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Who Should Pick up the Bill? Distributing the Financial Burden of Technological Innovations in Schools*

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Abstract

Technological innovations in classrooms generally come with substantial financial price tags. Although the distribution of such financial costs is of critical importance to practitioners, (potential) users, and policy-makers, little is known about different stakeholders' preferences towards who should pick up this bill. In this article, we exploit information obtained from a unique survey in Flanders (Belgium) to help fill this research gap. We thereby particularly assess how financing preferences depend on stakeholders' role in the educational environment (i.e. public officials, school principals, teachers, ICT administrators and parents) and their knowledge about the true extent of technological innovations' financial cost. Our main findings indicate that all stakeholders included in our analysis prefer to shift the financial burden of technological innovations at least to some extent onto other stakeholders. Yet, explicitly informing respondents about the high and diverse financial costs of tablets in schools tends to shift preferences towards funding models representing more equitable distributions of the financial burden.

Keywords: Tablet computers, Educational change, Funding, Survey, Belgium.

Word count: 7945 words

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1. Introduction

Modern technology developments have had a significant impact on the education sector during the last 40 years by inducing an increasing presence of Information and Communication Technologies (ICTs) in schools. Recently, ICTs in schools, colleges and universities are no longer restricted to personal computers and laptops, but also include tablet computers, web-based teaching tools, interactive whiteboards, visualisers, etc. While such technologies are often designed to have a great potential for both teaching and learning (Bonds-Raacke and Raacke, 2005; Banister, 2010; Enriquez, 2010), the effective integration of ICTs in schools is a very complicated process, which generally requires substantial adjustments from both teachers and students. Moreover, the potential benefits of new digital technologies often come with significant financial costs. These required outlays not only include the price for acquiring new equipment, but also the costs of setting up and maintaining the necessary hardware and network infrastructure, software updates, teacher training programmes, as well as costs due to crowding-out of alternative educational content or teaching styles (Sommerich *et al.*, 2007; Wurst *et al.*, 2008; VLOR, 2013).

The significant hurdle posed by the long-term financing of new technologies directly raises a key question: Who should cover the costs of integrating ICTs in schools? In principle, this financial cost can be covered in a number of different ways. One of these is direct government intervention, whereby the government provides schools with the budgetary means necessary to introduce a new technology. This can occur via, for instance, outright payment of the required costs, or earmarked subsidies intended for schools' investments in ICT material. Another approach would be to place the financial burden entirely on schools (i.e. financing the technological innovation from schools' operating budget) or even parents. Finally, one could imagine mixed financing schemes incorporating contributions from multiple stakeholders: e.g.,

schools receive a partial subsidy from the government and provide the remaining funding from their operating budget; or schools carry full formal responsibility for the financial implications of introducing new technologies while transferring part of the costs on to parents. Although the exact distribution of the financial costs of any technological innovation in schools is of critical importance to practitioners, (potential) users and policy-makers,¹ previous scholarship on ICTs in education tends to focus on the actual use of computers in educational practice and has given surprisingly limited attention to this financial aspect. As such, we currently have at best a very limited and incomplete understanding of various stakeholders' preferences towards who should pick up the bill for technological innovations in schools. That is, should the burden fall on the government, schools, or parents – or some combination thereof?

This article takes a first step towards filling this research gap. It thereby explicitly focuses on two aspects determining stakeholders' cost-distribution preferences. First, a standard *utilitarian* perspective – whereby “self-interest is recognized as a powerful force underlying the behaviour of animals and humankind” (Perloff, 1987: 3) – predicts that rational self-interested stakeholders aim to minimize the financial burden that falls upon themselves when introducing a technological innovation. In the case of multiple stakeholders across whom a given financial burden can be distributed (as is the case in our setting), this theoretical perspective naturally implies that different groups of stakeholders are expected to have conflicting interests in terms of distributing the financial burden of integrating new technologies in schools. For instance, school principals might favour funding alternatives, which shift a larger part of the burden away from the operating budgets of their schools, whereas parents may prefer the burden to be placed predominantly on schools or governments.

¹ In effect, our data suggest that all relevant stakeholders (including policy-makers, school principals *and* parents) generally perceive the ‘funding model’ as one of the main problems related to integrating ICTs in schools. Other critical concerns relate to the persistent lack of sufficient digital educational content and potential risks regarding a widening digital and social divide arising from the digitalization of education (see also VLOR, 2013).

We test this empirically by comparing the preferences of various user groups (in particular: the government, school principals, teachers, school ICT administrators and parents).

Second, rational self-interested economic agents need not necessarily ignore the utility of others. Acknowledging such “dependence of individuals’ utility on the utility or the actions of others” (Akerlof, 1997, 1005), recent experimental evidence has often highlighted the fundamental role of *fairness* considerations in the determination of human behaviour (Almås *et al.*, 2010; Kahneman *et al.*, 1986; Fehr and Schmidt, 1999; Tyran and Sausgruber, 2006). Such fairness considerations have been argued to become activated particularly with respect to financial decisions, such as the problem of allocating a fixed cost amongst different users (Cook and Kress, 1999). Building on insights from equity theory in sociology and social psychology (Homans, 1958; Blau, 1964; Ng, 1981), we argue that more detailed knowledge about the high costs of introducing tablets in schools will undermine strict utilitarian cost-minimization preferences and shift stakeholders towards a ‘fairer’ distribution of such costs: namely, away from funding alternatives where one group (such as the government, schools or parents) bears the entire financial burden and towards funding alternatives that involve at least some degree of burden-sharing. We test this proposition empirically by evaluating whether, and how, explicitly alerting respondents to the (substantial) financial cost of technological innovations in classrooms affects preferences for the distribution of this cost.

Our empirical analysis concentrates on the case of tablet computers (henceforth ‘tablets’) in Flemish primary and secondary schools. The primary dataset derives from a unique new online survey conducted in May-July 2014 with principals, teachers, ICT administrators and parents in schools with and without tablet computers. Central to our empirical analysis, the survey recorded respondents’ preferences towards distributing the financial burden of tablets in

schools. This primary survey dataset is complemented with information obtained from face-to-face semi-structured interviews with two senior public officials in the Flemish and Brussels departments of education (both of whom hold key responsibility for public policies concerning schools' ICT infrastructure). These interviews likewise included a discussion of the preferred funding model for introducing tablets in schools.

Our main findings can be summarized as follows. In line with predictions deriving from rational self-interested cost-minimizing behaviour, we find that all stakeholders included in our analysis prefer to shift the financial burden of technological innovations at least to some extent onto other stakeholders. Yet, interestingly, this preference for cost-shifting weakens substantially when explicitly informing respondents about the high and diverse financial costs of tablets in schools. This indeed induces a statistically significant shift in expressed preferences towards funding models representing more equitable distributions of the financial burden. These results thereby provide support for the idea that *fairness* considerations play a fundamental role alongside simple cost minimization preferences in stakeholders' position towards the financing of technological innovations in schools.

2. Theoretical background and hypotheses

The central aim of introducing new technological tools in educational environments lies in making teaching and learning more effective and efficient (Roblyer and Edwards, 2001; Wurst *et al.*, 2008). From this perspective, it is often maintained that mobile devices – such as tablets – have the ability to provide students with innovative tools that improve their performance. For instance, recent studies suggest that tablets can be used to help students with school difficulties (Ferrer *et al.*, 2011), assist pupils in becoming more self-confident in expressing their own ideas and thoughts (Alvarez *et al.*, 2011), and create a student-centred learning environment

(Ifenthar and Schweinbenz, 2013). Yet, these alleged benefits clearly do not come free of charge. Introducing tablets into schools – just as introducing any other technological device in any other setting – comes with substantial financial investments in infrastructure, staff training and technical support. The distribution of this financial burden is not innocuous, and can be resolved in a number of possible ways. In the remainder of this section, we argue that different stakeholders’ preferences towards a particular funding approach are affected by their self-interest as well as fairness perceptions.²

2.1. Stakeholder self-interest

Many scholars have argued that the most important motivation driving decision-making behaviour is self-interest (Perloff, 1987; Mansbridge, 1990; Monroe, 1991). This notion also lies at the heart of classical and neoclassical economics, and is the central building block of rational choice theory. Theoretical models within the latter paradigm view individuals as self-interested, rational agents who decide upon which action to take via cost-benefit calculations driven by their self-interest. The core desire thereby is to maximize one’s utility by maximizing (expected) benefits and minimizing (expected) costs.

From such a rational choice perspective, the upper bound of any stakeholders’ willingness to contribute financially towards the financing of a particular product or service can be related to the expected value of the product or service to him/her. This expected value indeed establishes the maximum benefit that can be attained, and therefore determines the maximum amount

² A third potential driver of individual-level preferences towards the distribution of the financial cost of technological innovations in schools is individuals’ ideological position. A fundamental distinction between individuals (and political parties) on the left and right of the ideological spectrum indeed concerns the desirability of government intervention (Hibbs, 1977; Imbeau *et al.*, 2001; Tavares, 2004; Potrafke, 2010, 2011). From such an ideological perspective, education has sometimes been described as a ‘basic right’ that should *not* be assigned on the basis of individuals’ or schools’ ability to pay, but rather requires government intervention (Poterba, 1996). This line of argument implies that individuals’ preferences for the distribution of technological innovations’ financial implications may be affected by their ideological position. Unfortunately, we lack the necessary information to test this proposition, and leave it for further research to (dis)confirm it.

stakeholders would be willing to invest to obtain it (Gafni, 1998). Yet, rational stakeholders will naturally want to achieve this benefit at the lowest possible cost. Such desire for cost minimization follows naturally from the assumption that money always has positive marginal utility, such that obtaining a pre-defined consumption level gives most utility when this can be achieved at the lowest possible expenditure. Clearly, therefore, the lower bound to one's willingness to pay for a particular product or service will be zero. While this is true for private goods, the same conclusion also holds with respect to public goods – such as education in general, and ICTs in schools more specifically – since the benefits of such goods cannot be confined only to those who contribute financially (Mueller, 2003).

What does this imply for different stakeholders' preferences regarding the funding model for technological innovations in schools? To answer this question, it is important to keep in mind that there are always multiple stakeholders involved in the decision to integrate new technologies in schools. Based on the argument above, one can assume that all of them desire the minimization of their contribution towards the financial implications of this decision. Clearly, such cost minimization amongst multiple stakeholders directly implies that different (groups of) stakeholders will have conflicting interests in terms of distributing the financial burden of new technologies in schools. The reason is that – under the natural assumption that a given financial burden needs to be covered – reducing one's own financial contribution must induce an increase in the contribution of others. As a result, one can expect all concerned stakeholders to have conflicting interests in terms of the preferred funding model (i.e. a free-rider problem arises). For instance, parents will prefer the financial burden of technological innovations to be placed on either the school or the government (or a combination thereof). School principals tend to favour funding alternatives shifting a larger part of the financial burden away from their schools' operating budgets (and thus towards parents or direct

government funding) – as this naturally preserves the availability of these funds for alternative purposes within the school.

H1: Stakeholders aim to minimize their own financial burden from integrating tablets in schools

2.2. Fairness perceptions

Although utilitarian theory can provide important insights into decision-making processes, John Rawls (1971) and James Mirrlees (1971) already stated that fairness in one's behaviour is a primary condition for a just society. Recent experimental evidence has confirmed that such "fairness considerations fundamentally affect human behaviour" (Almås *et al.*, 2010: 1176; Kahneman *et al.*, 1986; Fehr and Schmidt, 1999; Tyran and Sausgruber, 2006). In fact, it has been argued that many people have an inner desire for equality and are prepared to punish any unjust or unfair behaviour, or to distort their comprehension for reality to match their perceptions with a desire for a fair world (Lerner, 1982; Bénabou and Tirole, 2006).

One setting where fairness considerations play a central role concerns allocation problems involving the distribution of rewards, benefits, costs, or contributions between groups or individuals (Ng, 1981; Tijs and Driessen, 1986; Fehr and Schmidt, 1999; Tyran and Sausgruber, 2006). Such allocation problems are ubiquitous throughout human society – and clearly include the distribution of the financial burden of ICTs in schools. As a result, the cost-minimization preferences highlighted under hypothesis H1 will at best provide a partial explanation of different stakeholders' funding preferences. Building on insights from equity theory in sociology and social psychology (Homans, 1958; Blau, 1964; Ng, 1981), fairness in allocation problems is generally defined as the situation where all groups or individuals "receive rewards

that commensurate with their relative costs and inputs” (Ng, 1981: 439), or, reversely, participate in the costs or inputs in a way that directly relates to the groups’ or individuals’ benefits (Homans, 1958; Blau, 1964). For instance, Bordignon (1993: 345) argues that individual-level preferences towards the payment or evasion of taxes are determined by the “fairness of his fiscal treatment, with respect to both governmental supply of public goods [i.e. expected benefits] and the perceived behaviour of other taxpayers [i.e. relative costs]”.

In cost allocation frameworks – such as the distribution of the financial burden of technological innovations in schools – the actual size of the overall financial cost arguably plays an important role in triggering stakeholders’ fairness considerations. Indeed, imposing the complete financial burden of a technological innovation on one stakeholder – whether the government, schools or parents – clearly become less ‘fair’ or equitable when this financial burden is larger. This line of argument directly leads to the proposition that more detailed knowledge about the true cost of introducing tablets in schools will shift stakeholders towards a ‘fairer’ distribution of such costs: namely, away from funding alternatives where one group (such as governments, schools or parents) bears the entire financial burden, and towards funding alternatives that involve at least some degree of burden-sharing.

H2: Stakeholders prefer a more equitable distribution of the financial burden of tablets when they know the true size of this financial cost.

3. Empirical analysis

3.1. Institutional setting

Belgium is a federal country with four levels of government: the federal level, the Regions and Communities, the provinces and the municipalities. Within this institutional framework, “the

Flemish, French and German speaking Communities are responsible for culture, education, media and some social services [while] the Flemish, Brussels and Walloon Regions all deal with matters related to territorial issues, such as economic development, housing, environment and transport” (de Rynck, 2005, 485). The Communities thereby have near-exclusive autonomy over education matters since a large-scale devolution operation in 1988-89, which implies that they set the educational standards and targets that pupils have to attain at the end of each stage of their education. They also pay teachers’ wages and allocate resources for schools’ operating budget.

Within this legal framework, schools retain substantial autonomy in terms of the tools and pedagogical methods they use to reach the governments’ educational standards and targets. As a result, schools have significant flexibility in the effective allocation of their operating budgets, which is important since this implies that they have important decision-making power in terms of the financial burden of technological innovations in schools. That is, they have the authority to buy any technological devices deemed appropriate using the operating budget provided by the government. However, as this naturally excludes the use of these funds for alternative purposes, they can also set up alternative funding arrangements including, for instance, contributions from parents, students or third parties.

3.2. Data

Data collection to evaluate the research hypotheses set out in section 2 took the form of two semi-structured face-to-face interviews in December 2013 and March 2014, and a closed-form survey administered online between May and July 2014. The interviews were conducted with

two senior public officials in the education departments of the Dutch-speaking Community and the Brussels local government (both of whom carried key responsibility for developing strategic policies concerning primary and secondary schools' ICT infrastructure). The interviews addressed a number of themes (including respondents' education and work experience, their view on the perceived costs and benefits of ICTs in education, schools' experience with tablets, and the funding method for integrating tablets in their jurisdiction), but remained semi-structured since the discursive nature of such interview approach benefits information retrieval. These interviews not only helped in the development of the final version of the survey questionnaire (see below), but also provided key information about the position of the Flemish and Brussels governments concerning the funding of ICTs in schools. This was important because government officials responsible for ICTs in schools could not easily be targeted using a survey approach.

Our survey was circulated among school principals, teachers, ICT administrators and parents. The first three groups were addressed by distributing a link to the survey among 679 Flemish secondary schools and 2293 Flemish primary schools, and asking them to circulate it among their staff. To reach parents, we collaborated with a magazine called *Klasse voor ouders* ("Education for parents") – a monthly magazine in the Flemish region providing parents with information about schools, teaching, and broader educational tips – which uploaded a link to our survey on its website and included it in its newsletter.

The survey first of all collected information about a number of individual-level background characteristics (including sex, age, education level, marital status, and interest in ICT). Central to our analysis, however, is a question enquiring about respondents' preferences towards the optimal distribution of the financial burden of tablets when such devices are introduced in

(primary and secondary) schools. The exact question reads: “Should your (child’s) school introduce tablets as part of its education-oriented technological infrastructure, how, in your opinion, should the financial cost of introducing such tablets be covered?” Six answer options – which exhaust the entire range of potential funding options – were provided to respondents in a randomised order: *i)* total cost born by the government, *ii)* total cost born by the school, *iii)* total cost born by parents, *iv)* total cost distributed between the school and parents, *v)* total cost distributed between the school and the government, *vi)* equal distribution of the cost between government, school and parents. Respondents were asked to choose the option that most closely reflected their preferred funding model. Only one answer was allowed.

To address H2, we randomly assigned respondents to four different conditions, which aimed at priming respondents – prior to answering our key question – with respect to the financial costs involved in introducing tablets in schools. In a first condition, respondents received no information about the cost of introducing tablets in school. We refer to this condition as ‘*No Cost*’. In the remaining three conditions, they were shown a statement outlining in detail the various components of tablets’ financial implications. The exact statement employed was: “The total cost of introducing tablets in schools involves not only the purchase price of the tablets. It also includes additional financial costs related to investments in (wireless) infrastructure, broadband internet access, technical maintenance, insurance, etc.”.³ The three conditions where this message was displayed to respondents differed in terms of the information provided about how these costs are currently covered within Belgium. That is, one group of respondents

³ This statement was based on official government documents (e.g., VLOR, 2013), as well as declarations made by the two senior public officials we interviewed. One of these stated that “there are three major costs of using tablets. First, the acquisition of the tablets themselves. Second, the huge underestimated cost of the Wi-Fi, as schools need a lot of bandwidth to run tablet classes. Third, the cost of the content” (personal interview, December 2013). The second senior public official likewise stressed the costs associated with wireless internet access (i.e. “the school needs a much wider Wi-Fi coverage (...) because lots of apps are using Internet to fully work”), and added that insurance is critical since “most of the time a tablet is impossible to repair” (personal interview, February 2014).

received no information about how these costs are distributed (henceforth '*Cost only*'), one group was told that the government picks up the majority of this bill (i.e. "In Brussels, the Centre for ICT of the Brussels regional government largely covers these various costs, such that the burden on schools and parents remains limited"; henceforth '*Cost Gov*'), and the last group was told that the majority of this cost falls on the school and parents (i.e. "In Flanders, the school in principle should cover these costs, although it can partially forward them to parents. The financial burden of tablets on the school and parents can thus be substantial"; henceforth '*Cost School/parents*'). As such, we have four groups: one with no cost prime, one with a cost prime without distribution information, and two groups with a cost prime with different distributional statements. This allows us to assess the effects of cost size and distribution in our analysis.

Clearly, it is critical that respondents can understand the cost-related questions posed to them, interpret them in the same way, and display a willingness to answer them without difficulty or anxiety. We therefore pre-tested these questions using a limited-sample pilot study among employees at Vrije Universiteit Brussel, which aimed at ensuring that all concepts employed were clear and expressed comprehensibly. Feedback from these initial respondents led to minor revisions in the wording of the questions, answer options and framing alternatives, and highlighted the proper functioning of the randomization process critical to our test of hypothesis H2. All pilot respondents understood and interpreted our final question wording accurately, which endorses their reliability and validity for our analysis.

We received 877 valid responses to the survey: i.e. 283 parents, 355 teachers, 126 school principals, and 113 ICT administrators. The average age of our respondents is 42 years (standard deviation = 9.75 years), whereas 66% are female, 78% are married, and 32% have a

college or university degree. The sample is evenly spread across primary and secondary schools, as 47% of respondents work, or have children in, a secondary school. As illustrated in figure 1, our respondents are – unsurprisingly given the nature of our survey – individuals with a strong interest in ICT. Figure 1 indeed illustrates that 69% own a tablet computer, and 75% are registered on at least one social media website (most often Facebook).

Figure 1 about here

Keeping in mind the relatively small size of most schools in Flanders, each school has one unique principal. Consequently, the response rate for this group of stakeholders is 4.24%. Each school generally also has one unique ICT administrator, although our response rate for this group of stakeholders exceeds 4.24% since different schools often share the same ICT administrator. Unfortunately, we have no way of estimating how many parents followed the link that was uploaded by *Klasse voor ouders*, or how many schools forwarded our survey to their teachers. As such, we unfortunately cannot calculate the overall, nor the group-specific, response rates of our survey for these groups of stakeholders. These observations should be kept in mind when interpreting the results from our analysis below.

Before turning to the results, figure 2 contains the frequency distribution of the answers provided by all 782 respondents replying to our key cost-allocation question (detailed statistics provided in table A.1 in appendix A). This illustrates that only few respondents favour a situation whereby the school (4.22%), the parents (3.07%) or the school along with the parents (5.75%) bear the total costs of introducing tablets. The remaining three answer options – i.e. total cost born by the government, total cost distributed between the school and the government, and equal distribution of the cost between government, school and parents – each receive just

under 30% of responses. This first of all indicates that most respondents favour at least some degree of government intervention in order to tackle the financial implications of integrating tablets in schools. Nonetheless, there is much less unanimity concerning the exact extent of such government intervention. The share of respondents supporting full coverage by the government is not statistically significantly different from the share of respondents desiring a distribution of costs between the government and schools, or the share of respondents favouring an equal distribution of costs across government, school and parents ($p > 0.10$ in all cases).⁴ Overall, figure 2 highlights significant variation in individual-level preferences regarding the distribution of the financial burden of technological innovations in schools. The next subsection takes a first step at explaining this variation in light of our hypotheses formulated in section 2.

Figure 2 about here

3.3 Main findings

To assess hypothesis H1 – i.e. stakeholders aim to minimize their own financial burden from integrating tablets in schools – we split the information in figure 2 by the four groups of stakeholders included in our survey. The results are presented in figure 3 (detailed statistics provided in the top panel of table A.1 in appendix A). In our discussion of figure 3, we assess any observed variation among the different stakeholder groups using parametric difference-in-means t-tests. Such t-tests provide an easily interpretable estimate for differences in the share of respondents expressing a preference towards a particular funding option across different groups of respondents, and test the null hypothesis that these shares are the same across two

⁴ Our survey was implemented in Europe, where public opinion towards government intervention is generally more positive than in, for instance, the United States (e.g., Edlund, 1999). It would clearly be interesting to replicate our study in different institutional and ideological settings in order to verify to what extent this finding can be replicated elsewhere.

groups. Since the test procedure compares two samples, the analysis will naturally engage in pair-wise assessments. That is, we compare parents to teachers, parents to principals, and so on.⁵

Figure 3 about here

One observation immediately standing out in figure 3 is that teachers and principals are least favourable towards *any* tablet funding option, which includes schools bearing a large part of the financial burden of introducing tablets (i.e. total cost born by the school; total cost distributed between the school and parents; total cost distributed between the school and the government). This difference is starkest when considering the funding approach implying *exclusive* school funding. That is, whereas only 2.6% of teachers and principals prefer this option, 6.2% of all other respondents favour this alternative. The difference between both these groups (i.e. teachers and principals versus parents and ICT administrators) is not only quantitatively meaningful, but also statistically significantly different from zero at conventional levels ($t=2.546$; $p<0.05$). In contrast, teachers and principals stand out in their preference towards complete governmental funding of tablets in schools (31.4% of teachers and principals versus 26.1% of parents and ICT administrators; $t=1.658$; $p<0.10$). These observations are in line with the prediction – expressed in H1 – that rational, self-interested individuals prefer to minimize the financial burden falling on their own institution, and shift the burden as much as possible onto other stakeholders. In our Belgian setting, such cost-

⁵ Categorical variables – such as our dependent variable – are most frequently analysed using a Chi² test. This test effectively assesses whether the distribution across the various answer options conforms to some initially expected frequencies. Although this can be used to evaluate whether the overall distribution of responses is equivalent across our various groups of stakeholders, it is less suitable for more detailed comparisons of preferences towards particular funding options across groups. This can be addressed more appropriately using parametric difference-in-means t-tests.

shifting preferences by principals (and teachers) are particularly reasonable since tablets would have to be funded from the schools' operating budget, and thereby limit the availability of these resources for alternative purposes.

Interestingly, a similar observation can be made also for the remaining stakeholders included in our analysis. Indeed, figure 3 shows that parents are – together with teachers (most of whom are parents themselves) – least likely to favour *exclusive* parental funding for introducing tablets (2.3% versus 5.6%; $t=1.803$; $p<0.10$). However, parents are – compared to the other three stakeholders in our analysis – *most* likely to favour a distribution of the total cost of tablets among schools and parents. Although the difference with the other stakeholders in our analysis remains statistically insignificant ($p>0.10$ in all cases), this observation appears at odds with hypothesis H1. Still, it should be kept in mind that principals and teachers were found to strongly oppose funding alternatives including a large role for schools. Hence, our finding for parents here might be at least in part deriving from this strong preference among two of our remaining three stakeholder groups.

Finally, although not included in figure 3, our interviews indicate that the education department of the government of the Dutch-speaking Community (which is the government level responsible for education policy in our Flemish setting) explicitly prefers schools to fund all investments in tablets – as well as any additional costs related to the integration of tablets – from their operating budget. One of our interview respondents indeed declared that “the vision of the ministry is that every school should buy the basic infrastructure and not ask parents to pay for it” (personal interview, December 2013). The French-speaking Community likewise does *not* provide schools with additional funding for introducing tablets, and thus implicitly

expects other stakeholders to pick up this bill. This is again in line with a rational preference towards minimizing the financial burden falling on one's own institution.⁶

Turning now to hypothesis H2 – i.e. stakeholders prefer a more equitable distribution of the financial burden of tablets when they know the true size of this financial cost – we split the information in figure 2 by the four cost frames presented to our respondents (i.e. ‘*No Cost*’, ‘*Cost only*’, ‘*Cost Gov*’, ‘*Cost School/parents*’; see section 3.2 for details). The results are presented in figure 4 (detailed statistics provided in the bottom panel of table A.1 in appendix A). As before, we assess any observed variation among the different cost frames using parametric pair-wise difference-in-means t-tests.

Figure 4 about here

Looking first at the difference between respondents with and without information about tablets' financial implications, we find that 42.0% of respondents in the ‘*No Cost*’ frame prefer the total cost of tablets to be born by one stakeholder (whether the government, schools or parents). This falls to 34.7% when providing information about the costs of tablets. The difference between respondents with and without cost information is statistically significantly different from zero at conventional levels ($t=1.797$; $p<0.10$). It should also be noted that this reduction materializes across all three exclusive funding options provided to respondents, although it is strongest for the option to place the financial burden exclusively on parents (which falls from 5.1% among respondents in the ‘*No Cost*’ frame to 2.5% when providing information about tablets' financial

⁶ It might be noted at this point that the *local* government in Brussels has set up its own initiative to further the integration of tablets in secondary schools within its jurisdiction. One of our interview respondents stated that “every school in Brussels has the opportunity to step into the tablet project financed by the *local* government” (personal interview, December 2013, italics added).

costs). These observations are in line with hypothesis H2, since respondents clearly move towards a ‘fairer’ and more equitable *distribution* of the costs of tablets when these costs are explicitly indicated to be high.

The strongest shift in the preference distributions observed in figure 4, however, relates to respondents’ reaction to the cost frame indicating that the government currently largely picks up the bill for tablets in schools (*‘Cost Gov’*). Presenting respondents with this frame indeed strongly shifts the preference distribution away from the answer option where the government exclusively bears all costs (24.6% of respondents in the *Cost Gov* frame versus 30.6% of respondents in all other cost frames, $t=1.643$; $p=0.10$) to answer options including equal burden-sharing across all stakeholders (32.2% of respondents in the *Cost Gov* frame versus 26.8% of respondents in all other cost frames; $t=1.498$, $p=0.134$) and burden-sharing between the school and the government (33.2% of respondents in the *Cost Gov* frame versus 28.4% of respondents in all other cost frames; $t=1.305$, $p=0.192$).⁷ Interestingly, the same observation – though statistically and qualitatively much weaker – arises when evaluating the cost frame indicating that schools and parents largely pay for tablets in schools (*‘Cost School/parents’*). That is, it weakly reduces the share of respondents indicating that the school should be exclusively responsible for these costs (4.1% of respondents in the *Cost School/parents* frame versus 5.1% of respondents in all other cost frames, $p>0.10$), and weakly increases the share of respondents favouring any burden-sharing arrangement (62.8% of respondents in the *Cost School/parents* frame versus 60.0% of respondents in all other cost frames, $p>0.10$). Again, these observations are supportive of hypothesis H2, since respondents clearly move towards a

⁷ The latter two findings are statistically significant at conventional levels *only when* evaluated using one-tailed tests. Nevertheless, this might be considered as an appropriate approach given the clear directional prediction provided by our hypothesis H2.

‘fairer’ and more equitable distribution of tablets’ costs when these costs are explicitly indicated to be very high, and borne by one specific stakeholder.

One important potential limitation of our analysis at this point is that school principals and ICT administrators might be more aware of the costs of introducing tablets in schools (and the distribution of such costs) compared to teachers and parents. If so, providing this information in our survey might have little (or no) effect on them. Unfortunately, we are unable to test this possibility directly. That is, since we have no information about individuals’ prior knowledge concerning tablet costs, we cannot assess whether principals and ICT administrators really do have more information about this. Furthermore, since our sample of principals and ICT administrators is fairly small, we cannot credibly analyse their preference shifts due to the provision of cost information separately (and thus check whether these shifts are smaller than for parents and teachers). Consequently, the results in figure 4 might be largely driven by our sample of parents and teachers (which are also the largest groups in our survey), and future research should verify whether school principals document similar effects.

Before concluding, we should also note that figure 4 does not allow inferring potential shifts *within* stakeholder groups due to the cost information presented to respondents. As suggested above, however, one might imagine that certain groups of stakeholders are more sensitive to the explicit provision of cost information than others. Additionally, certain stakeholder groups might be more likely than others to turn to favouring a cost distribution that involves a smaller contribution from their own group after having been presented with information about additional costs.⁸ Unfortunately, such stakeholder-specific shifts cannot be assessed with the current sample, since our dataset does not have sufficient observations (and thereby analytical

⁸ We are grateful to an anonymous referee for pointing this out.

power) to allow credible analysis of this issue. Extending our analysis to potential stakeholder-specific shifts in preferences arising from the (lack of) availability of cost information thus appears an important avenue for further research.

Concluding discussion

Introducing new technologies in educational settings is often accompanied with substantial financial costs. Although a vast academic literature has covered the pros and cons of integrating technological innovations into educational settings (e.g., Roblyer and Edwards, 2001; Sommerich *et al.*, 2007; Wurst *et al.*, 2008; Alvarez *et al.*, 2011; Ferrer *et al.*, 2011; Ifenthar and Schweinbenz, 2013), this is – to the best of our knowledge – the first study to investigate individual-level preferences with respect to how the concomitant financial costs *should* be distributed. More specifically, we argued that (1) most stakeholders aim to minimize their own financial burden from integrating tablets in schools; and (2) knowledge of the substantial financial costs incurred from introducing tablets in schools shifts individual-level preferences towards a more equitable distribution of this financial burden. These theoretical propositions are substantiated in our comparative analysis of the funding preferences across all relevant stakeholders (the government, schools and parents). First, we find that most stakeholders favour at least some degree of government intervention for covering the costs incurred from introducing tablets in schools. Second, we illustrate that teachers and principals are least supportive of tablet funding that involves a significant burden on schools, whereas the government prefers schools to fund tablet initiatives from their operating budget (in line with H1). Finally, respondents shift towards a more favourable stance about distributing the tablet costs once this financial burden is explicitly highlighted to our respondents (in line with H2). This observation is consistent with extensive research conducted about the significant role of fairness perceptions on human decision-making (Lerner, 1982; Bénabou and Tirole, 2005).

Both findings extend the existing literature on ICTs in schools and clarify how stakeholders' financing preferences regarding technological innovations in educational settings are driven by their self-interest *and* fairness perceptions.

Although our analysis thus clearly documents the existence of diverging preferences across groups of stakeholders about who should pay, it is important to note that we do not go into the exact nature of their choices. That is, the self-interest argument merely maintains that 'someone else' should pay, but does not provide any indication about who that someone should be. Likewise, the fairness argument merely maintains that a distribution of the cost will be preferred (under certain conditions), not who should be involved in this cost distribution. Clearly, it would be interesting to take the analysis further, and develop more specific predictions about *i*) the conditions under which people desire specific (sets of) stakeholders to bear the financial burden of new innovations, *ii*) which type of people are more likely to desire specific (sets of) stakeholders to bear the financial burden of new innovations.

Furthermore, while we only test stakeholders' preferences towards the funding of tablets in primary and secondary school environments, our analysis is clearly applicable across different types of educational technologies (e.g., laptops, school websites, whiteboards, visualisers) and other levels of education (e.g., colleges or universities). Accordingly, future research should consider to what extent the findings observed in our Flemish setting can be replicated elsewhere and with respect to other technological tools integrated in schools. Since this is the first study to investigate the stakeholders' preferences for financing new technologies in an educational environment, such studies into the generalizability of our findings are critical to provide robust policy implications to professionals, policy-makers, and practitioners.

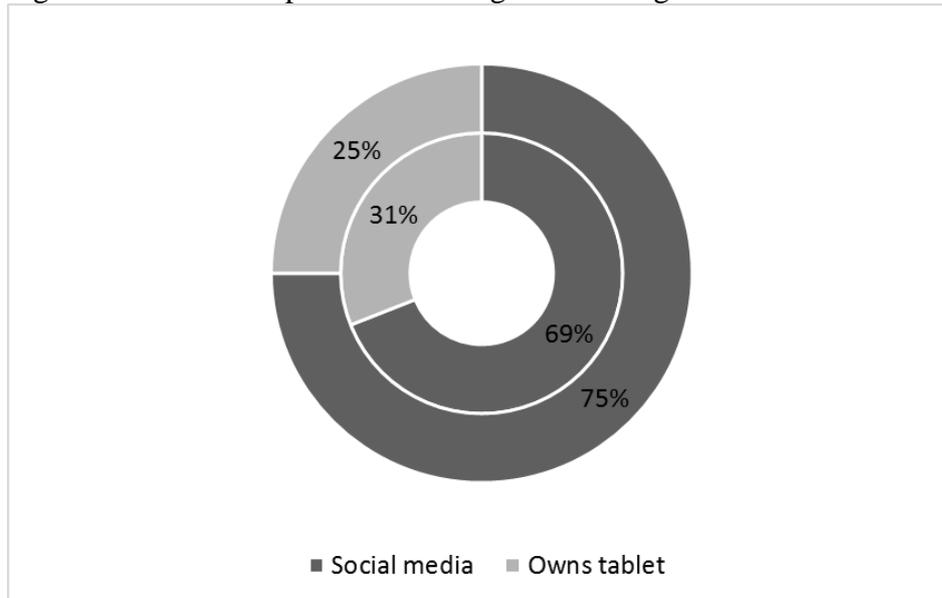
That being said, our present findings already suggests two main implications for educational practice. The first is linked to the fact that understanding the financing preferences of different stakeholders generates important insights regarding the public acceptability of significant financial investments into schools' ICT infrastructure. Governments and schools therefore should not only consider the pure technological aspects of new technologies, but also take into account the potential implications linked to distinct financing schemes when evaluating ICT investments. A second policy implication is that broad-based awareness of accurate information about the total cost of introducing tablets into education is critical *before* introducing any new technology in educational settings. Our results indeed suggest that this will have important implications for stakeholders' preferences towards the distribution of such costs, which in turn is likely to directly affect any cost-benefit analyses underlying the acceptance (or lack thereof) of new technological devices in schools. Such inferences can clearly be of vital significance to school principals, educational planners and policy makers.

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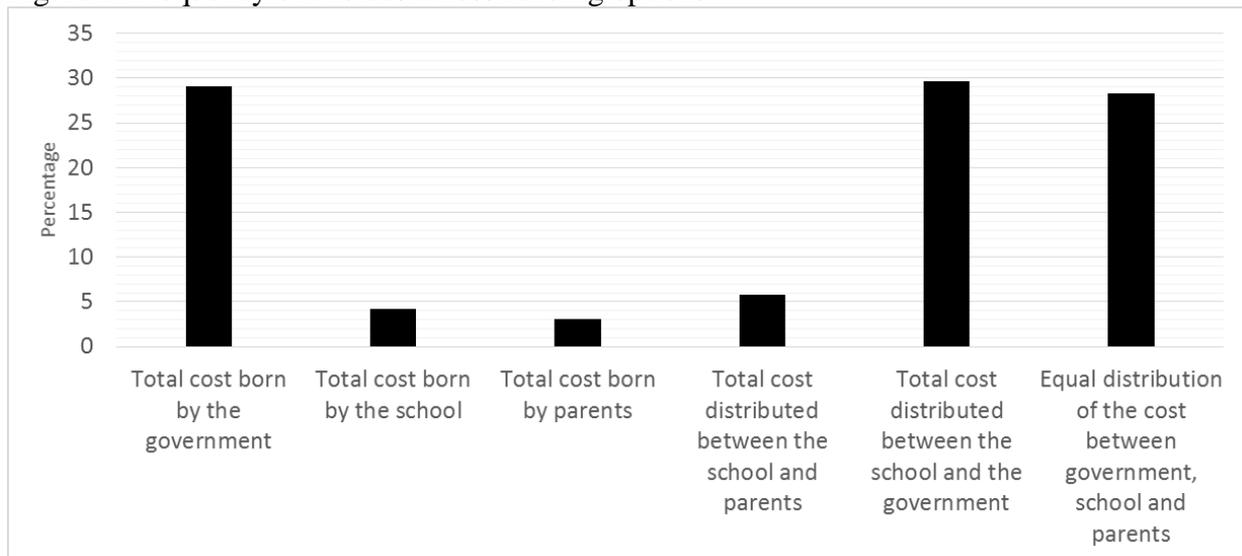
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Figure 1: Share of respondents owning tablet or registered on social media



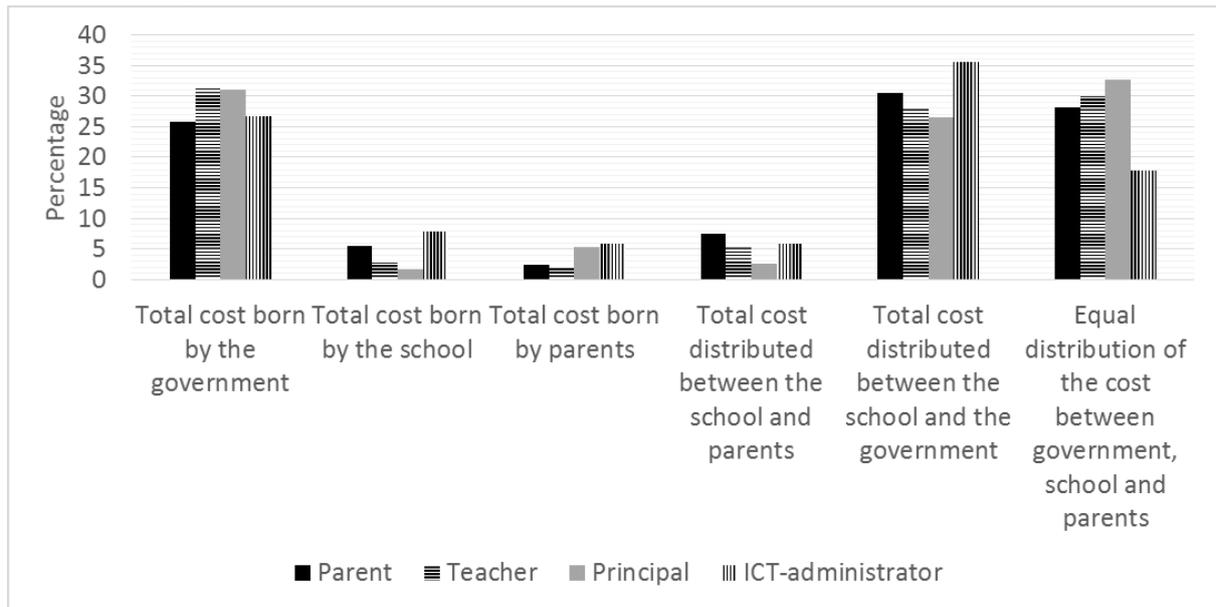
Source: The figure depicts the distribution of respondents owning a tablet (inner ring) or with a profile of social media (outer ring). The share of respondents with a tablet or social media profile is given in dark grey, while those without are in light grey. Own calculations.

Figure 2: Frequency of choices across funding options



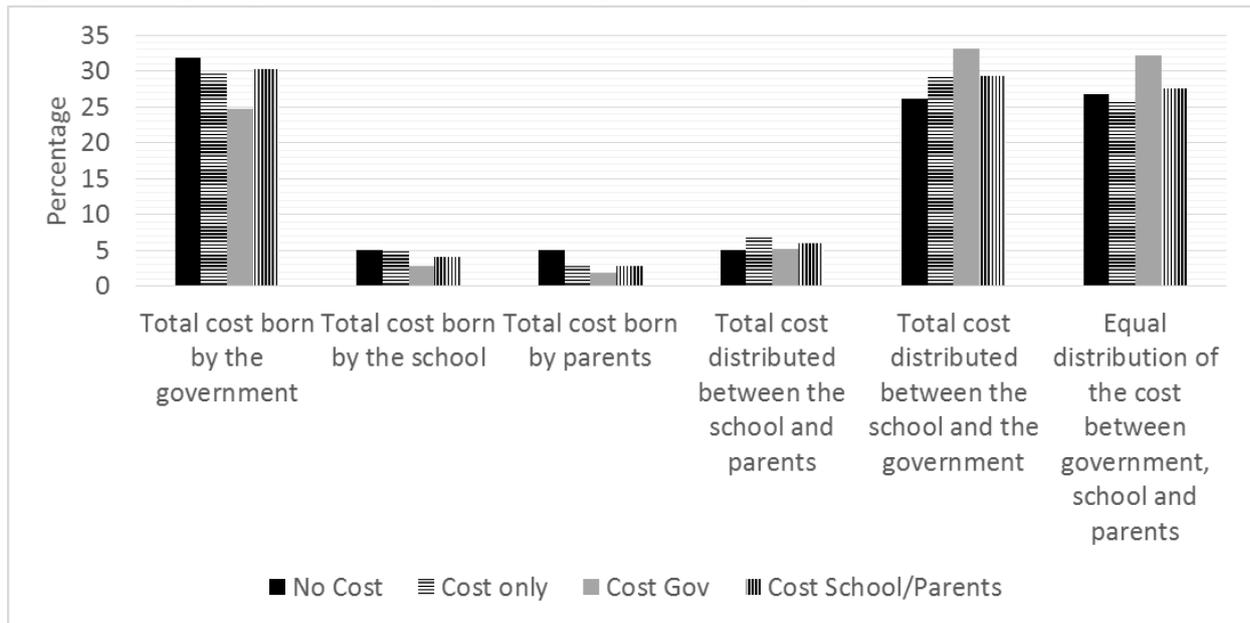
Source: Own calculations

Figure 3: Frequency of choices by stakeholder



Source: Own calculations

Figure 4: Frequency of choices by cost frame presented to respondents



Source: Own calculations

Appendix A

Table A.1: Distribution of choices by stakeholder and cost frame

	Panel I: Distribution of choices by stakeholder				
	Parent	Teacher	Principal	ICT administrator	Overall
Total cost born by the government	25.79	31.65	30.97	26.73	29.03
Total cost born by the school	5.55	2.85	1.77	7.92	4.22
Total cost born by parents	2.38	1.89	5.31	5.94	3.07
Total cost distributed between the school and parents	7.54	5.38	2.65	5.94	5.75
Total cost distributed between the school and the government	30.56	28.16	26.55	35.64	29.67
Equal distribution of the cost between government, school and parents	28.17	30.06	32.74	17.82	28.26
	Panel II: Distribution of choices by cost frame				
	No Cost	Cost only	Cost Gov	Cost School/Parents	Overall
Total cost born by the government	31.82	29.94	24.64	30.28	29.03
Total cost born by the school	5.11	5.08	2.84	4.13	4.22
Total cost born by parents	5.11	2.82	1.89	2.75	3.07
Total cost distributed between the school and parents	5.11	6.78	5.21	5.96	5.75
Total cost distributed between the school and the government	26.14	29.38	33.18	29.36	29.67
Equal distribution of the cost between government, school and parents	26.70	25.99	32.23	27.52	28.26

Note: The table presents the information graphically represented in figure 2 (final column), figure 3 (panel I) and figure 4 (panel II).