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# Behavioral effects of public service motivation among citizens: testing the case of digital co-production

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## ABSTRACT

In times where governments are increasingly unable to solve problems on their own, it is important to understand what motivates citizens to engage in co-production. Drawing on identity theory and on a sample of 966 citizens in Zurich, Switzerland, we analyze how public service motivation (PSM) is related to engagement in a digital co-production platform enabling citizens to support public service provision. As our dependent variable, effort intensity in platform use, is a behavioral outcome, we provide insights into the actual behavioral implications of PSM, going beyond self-reports. Using negative binomial regressions, we found a positive relationship between engagement and the PSM dimension “commitment to the public interest”, and a negative one with the dimension “compassion”. Additionally, social identification with the city moderates the relationship with engagement for certain PSM dimensions. In sum, our study contributes to a better understanding of what motivations drive citizens to collaborate with public organizations, which is an ongoing trend in many countries around the world.

## ARTICLE HISTORY

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## Introduction

Governments face increasing pressure to reinforce their problem-solving capacities due to the growing complexity and dynamics of modern societies. To keep up with citizens’ rising expectations regarding the quality, availability, and effectiveness of government services, a move from traditional top-down approaches of governance toward more interactive modes of public service provision can be observed in many countries (Sørensen and Torfing 2011). This development is further accelerated by increasing financial constraints, which often limit governments’ room for maneuver (Pierson 2001). To maintain the effectiveness and improve the efficiency of public services, co-production has been suggested as a key approach (Osborne and Stokosch 2013).

In a context where governments cannot operate in isolation anymore, it is important to understand what motivates citizens to engage in co-production. A potential explanation for collaborative behavior is the concept of public service motivation (PSM), which has attracted a lot of scholarly interest since Rainey (1982) laid the foundation for research on PSM almost 40 years ago (Perry and Wise 1990; Ritz, Brewer, and Neumann 2016). Today there are several definitions of PSM but “at the heart of the construct is the idea that individuals are oriented to act in the public domain for the purpose of doing good for others and society” (Perry, Hondeghem, and

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Wise 2010: 687). To date, research on PSM has almost exclusively focused on public servants. In this study, however, we follow Van Eijk and Steen (2016) and argue that public-service-motivated individuals may not only act out their motivation within their employing organization, but also to pursue their responsibilities and duties as citizens when outside the workplace. Based on this, we examine the following research question: *What is the relationship between public service motivation and citizens' engagement in digital co-production?*

Answering this research question is relevant to the vast body of research surrounding PSM for at least two reasons: First, scholars investigating PSM have thus far focused predominantly on self-reported attitudinal and behavioral outcomes of the concept. For instance, the relationships between PSM and performance, job satisfaction and organizational commitment have been researched extensively among civil servants (e.g., Bright 2008; Kim 2005; Leisink and Steijn 2009; Wright and Pandey 2008). However, empirical evidence on the relationship between PSM and actual behavior is still scarce (for positive exceptions see, for instance, Olsen et al. 2019; Jensen and Vestergaard 2017; Wright, Hassan, and Christensen 2017). So, there is still a need to assess whether and how PSM corresponds to observable behavior (Bozeman and Su 2015). This study aims to unravel the behavioral implications of PSM by making use of insights from identity theory (Burke and Stets 2009) and examining how PSM is related to an objectively measured behavioral outcome: *digital co-production*. At the same time, we take into account the respondents' social identification as a moderating variable. By studying the relationship between PSM and an independently measured form of actual behavior (digital co-production) we investigate what PSM really entails in practice.

Second, new digital technologies have caused a renewed interest in the topic of co-production (Meijer 2011), which is by its nature a concept that allows for observing the behavior of citizens while they collaborate with public organizations. As a result, several studies that analyze various aspects of digital co-production were published in the past few years (e.g. Abu-Tayeh, Neumann, and Stuermer 2018; Chun et al. 2010; Linders 2012). However, to the best of our knowledge, the present study is the first that links both fields of research by investigating digital co-production as a behavioral outcome of PSM, thereby contributing to the cross-fertilization of knowledge of two core concepts of the public management literature: PSM and (digital) co-production. Moreover, linking PSM and the behavior-oriented concept of digital co-production allows for addressing the issue that there is still generally little research that has rigorously investigated behavioral outcomes of PSM. Given the increasing importance of co-production for public service delivery, we believe that this study is not only of interest for academics, but also for policymakers.

The remainder of this study is structured as follows: In the following section, we review relevant literature on the topics of PSM and co-production, as well as on co-production through ICT-assisted channels. Based on both this review and insights from identity theory, we then formulate a set of hypotheses concerning the relationship between PSM and digital co-production. We then detail the sample, measures and methods that we used in the analysis before presenting our results. In our final section, we discuss the results in light of our theoretical considerations and highlight the main contributions of our study.

## Theoretical framework

PSM is a multidimensional concept consisting of the four dimensions (1) "self-sacrifice" (SSF), (2) "compassion" (COM), (3) "attraction to policymaking" (APM), and (4) "commitment to the public interest" (CPI) (e.g., Kim 2011; Perry 1996). COM, APM and CPI can be linked to affective, rational, and normative motive to engage in public service delivery (Perry 1996). In particular, COM reflects the degree to which individuals identify with the needs and suffering of others. APM indicates the extent to which individuals are attracted to the process of policymaking, and CPI assesses the extent to which individuals identify with the public interest and traditional public values such as equity, accountability, and concern for future generations. Finally, SSF refers to

the willingness to substitute services to set one's own needs and interests aside to better contribute to the well-being of society. This last dimension has been described as the altruistic foundation of the other three dimensions (Kim and Vandenabeele 2010). Since the relationships between the separate PSM-dimensions, and various antecedents and outcome variables, have been found to vary in strength and direction (e.g., Andersen and Serritzlew 2012; Neumann 2019), we approach PSM as a multidimensional construct in this study and elucidate how we should expect each dimension to be related to the provision of digital co-production. As such, analyzing the effects of the four dimensions of PSM separately is one of the most important aims of this study, and we expect the effect sizes of the various dimensions to differ markedly when correlating them to the concept of digital co-production, as we will explain in our hypotheses.

### ***PSM among citizens***

Originally, PSM research has focused on public servants. However, scholars have argued that PSM is not a characteristic found exclusively among civil servants (Houston 2008; Rainey and Steinbauer 1999). For example, Perry and Hondeghem (2008) identified that “public service motivation may also transcend the public sector, that is, characterize motivations in other areas of society that involve pursuit of public good” (p.3). Steen (2008) argues that it is also possible for private sector employees to act in accordance with their PSM, provided that the employing organization fits with the norms and values of the public service-motivated individual. Esteve, Van Witteloostuijn, and Boyne (2015) go even further, stressing that PSM is not necessarily bound to work and employment. More specifically, these authors argue that PSM is “a behavioral predisposition of any individual, irrespectively of whether or where he or she is employed rather than a characteristic specific to the public sector” (Esteve, Van Witteloostuijn, and Boyne 2015: 2).

This argument is in line with research on student samples, providing evidence that PSM and its consequences are observable even before individuals enter their work career. For example, Kjeldsen (2014) found that students who score highly on the affective dimension of PSM are likely to search for jobs that provide the opportunity to engage in daily contact with people in need. Similarly, in a study by Vandenabeele (2008), high levels of PSM among master students were positively related with a preference for public sector employment. This relationship was strongest for organizations featuring a high degree of publicness.

On the basis of this research, we argue that PSM is neither bound to public sector employment in particular, nor to the context of work in general. Instead, PSM and its outcomes may also be present among individuals in their role as citizens. This argument is supported by Perry's (2000) process theory of PSM, which suggests that PSM is affected not only by intra-organizational, but also socio-historical forces. Put differently, PSM seems to be shaped throughout a person's childhood and by significant life events, and organizational forces will further influence PSM once individuals have entered the labor market (e.g., Giauque, Anderfuhren-Biget, and Varone 2013; Fischer and Schott 2020). Examples of socio-historical forces with a seemingly greater influence on the onset of PSM are religion and family/parental socialization (Perry et al. 2008; Ritz, Brewer, and Neumann 2016; Vandenabeele 2011).

### ***(Digital) co-production***

Although the concept of co-production has been around for decades, it is experiencing a revival of interest among both scholars and practitioners around the world (Nabatchi, Steen, Sicilia, and Brand 2016). According to Meijer (2011), this new wave of attention to the idea of co-production is at least partially caused by new technologies. Critics may argue that co-production is no different from volunteering. However, what makes co-production unique and interesting to study is

that it “takes place within a context of professional service delivery and that it concerns services the people involved themselves use, i.e., not only for the benefit of others” (Verschuere, Brandsen, and Pestoff 2012: 1085). The concept of co-production refers to “the mix of activities that both public service agents and citizens contribute to the provision of public services. The former are involved as professionals or “regular producers”, while “citizen production” is based on voluntary efforts of individuals or groups to enhance the quality and/or quantity of services they receive (Pestoff 2018: 64). This definition of co-production presents a refinement of Brudney and England’s (1983) groundbreaking definition that defines co-production as “the critical mix of activities that service agents and citizens contribute to the provision of public services” (p. 59).

Alford (2002) examined four cases of co-production in Australia ranging from very simple (i.e., the use of zip codes in postal services) to rather complex (i.e., taxpayer collaboration with income tax requirements). Examples of traditional co-production activities are engagement in healthcare services (Van Eijk and Steen 2014) and activities in the domain of community safety (Van Eijk, Steen, and Verschuere 2017). A common thread through all these examples of co-production is that the co-producer benefits from the provided service him or herself. This makes co-production distinct from volunteering, which is primarily directed to the benefit others.

A number of studies exist that theoretically and empirically investigate possible ways of increasing citizens’ engagement in co-production. For instance, Thomsen (2017) found that both knowledge of how to co-produce and one’s self-efficacy perception foster citizens’ engagement in co-production. The relevance of self-efficacy as an antecedent of co-production was also supported by a large-sample survey distributed in five European countries (Bovaird, Van Ryzin, Loeffler, and Parrado 2015). This suggests that an individual’s sense of being both capable and able to carry out actions related to co-production is a strong antecedent of co-production. Pestoff (2012) focuses on the concepts of salience and ease when hypothesizing about individuals’ engagement in co-production. He argues that the more important the service is to potential co-producers, and the less effort required to become involved, the more likely a person is to join the co-production process. In another study, Jakobsen (2013) analyzes whether government initiatives providing citizens with resources relevant for their engagement in co-production increase their likelihood to invest time and energy to improve their children’s language skills. Huang and Feeney (2016) studied the motivations that public managers have to encourage citizen participation. The analysis of two national surveys showed that managers with higher PSM report greater levels of citizen participation in organizational decision making. Similarly, Coursey, Yang, and Pandey (2012) found a positive relationship between PSM and public managers’ attitudes toward citizen participation.

Motivation to co-produce can be both intrinsic and/or extrinsic (Abu-Tayeh, Neumann, and Stuermer 2018; Fledderus and Honingh 2016). Van Eijk and Steen (2016) studied the motivation to engage in co-production processes directly in combination with two different individual factors. More specifically, they analyzed how (1) perceptions of the co-production task and of one’s capacity to contribute to the public service delivery, (2) socioeconomic variables and social connectedness, and (3) self-interested and community-focused motivations are related to co-production. They find that all three of the analyzed sets of factors are to a certain degree important with regard to the likelihood to engage in co-production. Most interestingly, they found that community-focused motivations, which according to the authors, are closely related to PSM, are an important factor in explaining why individuals co-produce. Similarly, Stritch and Christensen (2016a) found PSM to be a significant predictor of engaging in eco-initiatives in the public workplace. The idea of community-focused motivations is related to the idea of normative appeals (Alford 2009). Individuals are more likely to co-produce if the benefit they receive from the service resembles values such as solidarity and equity.

In contrast to these studies on traditional types of co-production, “scholarship on co-production of public services repeatedly ignores the role of new media” (Meijer 2011: 598). Linders

(2012), who focuses on citizen cooperation in the age of social media, proposes four different categories of digital co-production, reflecting varying degrees of governmental responsibility: citizen sourcing, government as a platform, and do-it-yourself government. In *citizen sourcing* (citizens to government), citizens help the government to be more responsive and effective while the government is primarily responsible. In *government as a platform* (government to citizens), government makes its knowledge and IT infrastructure available to the public which paid for their development. Here the government does not hold responsibility for the resulting activities, although it facilitates public value creation indirectly. In *do-it-yourself government* (citizen to citizen) wired citizens effectively self-organize, presenting a substitute for traditional government responsibilities. In this informal arrangement of various citizens, the government plays no active role but may provide a facilitating framework. To our knowledge, very little research exists that specifically focusses on the relationship between citizens' motivations and co-production in the digital sphere, raising the questing of whether findings and insights from non-digital settings also apply to the digital world of co-production.

One exception is the study by (Abu-Tayeh, Neumann, and Stuermer 2018) that found both self-concern and other-orientation to be significant motivational drivers of citizen engagement in an online damage reporting platform, and that the effect of self-concern is stronger than that of other-orientation. This scarcity of studies is surprising and also represents a major gap in the literature, since ICT-based co-production has been identified as a key tool to improve the quality and effectiveness of public services over ten years ago (Chun et al. 2010; Fang 2002). We believe that digital applications provide an easy and quick way to collaborate with government agencies without the time commitment required by other forms of co-production, and therefore helps provide public services when time and resources are limited. Therefore, it is important to increase our hitherto limited knowledge about citizens' motivations for co-production in the digital sphere. Do different motives play a role here, if compared with motives to engage in traditional forms of co-production (i.e., engaging in neighborhood watches or becoming a member of a client council)? In the next section, we will discuss the relationship between PSM and digital co-production using insights from identity theory (Burke and Stets 2009).

### **PSM and digital co-production**

A fundamental assumption about PSM is that public service-motivated individuals expend greater effort as they are working to provide services they perceive as meaningful (Perry and Wise 1990; Wright and Grant 2010). *Identity theory* is useful to gain deeper insights into why public service-motivated individuals engage in behavior that is beneficial to society at large in general *and* in digital co-production in particular (e.g., Bednarczuk 2018; Schott, Van Kleef, and Steen 2015). A key concept in identity theory is the self, which is assumed to emerge out of the interaction between the individual and the society (Burke and Stets 2009; Stryker and Burke 2000). The concept of the self consists of a collection of different identities, each of which is based on the individual occupying a particular role in society, such as the role of an organizational member, a professional, or a son or daughter. PSM has also been referred to as an identity: a *public service identity* (Perry and Vandenabeele 2008; Vandenabeele 2007; Schott, Van Kleef, and Steen 2015). By means of socialization processes, public values and institutional logics are transmitted and individuals are expected to “acquire a new social identity as a member of the institution” (Perry and Vandenabeele 2008: 60).

According to identity theory, people engage in specific behaviors as they want to signal to others and themselves who they are: a process called *self-verification* (Stets and Burke 2003; Schott and Ritz 2018). With regard to PSM (or public service identity), this means that the more strongly people are committed to serve the public interest – the higher the levels of PSM are – the more likely they are to engage in activities, which aim at improving public service delivery.



The idea that self-verification helps explain the outcomes of PSM has been researched among civil servants (e.g., Bednarczuk 2018; Schott, Van Kleef, and Steen 2015). We argue that the same mechanism helps explain the outcomes of citizens' PSM. Because citizens with a public service identity – citizens with high PSM levels – want to express to others and themselves what they find important, they are likely to engage in prosocial behavior that benefit society at large.

In this study, we focus on a form of digital co-production as a type of prosocial behavior that is referred to as “citizen sourcing” or “citizens to government co-production” as defined by Linders (2012). Ultimately, we focus on a type of digital co-production that helps governments to be more responsive and effective while still being responsible for the quality of the public service. In particular, following the conceptualization of motivated action by Locke and Latham (1990), we analyze the intensity (as opposed to the direction or duration) of citizens' efforts in the use of an online platform called “Züri wie neu” (“Zurich as good as new”). This platform can be used to send damage reports to the city of Zurich, which is the largest city of Switzerland. As reporting is completely voluntary, “Züri wie neu” is a classic example of a platform for digital co-production between a local government and citizens. The received damage reports are used by the city to more promptly and efficiently address the issues concerned. A review of several hundred reports of the specific case of digital co-production studied in this article – the online platform “Züri wie neu” (“Zurich as good as new”) – suggests that there are many reports that affect public spaces and that reported issues have an impact on the larger public. As frequently engaging in this type of digital co-production is one way to verify one's public service identity, we anticipate that the overarching construct of PSM will be positively related to a user's effort intensity in using the platform, which leads us to our first hypothesis:

H1: PSM will be positively associated with effort intensity in platform use.

As the individual PSM dimensions may differ in their importance for certain outcomes (Wright and Grant 2010), it is important to consider the relationship with digital co-production for each dimension separately. Regarding the norm-based dimension of CPI, which is often seen as the core dimension of PSM (Kim 2011; Kim et al. 2013), we predict that it will be most strongly related to increased effort intensity in platform use. Commitment to the public interest can be interpreted as a motivation concerned with the improvement of public service to the greatest number of people (Jensen and Vestergaard 2017). Individuals with high levels of CPI identify strongly with public norms and values such as safety, security and equity (Kim 2011; Kim et al. 2013). As regularly reporting issues that pose a risk to society using an online application is likely to be perceived by citizens as an effective and efficient way to express these values and to make a difference, we formulate the following hypothesis:

H1a: CPI will be strongly positively associated with effort intensity in platform use.

While COM presents the affective PSM-dimension, SSF has been described as the altruistic foundation of the other three dimensions (Kim and Vandenabeele 2010). COM denotes the degree to which people are committed to and concerned about the needs of underprivileged groups, whereas SSF stresses the willingness to engage in prosocial behavior for tangible personal rewards (Perry 1996). Engaging in co-production by reporting infrastructure-related issues does not present a type of helping behavior that is directed toward individuals in need nor does it imply serious costs for the helping person in terms of time and money. The application can be downloaded for free and reporting an issue only takes a couple of minutes. As such, we expect that a platform designed to report infrastructure-related issues will provide users motivated by SSF and COM with only few opportunities to help the underprivileged and they will mostly use the platform as a means to help others in ad-hoc situations, as opposed to continually contributing to the public good and public values such as safety and security. However, in certain situations, submitting reports may still be conceived as a form of personal sacrifice for the good of

others and it may also be a means to protect weaker people in one's community such as elderly and children. However, while we do expect a positive effect, we assume that it will be weaker than that of CPI (see H1a). This leads to the following hypotheses.

H1b: SSF will be positively associated with effort intensity in platform use.

H1c: COM will be positively associated with effort intensity in platform use.

As argued, APM presents the rational dimension of PSM and focuses more on disposition to public policy processes. Individuals with high levels of APM are driven to participate in the process of policy formulation and they are committed to a public program because of personal identification (Kim 2011). Since the online platform is geared toward enabling citizens to report infrastructure-related issues rather than toward participating in public policy processes, we do not expect a relationship between APS and effort intensity in platform use. From this consideration follows our next hypothesis.

H1d: APM will not be associated with effort intensity in platform use.

### **The role of proximity**

In addition to these direct relationships, we place a focus on whether there is a difference in platform use between people who live in Zurich and people from out of town. Pestoff (2012) asserts that citizens' motivation to become involved in co-production processes depends on the importance of the provided service. Put differently, the likelihood to engage in co-production depends on the degree to which the provided service is important to the social collective one identifies with. Highly public-service motivated individuals are concerned with the wellbeing of the social collective, or "society at large", and they identify with the public interest (Perry and Hondeghe 2008).

Since the online application studied herein is exclusively geared toward reporting issues within the city limits of Zurich, it is reasonable to assume that living in the city is associated with an increased feeling of duty to consistently use the online platform. Compared to people who live in Zurich, people who do not can be expected to identify less with the city of Zurich; a social collective in the words of Pestoff (2012). We argue that in the specific situation of reporting issues relating to the city of Zurich, the public service identity and the identity as someone who lives in Zurich share meaning. Making the city safer and cleaner can be seen as both a contribution to society at large and a contribution to the city one lives in and identifies with. On the basis of this, we expect that the positive relationship between PSM and other-oriented behavior – i.e., high-intensity use of the online platform – is stronger for Zurich locals than for people who live out of town. This leads us to our final set of hypotheses.

H2: The association between overall PSM and effort intensity in platform use will be stronger for people who live in Zurich compared to those who live out of town.

H2a: The strong association between CPI and effort intensity in platform use will be stronger for people who live in Zurich compared to those who live out of town.

H2b: The association between SSF and effort intensity in platform use will be stronger for people who live in Zurich compared to those who live out of town.

H2c: The association between COM and effort intensity in platform use will be stronger for people who live in Zurich compared to those who live out of town.

H2d: There will be no association between APM and effort intensity in platform use regardless of whether one lives in Zurich or not.

Figure 1 provides an overview of all hypotheses indicating the expected associations between the concept of PSM as a multi-dimensional concept and a particular form of digital co-production: using the online platform "Züri wie neu".



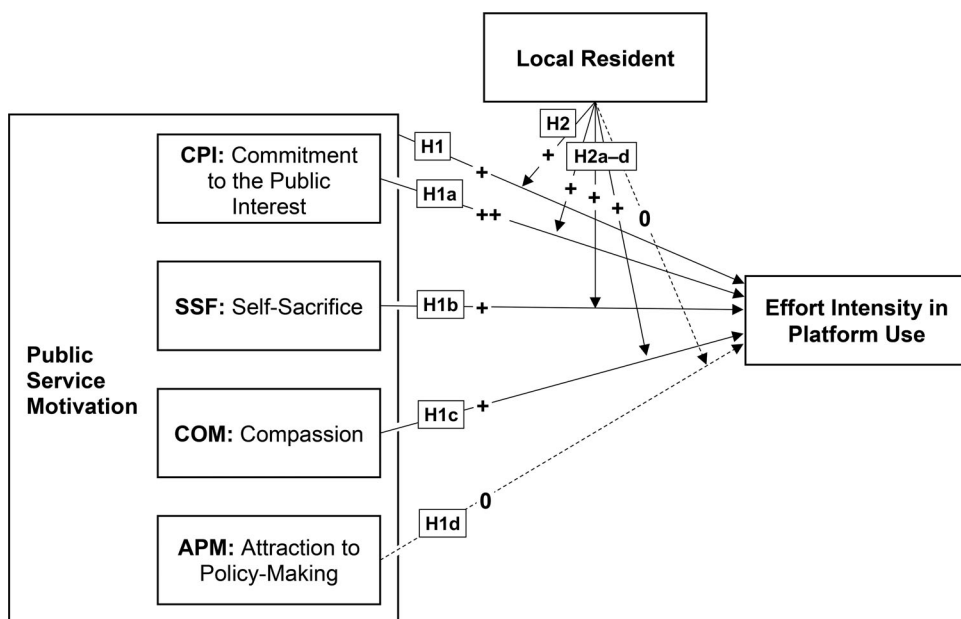


Figure 1. Research model.

## Sample, measures, and methods

### Sample

Data for analysis were sampled from users of the platform “Züri wie neu” (ZWN) (translation: “Zurich as good as new”) run by the city of Zurich in Switzerland. ZWN is a derivative of the FixMyStreet open source platform (UK Citizens Online Democracy 2019) geared toward enabling citizens to report infrastructure-related issues such as potholes, litter, and broken streetlights to the responsible local authorities in a simple way. The ZWN application is compatible with many different browsers and has native apps for both Google Android and Apple iOS.

First, in July 2016 we obtained a dataset containing all 7501 reports from 2613 unique users that had been submitted on the platform since its public launch in June 2013. This enabled us to measure the actual co-producing behavior of citizens. Second, a survey link was distributed via email to all 2613 users through the city of Zurich around the same time, asking them to devote approximately 10 minutes of their time to participate in a research project on the ZWN platform. One reminder was sent to users who had not yet finished the survey some two weeks later. As an incentive, users could opt to participate in a raffle to win one of three vouchers, worth 50 Swiss francs each, which could either be used as a donation to a charity or toward shopping at a grocery store chain. By linking these two datasets together, we were able to analyze the associations between our various independent and control variables and the actual number of reports that each user had filed, using negative binomial regression as an analytical method.

A total of 966 users took the survey, leading to 703 complete and 263 partial responses. Thus, the response rate was 37%. The sample comprised about 24% females, 78% Zurich locals, 93% German native speakers, and 84% of currently employed persons. The average study participant was 38 years old, worked 33 hours per week (the standard full-time employment is 42 hours in Switzerland), and had some degree of postsecondary education. Employees in the private and public sectors made up 42 and 35% respectively of the employed persons in the sample, 12% were self-employed, four percent worked in the nonprofit sector, and seven percent pursued other forms of employment. Except for the low number of females and the rather high levels of

currently employed and younger people in the sample, the sample characteristics appear to be suitably representative of the urban population in the greater Zurich area. While we were unable to do statistical tests comparing sociodemographic variables of the general population or the complete user database to our sample due to data unavailability, we did compare the platform users who participated in the survey to the ones who did not regarding their average number of reports. Using an independent samples t-test, we found that the participants group had an average of 3.50 reports, the non-participants only had 2.44 and this difference was statistically significant ( $p$ -value = 0.007). When we excluded seven outliers who each had more than 50 reports, the participants group still had an average of 3.06 reports while the non-participants had 2.00 reports on average. This difference was also statistically significant ( $p$ -value > 0.001), suggesting that there is a certain selection bias in our sample and that the results should only be generalized with caution.

## Measures

To avoid common method bias, we followed the suggestion by Podsakoff, MacKenzie, Lee, and Podsakoff (2003: 887) and obtained the measures of our predictor and criterion variables from different sources, namely from survey data (predictors) and from archival data (criterion), respectively. This way, we were able to eliminate one of the major sources of common method variance.

The *independent variable*, PSM, was measured as a second-order construct with reflective dimensions using a slightly adapted scale based on Kim (2011). The first order dimensions included APM, CPI, COM, and SSF, each of which were measured using three items, while the second order dimension was a global measure of PSM in which all four sub-dimensions were aggregated. Since Zurich is located in the German-speaking region of Switzerland, all PSM items were translated into German and back-translated into English by a second party to improve translation accuracy.

All answers were recorded on a seven-point Likert-type scale ranging from “strongly disagree” to “strongly agree”. On this original scale, the mean of APM was 5.25 (SD 1.32), the one of CPI was 5.52 (SD 0.96), the one of COM was 5.01 (SD 1.09) and the one of SSF was 5.17 (SD 1.03). The overall mean of PSM was 5.24 (SD 0.84). An examination of the histograms of these variables in the present sample of citizens showed that all PSM dimensions were negatively skewed, similar to what has been observed in many PSM studies using samples of public servants (e.g., Vandenabeele 2011). To assess the validity of the PSM measurement construct based on the sample of this study, we conducted a confirmatory factor analysis (CFA) (see Table 1). Judging by a combination of fit indices as recommended by Jackson, Gillaspay, and Purc-Stephenson (2009), the measurement model fit the data very well (RMSEA=.047; CFI=.982; TLI=.974;  $\chi^2(47)=125.694$ ;  $p<.001$ ). We also calculated the average variance extracted (AVE) for each dimension of the PSM scale to assess convergent validity. As per Table 1, all dimensions had AVE values of approximately 0.5 or higher, suggesting that convergent validity was good. To assess composite reliability, we calculated Cronbach’s alpha for each of the dimensions. The values ranged between 0.73 and 0.89 and thus were deemed sufficient. Calculating Raykov’s omega resulted in very similar values, further suggesting that composite reliability was good. Lastly, when assessing discriminant validity, we calculated the heterotrait-monotrait (HTMT) ratio of correlations (Henseler, Ringle, and Sarstedt 2015). A HTMT value at or below 0.85 is commonly interpreted as an indicator of good discriminant validity. The HTMT values for the correlations among the PSM sub-dimensions ranged between 0.47 and 0.85, indicating that discriminant validity was good. In a next step, regression factor scores (DiStefano, Zhu, and Mindrila 2009) were estimated for each case. As this led to very high correlations between the CPI, COM and SSF subdimensions of PSM ( $\rho$  between 0.85 and 0.91) and to generalized variance inflation factors

**Table 1.** PSM list of items (adapted from Kim (2011)) and confirmatory factor analysis (CFA) results.

Item	Factor loadings (standard errors)				
	PSM-APM	PSM-CPI	PSM-COM	PSM-SSF	PSM Global
Item					
PSM2: Sharing my views on public policies with others is attractive to me	1.000				
PSM1: I am very interested in politics*	0.924 (0.054)				
PSM3: It is important to me to always be up to date on the latest political events*	0.801 (0.031)				
PSM4: I consider public service my civic duty		1.000			
PSM5: Meaningful public service is very important to me		0.910 (0.053)			
PSM6: I would prefer seeing public officials do what is best for the whole community even if it harmed my interests		0.800 (0.054)			
PSM7: It is difficult for me to contain my feelings when I see people in distress			1.000		
PSM9: I feel sympathetic to the plight of the underprivileged			0.938 (0.047)		
PSM8: I am often reminded by daily events how dependent we are on one another			0.820 (0.052)		
PSM10: Making a difference in society means more to me than personal achievements				1.000	
PSM11: I am prepared to make enormous sacrifices for the good of society				0.901 (0.044)	
PSM12: I believe in putting duty before self				0.866 (0.046)	
Latent variable - second order CFA					
PSM-SSF					1.000
PSM-COM					0.972 (0.060)
PSM-CPI					0.843 (0.054)
PSM-APM					0.629 (0.064)
Cronbach's $\alpha$	.89	.73	.77	.80	
Raykov's $\omega$	.95	.73	.77	.80	
Average variance extracted (AVE, total = 0.61)	.79	.48	.53	.57	
Max. heterotrait-monotrait ratio of correlations (HTMT)	.47	.85	.85	.85	

Fit indices: RMSEA = 0.047; CFI = 0.982; TLI = 0.974;  $\chi^2(47)=125.694$ ;  $p<.001$ . Notes: N = 753; all items were measured on a 7-point scale; actual items in survey were in German; items marked with a \* were adapted to fit the context of citizen co-production; estimation procedure was maximum likelihood; listwise deletion of missings was used; software used was lavaan 0.6–5 in the R environment; covariance matrix available from the author upon request.

well above the commonly used threshold of 5 (GVIF values between 6.85 and 10.79, see Table A1 in the Appendix), indicating possible multicollinearity issues among these three variables (O'Brien 2007), we decided to instead use Bartlett factor scores, where the individual factors are less correlated with one another (DiStefano, Zhu, and Mindrila 2009), for the PSM subdimensions. This measure reduced the correlation coefficients and generalized variance inflation factors of the affected variables to acceptable levels ( $\rho$  between 0.55 and 0.67, see Table 2; GVIF values between 1.98 and 2.24, see Table A1 in the Appendix) and allowed us to use the Bartlett factor scores in all subsequent analyses.

The *moderating variable* of whether a person lives in Zurich or not was operationalized by creating a dummy variable based on the zip codes of the study participants home addresses, which participants were required to indicate during the survey. If a zip code identified a user as living in the city of Zurich, this variable was coded as 1 and 0 otherwise.

The *dependent variable*, effort intensity in platform use, was operationalized using the actual number of reports that each survey participant had submitted on the ZWN platform at the time of the survey. This variable was measured directly using the original database records which we obtained from the platform owner, the city of Zurich. Values ranged from 1 to 167 and on average, each user had filed 3.5 reports at the time of the data collection (standard deviation: 8.6). Matching between a user's survey response and his or her record in the platform's database was performed using an anonymized identification code provided to us by the city of Zurich's administration.

Control variables included age (measured in years), gender (measured as male = 1, female = 2), level of education (measured using eight ordered categories based on the Swiss education system, starting with "mandatory school" and ending with "doctorate or higher", plus a category "other" that was not considered in the analyses), mother tongue (measured as German = 1/reference category, French = 2, Italian = 3, Rhaeto-Romanic = 4, English = 5, other = 6), whether a person was currently employed or not (yes = 1, no = 2), working hours per week (measured in five percent-steps from 0–100, then converted into hours based on the usual 42 hour full working week in Zurich), sector of work (measured as private sector = 1/reference category, public sector = 2, nonprofit sector = 3, self-employed = 4, other/do not know = 5), and the number of months since a user filed their first report at the time of taking the survey. Table 2 displays descriptive statistics of all variables used in this study as well as the bivariate correlations among them.

## Methods

Given that our dependent variable, platform use as measured by the number of reports per user, is count data and thus has a Poisson distribution featuring a strong positive skew (see Figure A1 in the Appendix), we used negative binomial regression models to test our hypotheses. We preferred negative binomial regression over Poisson regression since we detected overdispersion in our dependent variable (Gardner, Mulvey, and Shaw 1995; Ver Hoef and Boveng 2007). Four different models were estimated. In the first model, only the global PSM measure was included. In model 2, instead of the global measure we included the four separate sub-dimensions of PSM. In the third model, we added the interaction term between the global PSM measure and the Zurich resident variable. In the last model, we included the four interaction terms between the PSM sub-dimensions and the variable Zurich resident. All four models furthermore included the complete set of control variables and were estimated in the R environment for statistical computing (version 3.6.2).

## Results

For a preliminary analysis of the hypotheses not involving interaction terms (1, 1a–1d), we turn to the Spearman-type correlations in Table 2. As for the PSM measures, only the correlation coefficient between APM and the number of reports per user is statistically significant and slightly positive ( $\rho = 0.08$ ,  $p < 0.05$ ), which however was not predicted by H1d. Given the statistically non-significant correlation coefficients between the number of reports and both the global PSM measure and the remaining PSM dimensions, no preliminary support for hypotheses 1 and 1a through 1d is found. Other statistically significant correlation coefficients involving the number of reports per user are related to the variables gender, where being female is associated with a

Table 2. Descriptive statistics and Spearman correlation coefficients.

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
Reports per user (1)	3.49	8.62	1												
PSM Global (2)	0.00	0.87	0.04	1											
PSM-APM (3)	0.00	1.44	0.08*	0.45***	1										
PSM-CPI (4)	0.00	1.05	0.06	0.8***	0.41***	1									
PSM-COM (5)	0.00	1.17	0.02	0.83***	0.28***	0.55***	1								
PSM-SSF (6)	0.00	1.12	0.04	0.91***	0.32***	0.62***	0.67***	1							
Gender (male = 1, female = 2) (7)	1.24	0.43	-0.07*	0.06	-0.13***	0.07†	0.11**	0.04	1						
Age (8)	38.20	13.42	0.06†	0.11**	0.09*	0.00	0.14***	0.10**	0.06†	1					
Local resident (1 = non-local, 2 = local) (9)	1.78	0.41	0.10**	0.07*	0.02	0.05	0.08*	0.08*	0.06†	0.06†	1				
Level of education (8-point scale) (10)	4.68	1.79	-0.01	0.13***	0.17***	0.19***	0.05	0.10**	0.00	-0.10**	0.07**	1			
Employment status (1 = employed, 2 = not employed) (11)	1.16	0.37	0.03	0.02	0.03	-0.02	0.05	0.02	0.02	0.37***	0.12***	-0.17***	1		
Working hours per week (12)	32.90	14.15	-0.02	-0.10**	0.02	-0.09*	-0.10**	-0.08*	-0.27***	-0.29***	-0.15***	0.02	-0.59***	1	
Time since first report (months) (13)	28.70	10.64	0.31***	0.03	0.10**	0.04	0.02	0.00	-0.05	0.07*	0.03	0.00	0.01	0.03	1

Notes: n = between 723 and 966; listwise deletion of missing; variable 2 is based on regression factor scores; variables 3–6 are based on Bartlett factor scores; significance codes:  $p < 0.001$  = '\*\*\*',  $p < 0.01$  = '\*\*',  $p < 0.05$  = '\*',  $p < 0.10$  = '†'.

**Table 3.** Negative binomial regression results - response variable: number of reports per user.

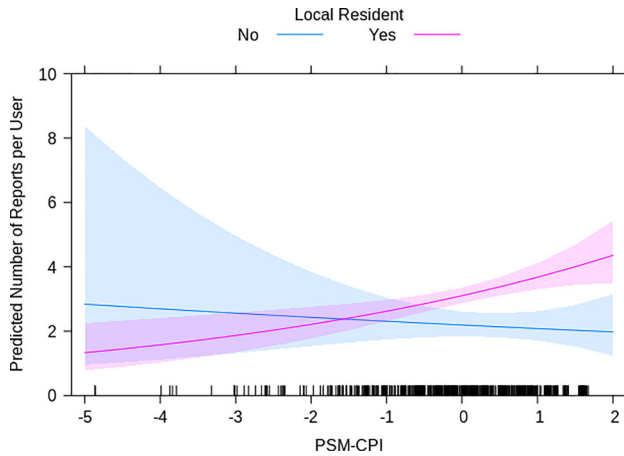
Independent variable	Model 1: Global PSM Incident rate ratio (Standard error)	Model 2: PSM Sub-dimensions Incident rate ratio (Standard error)	Model 3: Global PSM + Interaction Incident rate ratio (Standard error)	Model 4: PSM Sub- dimensions + Interactions Incident rate ratio (Standard error)
Main variables				
Local resident	1.34** (0.13)	1.36** (0.13)	1.34** (0.13)	1.42*** (0.14)
PSM	1.01 (0.04)		0.97 (0.09)	
PSM*local resident			1.05 (0.11)	
PSM-CPI		1.13** (0.05)		0.95 (0.10)
PSM-SSF		1.03 (0.05)		1.22† (0.12)
PSM-COM		0.88** (0.04)		0.75** (0.07)
PSM-APM		1.00 (0.03)		1.13† (0.07)
PSM-CPI*local resident				1.25† (0.15)
PSM-SSF*local resident				0.79* (0.09)
PSM-COM*local resident				1.22† (0.13)
PSM-APM*local resident				0.87* (0.06)
Control variables				
Female	0.74*** (0.07)	0.75** (0.07)	0.74*** (0.07)	0.75** (0.07)
Age	1.01 (0.00)	1.01† (0.00)	1.01 (0.00)	1.01† (0.00)
Level of education	0.98 (0.02)	0.97 (0.02)	0.98 (0.02)	0.98 (0.02)
Mother tongue: French (vs. German)	1.49 (0.54)	1.60 (0.58)	1.47 (0.54)	1.52 (0.55)
Mother tongue: Italian (vs. German)	0.95 (0.23)	0.92 (0.22)	0.95 (0.23)	0.93 (0.22)
Mother tongue: Rhaeto- Romanic (vs. German)	1.27 (0.64)	1.33 (0.66)	1.26 (0.63)	1.36 (0.67)
Mother tongue: English (vs. German)	1.38 (0.57)	1.2 (0.49)	1.38 (0.57)	1.13 (0.46)
Mother tongue: other (vs. German)	1.25 (0.28)	1.29 (0.28)	1.25 (0.27)	1.24 (0.27)
Not employed	0.70† (0.14)	0.69† (0.14)	0.69† (0.14)	0.71† (0.14)
Working hours per week	0.99 (0.01)	0.99 (0.01)	0.99 (0.01)	0.99 (0.01)
Sector: public (vs. private)	1.03 (0.09)	1.02 (0.08)	1.03 (0.09)	1.01 (0.08)
Sector: nonprofit (vs. private)	1.23 (0.22)	1.17 (0.21)	1.22 (0.22)	1.14 (0.20)
Sector: self-employed (vs. private)	0.91 (0.11)	0.9 (0.11)	0.91 (0.11)	0.90 (0.11)
Sector: other / don't know (vs. private)	0.99 (0.19)	0.99 (0.18)	0.99 (0.19)	0.98 (0.18)
Time since first report	1.04*** (0.00)	1.04*** (0.00)	1.04*** (0.00)	1.04*** (0.00)
Model fit indices				
2*log-likelihood	-3066.244	-3053.288	-3066.081	-3041.457
Likelihood ratio test		$\chi^2(3) = 13.00^{**}$ (vs. model 1)	$\chi^2(1) = 0.16†$ (vs. model 1)	$\chi^2(4) = 11.80^*$ (vs. model 2)
AIC	3104	3097	3106	3093

Notes: N = 699 after listwise deletion of missings; significance codes:  $p < 0.001 = ***$ ,  $p < 0.01 = **$ ,  $p < 0.05 = *$ ,  $p < 0.10 = †$ .

slight decrease in the average number of reports ( $\rho = -0.07$ ,  $p < 0.05$ ), Zurich resident, where living in Zurich is associated with a slight increase in reports ( $\rho = 0.10$ ,  $p < 0.01$ ), and the time since a user's first report, where a longer use of the platform was associated with a substantial increase in the average number of reports ( $\rho = 0.31$ ,  $p < 0.001$ ).

For a more adequate test of all hypotheses, we turn to the results of the negative binomial regression models as presented in Table 3. In model 1, which in addition to the control variables includes the variables Zurich resident and overall PSM, we observe only one statistically significant finding involving the main variables: Living in Zurich is associated with a reporting rate 1.34 ( $p < 0.01$ ) times greater compared to people from out of town, given the other variables in the model are held constant. Regarding PSM, a one-unit increase in overall PSM is associated





**Figure 2.** PSM-CPI\*Local Resident Effect Plot from Model 4.

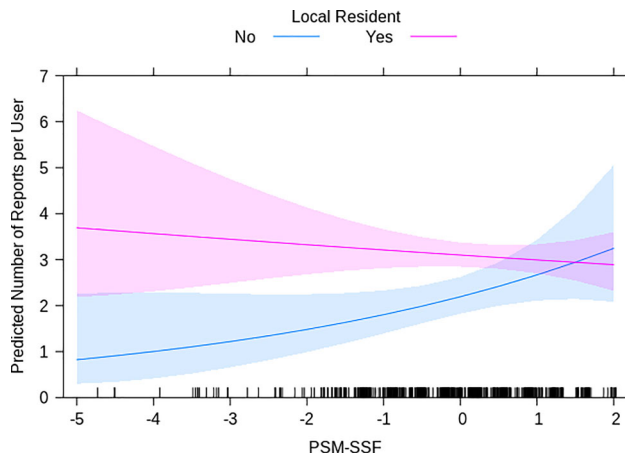
with a factor 1.01 ( $p = 0.83$ ) reporting rate increase. However, this finding is of very low magnitude and is not statistically significant, meaning that no support for H1 is found.

In model 2, the overall PSM variable was removed and replaced with four variables representing the various sub-dimensions of PSM. For CPI, we observe that a one unit-increase in this variable is associated with an increase by a factor of 1.13 ( $p < 0.01$ ) in the reporting rate. As this finding is statistically significant, it corroborates H1a. For SSF, we find an above-one but non-significant incident rate ratio (IRR) of 1.03 ( $p = 0.59$ ), meaning that there is no support for H1b. For COM, we find that a one unit increase in this variable is associated with a decrease in the reporting rate by a factor of 0.88 ( $p < 0.01$ ) and this IRR was statistically significant. This indicates that no support was found for H1c and the findings were even contrary to our expectations. For APM, we found an IRR slightly above 1 which however was not statistically significant, and therefore supports H1d.

In model 3, the interaction term between overall PSM and the Zurich resident variable is added. The interaction term serves to test whether the positive overall association between PSM and platform use differs between people who live in Zurich and those who live elsewhere. While the IRR of the interaction term is 1.05 ( $p = 0.68$ ), it is not statistically significant, indicating that no support is found for H2.

In model 4, the four interaction terms between the various PSM sub-dimensions and the variable Zurich resident are added. The interaction between the variables CPI and Zurich resident yields an IRR of 1.25 ( $p = 0.067$ ) which is marginally statistically significant. This suggests that the relationship between CPI and effort intensity in platform use may vary depending on whether one lives in the city or not. Thus, we investigate the interaction further. The simple slope for people from outside Zurich is  $-0.05$  ( $p = 0.64$ ), whereas the simple slope for Zurich residents is  $0.17$  ( $p = 0.0013$ ). The simple slope for Zurich residents is statistically significant, whereas the one for people from out of town is not. [Figure 2](#) shows the corresponding interaction effect plot. This finding suggests that the relationship between CPI and effort intensity in platform use is more positive for Zurich residents than for people who live outside the city, indicating that support for H2a is found.

The interaction term involving SSF yields an IRR of 0.79 ( $p = 0.044$ ), which is statistically significant. This indicates that the relationship between SSF and effort intensity in platform use may also vary depending on whether one lives in Zurich or not. Here, the simple slope for non-locals is  $0.20$  ( $p = 0.055$ ), whereas the simple slope for people living in the city is  $-0.04$  ( $p = 0.51$ ). However, both of these simple slopes are either marginally or not statistically significant. [Figure 3](#) shows the corresponding interaction effect plot. This suggests that the relationship between SSF



**Figure 3.** PSM-SSF\*Local Resident Effect Plot from Model 4.

and effort intensity in platform use does not vary between Zurich residents and people from out of town and, also considering the simple slopes' signs, we may say that no support for H2b is found.

The interaction term between the variables COM and Zurich resident yields an IRR of 1.22 ( $p=0.058$ ) which is marginally statistically significant. Thus, there is some indication that the relationship between COM and effort intensity in platform use may vary depending on whether one is a Zurich resident or not. The simple slope for people who live outside Zurich is  $-0.28$  ( $p=0.003$ ), whereas the simple slope for Zurich residents is  $-0.08$  ( $p=0.068$ ). The simple slope for non-locals is statistically significant, whereas the one for Zurich residents is only marginally statistically significant. Figure 4 shows the corresponding interaction effect plot. This finding suggests that the negative relationship between COM and effort intensity in platform use may be steeper for non-locals than for people who live in Zurich, indicating that at best partial support is found for H2c since the association is negative for both slopes.

Finally, the interaction term involving APM yields an IRR of 0.87 ( $p=0.040$ ), which is statistically significant, and suggests that the relationship between APM and effort intensity in platform use may also vary depending on whether one is a Zurich resident or not. The simple slope for non-locals is 0.12 ( $p=0.063$ ), whereas the simple slope for Zurich residents is  $-0.02$  ( $p=0.42$ ). Both slopes, however, are either marginally or not statistically significant. Figure 5 shows the corresponding interaction effect plot. This suggests that the relationship between APM and effort intensity in platform use is unlikely to vary between Zurich residents and people who live elsewhere. We thus conclude that support for H2d is found.

As for the control variables, we see that the estimated incident rate ratios for three of these variables are consistent and statistically significant across all four models. First, females compared to males are expected to have a reporting rate that is lower by a factor of about 0.75. Second, users who are not currently in employment have a reporting rate that is lower by a factor of about 0.7 compared to users who are currently employed (this was however only statistically significant at the 10%-level). Third, each one-month change in the variable "time since first report" of a user was associated with an increase in the reporting rate by a factor of 1.04, which was consistently highly statistically significant. This last finding is unsurprising since users who have been using the platform for a longer period of time naturally had more time to file reports. Additionally, in certain models, age is associated with a slight (IRR = 1.01) and only marginally statistically significant increase in the reporting rate.

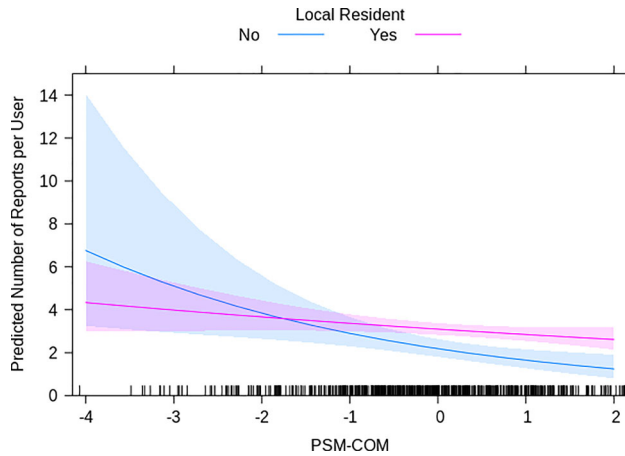


Figure 4. PSM-COM\*Local Resident Effect Plot from Model 4.

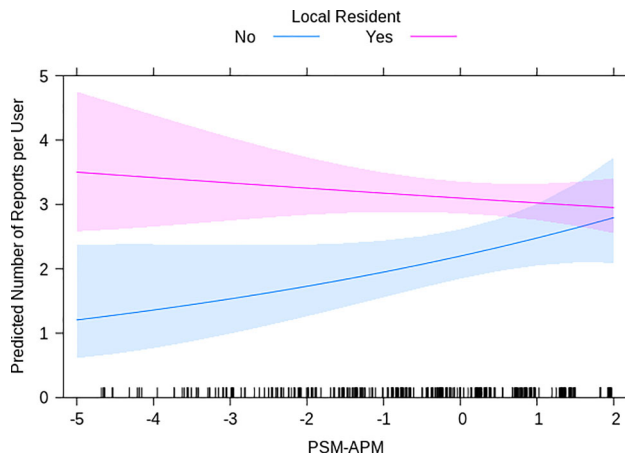


Figure 5. PSM-APM\*Local Resident Effect Plot from Model 4.

## Discussion and conclusion

The chief goal of this study was to find an answer to the question: *What is the relationship between public service motivation and citizens' engagement in digital co-production?* The case we investigated was the online platform “Züri wie neu” (“Zurich as good as new”) run by the city of Zurich in Switzerland. This platform allows users to digitally report damages and other issues in the city's infrastructure via a web browser or a dedicated smartphone application (Android and iOS) on a voluntary basis. A total of ten hypotheses served to analyze the research question both for PSM as an overarching construct and for its four sub-dimensions separately, and to analyze the potential interaction of PSM with being a Zurich resident, drawing on identity theory. We discuss our results and identify one minor and three major contributions of this study.

As a *first* contribution, we want to stress that the various sub-dimensions of PSM differ quite strongly in their degree and direction of contribution to engagement in digital co-production, which is our most important finding. This highlights the importance of the recommendation by several authors (e.g., Andersen and Serritzlew 2012; Jensen and Vestergaard 2017; Taylor 2007) to analyze the sub-dimensions of PSM separately since their relationships with other variables may vary, suggesting that each dimension taps into certain specific motives to benefit society. As

expected, we found that CPI was positively and APM was not associated with platform use effort intensity (H1a and H1d), suggesting that CPI is a driver of digital co-production while APM is not. Contrary to our expectations, SSF was not associated with platform use (H1b) and COM was found to be even negatively, instead of positively, associated with platform use effort intensity (H1c). This suggests that SSF is not a driver of this form of digital co-production in the context of Switzerland. Possibly, SSF as an altruistic type of motivation (Perry 1996) is more geared toward truly sacrificing significant personal resources, such as time and money, to benefit society at large. Reporting damages online may not tap into this type of motivation. The negative relationship between COM and the user's reporting rate may even indicate that an engagement with the platform is viewed as something negative that keeps individuals with high levels of COM from engaging in activities typically associated with COM, such as personally helping people in need. This argument is indirectly supported by recent research by Prysmakova's (2019), who found that party membership, which also presents a prosocial type of behavior that is not directed at personally helping people in need, correlates negatively with the PSM dimension "compassion".

The observation that CPI, which is often conceived as the core dimension of PSM (e.g., Perry 1996), is a driver of engagement in digital co-production presents a *second* key contribution of this study. While, thus far, the question of whether PSM leads to actual behavioral outcomes is still debated in the literature (e.g., Bozeman and Su 2015; Brewer and Brewer 2011), we provide additional evidence that individuals actually do behave in a manner systematically related to their levels of the PSM core dimension of CPI. What allows us to be confident about this finding is that we used actual behavioral data collected over a period of over three years, as opposed to self-reported or intended behavior, which is often biased (Podsakoff et al. 2003). As such, our study corroborates the limited amount of previous research suggesting that PSM is an important driver of desired behaviors (e.g., Andersen 2009; Andersen and Serritzlew 2012; Bellé 2013; Houston 2006; Kim 2006; Lee 2012), thereby strengthening the relevance of the concept of PSM (Bozeman and Su 2015). In addition, our focus on actual behavior rather than self-reported indicators of behavior contributes to the recently introduced research field of Behavioral Public Administration (BPA), which presents a micro-perspective of individual behavior and attitudes (Grimmelikhuijsen et al. 2017). In contrast to our expectations, we found no support for H1 positing that overall PSM will be positively associated with effort intensity in platform use. An explanation for this non-finding may be the varying findings of different sub-dimensions as presented above. The effects of the different sub-dimensions are likely to have canceled each other out. We therefore recommended to include PSM as a global and multi-dimensional concept when studying its relationship with (digital) co-production in the future.

*Third*, we echo the call for more attention to context in PSM research (Perry, Hondeghem, and Wise 2010). In particular, based on identity theory (Burke and Stets 2009), we put forward the hypothesis that the behavioral consequences of PSM will be stronger for Zurich residents compared to people who live outside the city (H2). Although we did not find support for this hypothesis, we did find some interesting results concerning this interaction in separate analyses of the PSM sub-dimensions (H2a-d). Again, the large differences between the sub-dimensions, which will be discussed below, present one explanation for the non-findings (H2).

As expected, we found the positive association between CPI and frequent platform use to be stronger for Zurich residents than for non-locals, suggesting that a strong identification as a member of the city a person lives in reinforces the role of CPI in co-production (H2a). Contrary to our expectations, we did not find that the positive association between SSF and platform use will be stronger for Zurich residents (H2b). Filing online reports is not a very strenuous activity and individuals who are motivated by SSF and who identify as a member of the city may prefer to engage in more demanding prosocial activities that come at certain costs rather than quickly reporting issues online. An example of this may be helping disadvantaged children with their

homework in one's neighborhood. When turning to the hypothesis stating that the association between COM and effort intensity in platform use will be stronger for Zurich residents compared to non-locals (H2c), we only found partial support. In particular, we found that the negative relationship between COM and effort intensity in platform use is stronger for non-locals than for people who live in Zurich, meaning that the decrease in digital co-production as a consequence of increasing levels of COM is stronger for individuals living outside the city of Zurich. This finding can be explained from an identity theory perspective (Burke and Stets 2009). Since people who live outside Zurich can be expected to identify less with the city than Zurich residents, engagement in the platform "Zuri wie neu" may be viewed as even more negative by them. In particular, it may be seen as making it impossible to personally help people in need, whom they care about most: fellow citizens of their hometown.

Finally, we expected that there will be no association between APM and platform use regardless of whether one is a Zurich resident or not (H2d). We found support for this final hypothesis in the data. This suggests that APM does not play any role in digital co-production regardless of whether one lives in the city or not.

In summary, we show that for two PSM dimensions, the increase or decrease of effort intensity in platform use as a consequence of the varying levels of PSM sub-dimensions depends on whether one is a Zurich resident or not. This means that it is important to consider contextual circumstances when theorizing on the relationship between PSM and behavioral consequences such as digital co-production.

A final contribution of this study is the insight regarding the role of PSM among citizens, since most previous research on PSM has focused on public servants (Ritz, Brewer, and Neumann 2016) or used data from student samples (e.g., Christensen and Wright 2018; Holt 2019; Stritch and Christensen 2016b). Public servants' PSM has, for instance, been found to be associated with prosocial types of behavior, such as donating blood and volunteering (e.g., Houston 2006; Prysmakova 2019; Schott et al. 2019; Ritz et al. 2020). Positive examples of studies that do investigate the role of PSM among citizens are Perry et al. (2008) and Pedersen, Stritch, and Taggart (2017). While Pedersen, Stritch, and Taggart (2017) studied the moderation role of PSM in the relationship between citizen perceptions of procedural fairness and public hiring, Perry et al. (2008) investigated the antecedents of a large number of public-service motivated individuals. We show that citizens' PSM is also associated with prosocial behavior by studying its effects on digital co-production through a self-verification point of view (Burke and Stets 2009). Our results suggest that the mechanism of self-verification is not only useful to understand the traditionally studied outcomes of public servants' PSM but that this mechanism also helps us understand why public-service motivated citizens engage in prosocial behavior, such as digital co-production. Given the increasing importance of co-production that involves contributions of citizens in public service delivery (Nabatchi, Steen, Sicilia, and Brand 2016), especially through digital channels (Chun et al. 2010; Fang 2002), we believe that studying the relationship between PSM and behavioral outcomes in citizens will become increasingly important. Thus, we encourage other researchers to intensify research efforts in this direction.

This study has several strengths and limitations. As for the strengths, the study relied on a relatively large and diverse sample, meaning that generalizability should be good at least in the Swiss context and in the context of similar platforms. In addition, this study relied upon different sources for the independent and dependent variables, resulting in the risk of common method biases being substantially reduced. Furthermore, the construct of PSM was included in the analyses both as an overarching construct and with its sub-dimensions, allowing for more differentiated insights into the various associations that the sub-dimensions have with our dependent variable of platform use. As for the limitations, it should be noted that cross-sectional data was used that does not allow for definitive statements on the causality of the variable relationships investigated. In addition, as mentioned in the sample description, our sample from the survey

included an unusually low share of females (24%) and rather low levels of not currently employed (16%) and older people (6% were 60 years or older). As the data from the database of the “Zurich as good as new”-platform did not contain information on sociodemographic variables, we were unable to compare the survey sample to the population of platform users. As such, we were unable to determine whether these abnormalities stem from selection bias issues or are manifestations of digital inequalities (Robinson et al. 2015). We however found that on average survey participants reported more than platform users who did not participate in the survey, suggesting that we do have a certain selection bias in our sample and should be cautious when generalizing the results. A closer analysis of the two subgroups revealed that the number of one-time users in the survey participants group was 51.5%, whereas it was 68.8% in the non-participants group. This may help to explain the group differences to a certain extent, since one-time users may have just tried the platform once before deciding it was not for them, also making them less likely to respond to the survey which was connected to the platform. Furthermore, we only examined the intensity of citizens’ efforts and did not analyze their direction and duration (Locke and Latham 1990). Moreover, in this study, only the quantity of reports that users filed was considered while the quality of these reports was not assessed. Since report quantity alone is an incomplete measure of successful co-production on the “Zurich as good as new”-platform, we encourage scholars to consider quality aspects of digital co-production in future research. In addition, future studies should also use longitudinal data and experimental or qualitative methods to gain deeper insights into the causal mechanisms involved.

There are also a number of practical implications that follow from this study. The finding that citizens with high levels of CPI exhibit stronger engagement in co-production is valuable for public organizations, especially at the local level where the possibilities to have citizens collaborate with local public government are manifold. For example, organizations are advised to emphasize the positive impact citizens can have on society through their participation (Grant 2008), thereby not only stimulating higher levels of PSM, but indirectly also the likelihood to engage in co-production activities. Next to this, the results of this study suggest it would be prudent to bring co-production opportunities and services to the attention of individuals who are already public-service motivated. From the vast body of literature on PSM, we know that, for instance, nonprofit and public sector workers have higher levels of PSM than private sector workers (Taylor 2010). Regarding personal characteristics, women (who were underrepresented in our sample), the variable age and higher levels of education are positively associated with PSM (Ritz, Brewer, and Neumann 2016).

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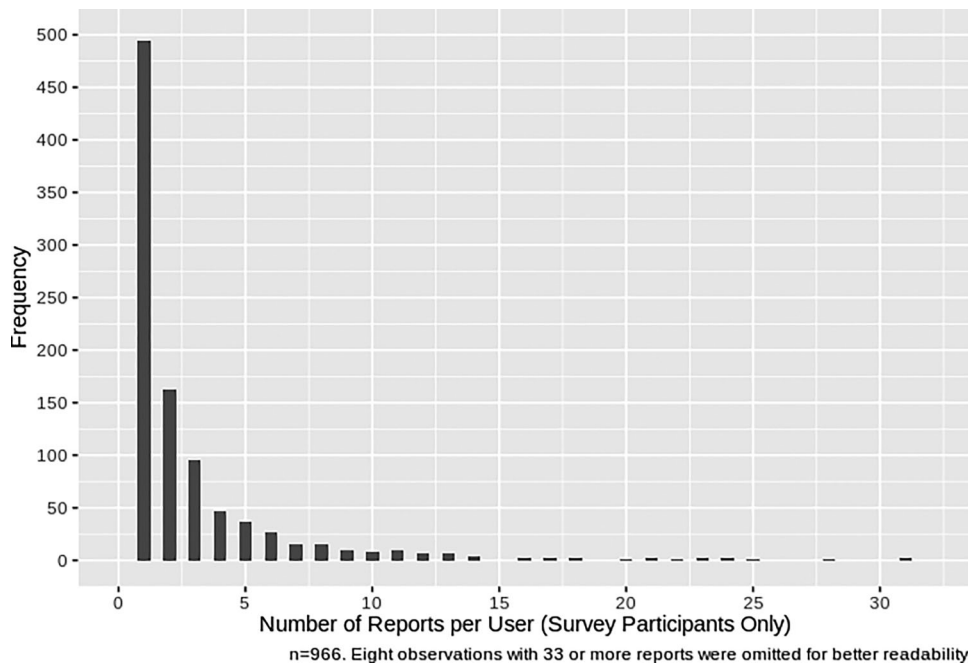
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## Appendix



**Figure A1.** Distribution of the Dependent Variable (Number of Reports per User).

**Table A1.** Variance Inflation Factors Based on Regression Factor Scores and Bartlett Factor Scores (Based on Regression Model 2 using PSM Sub-dimensions).

	Generalized Variance Inflation Factor (Degrees of Freedom) - Regression Factor Scores	Generalized Variance Inflation Factor (Degrees of Freedom) - Bartlett Factor Scores
PSM-CPI	7.57 (1)	2.08 (1)
PSM-SSF	10.79 (1)	2.24 (1)
PSM-COM	6.85 (1)	1.98 (1)
PSM-APM	1.41 (1)	1.34 (1)
Gender	1.15 (1)	1.15 (1)
Age	1.38 (1)	1.39 (1)
Local resident	1.08 (1)	1.08 (1)
Level of education	1.11 (1)	1.11 (1)
Mother tongue	1.21 (5)	1.21 (5)
Employment status	3.14 (1)	3.14 (1)
Working hours per week	2.93 (1)	2.93 (1)
Sector of work	2.22 (4)	2.22 (4)
Time since first report	1.03 (1)	1.03 (1)