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Co-production in public services: does involving citizens attenuate the effect of environmental turbulence on public service performance?

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Abstract:
Public management research on organizational performance indicates that environmental turbulence negatively affects performance, and that this relationship may be attenuated by external management behavior. In this study, we focus on the moderating role of a specific type of external management, namely: co-production. Co-production broadly refers to the involvement of or cooperation with citizens in the organizational processes of public service providers. We distinguish between the participation of citizens in (a) the *design of public services* and (b) *executing public services.* We examine the moderating role of co-production in an analysis 150 secondary schools in The Netherlands. Our analysis relies on qualitative coding of school plans, and relates this measure of co-production to objective measures of environmental turbulence and school performance.

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Disclaimer: Working paper that presents an early-stage theoretical framework and analysis.

INTRODUCTION The quality of public services is highly dependent on changes in the external environment of the organization that provides the services. For instance, the massive influx of refugees from war-torn countries has put a strain on public services such as education, basic housing and welfare. Changes in funding and demand for public organization may interfere with processes of service delivery and decision-making. Because changes can come from different angles (political, economic, social, and technical) and organizations face myriad changes simultaneously, managing these changes represents a major challenge. The intensity of these changes is often referred to as environmental turbulence (Boyne & Meier, 2009; Emery & Trist, 1965).

According to existing models of public management (e.g., O'Toole and Meier 1999; Lynn, Heinrich and Hill 2000), environmental turbulence challenges the organization's necessary stability, and subsequently negatively affects organizational performance. However, this negative effect can be attenuated by external management activities that are aimed at (a) exploiting the environment for resources and (b) buffering against environmental turbulence (O'Toole & Meier, 1999; 2011). Empirical research indeed shows that certain management activities can mitigate the negative effect of environmental dynamism (for example, Andrews et al., 2013; Meier & O'Toole, 2009; Van den Bekerom et al., 2016; 2017).

In this study, we focus on the moderating role of a specific type of external support, namely: co-production. Co-production broadly refers to the involvement of or cooperation with citizens in the organizational processes of public service providers. We distinguish between the participation of citizens in (a) the *design of public services* and (b) *executing public services* (Brandsen and Honingh, 2016).

We assess this issue in Dutch secondary schools *(Dutch: Voortgezet Onderwijs)* because here great variation exists in the degree in which both types of co-production are present, as well as different types of co-producers (i.e. parents and students). Moreover, the educational sector is constantly dealing with environmental challenges such as the massive influx of refugees, student declines in rural areas as well as student influx in urban areas, teacher shortages, recent teacher protests and the introduction of the Inclusive Education Act (*Dutch: Passend Onderwijs*). Zambrano-Gutiérrez et al. (2017) indeed find that co-production by involving parents can attenuate or even eliminate the negative relationship between environmental turbulence and student performance in schools in the United States of America. In this study, we distinguish empirically between co-production by both *parents* and *students*.

Our central research question is**:** *To what extent does co-production moderate the effect of environmental turbulence on school performance?*

*T*o establish which co-production (design and/or delivery by parents and/or students) activities schools employ, we conduct a quantitative content analysis of the school plans of ± 150 secondary schools in the Netherlands. Data obtained from these educational plans will be combined with objective, independently measured school performance data (such as grade retention rates) as well as data on environmental turbulence (changes in the number of students over time).

THEORETICAL FRAMEWORK

The impact of environmental turbulence on performance

A predictable and controllable flow of resources and constraints is crucial for maintaining the quality of or improving services and goods (Scott, 2003). Maintaining this steady flow is an important challenge for organizations. The environment in which a public organization operates is constantly changing (Aldrich, 2008; Emery & Trist, 1965). These changes are often minor fluctuations that can be anticipated and built into service delivery. However, all elements of the external environment might change in unpredictable ways (Boyne & Meier, 2009), and "changes can come from anywhere without notice and produce consequences unanticipated by those initiating the changes and those experiencing the consequences" (Pfeffer & salancik, 2003, p. 69). Examples of such changes are sudden budget cuts, abrupt changes in client characteristics, or drastic changes in existing rules and regulations. In the public management literature, unpredictable changes in an organization's environment are referred to as "dynamism" (Beard & Dess, 1984), "environmental shocks" (O'Toole & Meier, 2011), or "environmental turbulence" (Boyne & Meier, 2009; Emery & Trist, 1965).

One widely used model for explaining the relationship between the environment and organizational performance is the O'Toole and Meier model of public management (1999; 2011). This model of public management has its roots in the open system perspective (O'Toole & Meier, 2011), implying that in addition to organizational elements, the model includes the environment as a separate determinant of organizational success. According to the O'Toole and Meier model (1999; 2011), organizational performance is a product of environmental forces, past performance, organizational stability, internal management, and external management. negative environmental forces—that is, environmental turbulence—challenge the organization's necessary stability, such as "structural stability" (the organization's formal hierarchy), "mission stability" (organizational goals), "procedural stability" (organizational rules and operating procedures), "personnel stability", or "production or technology stability" (in terms of resources sought by organizations) (O'Toole & Meier, 2011, p. 24), and consequently negatively affect organizational performance.

Extant public management studies examining the management of environmental turbulence, such as sudden budget cuts, abrupt changes in service demand, or immigration in local governments, indeed show that turbulence negatively affects the performance of public organizations (for example, Andrews, Boyne, O'Toole, Meier, & Walker, 2013; Boyne & Meier, 2009; Meier & O'Toole, 2009; Meier, O'Toole, & Hicklin, 2010; Van den Bekerom, Torenvlied, & Akkerman, 2016; Zinn, Mor, Feng, & Intrator, 2009). Hence, we arrive at our first hypothesis:

Hypothesis 1: Environmental turbulence is negatively related to school performance.

Mitigating negative impacts of turbulence

According to the O'Toole and Meier model, two sets of variables are assumed to help public organizations protect against, insulate against, and mitigate negative impacts of turbulence on organizational performance. The first set of variables taps the organization's stabilizing features that help the organization bolster its administrative system to protect against externally produced uncertainty and instability (Fennell & Alexander, 1987; O'Toole & Meier, 2011). The second set of variables taps internal and external management activities. Internal management activities constitute a manager's efforts to manage inside the organization. External management encompasses a manager's efforts to interact with the external environment. These external management activities are aimed at (a) exploiting the environment and (b) buffering against environmental turbulence (O'Toole & Meier, 1999; 2011; Geletkanycz, Brian, Boyd, & Finkelstein, 2001; Pfeffer & salancik, 2003). In this study, we focus on a specific type of external management: co-production.

Co-production

Co-production and co-creation generally refer to the involvement or participation of citizens in the delivery of public services. A distinction between the two terms is relevant, because citizens can contribute to the delivery of public services in different ways. In the context of schools, for instance, parents and students themselves can contribute to the activities of the school by assisting (others) with homework, organizing additional classes or events, but also by advising the school how to organize or develop its teaching programs (Honingh, Bondarouk, & Brandsen, 2018). Co-production is defined by Voorberg, Bekkers, & Tummers (2015, 15) "as the involvement of citizens in the co-implementation of public services". Alternatively, the term co-creation is reserved to refer to the design of public services. Similarly, Brandsen, Verschuere and Steen (2018) state that co-production concerns services that citizens receive during the implementation phase of the production cycle, whereas co-creation concerns contributing to services at a strategic level.

While the above-mentioned distinction between co-production and co-creation cannot be consistently found throughout the public management literature on co-production, the separation between citizen involvement in the design and execution of public services is relevant for the purposes of this study. It is for instance present in the typology provided by Brandsen and Honingh, who define co-production as "a relationship between a paid employee of an organization and (groups of) individual citizens that requires a direct and active contribution from these citizens to the work of the organization (Brandsen and Honingh, 2016, p. 431)." Their typology distinguishes types of co-production based on the extent to which citizens are involved in designing services, and the extent to which citizens are involved in participating in the core services or complementary processes of the organization. In an empirical examination of co-production and school performance, Zambrano-Gutiérrez, Rutherford and Nicholson-Crotty (2017) build on the Brandsen and Honingh typology to separate design-core co-production and implement-complement co-production. Design-core co-production refers to the degree

in which users have access to the design of instructional practices, and implement-complement co-production occurs when service users partake in complementary educational tasks to facilitate learning.

In this study, we compare co-production in designing services and co-production in executing services. We also distinguish empirically between co-production by students and co-production by parents. For both types of co-production, we expect that co-production is positively related to school performance. Co-production in designing services can bring in additional resources and a diversity of ideas. Participation in decision-making and strategy formulation can also increase the degree of acceptance or buy-in of new decisions or policies of the school. We expect that co-production in the delivery or production of services supply the school with additional resources and organizational capacity, but may also increase trust between professionals and citizens as a result of socialization processes (Honingh et al., 2018).

However, our analysis focuses especially on the moderating role of co-production in the turbulence-performance relationship (cf. Van den Bekerom, Torenvlied, & Akkerman, 2016; Zambrano-Gutiérrez et al., 2017). As outlined above, turbulence can disrupt organizational stability and thereby reduce performance. We hypothesize that co-production attenuates the negative relationship between environmental turbulence and school performance. In our theoretical reasoning, we see co-production as externally oriented management behavior (O'Toole & Meier, 1999). Involving students and parents in the design or delivery of services allows organizations to exploit additional resources in the environment, as well as buffer against external shocks. Co-production can be a means to exploit the environment, for instance enabling a school to obtain a greater amount of ideas or support on how to deal with environmental turbulence. Van den Bekerom et al. (2016: 645) state that "co-production with parents helps the school to buffer turbulence when environmental shocks occur, in terms of flexibility in parents' and students' demands, additional resources, and innovative solutions that help the school deal with the shock". Co-production may thereby enable school management to behave proactively rather than reactively amidst turbulent conditions (cf. Zambrano-Gutiérrez et al., 2017). Van den Bekerom et al. (2016) find evidence that co-production, measured by school principals' networking activities with actors such as the parent committee and the participatory council, attenuates the negative relationship of changes in student population and school performance in a sample of Dutch primary schools. Likewise, Zambrano-Gutiérrez et al. (2017) find that co-production can attenuate or even eliminate the negative relationship between environmental turbulence and student performance in schools in the United States of America. We formulate the following hypothesis:

Hypothesis 2: The negative relationship between environmental turbulence and school performance is attenuated by co-production.

RESEARCH CONTEXT

In the 2018-2019 academic term, 1.422 mainstream secondary schools were responsible for the education of approximately 1 million students in The Netherlands (scholenopdekaart.nl). There are four types/levels of mainstream secondary education in the Netherlands: a) practical training (PRO), b) pre-vocational secondary education (VMBO), c) senior general secondary education (HAVO), and Pre-university education (VWO). These types prepare students for either work and further vocational training or further higher education (e.g. universities). Secondary schools may choose to offer only one type of education, but most schools offer multiple types (e.g. providing VMBO, HAVO, and VWO education). Next to the mainstream secondary schools, there are (secondary) special schools that provide education for students with special needs, such as students with visual disabilities, hearing impediments, with intellectual disabilities and chronically ill students, and lastly students with behavioral and psychiatric disorders. Secondary education usually begins at the age of 12 and is compulsory. It ends for students aged eighteen and up or when they get a diploma on the HAVO, VWO, or vocational level.

Dutch secondary schools vary with respect to their educational philosophy or denomination. There are seven different denominations in secondary education: 1) general/special denomination: contains schools that are not restricted to religion or organize their education concerning a anthroposophical philosophy, 2) public denominated school that do not engage in any religion or philosophy, 3) school that engage in a Protestant Christian philosophy, 4) schools that act out of a Catholic philosophy, 5) schools that act upon a collaborative philosophy, 6) confessional: schools that organize their education based upon other religions and 7) remaining: schools that do not fit in one of the 6 other categories or that have not shared their information about their denomination.

The executive oversight and regulatory powers, such as educational policies, the internal organization, personnel and employment policies, the financial management of the school, and ultimately, the school's performance, are assigned to the school board. Despite the school board's final accountability, the school's management team is responsible for the day-to-day running of the school, which includes administrative duties associated with the general running of the school, assisting in the planning and implementation of policies, and maintaining internal and external contacts in the school's environment.

As of 1998, Dutch secondary school are legally obliged to formulate a strategic plan, at least once every four years. A strategic plan covers the school's educational policy, it's personnel policy, and rules and regulations concerning the quality of education. The strategic plan provides parents and students the opportunity to receive insight in the school's policies and procedures. The Inspection of Education is responsible for inspection and reviews each school and institution.

RESEARCH DESIGN

Data collection

In order to test the hypothesizes, a data set is used that contains information about approximately 150 Dutch secondary schools. The data set was constructed by integrating two data sets. The first set contains information about co-production behavior that is created by coding the multi-year strategic plans of the 150 Dutch secondary schools. The schools included in this data set were randomly selected via a list of all 1608 locations of secondary schools which were obtained through DUO, (Education Executive Agency, an organization by the Dutch Ministry of Education, Culture and Science). We randomly assigned number to the schools on the list, after which a sample of 150 schools was selected. Schools were included in the sample if they had published a multi-year strategic plan that covered the year 2018. The first 150 schools that met the criteria were added to the sample. The strategic plans that were used in this study were obtained through www.scholenopdekaart.nl (a website which has been developed by the Dutch sector organization for secondary schools on which citizens can compare schools) or through each school's website. Once the 150 schools were selected and the multi-year strategic plans were collected, the coding process started. [more schools (and their strategic plans) will be added a later stage] More information about the coding strategy can be found in the measures section.

The first data set was combined with a second data set that provides information about school performance and environmental turbulence. The two data sets were linked to each other by each school location's unique identification number, assigned by the Dutch ministry of Education, Culture and science. This is a six-digit code on the basis of which all locations of secondary schools in the Netherlands can be identified.

Measures

Coproduction. As stated earlier, we compare co-production in designing services and co-production in executing services. We also distinguish empirically between co-production by students and co-production by parents. In order to measure co-production, the 150 strategic plans were systematically coded. We operationalized the two concepts of co-production, by students and by parents, according to the operationalization in Table 1. We only coded co-production activities if the activities were clearly formulated and already implemented. We reframed from coding ambitions or future policies, neither did we code the mere mention of contact between schools and students/parents (e.g. only mention that contact with parents/students is important, or that there is contact with parents/students). In addition, we did not code any interactions between students and the school regarding students' day-to-day educational progress (e.g. contact between teachers and students, mentors and students, etc.). Codes 'ST4' and 'PA4' tap the *design of public services* and codes 'ST5' and 'PA5' tap the *execution of public services*. Next to coproduction, we have also coded more general types of contact between students/parents and the school, ranging from one-sided communication ('ST1', 'ST2', 'PA1', and 'PA2') to dialog between students/parents and the school ('ST3', 'ST4').

Table 1.

Operationalization of co-production.

Concept	Sub concept	Code	Definition	Indicator
Co-production by students	**One-sided communication**	ST1	School → Students: providing students information about school policies and procedures. There is no dialogue, just one-sided communication.	Posting information on the website or social media, publishing newsletters, providing information on exams, etc.
	One-sided communication	ST2	Students → School: retrieving information (or other resources) from students. There is no dialogue, just one-sided communication.	Asking students about their experiences, organizing customer satisfaction surveys.
	Dialogue	ST3	Students←→ School: dialogue between the school and students, but not meant for the design or evaluation of school policies and procedures.	Meeting and consultation with both teachers and parents present, open houses, etc.
	Designing services	ST4	Students←→ School: structural participation or one-off dialog about designing or evaluation school policies.	Student committees, student panels, focus groups, participatory council, etc.
	Executing services	ST5	Students←→ School: Structural or	Students are trained to take an active role in

			one-off participation by students in implementing, supporting or executing school policies.	preventing bullying, students provide new students with information, senior students act in a buddy-program with junior students, etc.
Co-production by parents	**One-sided communication**	PA1	School → Parents: providing parents information about the school's policies and procedures. There is no dialogue, just one-sided communication.	Posting information on the website or social media, publishing newsletters, provide parents insight into student's performance.
	One-sided communication	PA2	Parents → School: retrieving information (or other resources) from parents. There is no dialogue, just one-sided communication.	Organizing customer satisfaction surveys, asking parents about their opinion on school policies (through surveys).
	Dialogue	PA3	Parents←→ School: dialogue between the school and parents, but not meant for the design or evaluation of school policies and procedures.	Parent-teacher meetings about students' educational progress, consultations with parents about creating student supervision plans, being in touch with students' mentor, having e-mail conversations with the school, etc.
	Designing services	PA4	Parents←→ School:	Parent committees, parent panels, focus

			structural participation or one-off dialog about designing or evaluation school policies.	groups, participation council, etc.
	Executing services	PA5	Parents←→ School: structural or one-off participation by parents in implementing, supporting or executing school policies.	Parents help organizing parent nights, parents give guest lectures, parents assist with field trips, etc.

Environmental turbulence. To measure environmental turbulence, we use the data from DUO[1] and calculate the standard deviation for the number of students between 2015 and 2018 for each school. The standard deviation quantifies the amount of variation or dispersion in the number of students per school across the years 2015, 2016, 2017, and 2018. The larger the variation in the number of students, the larger the amount of environmental turbulence.

School performance. To measure school performance, we use data from Dienst Uitvoering Onderwijs (DUO)[2] and calculated the percentage grade retention, the percentage upflow (Dutch: "opstroom") and downflow (Dutch: "afstroom"). Retention refers to the practice of requiring a student who has been in a given grade level for a full school year to remain at that level for a subsequent school year (e.g., "flunking"). Upflow refers to the intermediate transfer to a higher level of education, whereas downflow refers to the intermediate transfer to a lower level of education.

Controls. After the data collection is done, we will control for the following variables:

- Size of the strategic document (i.e., the number of pages)
- Denomination (Roman catholic, Protestant, Public, etc..)
- Types/level of secondary education (VMBO, HAVO, VWO, etc..)

[1] https://duo.nl/open_onderwijsdata/databestanden/vo/leerlingen/leerlingen-vo-3.jsp
[2] https://duo.nl/open_onderwijsdata/databestanden/vo/leerlingen/leerlingen-vo-zit.jsp

RESULTS

DV: Grade retention (unstandardized coefficients; standard error between parentheses)

	M1	M2	M3	M4	M5
Turbulence	0.074*			0.185**	0.156**
	(0.041)			(0.074)	(0.067)
ST4		0.096		0.522	
		(0.256)		(0.343)	
ST5		-0.002		-0.126	
		(0.246)		(0.309)	
PA4			0.055		0.379
			(0.204)		(0.283)
PA5			-0.091		-1.115
			(0.665)		(1.306)
ST4*Turbulence				-0.056*	
				(0.034)	
ST5*Turbulence				0.026	
				(0.021)	
PA4*Turbulence					-0.030*
					(0.018)
PA5*Turbulence					0.092
					(0.092)
constant	5.525***	5.941***	6.036***	4.321***	4.626***
	(0.620)	(0.656)	(0.659)	(0.950)	(0.922)
r2	0.027	0.002	0.001	0.056	0.051
N	121	127	127	121	121

** p<0.10, ** p<0.05, *** p<0.01*

- Turbulence has a positive effect on grade retention (if turbulence increases, so do retention rates), which confirms H1.
- Coproduction has no direct effect on retention rates.
- If students and parents both engage in the design of public services, the positive effect of turbulence on grade retention decreases, which confirms H2.
- There is no moderating effect of the execution of public services by both students and parents.

DV: Upflow (unstandardized coefficients; standard error between parentheses)

	M1	M2	M3	M4	M5
Turbulence	0.000			0.088	0.097*
	(0.036)			(0.065)	(0.058)
ST4		0.222		0.576*	
		(0.223)		(0.302)	
ST5		-0.283		-0.390	
		(0.214)		(0.272)	
PA4			0.259		0.706***
			(0.177)		(0.245)
PA5			-0.127		-1.953*
			(0.578)		(1.130)
ST4*Turbulence				-0.043	
				(0.030)	
ST5*Turbulence				0.021	
				(0.019)	
PA4*Turbulence					-0.038**
					(0.016)
PA5*Turbulence					0.141*
					(0.079)
constant	4.871***	4.595***	4.214***	3.824***	3.363***
	(0.549)	(0.571)	(0.573)	(0.838)	(0.797)
r2	0.000	0.015	0.018	0.040	0.072
N	121	127	127	121	121

** p<0.10, ** p<0.05, *** p<0.01*

- Turbulence has no effect on the percentage upflow, which rejects H1.
- Coproduction has no direct effect on retention rates.
- If the levels of both parents' engagement in the design of public services and turbulence increases, the percentage upflow drops.
- If the levels of both parents' engagement in the execution of public services and turbulence increases, the percentage upflow increases.

DV: Downflow (unstandardized coefficients; standard error between parentheses)

	M1	M2	M3	M4	M5
Turbulence	0.074***			0.089*	0.099**
	(0.025)			(0.046)	(0.041)
ST4		0.018		0.089	
		(0.162)		(0.213)	
ST5		-0.030		0.007	
		(0.155)		(0.191)	
PA4			-0.052		0.039
			(0.129)		(0.176)
PA5			0.204		0.184
			(0.419)		(0.811)
ST4*Turbulence				0.001	
				(0.021)	
ST5*Turbulence				-0.006	
				(0.013)	
PA4*Turbulence					-0.007
					(0.011)
PA5*Turbulence					0.001
					(0.057)
constant	2.559***	3.173***	3.254***	2.267***	2.336***
	(0.381)	(0.415)	(0.416)	(0.589)	(0.572)
r2	0.067	0.000	0.002	0.081	0.074
N	121	127	127	121	121

** p<0.10, ** p<0.05, *** p<0.01*

- Turbulence has a positive effect on the percentage downflow (if turbulence increases, so does the percentage downflow), which confirms H1.
- Coproduction has no direct effect on retention rates.
- There is no moderating effect of the design and the execution of public services by both students and parents.

PRELIMINARY CONCLUSION

- Environmental turbulence seems to decrease school performance (measured as grade retention and student downflow).
- Coproduction by parents (both the design and execution of school policies) seems to moderate the negative effect of turbulence on school performance (measured as grade retention).
- Coproduction by students seems to have no moderating effect on the negative effect of turbulence on school performance (measured as grade retention, student upflow, and student downflow).

DISCUSSION

- We have not yet controlled for the length of the strategic plans, denomination and type of secondary education due to small-n (low statistical power).
- We have not yet included the general types of contact between students/parents and the school (one-sided communication and dialogue).
- We will formulate hypotheses on the differences between the moderating effects of the design of public services and the execution of public services.
- We will formulate hypotheses on the differences between the moderating effects of coproduction and mere contact (one-sided and dialogue).

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