Health information exchange, system size and information silos

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ABSTRACT

There are many technology platforms that bring benefits only when users share data. In healthcare, this is a key policy issue, because of the potential cost savings and quality improvements from 'big data' in the form of sharing electronic patient data across medical providers. Indeed, one criterion used for federal subsidies for healthcare information technology is whether the software has the capability to share data. We find empirically that larger hospital systems are more likely to exchange electronic patient information internally, but are less likely to exchange patient information externally with other hospitals. This pattern is driven by instances where there may be a commercial cost to sharing data with other hospitals. Our results suggest that the common strategy of using 'marquee' large users to kick-start a platform technology has an important drawback of potentially creating information silos. This suggests that federal subsidies for health data technologies based on 'meaningful use' criteria, that are based simply on the capability to share data rather than actual sharing of data, may be misplaced.

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1. Introduction

The need for information exchange in healthcare is pressing, due to growing evidence that exchanging and sharing patient data can potentially reduce mortality and even reduce costs (Bower, 2005; Walker et al., 2005; Miller and Tucker, 2011a; McCullough et al., 2011). The success of efforts to leverage 'big data' in healthcare, such as the 'learning health' system (Smith et al., 2012), will depend crucially on the willingness of providers to share their data (Goodby et al., 2010). However, it is unclear what the best steps are for policymakers to take to ensure that information exchange happens.

One commonly advocated strategy for kick-starting a platform for data exchange is to secure a large 'marquee' user to help attract other users to the platform. As described by Eisenmann et al. (2006), "the participation of 'marquee users' can be especially important for attracting participants." Gowrisankaran and Stavins (2004) set out a foundational economic framework for understanding this.

Due to marquee users' scale, they can internalize some of the network effects inherent in the platform and in turn then attract more users to the platform. To see this, consider a network technology that connects multiple separate firms. Each firm will adopt a network technology based on whether it receives net benefits from being part of the network, but it will not internalize the positive effect that its adoption has for other firms in the network. If a subset of these firms merge, then adoption increases, because the newly merged firm is able to internalize the network benefits from adoption at different locations.

This paper asks how the size of a user that adopts an information exchange technology affects subsequent *usage*. We use data on the exchange of electronic health data within a local health area and investigate how the number of hospitals within a hospital's system influences its likelihood of sharing data.

In this setting, larger hospital systems may be better able to internalize the high costs of ensuring compatibility with complex information exchange standards, making it cheaper for them to exchange data both internally and externally. Correspondingly, we find that hospitals with more hospitals in their system are indeed more likely to exchange electronic information internally. However, they are less likely to exchange electronic information externally with other nearby hospitals. This decision to exchange information externally does not seem to be driven by the systems' age or manufacturer, nor by the number of other hospitals

they could potentially interact with. We argue that this contrast between a willingness to share data internally and a lack of willingness to share data externally reflects a tendency for larger hospital systems to create 'information silos.' An information silo is a data system that does not exchange data with other similar systems.

A potential explanation for larger hospital systems' propensity to create information silos is that they fear that by facilitating data outflow, they may lose patients. If the hospital allows data outflow, patients may seek more follow-up care in stand-alone or community hospitals, which may offer more convenience or lower costs to patients whose insurance imposes substantial cost-sharing (Melnick and Keeler, 2007). We offer three pieces of evidence, based on estimating heterogeneous effects of system size on data exchange, that suggest that strategic motivations like these at least partially drive our results.

First, we find a stronger negative relationship between hospital system size and external information exchange among hospitals that have insurance arrangements that make it easier for patients to leave their hospital system. Second, hospitals that pay their staff more are less likely to share their data with hospitals outside their system if they are part of a larger system. Third, specialty hospitals are less likely to share data outside their system if they are part of a larger system. The first result suggests that if patients are likely to seek treatment elsewhere, hospitals are less likely to share data. The latter two results suggest that if hospitals invest valuable resources in patient care, they may also be less likely to be willing to share data. While not conclusive, these findings provide some evidence that the creation of information silos that we observe is linked to strategic concerns.

Policymakers and researchers have focused on questions of encouraging compatibility and inter-operability at the IT vendor level, but we show that users who have already adopted may also choose not to exchange information with others. This is important because of recent policy emphasis on the diffusion of Electronic Medical Records (EMRs). The United States federal government has provided $19 billion in financial incentives to healthcare providers under the 2009 HITECH Act to encourage them to adopt EMRs. Part of the motivation for government coordination is the belief that to reduce healthcare spending, it is not enough for healthcare providers to simply adopt the technologies. Providers need to be able to share electronic patient data as well.[2] To help coordinate this sharing of data, EMRs only qualify for aid if they fulfill government criteria for 'meaningful use.'[3]

Much of the policy literature has criticized the 'meaningful use' criteria as setting too a low a standard in terms of adoption of technology (Wolf et al., 2012). This reflects that the focus so far of the 'meaningful use' criteria has been on achieving technical inter-operability rather than actual sharing of data. For example, the pivotal 'Core Measure 13' states that to qualify, a hospital has to have 'Performed at least one test of certified EHR technology's capacity to electronically exchange key clinical information.'[4] This test would qualify even if it used fictional patient data.

However, our results suggest that compatibility or capability alone will not be enough to ensure that electronic information is actually shared. To succeed in ensuring comprehensive meaningful use, the federal government will have to address the fact that larger hospital systems that may be producing the best health outputs may also be less willing to exchange information. This reluctance to share information may stem from the notion that records are the property of the hospital. As quoted in Knox (2009), Dr. Delbanco, a primary care specialist at Beth Israel Deaconess Medical Center in Boston, states, "You can get it [the patient record] [...] But we do everything in the world to make sure you don't get it." The findings of this paper suggest that this ethos may be echoed in the switch from paper to digital records. This means the digitization of health records may not make patient healthcare provider transitions as seamless as hoped for by policymakers. This is important as policymakers set policy priorities for 'stage 3' of meaningful use, the target date for which is currently 2016.

This adds to a broader literature which has questioned the wisdom and likelihood of achieving a quick transition to digital health given larger general equilibrium issues (Christensen and Remler, 2009; Murray et al., 2011). In particular, they highlight a potential cost of speed, which is that in their haste to give incentives to adopt, policymakers may inadvertently also be giving hospitals incentives to adopt systems that are incompatible with the ultimate aim of widespread sharing of health information.

2. Conceptual framework

We study the decisions of hospitals to exchange patient information with other hospitals, inside and outside of their systems. This section presents a conceptual framework for modeling these decisions and then illustrates the various ways in which they can be affected by the hospital's system size. This framework is used to motivate our main empirical analysis and choices of control variables.

Because data exchange is a classic network externality setting, our framework allows for data exchange to generate positive externalities to other local hospitals. This is similar to models of information exchange technology adoption in other settings, such as Gowrisankaran and Stavins (2004), who study the decision of banks to adopt electronic exchange capabilities. We differ from this prior literature along two key dimensions. First, we consider the decision to participate in data exchange separately from the technology adoption decision that enables exchange. This allows us to account for the facts that hospitals can selectively choose to exchange data (only within their system, for example) and that hospitals with IT systems capable of exchange may not participate at all. Second, unlike Gowrisankaran and Stavins (2004) and other papers that assume that consumers are permanently tied to their providers (banks, in their case), our model explicitly considers the potential competitive effects of data exchange that arise when consumers can switch providers. In our setting, this means that we model hospitals as thinking about the impact of data exchange on their their current customer base as well as how participating in data exchange may change their future customer base. These considerations are a crucial motivation for why we might expect system size to have differential effects on the decisions to exchange

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