coefficients.

	READ	MATH	SCIE
PINVPTIN	13.085	9.216	12.428
	3.899	4.495	3.575
PINVTCIN	-36.800	-35.458	-34.897
	3.811	3.394	3.157
PINVLSG	45.865	3.235	31.813
	35.336	40.504	43.751
PINVLSG	44.038	1.146	27.451
	35.619	39.856	43.819
PINVOLUN	-12.587	-15.295	-15.702
	5.385	5.658	5.300
PINVMTNG	1.971	5.109	12.662
	11.811	13.160	13.369
PINVMTNG	14.990	13.486	23.245
	12.067	13.155	13.353
PINVCOMM	-9.233	-12.711	-13.943
	3.760	3.979	3.638
FEMALE	0.536	-36.095	-31.486
	4.754	4.502	4.291
IMMIG	-0.036	2.361	4.062
	10.869	11.174	9.383
IMMIG	-26.478	-7.394	-6.038
	9.403	7.992	8.492
LANGSME	22.739	20.239	17.961
	5.847	5.256	4.806
ST076Q01NA	14.291	21.383	19.065
	4.281	4.073	3.440
ST076Q02NA	-11.189	-11.137	-14.623
	3.887	3.991	3.562
ST076Q03NA	-16.488	-20.510	-15.692
	3.925	4.328	3.804
ST076Q04NA	14.964	6.578	13.451
	4.862	4.924	4.195
ST076Q05NA	0.869	-1.573	-7.240
	4.801	4.998	4.842
ST076Q06NA	-13.573	-11.459	-10.043
	4.778	5.263	5.050
ST076Q07NA	-10.944	-9.193	-10.317
	4.366	4.505	4.240
ST076Q08NA	16.509	16.029	14.073
	6.443	6.635	5.815

ST076Q09NA	-16.418	-13.104	-10.498
	4.378	4.033	3.945
ST076Q10NA	-36.263	-33.289	-34.185
	6.651	6.555	5.733
ST076Q11NA	-11.855	-6.759	-12.347
	4.023	4.640	3.762
CONS	450.002	516.088	476.139
	37.999	42.167	45.845
ADJUSTED R SQUARED	0.219	0.197	0.211
N	5812.000	5812.000	5812.000

Essay 4: Pathways of educational co-production: The relationship between parental involvement and children's school participation in India

Abstract

Most of the education sectors around the developing world face many challenges, the consequences of which significantly matter to its long-term development outcomes. Schools and communities are not exempted from facing wicked problems which affect equity, efficiency, and quality of education. In this essay, we aim to study one of the most basic relational features of education governance in the case of a developing country. We believe that by unearthing such salient features of specific education governance systems, it will allow us to understand how education outcomes relate to the highly localized and contextualized parental involvement patterns.

We do this specifically within the context of a fragmented and constrained service delivery system by situating our research project within the public education system of India. The country presently has the world's largest education sector, counting more than 250 million students in the most recent academic year. We exploit and link two waves of the India Human Development Survey (2004/5 & 2011/12), a series of two linked waves of a nationally representative survey of communities and households.

Our results show that parental involvement is temporally and positively related with the school retention. A child whose parent is PTA member is 1.5 to two times more likely to be in school than those children who are not. Moreover, PTA membership is also among the most important correlate of school retention, along with on a wide variety of indicators on caste, schooling, and sanitation practices. Our contribution resonates with education policies concerning parental engagement, while being mainly methodological and empirical. We innovate by utilizing large-scale multi-period household surveys which offer generalizability about parental involvement at the national level. Our choice of India as a context also resonates with the education policy in developing regions, as parental cooperation for a long time is understood inadequately in similar/related contexts.

Keywords: co-production, parental involvement, India, longitudinal surveys, IHDS

Introduction

Developing countries' education system have always wrestled with issue of equity, efficiency, and quality. This matter is mainly imperative among developing countries, where it remains a significant development policy issue. Our paper resonates with this development theme by examining the challenge of inequality in access to education within the context of the world's largest and most challenged education system, in India. We contribute to the discussion by investigating Indian parents' engagement with the schools in their community and how such a relationship reinforces the school participation of their children. For years, the education literature has been replete with empirical evidence showing how certain forms of parental engagement are highly valuable to education outcomes. The education discourse within the public management and policy stream of literature, on the other hand, is undergoing a renewed and strengthened perspectives on relational features of school management.

In this light, our broad goal is to identify and to quantify some of the likely determinants of a novel form of parental involvement, as well as to estimate its association on education outcomes. Specifically, we investigate the drivers of parental engagement within communities, though two under-evaluated but common parental mechanisms, (1) parent-to-teacher interactions and (2) how membership in school committees like parent-teacher associations potentially influence education outcomes. Furthermore, we do trace the temporal association of these parental engagements in their children's education outcomes through a longitudinal design. Our paper folds together several contributions: first, we explore this question through the context of the world's largest, yet fragmented and problematic education system (G. G. Kingdon, 2007; Tilak, 2018). Second, in order to robustly identify a possible link between engagement and education outcomes, we employ the use of a multi-period nationally representative household which allows

us to trace and estimate a channel or mechanism. Third, we aim to contribute to the empirical literature on parental involvement in a co-production framework, a broad emerging framework where lay actors get involved with service providers within any stage of the delivery of public services (Nabatchi et al., 2017; Parks et al., 1981; Voorberg et al., 2015).

Review of the Literature

Parental involvement within a broad development agenda

Until recently, the discourse on parental involvement and participation are confined only within the intersectional streams of education, child development, and educational psychology. Throughout the years, these fields have published a steady stream of research outputs investigating the determinants of educational outcomes in a wide variety of contexts, research approaches, and units/levels of observation. Years ago, the immense share of the literature in this area are qualitative and non-empirical (Fan & Chen, 2001); but empirical and quantitative studies have been gaining traction.

Historically, the fields mentioned above offered the earliest perspectives about parental involvement in schools. Education co-production as a conceptual embodiment of involvement and participation has not taken off until the late 1980s, as co-production is a general terminology much more commonly used in the political science and social choice literature to imply resource sharing arrangements between agents. Davies (1985, 1987) is among the first to associate school-family partnerships as examples of co-productive work in the field of education, which contributed to laying fundamental definitions of the new co-production in schools. Parental roles in schools, as

an example, can be exercised through a wide variety of roles both within and outside schools. Davies mentions that these activities include placing a substantial level of attention on the joint and shared responsibility among education stakeholders. Among others, he also cites establishing parental volunteer programs, informing parents about school activities, and coordinating home tutorship programs, among other examples. Successive works such as that of (K. V. Hoover-Dempsey & Sandler, 1997; 1995) have shown the approaches by which parents are motivated to engage themselves with schools. Three basic psychological dimensions have been cited for influencing parents' participation decisions: (1) parent's construction of the parental role, (2) parent's self-efficacy for helping his/her children succeed in school, and (3) general invitations and the demand for involvement from child and school.

Moreover, the parental mechanisms which influence a child's education outcomes can also occur through mechanisms such as modeling, reinforcement, and instruction. In line with policy and practice, their work underscores that extending benefits accruing from parental involvement should consider the perspectives of parents themselves within the process of crafting policies about their participation. As early as 1991, Comer & Haynes (1991) notice that educational programs established within "traditional and inflexible school environments" are less likely to be as successful, as compared to those projects organized within a collaborative structure.

Within the last yen years, successive works had shown how parental involvement matter at the school level is known to influence several of children's developmental and educational outcomes positively. A meta-analysis of strategies that promote student achievement (Hill & Tyson, 2009)

found that familial, family-school relations, and parental involvement are positively related to student achievement. Moreover, parental engagement among disadvantaged groups such as children ethnic minorities has also been found to positively influence academic achievement, as shown in a meta-analysis done by (Stewart, 2011). However, parental involvement is also unexpectedly variable across many settings. It also has notable variances between the reality of actual practice and the enactment of parental participation (Cottle & Alexander, 2014). More parents are observed to be more involved in the earlier years of the child, with mothers being observed to be more active as compared to fathers (Williams et al., 2002). There have also been many barriers for parents to be involved (Hornby & Lafaele, 2011). The inhibiting factors stem from the characteristics of the parent/family, child, parent-teacher relations, and the broader social contexts which play significant roles. Still, parents begin to recognize that the future of their child does not solely depend on the efforts of the teacher but to a growing extent to their role as co-educators (Ule et al., 2015);

Parental Involvement and the education challenges in India

Education systems in that of developing and least developed countries continue to face issues of access and equity. We chose India as the research setting for this study because of three main reasons. First, India presently has the world's most extensive education system: its central government estimated[8] that there were about 202 million learners who are age-appropriate to attend an elementary school and another 48.5 million for the high school as estimated in the country's 2017 population projections. The country is home to most number of illiterate persons in the world (Ganapathi, 2018) . The size of its education sector underscores the immense pressure for the government and its other education stakeholders to deliver quality education. It

[8] http://mhrd.gov.in/sites/upload_files/mhrd/files/statistics-new/ESAG-2018.pdf, P. 23

faces persistent challenges on equity, quality, and access. Educational deprivation, especially on the issues of access among the marginalized and lower socioeconomic groups is common and severe (Tilak, 2018). Despite improvements in the gross primary enrollment rate in recent years, drop-out rates and secondary school participation remains low. The choice of variables on parental engagement with school's links with the policy consequences of *Sarva Shiksha Abhiyan*, the world's most extensive basic education program. It is also the country's flagship partnership and stakeholder-oriented reform aiming towards improving education quality and access in schools (Ward, 2011).

Second, the interactions across a wide variety of social and cultural characteristics of children and their families with those factors relating to teachers and schools remain underexplored. India has also not surfaced in many parental involvement studies, most notably in those entailing a national-level longitudinal scope. The richness in cultural traditions and beliefs strongly intertwine with educational attitudes and practices which certainly influences development outcomes. For example, families' adherence to specific cultural practices and beliefs such as the non-participation of women into the labor market constrains investments and decisions by families to send girls to schools (G. G. Kingdon, 2007). Education outcomes for women continues to be low and there are wide disparities on many education outcomes among castes (A. Deshpande, 2007). Many of the prior studies on the parental involvement did not consider highly contextualized features of study countries. Third, issues of school management in a developing country setting are significant for countries like India. Teacher absenteeism is a systemic problem (Kremer et al., 2005), as well as the pay of teachers (Muralidharan & Sundararaman, 2011; Woessmann, 2011). These factors are both highly associated with

educational outcomes, and how this relates to parental engagement, specifically in India, remains an issue of concern.

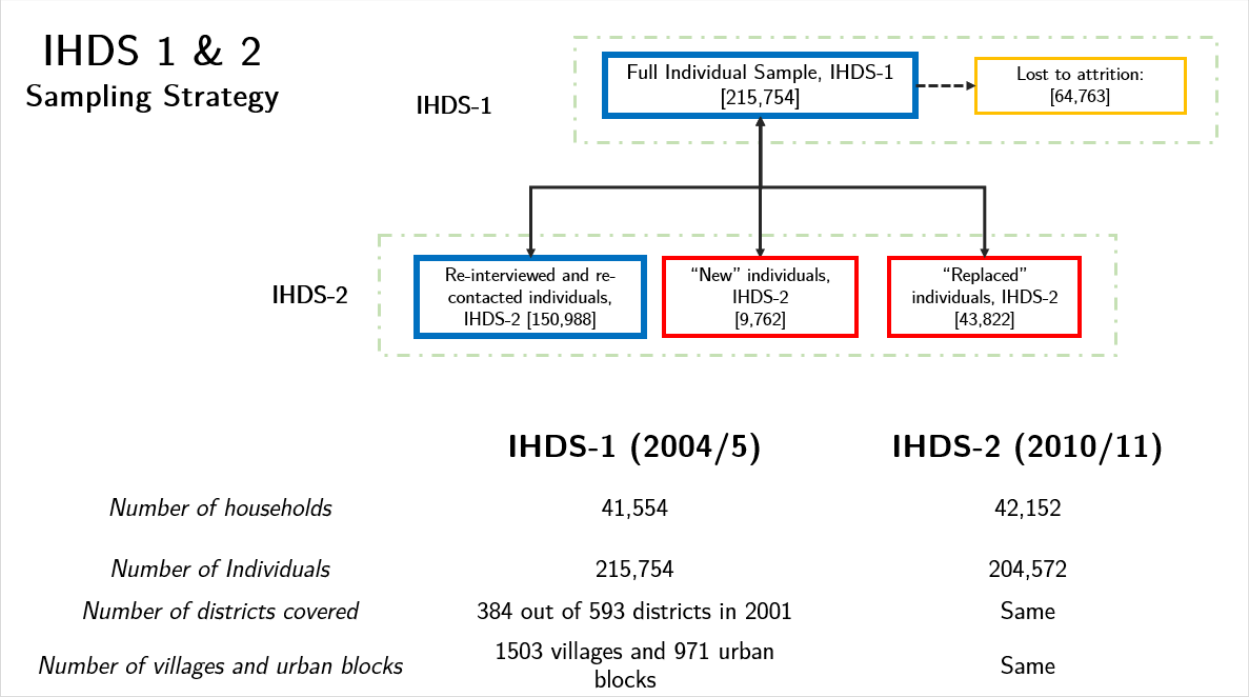
Data and Methods

Data source and description

Our primary data source is the India Human Development Survey (IHDS), a series of two linked household survey waves jointly developed by research teams from the National Council of Applied Economic Research (NCAER) in Delhi and the University of Maryland[9] (Desai & Vanneman, 2015; Vanneman, 2008). The general idea of the survey is to bring together a wide range of development-related topics in a single nationally representative survey, which should allow evaluation/analyses of associations across a range of social and economic conditions. Both survey waves cover topics on health, education, economic status, mortality, fertility, gender relations, and social capital at the level of individuals and households. Furthermore, additional features are included, such as local institutions like schools and health facilities, crops, and harvest. One distinguishing feature of the IHDS-2 is the addition of modules on youth activities, which enable the capture transition to adulthood of young household members in the earlier wave.

[9] Access to the public use files are available through https://www.ihds.umd.edu/. IHDS-1 was first released June 2008 and IHDS-2 was first released on June 2015; it was re-updated 2018.

In terms of coverage, the IHDS is sufficiently large to study an extensive set of indicators within a wide variety of sub-national geographical and social contexts. It covers 33 states and union territories, as well as capturing the populous main metropolitan areas of Delhi, Mumbai, Chennai, and Kolkata. The first wave of the survey in 2004/2005 covered 41,554 households (215,754 individuals) across the 1,503 villages and 971 urban neighborhoods (Barik et al., 2018). During the second wave, households are re-interviewed, including the new households that were separated from the original households but are still living within the same area. Collection of information on the households with unknown status and whereabouts are gathered from the closest living relative from the original households, following the standard guidelines of demographic surveys. By 2011/12, an estimated 64,763 individuals were lost due to attrition, i.e., due to moving out.



	IHDS-1 (2004/5)	IHDS-2 (2010/11)
Number of households	41,554	42,152
Number of Individuals	215,754	204,572
Number of districts covered	384 out of 593 districts in 2001	Same
Number of villages and urban blocks	1503 villages and 971 urban blocks	Same

Figure 4 IHDS-1 and IHDS-2 Sampling and re-sampling strategy

Captured information on family backgrounds is extensive, covering the health and education status of members, income, expenditures, debt, confidence in institutions, social capital, crime, anthropometry, and child learning. Finally, the IHDS also includes other linked modules. The primary school questionnaire contains information on school characteristics, physical structure/s, school costs, school management and community involvement, personnel profile, and classroom observation. Other modules include examined harvest/crops and medical facilities. Questions also include school and community participation in the social capital module of the survey.

Matching issues and challenges

Our primary unit of analysis in our study is the child recorded in the first wave of the survey. Tracing the educational progress of children through the two datasets is not an easy and direct task. Individually matching them entailed multiple levels of careful checks. We double-checked for the data entry consistency across both waves, cross-checking them with the rosters and making sure that numerical entries make reasonable sense. These routine data quality checks included gender, age, and birthdays. For our analyses, we excluded children who have data entry inconsistencies such as “gender” shifting during the second wave (about 70), or those whose age increased by more than the actual reasonable year difference between two survey waves. We place a high level of attention on ensuring that roster profiles are matched cleanly so all succeeding statistical tests do not get compromised by data quality issues.

To follow the education progress of children, both waves of IHDS have sections on children’s educational profile within the women’s questionnaire. These modules on the children’s profile

include information enrollment at the primary levels of standards 3 to 6 (equivalent to grade levels 3 to 6). The IHDS-1 covered a total of 14,604 children. At the full individual level, the survival rate between the two survey waves is about 69 percent (150,988 out of 215,754 individuals). For the school children in the roster, 10,667 (out of the 14,604) were re-surveyed in the second wave, representing approximately 73.04 percent survival rate or an attrition rate of 26.96 percent. Prior studies on the attrition rate in the IHDS in India indicate that moving out is driven by wealth/socioeconomic variables, with mostly poorer households more likely to stay.

Variables and Measures

Educational progression. Our primary dependent variable is the schooling status of the child during the second wave of the survey. During the first wave, the schooling status was recorded; in our primary interest to identify possible and candidate causal channels, we considered a variable measured at a later period. During the first survey wave, mothers (or other family respondents) were asked about the schooling status of children 8 to 11 years old in their households. We combined this information with the other details from the separate family roster, thus allowing us to link schooling characteristics with the sociodemographic profile. All individuals in the survey have identifiers, which we used during the second wave to match/update the roster information. Given that this is an extensive national household survey, coding errors are still possible. We excluded those observations which did not give consistent or reliable information between the two periods.

Parental Involvement Measure. Two forms of parental involvement at both school and household levels were recorded. To obtain it at the household level, we used the answers of respondents to the following questions:

> *(1) "Do you participate in any school committee like the Parent-Teacher Association? (Yes/No)"*
> *(2) "During the year, how many times does [did] someone from the family discuss {CHILD's NAME} school work with the teacher? (Number of times within the last 12 months)"*

Item number 1 is a dichotomous variable (0 or 1), which we coded as MEMBPTA and item number 2 as QPARDISC for our quantitative analyses with a range of values from 0 to 99.

Other variables. We considered other observables at the level of the child. These are the gender of the student (a dummy variable, FMALE) and age during the first wave (AGE0405). The role of gender in social mobility is widely studied in India, a country with a pronounced male advantage in education (Mohanty & Rammohan, 2015) . We also took into account child habits such as absenteeism of more than five days a month (ABSENT5); the average performance as a student (AVESTDNT), school repetition history (NREPEATS), school enjoyment (SCHLENJOY) and whether the child received schooling commendation (CHLDPRSD) or if they are abused (CHILDBT). Many of these indicators are not reported as standard performance indicators in the country but are important indicators of the learning experience of the child in the classroom.

Furthermore, we included indicators about teacher quality, such as if the teacher has favoritism/bias (BSTCHR), the regularity of teacher attendance (TEACHATT), an assessment of teaching performance (GDTCHR) and if the teacher lives within the local area (LOCALTCH).

India suffers from chronic teacher absenteeism, teacher shortage and lack of training, especially in poor and rural areas (G. Kingdon & Muzammil, 2009; Mooij & Narayan, 2010; Pandey, 2006), hence including these variables about the teacher are important.

Indicators such as religion, tribe and class are also important in studies pertaining to social stratification and for this reason we included a dummy variable indicating poverty status of the household (POOR2005HH), categorical variables indicating if the family lives on a rural area, urban area, or urban slum (URBANITY), as well as caste membership (wGROUPS8). In India, perceived social status is determined by the caste system (Bros, 2014), as well as one of the main determinants of several indicators of economic status. The caste system shapes and limits the behavior and interactions with people coming from other social classes (A. Deshpande, 2007; M. S. Deshpande, 2010). Also, households coming other groups such as scheduled castes and scheduled tribes, as well as Muslims are more likely to be in lower income groups in comparison from high-caste Hindu households (Borooah et al., 2014). We believe that these information about social stratification are relevant for any discourse concerning access and equity in education in the country. We also include a variable on sanitation practices, particularly whether a household practices open defecation (TOILETQ). Household sanitation practices, such as open defecation, has been recently studied to be linked to the practice of untouchability (D. Coffey et al., 2015; Diane Coffey et al., 2014, 2017) and thus sanitation preference carry potential beliefs about internalized prejudices and social class distinctions, which also encompass education beliefs.

Analysis Plans

The first stage. Aside from the descriptive analyses of parental engagement and child characteristics, we conducted two stages of regression analyses in response to the research questions we posed at the beginning. To investigate the correlates of the number of parent-teacher engagement in discussing children's schoolwork, we used a negative binomial regression framework to factor in the dispersed data. We have initially performed initial tests whether a Poisson model or zero inflated model is appropriate, but a negative binomial regression framework is more suitable given the goodness of fit and model parsimony.

The second stage. A logistic regression framework was adopted as part of the next stage in estimating the association between parental involvement on retention and attendance. Specifically, we started with a baseline model below:

$$y_i = \alpha * \boldsymbol{PTA} + \boldsymbol{\beta} * \mathbf{X}\mathrm{i}' + \varepsilon\_i$$

Where y_i is a binary variable denoting whether the child remains to attend a school during the second survey wave (1 if yes and 0 if not attending). $\mathbf{X}\mathbf{i}'$ is a vector of child and family characteristics during the 2004/05 wave of the survey, described above.

Furthermore, we also tested our models whether a hierarchical logistic modeling (HLM) regression framework is necessary to conduct the analyses. The HLM framework, precisely a case of multilevel mixed-effects logistic regression is necessary in cases where the primary units of observations are nested in clusters, thus rendering a hierarchical data structure. The IHDS is designed to be representative at the state level, and the sampling of the households considers the urban-rural population distribution, with the districts as the sampling unit of the villages. Several iterations of our model in a hierarchical framework with districts and states as nesting levels of the

households and children did not render an intra-class correlation coefficient higher than 0.10. It was only 0.04 at the state level and 0.08 at the district-state level, implying that the hierarchical/multilevel analysis framework is not necessary, and a random-effects framework should suffice. It implies further that school attendance as the source of variation comes at the individual or household level and not at the higher-order clustering (state or districts). In this regression framework we included the vector variables capturing the observed characteristics of the child in 2004/05 (mentioned earlier); $\mathbf{Xi}'$, as well as controlling for the parents and household characteristics. These variables include, among others, socioeconomic status, demographics (caste and religion), geographic fixed effects (such as state and urbanization), and the child's school experiences and perceptions during the first wave of the survey. ε_i captures the child-level error term. In all analyses, the necessary survey weights are applied to the estimation process. As with analyses of household surveys with similar research designs, the standard errors are clustered at the household level.

Attrition Issues. During the second round of the IHDS, households are revisited, and family members' rosters updated about their status on a comprehensive set of indicators. Out of the 14,683 children ages, 8 to 11 covered in 2004/5, about 10,462 of whom were traced by the second round of the survey. An estimated 4,221 were not traced, representing an attrition rate of 28.7 percent. For a survey of this magnitude and representability, the overall attrition rate is still low, and it still permits a reasonable sample size to perform regression analyses. The attrition is higher among non-school attendees and is similar for those who attended school in the past, as well as during 2004/05. The school retention rate of 74.28%, [6,244/ (11,762-3,355)] *100 among the 8-11-year-old children happen to be not very far from the estimated lower secondary level completion rate

in India between 2008 (68.3%) and 2011 (76.47%)[10]. We conducted simple t-tests to show how the re-interviewed children are different from those who dropped out of the survey. The children in the attrition group are more likely to be less poor, they live in urban areas, are females and have parents who are PTA members. Hence, it implies that our sample represents a more significant share of the rural poor in India, further underscoring how education outcomes are transcended in less advantageous social positions.

Results

Descriptive Statistics

The descriptive statistics are presented below. Overall, the enrollment rate of children during the first wave of the survey is high at 98 percent (INSCHL1), but during the second wave, the enrollment rate falls drastically at 72.9 percent (INSCHL2, controlling for attrition). There is a high variance across various socioeconomic and geographic groups displayed in the succeeding sections in terms of enrollment and parental engagement with the teachers. Parents discuss the progress of their children with teachers 2.60 times on the average; almost half of the parents are PTA members. Socioeconomic variation is also highly persistent.

Children generally enjoyed schools (SCHLENJOY, 93 percent), and a third reported are being praised by their teachers (CHLDPRSD, 32 percent). Child beating is particularly high at 32 percent (CHLDBEAT). Teachers, in general, were generally positively perceived, particularly regarding fairness (FRTCHR), competence (GDTCHR), and attendance (TEACHATT). However, teacher attendance is probably overestimated by parents as previous studies have confirmed high

[10] https://data.worldbank.org/indicator/SE.SEC.CMPT.LO.ZS?locations=IN

absenteeism rates or may even imply that parents are unlikely to report teacher absenteeism. Results are summarized in Table 1 below.

Table 17 Descriptive Statistics of children 8 to 11 (based on IHDS-1)

Variable	Obs	Mean	Std. Dev.	Min	Max
FMALE	14,604	0.47	0.50	0	1
AGE0405	14,604	9.47	1.06	5	13
INSCHL2	14,604	0.53	0.50	0	1
MEMBPTA	14,305	0.49	0.50	0	1
QPARDISC	13,725	2.60	4.55	0	99
QPARDISC_SQ	13,725	27.49	298.60	0	9801
DISC2X	13,725	0.89	0.74	0	2
INSCHL1	14,604	0.98	0.13	0	1
NOTSCHL	14,604	0.02	0.13	0	1
ABSENT5	14,604	0.22	0.41	0	1
FACATT	14,318	0.97	0.17	0	1
TEACHATT	14,314	0.97	0.18	0	1
LOCALTCH	14,300	0.57	0.50	0	1
FRTCHR	14,307	0.97	0.16	0	1
GDTCHR	14,298	0.97	0.17	0	1
BSTCHR	14,303	0.10	0.29	0	1
AVESTDNT	14,270	1.01	0.50	0	2
SCHLENJOY	14,295	0.93	0.26	0	1
NREPEATS	14,183	0.16	0.52	0	5
CHLDPRSD	14,091	0.32	0.47	0	1
CHLDBEAT	14,004	0.23	0.42	0	1
POOR2005HH	14,593	0.28	0.45	0	1
URBANITY	14,604	1.32	0.51	1	3
SECDUM	14,604	0.20	0.40	0	1

The variation in parental participation across states and groups

Differences in parental participation in school committees' rates varied noticeably among the poor and the non-poor households across all Indian states in 2004/2005. Non-poor households have significantly higher participation rates as compared to the households below the poverty line (diff=19.6%, $p<0.001$). Within each state, statistically, significant differences range from 9.8% in Karnataka ($p<0.05$) to 47.9% in Jharkhand ($p<0.001$). Within each caste group, the

difference in participation rates varied significantly according to the poverty status. Adivasi or tribal households reported the lowest participation rates; the difference between poor and non-groups is vast and statistically significant (diff=23.4 %, p<0.001). Figures 2 and 3 below illustrate the extent of this variation across states and caste groups.

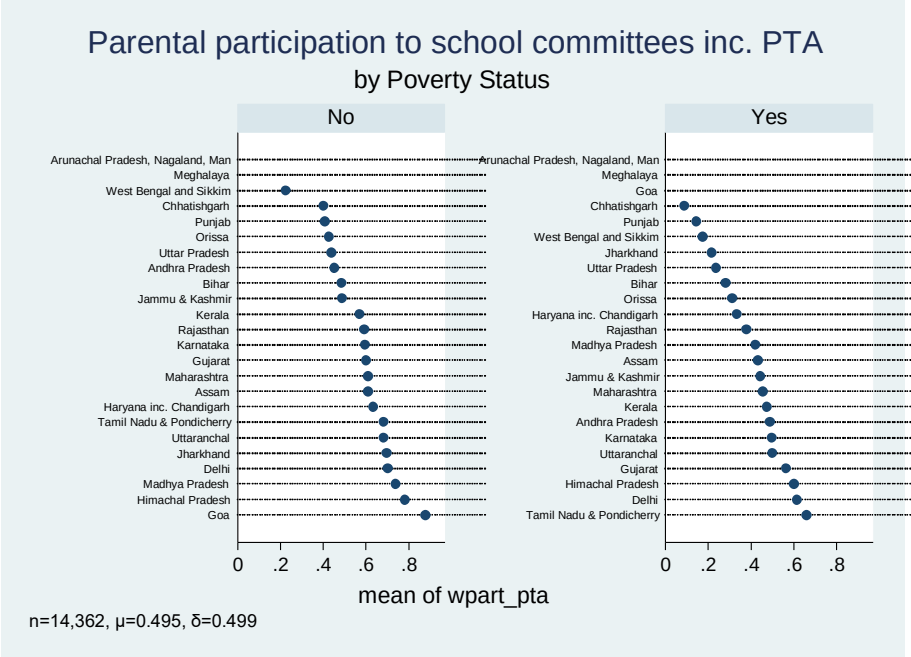


Figure 5 Parental participation across states according to the poverty status of households.

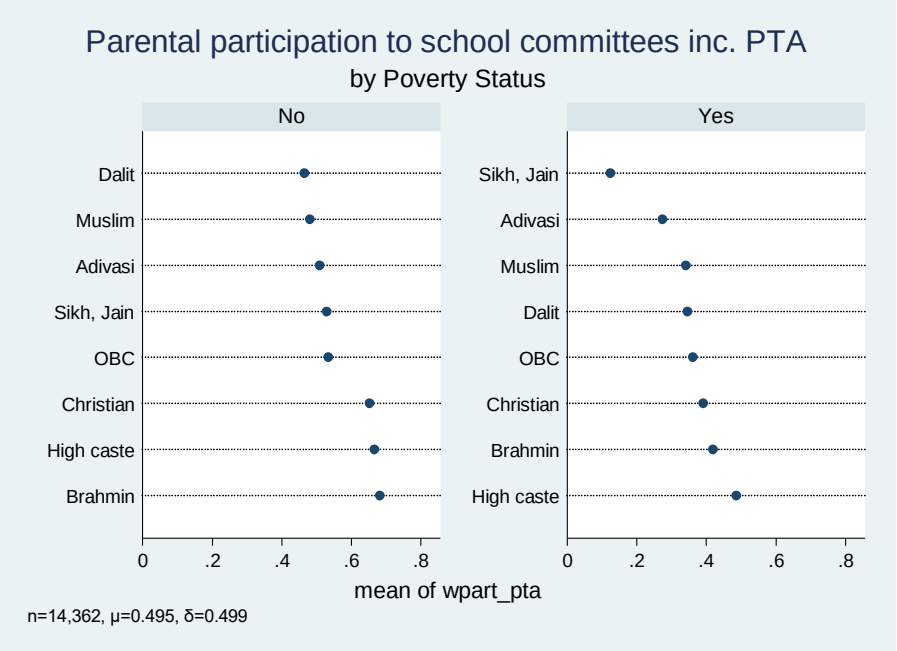


Figure 6 Parental participation across caste groups according to the poverty status of households.

The number of times parents discuss their children's work with the teacher varies considerably among states, too. The difference is statistically significant between poor and non-poor households in at least 14 states. Parents from non-poor households discuss their children's progress with the teacher almost twice as much as poor households (μ_{np}=2.99 vs. μ_{np}=1.63, d=1.36, p<0.001). Within each caste, we find starker differences, as (mostly non-poor) Sikh/Jain households hold discussions with teachers 5.38 times in the year, against the national average of 2.6. Across Brahmins, Muslims, OBCs, Christians, and Adivasi households, we find poor households discussing children's works with their teachers significantly less than their non-poor counterparts. Figures 4 and 5 (appendices) further illustrate the extent of this variation across states and caste groups.

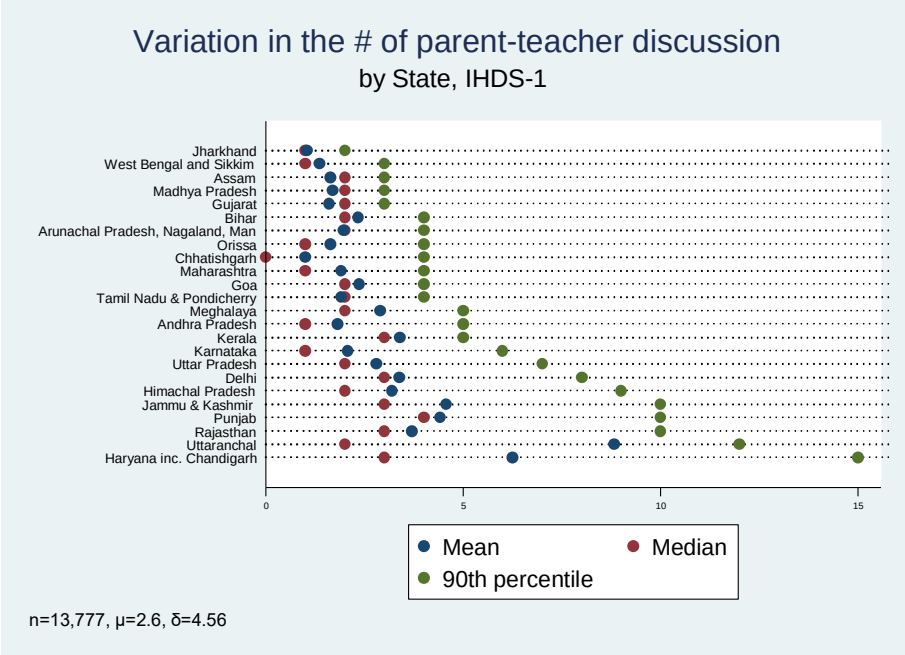


Figure 7 Variation in the number of parent-teacher interactions by state

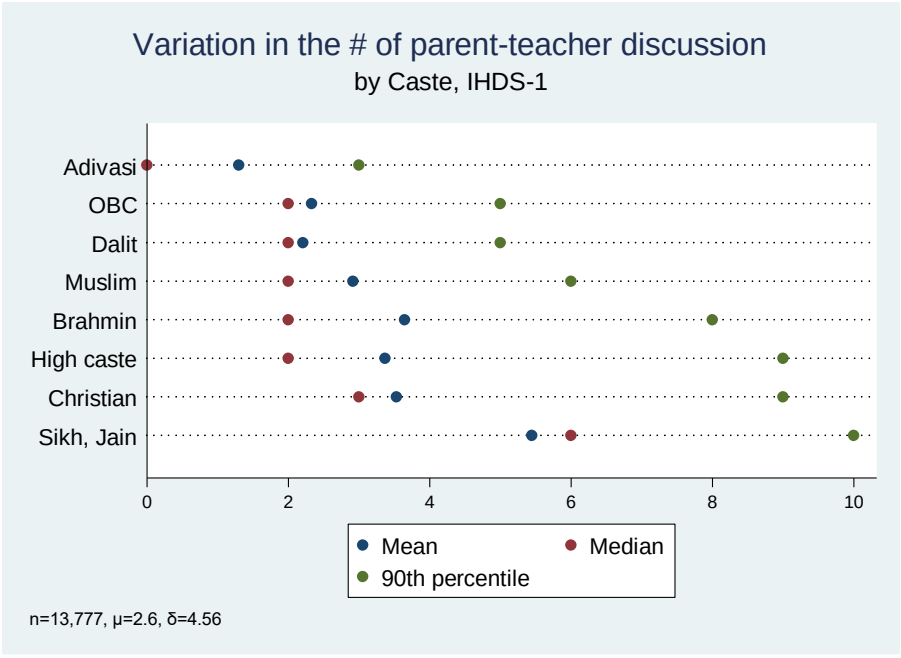


Figure 8 Variation in the number of parent-teacher interactions by caste

Binomial regression estimates of parent-teacher engagement

The average count of parent-teacher engagement in India averaged 2.60 in 2004/05, with a variance of 20.8, implying an over dispersed count (see Figure 6). As castes and states explained significant variation in parental involvement in PTA membership, we also included these in our control variables, along with the observable family and child characteristics. Our initial ordinary Poisson regression estimates showed an underestimation of the standard errors; we fit a negative binomial regression to take into consideration the overdispersion of the data, as summarized in Table 2.

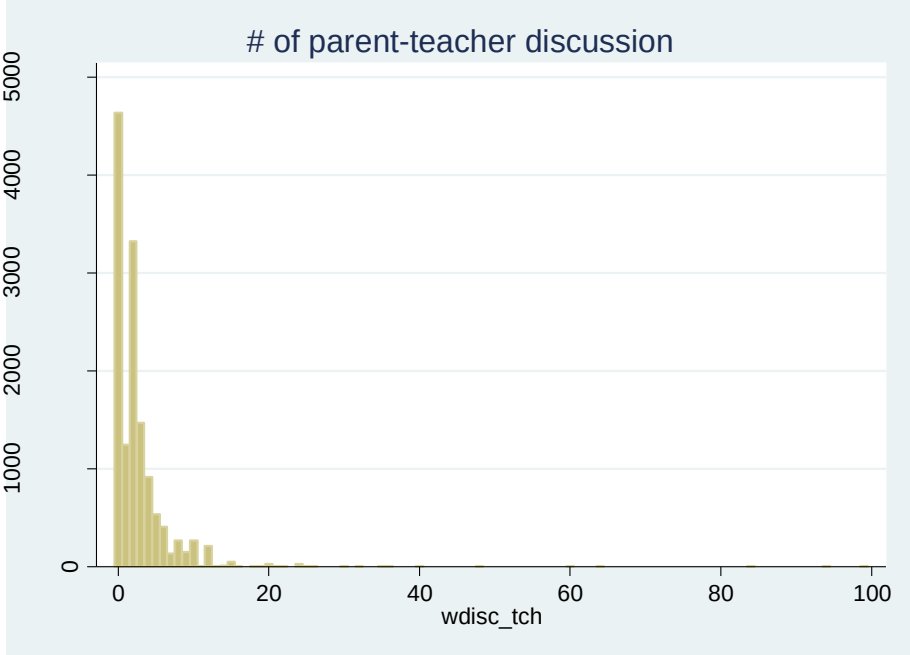


Figure 9 Overdispersion in parent-teacher interactions count

We performed two sets of regressions, several sets of specifications covering the full sample of children in the first wave of the survey (Table 1 in the appendices), and the second set covering only those children covered in both waves (Table 2 in the appendices). Using this approach allows us to compare the magnitude and stability of estimates and the overall fit of the model with the

data. All regressions yielded a statistically significant good fit; regressions performed with robust standard errors.

We find that PTA membership is statistically significant and is positively related with parent-teacher engagement, with incidence ratios of between 2.72-2.74. This relationship implies that membership increases the parent-teacher interactions by a factor between 1.72 and 1.74, keeping all other factors constant. The sex of the child does not seem to influence the level of parental engagement. Our finding also implies that parents have no gender bias on engagement with teacher. We find a result that resonates with one finding in Chapter 3 of this manuscript, that behavioral or academic problems are likely triggers of parental involvement. The IRR of the variable ABSENT5 indicates that the engagement of the parent increases when a child is absent for at least five days in a month. Anecdotal evidence in the field might indicate that this is when parents personally report to the teachers the reason for absences, i.e., sickness.

One contribution of our empirical work is an emerging strand of the literature that education outcomes, especially in India, are related to the household's sanitation behavior. Families who do not practice open defecation engage with teachers more than those families who do. The incidence ratios for (TOILETQ) latrine use and flush toilets range from 1.19 to 1.39 ($p<0.01$). Hence, we can find initial evidence that schooling decisions (and outcomes) may interact with other household behavioral indicators. A lot of the literature significantly has also linked personal hygiene and family sanitation practices to a caste-dependent set of beliefs (D. Coffey et al., 2015; 2014). We investigated this further in the logistic regression modeling framework in the following section.

Moreover, we find that parent-teacher engagement is also positively associated with child praise (CHLDPRSD) and school enjoyment (SCHENJOY) ($p<0.05$ and $p<0.01$, respectively). Children with siblings do not seem clear to factor (SECDUM). However, parents of better-performing students (AVESTDNT) and those who have had a history of school repetition (NREPEATS) are more likely to engage with teachers. The latter situation may imply that parents are more likely to work with teachers to prevent further school grade repetition; however, the margin of prediction tends to be more extensive as the number of predictions increases (See Figure 1 in the appendices). We also find that parents from urban and urban slums are likely to engage more with teachers as compared to their rural counterparts (URBANITY 2 and 3 have IRRs between 1.20 to 1.26; $p<0.01$).

Among the teacher's characteristics, favoritism is the only teacher-related variable which is associated positively with engagement (BSTCHR IRR= 1.14, $p<0.05$). This interpretation is only valid for those children surveyed in both waves. Teacher attendance, teacher's habitation, and teacher's perception of performance is not associated with parental involvement significantly.

Table 18 Negative Binomial Regression Estimates of Parent-Teacher Discussion, comparison between full 2004/05 and surviving 2010/11

VARIABLES	Model 5, Full 2004/05	IRR	Model 5, Only 2010/11	IRR
MEMBPTA	1.008***	2.74	1.000***	2.72
	(0.0412)		(0.0495)	
FMALE	-0.0224	0.98	0.0136	1.01
	(0.0329)		(0.0394)	
AGE0405	-0.0174	0.98	-0.0286	0.97
	(0.0157)		(0.0187)	
ABSENT5	0.0871**	1.09	0.128***	1.14
	(0.0405)		(0.0485)	
SECDUM	-0.0339	0.97	-0.0398	0.96
	(0.0394)		(0.0457)	
1.TOILETQ	0.331***	1.39	0.385***	1.47
	(0.0709)		(0.0860)	
2.TOILETQ	0.182***	1.20	0.223***	1.25
	(0.0654)		(0.0749)	
3.TOILETQ	0.204***	1.23	0.190***	1.21
	(0.0386)		(0.0460)	
AVESTDNT	0.147***	1.16	0.118***	1.13
	(0.0375)		(0.0435)	
NREPEATS	0.0729**	1.08	0.0713**	1.07
	(0.0283)		(0.0329)	
SCHLENJOY	0.218***	1.24	0.245***	1.28
	(0.0625)		(0.0730)	
CHLDPRSD	0.107**	1.11	0.123**	1.13
	(0.0423)		(0.0516)	
POOR2005HH	-0.160***	0.85	-0.110*	0.90
	(0.0483)		(0.0572)	
2.URBANITY	0.234***	1.26	0.208***	1.23
	(0.0427)		(0.0515)	
3.URBANITY	0.207***	1.23	0.180*	1.20
	(0.0787)		(0.0977)	
BSTCHR	0.0720	1.07	0.134**	1.14
	(0.0545)		(0.0678)	
TEACHATT	0.0222	1.02	0.0565	1.06
	(0.111)		(0.116)	
LOCALTCH	-0.0348	0.97	-0.0455	0.96
	(0.0333)		(0.0402)	
GDTCHR	-0.0530	0.95	-0.100	0.90
	(0.125)		(0.136)	
1.WGROUPS8	-0.143**	0.87	-0.167**	0.85
	(0.0638)		(0.0826)	
3.WGROUPS8	-0.175***	0.84	-0.187***	0.83
	(0.0483)		(0.0579)	
4.WGROUPS8	-0.167***	0.85	-0.154**	0.86
	(0.0517)		(0.0607)	
5.WGROUPS8	-0.285***	0.75	-0.328***	0.72
	(0.0673)		(0.0782)	
6.WGROUPS8	-0.104	0.90	-0.0834	0.92
	(0.0768)		(0.0979)	

7.WGROUPS8	0.216**	1.24	0.315***	1.37
	(0.0881)		(0.105)	
8.WGROUPS8	0.00707	1.01	-0.172	0.84
	(0.112)		(0.137)	
Ln alpha	-0.398***		-0.367***	
	(0.0593)		(0.0719)	
Constant	0.373*		0.395	
	(0.212)		(0.242)	
Observations	13,034		9,497	
Pseudo R	0.0896		0.0864	
p	0		0	
chi2	2817		2008	
alpha	0.672		0.693	

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. State dummies included in the model but not shown for brevity purposes.

Caste and state effects. We also included information on the household's caste membership, with the High Caste as our base case in our regression models. We find that Brahmins, Other backward castes (OBCs), Dalits (Untouchables) and Adivasis (tribal groups) are all on a position of disadvantage when it comes to engaging with teachers (1.wGROUPS8, 3.wGROUPS8, 4.wGROUPS8 and 5.wGROUPS8; IRRs below 1, $p<0.05$). On the other hand, Jains and Sikhs are the opposite (7. wGROUPS8, IRR 1.24 to 1.37, $p<0.01$). The same effect can is still evident, regardless of urban location, as shown in the figure below. The caste system is a stronger predictor of engagement than the location. Moreover, controlling for the state, we also find that parents from the north, especially Punjab, Haryana, and Jammu & Kashmir, are more likely to engage with teachers than the rest of other Indian states (all $p<0.01$; computations not shown for brevity).

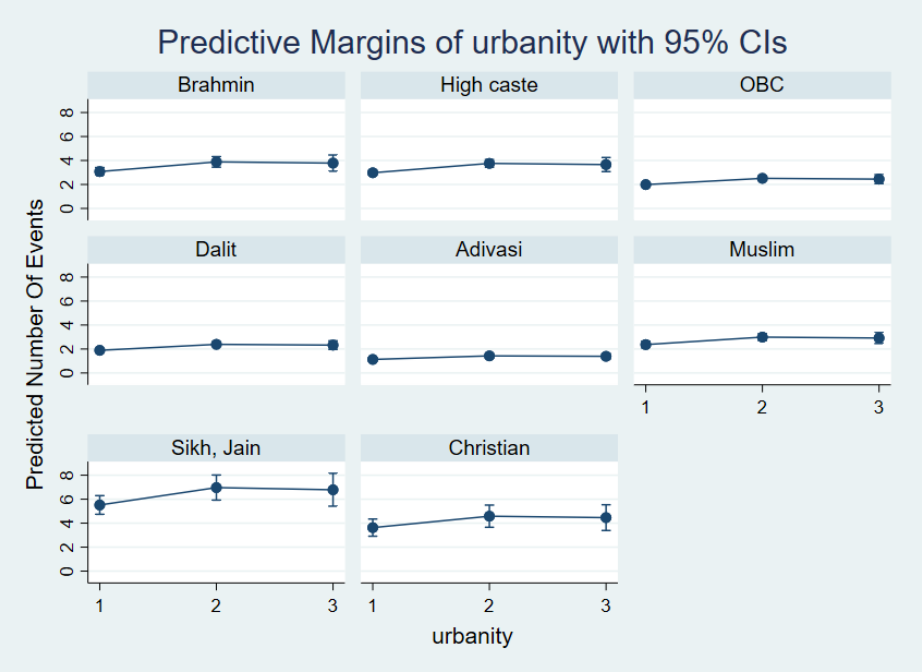


Figure 10 Predicted Parental engagement by caste, disaggregated by urban status

In this section, we reported our estimates of the binary logistic regression model, with the education outcomes during the 2010/11 as our dependent variable.

The relationship between participation and school retention. In this section, we test whether variables on parental involvement along with the child, family characteristics are related to school outcomes. In addition to our variables on parental engagement, our independent variables are the 2004/05 characteristics of the child, the family, and the teacher. We create several specifications but report the full models in the table below.

Table 19. Logistic regression estimates of parental engagement, child and teacher characteristic as determinants of school attendance in India

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
MEMBPTA	0.706***	0.439***	0.439***	0.351***	0.409***	0.332***
	(0.0730)	(0.0646)	(0.0646)	(0.0645)	(0.0661)	(0.0651)
DISC2X		0.246***	0.246***	0.228***	0.259***	0.241***
		(0.0618)	(0.0618)	(0.0629)	(0.0617)	(0.0628)
FMALE		0.0634	0.0634	0.0444	0.0678	0.0490
		(0.0726)	(0.0726)	(0.0788)	(0.0717)	(0.0783)
POOR2005HH		-0.526***	-0.526***	-0.464***	-0.531***	-0.471***
		(0.0706)	(0.0706)	(0.0717)	(0.0707)	(0.0724)
SECDUM		0.385***	0.385***	0.414***	0.390***	0.420***
		(0.0711)	(0.0711)	(0.0691)	(0.0700)	(0.0696)
AVESTDNT				0.313***		0.301***
				(0.0954)		(0.103)
NREPEATS				-0.122**		-0.120**
				(0.0521)		(0.0534)
SCHLENJOY				0.364**		0.345**
				(0.159)		(0.153)
CHLDPRSD				0.191**		0.168*
				(0.0819)		(0.0859)
BSTCHR					-0.231**	-0.247**
					(0.107)	(0.113)
TEACHATT					0.189	0.129
					(0.181)	(0.199)
LOCALTCH					0.193**	0.160**
					(0.0751)	(0.0760)
GDTCHR					0.370	0.238
					(0.235)	(0.241)

	(0.374)	(0.394)	(0.394)	(0.386)	(0.386)	(0.378)
Constant	0.711***	0.823***	0.823***	0.305	0.225	-0.0638
	(0.153)	(0.140)	(0.140)	(0.217)	(0.286)	(0.311)
Observations	10,305	9,842	9,842	9,603	9,777	9,542
Pseudo R^2	0.0883	0.103	0.103	0.110	0.107	0.113
N_clust	45	44	44	44	44	44
chi2	73697	192603	192603	3.216e+06	1.478e+06	3.353e+06
p	0.0000	0.000	0.000	0.000	0.000	0.000

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All regression specifications include caste and state dummies.

Overall, we find that PTA membership in 2004/05 is significantly related to school attendance after seven years. The log of odds of MEMBPTA shows that while it is decreasing in magnitude as child and teacher characteristics are added, it remains consistently positive throughout the rest of other models. A child whose parent is a PTA member is almost between 1.51 to 2.03 times more likely to be in school seven years later ($p<0.001$) than a child whose parent is not a member. On the other hand, at least one discussion of a parent with the teacher about the child's progress increases the likelihood as well of school retention by about 1.28 times ($p<0.001$), as indicated by the beta coefficient of DISC2X.

Across our five specifications, we do not find the child's gender to be associated with schooling outcomes. However, when we interact gender with the PTA membership, it is positively associated on schooling outcomes. The household's poverty status remains an adverse predictor of schooling outcomes, as it constrains education attendance. While its magnitude decreases as we add teacher and schooling characteristics, the child remains at least 40 percent less likely to be in school in 2011 because of poverty status in 2004. All other teacher's characteristics are insignificant except

for the biased teacher (teacher favoritism), having an odds ratio of 0.78 to 0.80 ($p<0.05$), implying that students who have had a biased teacher are 20 to 22 percent less likely to be in school seven years later. The child's experiences and characteristics within the school during 2004/5 indicate that its effects persist. Child academic performance (odds ratio=1.26, $p<0.001$) is actively and positively associated with retention (AVESTDNT). Students who have repeated grades before the school year in 2004/05 are also more likely to have dropped out seven years later (NREPEATS).

Caste and retention. The family's caste remains a robust predictor of the school retention of children. With the Brahmin caste as the base case, we find strong evidence of disadvantage across other caste groups. Children whose families identified in 2004/5 as OBC (other backward class) are 36.8% likely to be out of school ($p<0.05$). Children from the Dalit groups have 47.8% less likely to be in school ($p<0.05$), Adivasi children 46.31% ($p<0.05$), and Muslim children 55.64% ($p<0.001$). Only with Sikhs/Jains/Christian children, we observe that caste does not influence school retention outcomes.

Interaction effects with other variables. To further understand the extent to which PTA membership interacts with other variables, we run several regressions to test whether our observations remain stable. We find that PTA membership remains positive, but its magnitude decreases further if regressions are restricted to only rural households. This pattern implies that PTA memberships are likely to be more effective (in terms of magnitude) in urban areas than it is in rural areas. Moreover, we linked the household dataset with the school dataset and performed initial tests whether the type of school and the corresponding PTA membership status influences educational retention. We find that enrollment in private schools, even if there is no PTA membership, is positively related to school attendance well. The reason is straightforward that enrollment in private schools proxies the economic resources and education investment

capabilities of the household. However, this is only limited to private schools which are non-aided and unrecognized by the government; it does not apply to aided yet recognized private schools, where we find no effect.

Moreover, interacting with the PTA membership with aided yet recognized private schools show that students are 3.04 times to be more likely in school than students in the public schools without a PTA membership. Moreover, female students whose parents are PTA members are 1.22 times likely to be in school than boys whose parents are non-PTA members ($p<0.10$).

Finally, we interacted the variables on toilet quality at home, with the PTA membership and the poverty status of the household. We find that when students are whose family are poor, practitioners of open defecation, and whose parents are neither PTA members are 28.3 percent less likely to be in school seven years later (Table 3 appendices). However, just the adoption of flush toilets of a non-poor family (without PTA) increases the likelihood of staying in school 47 percent. Low-income families with open defecation systems, even if having a PTA membership, are still 35.3 percent less likely to see their child in school seven years later. Families with flush toilets and parents with PTA members are more likely to have a child still in school, 1.82 times (if the household is poor), and 2.16 times (if the household is noon-poor).

What generally comes in our analyses up is that the family's sanitation practices and PTA membership reinforces each other in terms of how they influence education outcomes. PTA membership can have stronger predictive power on education outcomes if sanitation practices go along with it. Our quantitative findings are summarized in the last table in the Appendices.

Discussion and Limitation

Our primary motivation for carrying out this study is the recognition that schools are among the most fundamental and essential of social institutions in any modern society. They are responsible for weaving society's moral, social, and cultural fabric; it also the place of the advancement of values, traditions, and knowledge. As with any country, schools are embedded within the broader social agenda of education and human capital formation. India is no exception to this.

In developing countries such as India, the social problems associated with educational underdevelopment may appear above and beyond within the control of schools—a seemingly wicked problem for the education sector. Our paper relates and touches on these issues by contributing to the narratives on how school and family relations, exemplified through teachers and parents, may introduce conceptual clarity in understanding the likely mechanisms and channels of enhancing educational outcomes.

Our findings help illuminate that simple parent-teacher relation are simple yet important. They connect families with schools, as well as the right social institutions which make it possible to achieve educational progress. With our modest goal, we believe we contribute to the literature through the empirical approaches we employed. First, we substantiate the literature, possibly framing it in the light of interest of social justice in developing countries.

In our approach, we started by describing the terms of involvement gaps across broad social categories in India. Aside from persistent state-wide differences, we have observed and described that children from minorities such as Adivasis (scheduled tribes), other backward castes (OBCs), Muslims and the Dalits suffer from low levels of engagement with schools. Our estimates also show that they have less likelihood to be in school.

PTA membership remained to be significantly and positively related with parent-teacher engagement, as well as significantly related to the likelihood that he/she retains schooling, and the inverse is also true for household poverty status in 2004/05. In other words, educational disadvantage and inequality in India is strongly associated with both income levels and caste. Only enrollment in private tuition generally is associated with school retention even if there is no PTA membership. Otherwise, PTA membership seems to be important for school retention for non-privately enrolled students, especially in rural areas. Lastly, children of families who are practitioners of open defecation, even if with PTA membership, have significantly less likelihood in school retention.

Limitations

Our study is not without limitations and drawbacks, but we believe there are opportunities for future research work. First, the longitudinal research design of IHDS measured on two periods does not provide ways of controlling other factors that happened between the two periods. These could give enriched our analysis, instead of having just two periods of study. However, our work still allowed us to correlate parental involvement, and a variety of households have with education outcomes. A quasi-experimental research design may be designed using the IHDS datasets, using differences-in-differences with propensity score matching (PSM), with PTA interaction as the treatment variable. This is one approach that has not been explored with the datasets and is a viable approach for future work.

Second, the surveys do not adequately describe nor fully unpack the features of the parental engagement of parents with teachers in India. There are only a few questions about this, so we do not know about the quality and depth of their engagements nor if they are sustained and reinforced over time. Nevertheless, with our results, we can safely argue that even the most basic involvement arrangements between parents and teachers may matter in the long run for education outcomes of children. Education, regardless of the context, always has multiple stakeholders, and we demonstrated that engaging parents is just but one of the most effective and channels of influencing education outcomes.

Our third limitation is the methodology and the choice of variables. In our analyses, we carefully tested our models for fit and robustness. Many of the variables which we used are mostly dichotomous, and we did not use many scale variables. IHDS does not have those features as part of its design because it invested a lot in getting as much information on the most representative samples of Indians from a longitudinal perspective. Therefore, we cannot fully characterize nor describe the features of the depth engagement among Indian parents within the school. However, having our results, it would be a good starting point as a recommendation for the future to investigate such a depiction of engagement, i.e., through a more focused and in-depth qualitative approach.

Lastly, our goal is to link how parental involvement relates to development outcomes in a generalizable and comparative perspective. Even though involvement is only depicted through PTA memberships and the number of discussions parents had with school staff, we show that such interactions lay the foundations of further and parallel educational co-production at home. However, we do not have the in-depth information of such parental involvement, so our

conclusions about home-based involvement are still limited. The suggestion to do qualitative work is, therefore, suggested a future possibility.

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Appendices

List of States included as controls

Jammu & Kashmir
Himachal Pradesh
Punjab
Chandigarh
Uttaranchal
Haryana
Delhi
Rajasthan
Uttar Pradesh
Bihar
Sikkim
Arunachal Pradesh
Nagaland
Manipur
Mizoram
Tripura
Meghalaya
Assam
West Bengal
Jharkhand
Orissa
Chatishgarh
Madhya Pradesh
Gujarat
Daman & Diu
Dadra & Nagar Haveli
Maharashtra
Andhra Pradesh
Karnataka
Goa
Kerala
Tamil Nadu
Pondicherry

Table 20 Negative binomial regression estimates, all children 2004/2005. Dependent variable is number of teacher-parent interactions

VARIABLES						
MEMBPTA	1.085***	1.054***	1.034***	1.013***	1.008***	1.048***
	(0.0395)	(0.0393)	(0.0404)	(0.0410)	(0.0412)	(0.0395)
FMALE		-0.0354	-0.0275	-0.0237	-0.0224	-0.0344
		(0.0329)	(0.0326)	(0.0327)	(0.0329)	(0.0330)
AGE0405		-0.0154	-0.0203	-0.0167	-0.0174	-0.0162
		(0.0157)	(0.0157)	(0.0157)	(0.0157)	(0.0157)
ABSENT5		0.0479	0.0868**	0.0953**	0.0871**	0.0456
		(0.0402)	(0.0406)	(0.0410)	(0.0405)	(0.0399)
SECDUM		-0.0530	-0.0405	-0.0333	-0.0339	-0.0538
		(0.0387)	(0.0389)	(0.0395)	(0.0394)	(0.0386)
1.TOILETQ		0.391***	0.396***	0.334***	0.331***	0.385***
		(0.0653)	(0.0653)	(0.0706)	(0.0709)	(0.0650)
2.TOILETQ		0.387***	0.291***	0.190***	0.182***	0.381***
		(0.0926)	(0.0628)	(0.0652)	(0.0654)	(0.0928)
3.TOILETQ		0.338***	0.324***	0.206***	0.204***	0.334***
		(0.0333)	(0.0342)	(0.0385)	(0.0386)	(0.0342)
AVESTDNT			0.160***	0.144***	0.147***	
			(0.0386)	(0.0379)	(0.0375)	
NREPEATS			0.0769***	0.0728**	0.0729**	
			(0.0285)	(0.0284)	(0.0283)	
SCHLENJOY			0.215***	0.212***	0.218***	
			(0.0616)	(0.0622)	(0.0625)	
CHLDPRSD			0.110***	0.103**	0.107**	
			(0.0415)	(0.0428)	(0.0423)	
POOR2005HH				-0.159***	-0.160***	
				(0.0482)	(0.0483)	
2.URBANITY				0.224***	0.234***	
				(0.0405)	(0.0427)	
3.URBANITY				0.204***	0.207***	
				(0.0774)	(0.0787)	
BSTCHR					0.0720	0.0471
					(0.0545)	(0.0520)
TEACHATT					0.0222	0.0438
					(0.111)	(0.102)
LOCALTCH					-0.0348	0.00569
					(0.0333)	(0.0326)
GDTCHR					-0.0530	0.0254
					(0.125)	(0.114)
1.WGROUPS8	-0.0743	-0.102	-0.140**	-0.143**	-0.143**	-0.102
	(0.0634)	(0.0634)	(0.0637)	(0.0637)	(0.0638)	(0.0635)
3.WGROUPS8	-0.276***	-0.205***	-0.204***	-0.178***	-0.175***	-0.202***
	(0.0476)	(0.0486)	(0.0486)	(0.0480)	(0.0483)	(0.0487)
4.WGROUPS8	-0.310***	-0.210***	-0.203***	-0.166***	-0.167***	-0.210***
	(0.0491)	(0.0509)	(0.0514)	(0.0516)	(0.0517)	(0.0509)
5.WGROUPS8	-0.388***	-0.266**	-0.354***	-0.287***	-0.285***	-0.262**
	(0.111)	(0.104)	(0.0667)	(0.0670)	(0.0673)	(0.105)
6.WGROUPS8	-0.141*	-0.153**	-0.121*	-0.106	-0.104	-0.150**

	(0.0796)	(0.0744)	(0.0736)	(0.0763)	(0.0768)	(0.0746)
7.WGROUPS8	0.265***	0.190**	0.191**	0.216**	0.216**	0.190**
	(0.0895)	(0.0889)	(0.0860)	(0.0886)	(0.0881)	(0.0888)
8.WGROUPS8	-0.181	-0.169	-0.0141	0.0161	0.00707	-0.172
	(0.164)	(0.152)	(0.106)	(0.110)	(0.112)	(0.152)
lnalpha	-0.295***	-0.334***	-0.381***	-0.394***	-0.398***	-0.336***
	(0.0587)	(0.0593)	(0.0571)	(0.0590)	(0.0593)	(0.0594)
Constant	0.666***	0.689***	0.334*	0.329*	0.373*	0.626***
	(0.0618)	(0.163)	(0.172)	(0.169)	(0.212)	(0.205)
Observations	13,539	13,468	13,113	13,104	13,034	13,391
alpha	0.745	0.716	0.683	0.674	0.672	0.715
df_m	29	36	40	43	47	40
chi2	2490	2683	2745	2798	2817	2673
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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

Table 21. Negative binomial regression estimates, only attending 2010/11. Dependent variable is number of teacher-parent interactions

VARIABLES	1	2	3	4	5	6
MEMBPTA	1.068***	1.052***	1.021***	1.005***	1.000***	1.048***
	(0.0474)	(0.0468)	(0.0483)	(0.0493)	(0.0495)	(0.0470)
AGE0405		-0.0237	-0.0291	-0.0269	-0.0286	-0.0253
		(0.0186)	(0.0189)	(0.0189)	(0.0187)	(0.0186)
FMALE		0.0107	0.0104	0.0125	0.0136	0.0122
		(0.0387)	(0.0391)	(0.0393)	(0.0394)	(0.0388)
ABSENT5		0.0992**	0.132***	0.141***	0.128***	0.0916*
		(0.0477)	(0.0482)	(0.0488)	(0.0485)	(0.0477)
SECDUM		-0.0476	-0.0438	-0.0395	-0.0398	-0.0492
		(0.0452)	(0.0453)	(0.0460)	(0.0457)	(0.0450)
1.TOILETQ		0.416***	0.433***	0.388***	0.385***	0.413***
		(0.0802)	(0.0801)	(0.0853)	(0.0860)	(0.0803)
2.TOILETQ		0.298***	0.317***	0.236***	0.223***	0.291***
		(0.0696)	(0.0721)	(0.0745)	(0.0749)	(0.0700)
3.TOILETQ		0.288***	0.284***	0.193***	0.190***	0.288***
		(0.0411)	(0.0421)	(0.0459)	(0.0460)	(0.0420)
AVESTDNT			0.128***	0.114***	0.118***	
			(0.0447)	(0.0437)	(0.0435)	
NREPEATS			0.0753**	0.0702**	0.0713**	
			(0.0333)	(0.0329)	(0.0329)	
SCHLENJOY			0.234***	0.234***	0.245***	
			(0.0725)	(0.0734)	(0.0730)	
CHLDPRSD			0.120**	0.117**	0.123**	
			(0.0507)	(0.0521)	(0.0516)	
POOR2005HH				-0.108*	-0.110*	
				(0.0571)	(0.0572)	
2.URBANITY				0.195***	0.208***	
				(0.0486)	(0.0515)	
3.URBANITY				0.179*	0.180*	
				(0.0958)	(0.0977)	
BSTCHR					0.134**	0.109*
					(0.0678)	(0.0650)
TEACHATT					0.0565	0.0691
					(0.116)	(0.108)
LOCALTCH					-0.0455	-0.0194
					(0.0402)	(0.0385)
GDTCHR					-0.100	-0.0251
					(0.136)	(0.122)
1.WGROUPS8	-0.123	-0.141*	-0.171**	-0.167**	-0.167**	-0.139*
	(0.0814)	(0.0821)	(0.0827)	(0.0826)	(0.0826)	(0.0825)
3.WGROUPS8	-0.275***	-0.217***	-0.216***	-0.191***	-0.187***	-0.213***
	(0.0580)	(0.0585)	(0.0586)	(0.0575)	(0.0579)	(0.0589)
4.WGROUPS8	-0.277***	-0.194***	-0.184***	-0.153**	-0.154**	-0.195***
	(0.0590)	(0.0606)	(0.0606)	(0.0607)	(0.0607)	(0.0606)
5.WGROUPS8	-0.547***	-0.417***	-0.385***	-0.330***	-0.328***	-0.413***
	(0.0748)	(0.0764)	(0.0771)	(0.0779)	(0.0782)	(0.0767)
6.WGROUPS8	-0.0818	-0.104	-0.0945	-0.0841	-0.0834	-0.102
	(0.101)	(0.0936)	(0.0933)	(0.0969)	(0.0979)	(0.0942)
7.WGROUPS8	0.360***	0.311***	0.287***	0.307***	0.315***	0.316***
	(0.108)	(0.106)	(0.103)	(0.105)	(0.105)	(0.106)

8.WGROUPS8	-0.182	-0.188	-0.178	-0.147	-0.172	-0.206*
	(0.115)	(0.122)	(0.129)	(0.133)	(0.137)	(0.124)
lnalpha	-0.298***	-0.334***	-0.353***	-0.360***	-0.367***	-0.339***
	(0.0666)	(0.0682)	(0.0694)	(0.0712)	(0.0719)	(0.0686)
Constant	0.616***	0.684***	0.343*	0.337*	0.395	0.662***
	(0.0729)	(0.194)	(0.206)	(0.201)	(0.242)	(0.236)
Observations	9,848	9,799	9,564	9,558	9,497	9,734
alpha	0.742	0.716	0.702	0.698	0.693	0.713
chi2	1798	1924	1949	1982	2008	1920

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

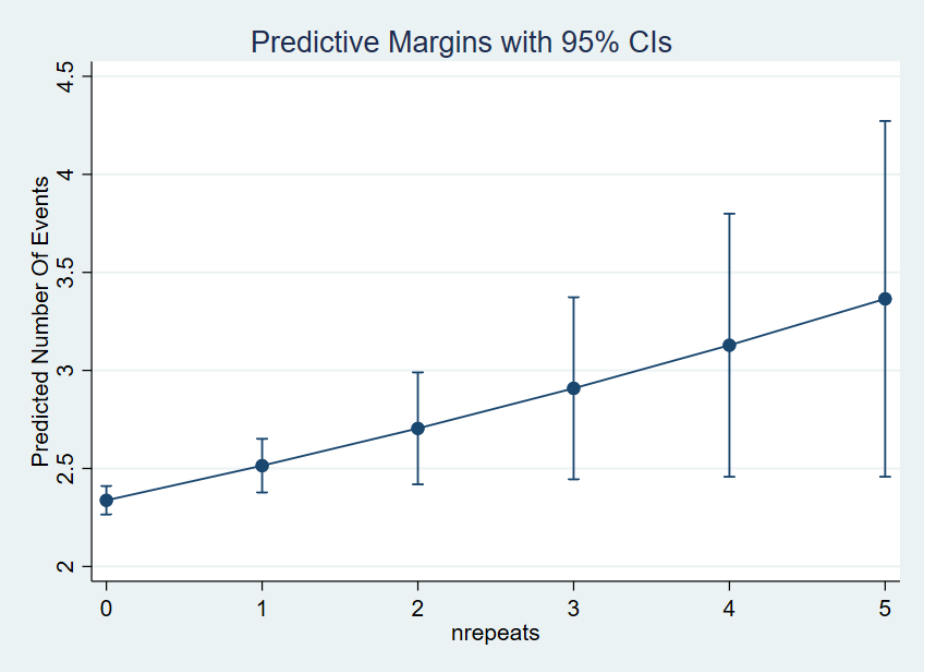

Figure 11 Margins of Number of Repetitions and Parental Involvement

Table 22 Logistic Regression interacting PTA membership with other variables

VARIABLES	Rural HH Only	School type and PTA	PTA Membership and Female	PTA Membership and Toilet and Poverty
disc2x	0.229***	0.277***	0.279***	0.252***
	(0.0687)	(0.0609)	(0.0611)	(0.0637)
membPTA	0.216***			
	(0.0749)			
poor2005hh	-0.373***	-0.432***	-0.432***	
	(0.0846)	(0.0883)	(0.0884)	
0b.membPTA#1b.schltype		0		
		(0)		
0b.membPTA#2.schltype		0.407*		
		(0.242)		
0b.membPTA#3.schltype		0.565***		
		(0.154)		
0b.membPTA#4.schltype		0.668***		
		(0.165)		
0b.membPTA#5.schltype		0.275		
		(0.260)		
1.membPTA#1b.schltype		0.0410		
		(0.0683)		
1.membPTA#2.schltype		1.113***		
		(0.252)		
1.membPTA#3.schltype		0.986***		
		(0.159)		
1.membPTA#4.schltype		1.179***		
		(0.215)		
1.membPTA#5.schltype		0.579		
		(0.500)		
0b.membPTA#0b.fmale			0	
			(0)	
0b.membPTA#1.fmale			0.0257	
			(0.122)	
1.membPTA#0b.fmale			0.0689	
			(0.0922)	
1.membPTA#1.fmale			0.203**	
			(0.0931)	
0b.membPTA#0b.toiletq#1.poor2005hh				-0.333***
				(0.103)
0b.membPTA#1.toiletq#0b.poor2005hh				0.298*
				(0.157)
0b.membPTA#1.toiletq#1.poor2005hh				-0.140
				(0.252)
0b.membPTA#2.toiletq#0b.poor2005hh				0.474
				(0.411)
0b.membPTA#2.toiletq#1.poor2005hh				0.0149
				(0.594)
0b.membPTA#3.toiletq#0b.poor2005hh				0.385**
				(0.155)
0b.membPTA#3.toiletq#1.poor2005hh				0.274
				(0.403)
1.membPTA#0b.toiletq#0b.poor2005hh				0.0413

				(0.0861)
1.membPTA#0b.toiletq#1.poor2005hh				-0.435***
				(0.153)
1.membPTA#1.toiletq#0b.poor2005hh				0.878***
				(0.212)
1.membPTA#1.toiletq#1.poor2005hh				-0.103
				(0.212)
1.membPTA#2.toiletq#0b.poor2005hh				0.991**
				(0.424)
1.membPTA#2.toiletq#1.poor2005hh				0.868
				(0.998)
1.membPTA#3.toiletq#0b.poor2005hh				0.774***
				(0.153)
1.membPTA#3.toiletq#1.poor2005hh				0.603**
				(0.282)
Constant	0.112	-0.146	-0.158	-0.181
	(0.348)	(0.254)	(0.250)	(0.283)
Observations	6,847	7,715	7,715	7,677
chi2	2.483e+06	13751	9646	893507

Other variables such as student and teacher characteristics, caste and state characteristics are not shown.'

Note: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

School types:

- 1 government;
- 2 Private aided and recognized;
- 3 Private recognized, not aided;
- 4 Private unrecognized and
- 5 convent and others.

Toilet types:

- 0 None/Open fields;
- 1 traditional latrine;
- 2 VIP latrine and
- 3 flush toilets