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## Risk shifting and disorganization in multi-tier contracting chains: The implications for public safety

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### ABSTRACT

Organizational responses to financial crises have contributed to workplace changes, including a reliance on multi-tier sub-contracting chains. An extensive research literature discusses the adverse impact of these trends on worker health and safety. Research has shown that economic pressures leading to unsafe practices by contractors, hazardous forms of disorganization in contracting chains and regulatory failure contribute to adverse health and safety outcomes for workers. Less research has addressed the impact of sub-contracting chains on the potential for complex catastrophic incidents in which the public could be impacted. We contribute to a growing body of work on this subject by examining excavation work around high pressure natural gas pipelines in Australia. We draw on past research complemented with concepts from the economics literature to highlight the impact of ‘risk shifting’ as contractors seek to cope with financial pressure in highly competitive sectors. Contract terms incentivize contractors to work as quickly as possible while also prioritizing compliance with safety-related rules. Using qualitative data from 36 face-to-face interviews we discuss the way that supply chains characterized by these types of contracts can lead to situations where the pressure to work quickly means that contractors might trade off safe work practices in order to meet project deadlines and make a profit. We argue that in times of acute financial pressure, safety can become fungible with an associated increase in risk to the public. The findings of this research may have broader implications for other public risk situations in sectors with similar structures and organizational arrangements.

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### 1. Introduction

Organizational responses to events such as the global financial crisis and more localized economic fluctuations have contributed to key changes to employment relations. Over time, these changes have seen a growth in job insecurity and precarious employment with strategies previously considered ‘non-standard’ such as casual contracts, outsourcing and complicated sub-contracting chains now normal forms of employment relationships (Benach et al., 2000, 2007; Bryan and Rafferty, 2015; Johnstone et al., 2001). Notwithstanding the financial benefits these may provide to organizations, research shows that a reliance on sub-contracting strategies has important implications for workplace health and safety (WHS) (see Quinlan and Bohle, 2015, for a summary).

When it comes to large-scale organizational accidents, inquiries into several disasters have also highlighted problems with contrac-

tor management and communication. For example, the official commission of inquiry into the 2001 explosion at the AZF chemical factor in Toulouse, France that killed 30 people identified problems with contractor safety management as a critical factor in the incident. The inquiry further recommended that multi-tiered sub-contractor arrangements on major hazards sites be banned (Quinlan et al., 2013). Contracting and outsourcing is also ubiquitous in other hazardous industries, such as offshore oil and gas exploration (see also Wright, 1986, 1994). For example, drilling rigs are owned and operated by organizations that are then hired by the oil company that holds an exploration license in order to drill a series of wells to search for hydrocarbons. Other technically complex tasks such as well cementing and testing are undertaken by yet another group of specialist contractors. Many of the individual workers in this sector do not have stable employment and rotate through a series of employment relationships depending on broad economic and geographic factors. Blowouts in this industry including Deepwater Horizon (Hopkins, 2012) and Montara (Hayes, 2012) have raised questions of how risk is managed across such fluid contracting arrangements.

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Somewhat surprisingly given this background, the impact of outsourcing and sub-contracting on major accidents has been relatively little studied. Quinlan and Bohle (2008) report a total of 16 studies relevant to this issue with few seeking to explore the link between outsourcing and a drop in organizational safety performance (see also Quinlan et al., 2013). This paper aims to contribute another case study to this body of knowledge and to provide insights on the reasons for this link.

Our case study addresses the potential for damage to the high pressure natural gas pipelines that run under our cities, towns and suburbs (and across country) by those who regularly work around such infrastructure. Failure of a high pressure natural gas pipeline can have catastrophic consequences as was graphically seen at San Bruno California in 2010 when eight members of the public died and 40 homes were destroyed when a gas pipeline failed (Hayes and Hopkins, 2014). This particular failure was not the result of a pipeline strike, but such events are not uncommon. The potential consequences of gas pipeline failure were also dramatically illustrated in Ghislenghien, Belgium in 2004 when construction of a car park damaged a high pressure natural gas pipeline. When normal pipeline operations resumed some time later, the pipeline ruptured resulting in 24 deaths, mainly amongst emergency services crews (Mahgereteh and Atti, 2006). From the perspective of the gas pipeline sector, non-pipeline contractors working near pipelines represent a risk to the integrity, and thus the safety, of pipelines, workers and the community (Ramírez-Camacho et al., 2016). Although external interference failure rates in Australia are low in comparison to other countries, this remains the dominant cause of pipeline damage, responsible for 85% of reported incidents (Tuft and Bonar, 2009; Tuft and Cunha, 2013).

One significant group of people who work around pipelines are civil construction contractors working for organizations with an interest in other types of linear infrastructure (electricity and communication cabling, water pipelines, roads, drains and the like). In this paper we draw on interviews with personnel from a case study organization (CSO) involved in a large-scale infrastructure project that includes work around buried assets, not limited to high pressure gas pipelines. The principle task for the CSO is rolling out their project on time and within budget and, typically, they use a competitive tendering process to contract out responsibility for excavation, construction and building work. As primarily project managers, the CSO operates a complex chain of Construction Partners (CPs) who engage and manage sub-contractors across the country. In the context of these complex relationships, we used qualitative face-to-face interviews to probe participants' awareness of the risks associated with working around hazardous buried infrastructure and the governance strategies they used to manage potential risks. Of particular interest was whether contracted time and cost pressures contribute to unsafe work practices in civil construction work around high pressure gas transmission pipelines.

To reflect on how work practices with the potential to impact safety outcomes are influenced by extended sub-contracting chains in the context of excavation near high pressure pipelines, we draw on two theoretical domains. First, the existing literature around worker health and safety in precarious and contingent work, including sub-contracting chains (e.g., see James et al., 2007; Quinlan et al., 2013; Walters et al., 2005, amongst others), which also has relevance to public safety. Complementing that approach, we use the concept of 'risk shifting' to investigate how financial and safety pressures are managed through the supply chain. The next section outlines the literature regarding worker health and safety outcomes in the context of sub-contracting chains and discusses the origin of the risk shifting concept and the way in which we apply it in this case.

## 2. Conceptual framework

Particularly in times of financial stress or crisis, extended sub-contractor supply chains provide a range of benefits for organizations, such as important cost savings, access to specialist skills, job creation, knowledge generation and innovation and enhancing the speed of task completion (Quinlan et al., 2013). These strategies represent a shift away from internal management hierarchies to a reliance on market forces (Williamson, 1975). The use of "fragmented organizational forms" (James et al., 2007, 165), such as sub-contracting, can be explained from either a "transaction cost" or "resource-based" perspective. From a transaction cost view, outsourcing or sub-contracting is one way to manage costs associated with production, whether internal or external, as well as service delivery. From a resource-based perspective, outsourcing and sub-contracting can offer ways to achieve better competitive outcomes based on the capacity of an organization to use resources (physical and non-physical) to secure a competitive advantage. In either case, the point here is that changes in the business environment contribute, amongst other things, to a transfer of risk to those suppliers (and workers) lower in the supply chain (James et al., 2007). Further, although providing benefits for client or contracting organizations this fragmentation does not come without potential repercussions for safety.

### 2.1. Outsourcing and worker safety

There is an extensive body of research into safety and contingent work that has identified contributory factors linked to work practices that are implicated in adverse health and safety outcomes for workers (Quinlan and Bohle, 2008; Quinlan et al., 2001). In their discussion of the impact of contingent work in the Australian long-haul trucking sector, Mayhew and Quinlan (2006) found that the associated competitive pressures had a direct negative impact on worker health and safety as well as exacerbated levels of risk. Quinlan et al. (2013) also discussed the adverse implications of outsourcing maintenance responsibilities in the context of serious aviation events, including accident fatalities, in the US aviation sector. As we noted earlier in this paper, issues around contractor safety management are also relevant for large-scale organizational accidents, with safety management in multi-tier contracting chains highlighted as critical factors (Quinlan et al., 2013, see also Wright, 1986, 1994). However, sub-contracting chains present particular challenges in terms of safety management and risk coordination. For example, control, and thus responsibility, is often diffused down the contracting chain and exacerbated by poor levels of supervision and training, which then prevents effective communication (Kochan et al., 1994; Rebitzer, 1995).

These issues, together with economic and financial pressures as well as other structural factors such as regulatory failure and the role of trade unions have been identified as having a significant impact on safety outcomes in sub-contracting chains (e.g., see Quinlan et al., 2001, 2013; Quinlan and Bohle, 2008). Similarly, Walters et al. (2005) note the intricacies of multi-employer work sites, with complex supply chains, large numbers of casual and relatively low skilled workers and low levels of union organization as significant challenges in terms of improving safety outcomes. The approach used in this paper does not discount the broad relevance of these factors and the implications for worker safety, but the focus here is specifically on work practices. The central point addressed in this paper is the way that economic and financial pressures can often lead contractors to engage in 'corner-cutting' or other unsafe work practices (James et al., 2007; Quinlan et al., 2013). Using the pipeline case, we draw on the existing literature

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