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The Strategic Implications of Firm-Specific Incentives

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The Strategic Implications of Firm-Specific Incentives

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B.S.E., University of Michigan, 2003

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An abstract of
A dissertation submitted to the Faculty of the
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Abstract

The Strategic Implications of Firm-Specific Incentives
By David G. Kryscynski

This dissertation explores the strategic implications of firm-specific incentives – i.e. incentives that are more valuable to workers in their focal firms than similar incentives at rival firms. Strategy scholars have largely dismissed the value of incentives in realizing human capital based competitive advantages because they have assumed that incentives are more or less created equally across firms. In contrast, the theory of firm-specific incentives argues that some firms may be able to offer incentives that rivals cannot imitate or replicate, and that these incentives may be offered and maintained at cost discounts relative to rivals. In other words, these incentives may actually explain sustained human capital based competitive advantages.

Following a three paper dissertation model, the first paper theoretically develops the firm-specific incentives construct and illustrates how this construct is distinct from extant concepts and approaches in the organizational literature. This paper also articulates the high level performance implications of firms' abilities to create, offer and/or leverage these incentives in their overall incentive bundles.

The second paper explores the empirical implications of firms' abilities to offer more incentives that are highly firm-specific in a sample of 275 software firms. Primary firm-level data on firm-specific incentives is combined with individual level financial compensation data for 7770 developers to explore the relationships between firm-specific incentives and voluntary turnover and wage outcomes. Results suggest that firms that offer more incentives that are highly firm-specific have lower voluntary turnover and lower wage-tenure slopes.

The third paper explores whether small firms have advantages offering incentives that are highly firm-specific in a sample of 271 software firms. Primary firm-level data on firm-specific incentives is combined with firm level data from secondary sources to explore the relationships between firm size and firm-specific incentives. Results suggest that smaller firms offer more incentives that are highly firm-specific in their overall incentive bundles.

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As a man of faith I must first acknowledge the blessings and sustenance bestowed by a loving Father in Heaven. He blessed me with health, love, joy and happiness while simultaneously molding and shaping me as a husband, father and scholar. In the darkest moments of the last five years he always seemed to give some light to encourage me to persist. In many cases, He gave that light by sending others to teach me, love me, guide me and remind me of my worth.

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Table of Contents

List of Figures

List of Tables

1. WHY STRATEGY FRAMEWORKS NEED A THEORY OF FIRM-SPECIFIC INCENTIVES

1.1. A Theory of Firm-Specific Incentives

A firm has competitive advantage "if it is able to create more economic value than the marginal (breakeven) competitor in its product market." (Peteraf and Barney 2003:314) Accordingly, a firm has a human capital based competitive advantage if a portion of this above normal economic value is attributable to superior access to and/or utilization of employee knowledge, skills and abilities (Chadwick and Dabu 2009). Thus, creating and capturing above normal economic value through human capital requires increasing the gap between worker marginal products and the economic costs of keeping those workers in place (Brandenburger and Stuart 1996). People are not like other physical assets, however, because they can choose to quit (Barney 1991; Coff 1997; Hall 1993) and/or to withhold effort (Gottschalg and Zollo 2007; Makadok 2003). In other words, firms must continue to persuade workers to both exert effort and stay even after they are "in place."

Given the significant challenges associated with motivating and retaining workers, strategy scholars have an opportunity to borrow insights from decades of research by organizational behavior and human resource management scholars exploring the underlying mechanisms explaining these desirable worker outcomes. Doing so will begin to uncover the "micro-foundations" of competitive advantage (Abell, Felin, and Foss 2008; Coff and Kryscynski 2011; Felin and Foss 2005; Foss 2011) and add much needed

nuance to the often over simplified assumptions about the nature of workers invoked in strategy scholarship.

This dissertation joins the growing conversation uncovering the micro-foundations of competitive advantage by theoretically and empirically exploring the concept of firm-specific incentives. Just as firm-specific human capital describes worker knowledge, skills and abilities that have greater use value in the focal firm than in all other firms (G. Becker 1964), firm-specific incentives describe incentives that are more valuable to workers in their focal firms than similar incentives available at other firms. In other words, firm-specific human capital captures differences in how much and what kind of value *workers* create for their firms while firm-specific incentives capture differences in how much and what kind of value *firms* create for their workers. The core argument in this dissertation is that firm-level variance in firm-specific incentives may help explain how some firms can create human capital based competitive advantage even when extant theory suggests that they should not.

The three papers comprising this dissertation each explore the firm-specific incentives construct in ways that make very specific contributions to the organizational literature, but it is important to articulate how these papers fit together, and how they collectively contribute to the broader literature explaining human capital based competitive advantage. Accordingly, the remainder of this chapter reviews extant theory connecting human capital to competitive advantage, articulates the theoretical shortcomings of the firm-specific human capital construct as the dominant explanation for human capital based competitive advantages, briefly introduces the firm-specific incentives construct and introduces each of the three papers.

1.2. Human Capital Based Competitive Advantage

Scholars have long recognized the importance of human capital as a potential source of sustainable competitive advantage (Barney 1991; Coff 1997; Hall 1993). Workers can possess valuable knowledge, skills and abilities that provide the foundations of a firm's idiosyncratic knowledge and competitive capabilities (Conner and Prahalad 1996; Felin and Hesterly 2007; Teece 2007). A firm's stock of human capital represents a resource that can be highly valuable to the firm (Ployhart and Moliterno 2011; Ployhart, Van Iddekinge, and MacKenzie 2011) but also very difficult to imitate and replicate (Wright, McMahan, and McWilliams 1994). Accordingly, firms that are better able to attract, motivate and retain talented workers at economic discounts relative to rivals should be positioned to realize sustained human capital based competitive advantages (Chadwick and Dabu 2009).

The importance of retaining workers at economic discounts has led strategy scholars to emphasize the role of firm-specific human capital in competitive advantage (Harris and Helfat 1997; Kor and Leblebici 2005; Wang, He, and Joseph Mahoney 2009). Firm-specific human capital refers to worker knowledge, skills and abilities that have higher use value in the focal firm than in all other firms in the labor market. Examples include intimate knowledge of a firm's proprietary technology or knowledge of the social landscape in a particular company. Workers may be able to take such knowledge with them when they leave, but this knowledge is imperfectly deployable in the new firm and may not be as applicable in the new context (He and Wang 2009; Wang et al. 2009). In contrast, general human capital typically refers to skills that are of comparable value to many firms – i.e. there is little difference in the value the first and second-best employers

place on these skills. The most common example of general human capital is the skills gained through education.

The distinction between firm-specific and general human capital is important because it lays the foundation for a strong theme in the human capital literature - i.e. the assumption that firm-specific human capital facilitates retention (Bartel and Borjas 1977; Glick and Feuer 1984). While it is commonly recognized that firm-specific skills would have some use value in other contexts, it is assumed that there is a large difference between their use value in the focal firm and all other firms. This difference in value affects the wages alternative firms are willing to pay for these skills in the labor market – i.e. these skills have low exchange value. Thus, firm-specific skills have high use value in the focal firm, but low exchange value in the labor market.

The assumed low exchange value of firm-specific human capital in the labor market creates a dilemma for workers. According to Becker's (1964) investment framework, workers can choose to invest in either firm-specific or general skills – these are mutually exclusive activities. Thus, when a worker possesses a bundle of firm-specific and general skills, the firm-specific portion of that bundle represents foregone investments in general skills. By investing in firm-specific skills workers increase their overall use value to their firms, without an accompanying increase in their overall exchange value in the labor market. If we assume that the focal firm will compensate workers for at least a portion of their increased use value from firm-specific human capital (G. Becker 1964; O. Williamson 1975), then workers face a dilemma when considering a move. They can only demand compensation for their general human capital in the broad labor market, but the focal firm offers compensation for both their firm-specific and general human capital.

Thus, since general human capital is similarly valued by many firms in the labor market, a move requires sacrificing both the additional compensation associated with the use value of firm-specific skills *and* the time lost due to investments in firm-specific human capital that have low exchange valued elsewhere. The received conclusion is that workers with firm-specific human capital will prefer to stay in their focal firms, ceteris paribus, and this conclusion has led to the deeply held assumption that firm-specific human capital reduces quits (G. Becker 1964; Hashimoto 1981; Jovanovic 1979). Not that these skills themselves prevent worker quits, but that the lack of market value for these skills tends to hold workers in place.

Besides holding workers in place, firm-specific human capital also facilitates holding workers in place at discounts relative to the full use value of their skills. Since workers cannot demand wages for these skills in the labor market, firms can choose how much to compensate workers for their firm-specific investments (G. Becker 1964; O. Williamson 1975). In other words, firms can compensate workers at a "sweet spot" compensation level that is somewhere between the exchange value of the worker's general human capital and the combined use value of the worker's firm-specific and general human capital in the focal firm. By paying workers for only a portion of their firm-specific skills the firm can retain some of the value from these skills. Thus, firms can retain these workers at discounts relative to the full use value of their skills. The larger the gap between the use value of worker skills and the actual compensation level, the greater the gap between the value created and the costs of holding workers in place and, therefore, the greater the human capital based competitive advantage.

Firm-specific human capital fails to fully explain why some firms can realize human capital based competitive advantage, however, for at least two reasons. First, there is reason to suspect that workers with firm-specific human capital may be more mobile than is often assumed by strategy scholars. In a working manuscript, Campbell, Coff and Kryscynski (2011) argue that the immobility of workers with firm-specific human capital is overstated because traditional models fail to capture the effects of imperfect information, the duality and co-development of general and firm-specific human capital, and heterogeneity in how firms value different kinds of general human capital. In other words, they argue that outside options for employees with firm-specific human capital may be better than often considered and, accordingly, the economic costs of retaining these employees are likely higher than often assumed.

The second reason that reliance on firm-specific human capital fails to fully explain human capital based competitive advantage is that we lack a compelling argument for why workers may be more motivated to exert effort when they possess firm-specific human capital. This is concerning because simply retaining workers does not ensure that they contribute appropriately to value creation (Gottschalg and Zollo 2007; Makadok 2003). Since it may not be reasonable to assume that firms are homogeneous in their abilities to motivate their workers (Gottschalg and Zollo 2007), we must also explore motivation-based explanations for heterogeneity in creating and capturing economic value through human capital. Unfortunately, there is a paucity of research explicitly connecting firm-specific human capital to systematic differences in firm-level worker motivation and subsequent performance outcomes.

The small stream of research that does explore the connection between firm-specific human capital and worker motivation actually predicts a motivational problem, rather than a solution. Wang and Barney (2006) describe the inherent paradox with firm-specific human capital – firms rely on worker firm-specific investments for competitive advantage, but workers prefer not to make them. Specifically, employee investments in firm-specific human capital leave them open to the classic hold-up problem (O. Williamson 1975) – i.e. once they make the investments the firm can act opportunistically and not fully compensate them. Workers should prefer not to make these investments without appropriate contractual assurances of adequate compensation and/or up-front compensation. Thus, rather than solving a motivational problem, it appears that emphasizing firm-specific human capital may actually create a motivational problem – i.e. the problem of motivating workers to make these investments in the first place.

1.3. The Strategic Importance of Firm-Specific Incentives

Given the concerns with relying on firm-specific human capital as the prevailing explanation for how some firms can create human capital based competitive advantage, it seems appropriate to shift research attention to other mechanisms through which firms can realize such advantages. This dissertation argues that firm-specific incentives may be one such mechanism. Rather than exploring the specificity of workers' skills, which constrain mobility due to lower skill value at outside options regardless of workers' desires to quit, this research explores the specificity of *incentives*, which constrain mobility by reducing workers' desires to quit or lose their jobs regardless of the external value of their skills.

Organizational scholars often focus on incentives that are pecuniary in nature and high powered, but incentives need not be limited to such a narrow focus. A more general definition treats incentives as factors that incite or tend to incite people to desired actions (www.dictionary.com; www.merriam-webster.com) such as joining the firm, increasing commitment to the firm, and/or exerting greater effort at work. These factors may be monetary in nature, but may also be intangible (Clark and J. Wilson 1961), intrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), and/or social (Sauermann and Cohen 2008). Incentives affect worker actions because they have some positive utility for those workers, and workers tend to behave in utility maximizing ways. Some incentives are contingent upon specific actions, such as rewards for sales or production results, while others are contingent simply upon organizational membership, such as worker health benefits available to all full time employees. Some incentives are excludable and offered only to a few workers, such as raises, bonuses or premium office spaces, while others are non-excludable and readily available to all workers, such as the positive reputation of the firm, the natural beauty surrounding the work complex, or the proximity of the office to desirable local attractions. A broader conceptualization of incentives allows us to account for the many factors that have positive utility for workers and that motivate those workers to desired actions

Firm-specific incentives are *incentives that are more valuable to workers in the focal firm than similar incentives at worker's second best options.* Firm-specificity is ultimately a continuum with ends anchored by purely firm-specific and purely general incentives. Purely firm-specific incentives are only valuable to workers in the focal firm and are essentially unavailable at other firms. Purely general incentives are equally

valuable and readily available to workers across firms. An example of a highly firm-specific incentive is the natural beauty available to professors at the University of Hawaii. This beauty can be valuable to professors, relatively low cost for the university to provide, and nearly impossible for competing universities to replicate. An example of a highly general incentive is a monetary base wage. Money is valuable to workers, but is costly to provide and easy for competitors to replicate.

Firm-specific incentives may help with the problems of attracting, motivating and retaining talented workers because workers tend to join and stay at firms where they derive the greatest utility (Rosen 1986; Shaw et al. 1998). Additionally, workers tend to exert greater effort in firms that offer the greatest utility (Akerlof 1984; Weiss 1990). Since firm-specific incentives are inherently more valuable to workers in the focal firm than similar incentives elsewhere, firms that offer more incentives that are highly firm-specific will be better positioned to retain and motivate their talented workers, controlling for worker utility from other incentive offerings (Kryscynski 2011b).

While firm-specific incentives may help to explain heterogeneity in firm-level worker motivation and quit rates, they can only help explain above normal economic value creation if they facilitate lower economic costs than rivals holding outputs constant, higher outputs than rivals holding economic costs constant, or both lower economic costs and higher outputs than rivals (Brandenburger and Stuart 1996). Many firm-specific incentives meet these requirements because they are low cost for the firms to maintain once in place – e.g. geographic location, unique reputation, organizational culture, and so forth. The theory paper (next chapter) articulates the low cost potential of firm-specific incentives in more detail.

Given the potential for firm-specific incentives to explain human capital based competitive advantage, it is perplexing that scholarly research has neglected these kinds of incentives. Coff's (1997) early mentioning of firm-specific forms of compensation as one potential tool to address human capital hazards is one of the only references to the concept. In fact, with the exception of a handful of studies exploring incentives for high level executives (e.g. Mackey 2008), strategy scholars have almost completely ignored the importance of incentives as a potential source of advantage. Most strategic incentive research follows the embedded assumptions of the strategy implementation literature – i.e. incentives are tools to achieve higher internal efficiency through fit with organizational contingencies (Galbraith 1977; Galbraith and Kazanjian 1986b; 1986a). Based on this assumption, firms simply select the optimal incentive system given their specific situations and maximize internal efficiency accordingly (e.g. Balkin and Gomez-Mejia 1987; 1990). Better fit may lead to better efficiency, but if all firms select the optimal incentive systems for their contingencies, then these systems provide no advantage. It seems necessary to challenge this embedded assumption by examining incentives that are inherently firm-specific, and the associated firm-level outcomes.

1.4. Overview of Dissertation Papers

Since the firm-specific incentives construct is new to the organizational literature, the first paper conceptually develops the construct in detail and directly addresses three specific research questions: (1) what are firm-specific incentives and how are they distinct from other incentive categorizations and concepts in the organizational literature? (2) What makes some incentives highly firm-specific? And (3) what are the implications of firm-specific incentives for human capital based competitive advantage? Several

high level propositions are developed suggesting that firms with more firm-specific incentives should achieve performance advantages. The primary contribution of this paper is the theoretical development of this unexplored construct. This paper lays the conceptual groundwork that guides the two empirical chapters to follow.

One of the main empirical contributions is the development and execution of a novel measure for firm-specific incentives in a proprietary data set based on a sample of 2874 U.S.-based firms in the software and related industries. Researcher administered key informant surveys were combined with individual level compensation data from Culpepper and Associates (a compensation survey firm) and firm profile data available from company websites and online databases. Additionally, a sample of firms also distributed surveys to software developers for validation of the key informant responses.

The second paper empirically explores whether firms that offer more incentives that are highly firm-specific are better positioned to realize human capital based competitive advantage. The main hypotheses from this paper are that these firms will have lower voluntary turnover rates, lower compensation rates and lower wage-tenure slopes than rivals. Results support the expectation that firms that offer more incentives that are highly firm-specific have lower voluntary turnover and lower wage-tenure slopes, but do not appear to have lower base wage rates than rivals.

Given the importance for firm-specific incentives for strategic outcomes such as wage profiles and voluntary turnover, the third paper explores whether some firms have natural advantages in creating and offering firm-specific incentives. Specifically, this paper examines whether small firms have advantages offering firm-specific incentives. The main hypothesis is that small firms will have advantages because of their reduced

bureaucratic constraints and greater proximity between workers and key decision makers (Cardon and Stevens 2004; Rousseau, Ho, and Greenberg 2006; Zenger 1994). Results support this expectation and a series of robustness checks suggest that small firms have advantages even after controlling for potential labor market sorting do to worker preferences. Besides articulating one important mechanism underlying differences in firm incentive offerings, this paper also contributes by offering a rich empirical test of incentive differences between large and small firms that includes measures of incentives often assumed to be important in small firms, but rarely measured (Cardon and Stevens 2004).

Taken together, these three papers inform an overall theory of firm-specific incentives. The first paper lays the theoretical groundwork for the construct, the second paper demonstrates that these incentives lead to positive firm-level outcomes and the thirf paper demonstrates that some firms have natural advantages offering these incentives.

2. HOW FIRM-SPECIFIC INCENTIVES EXPLAIN HUMAN CAPITAL BASED COMPETITIVE ADVANTAGES

2.1. Developing the Nascent Firm-Specific Incentives Construct

This paper develops the nascent construct of firm-specific incentives and explores how these incentives may be linked to competitive advantage. Firm-specificity of incentives captures the extent to which incentives are more valuable to workers in the focal firm than similar incentives at workers' next best options in the labor market. As such, these incentives may effectively bind employees to their firms in ways that are difficult for rivals to imitate or substitute. Since a large portion of firms' valuable knowledge and productive capabilities reside within the individual employees (Felin and Hesterly 2007) and in the complex social relationships between those employees (Baker and Dutton 2007; Collins and Smith 2006), firms that can retain employees in ways that are difficult to imitate or substitute may be better positioned to realize human capital based competitive advantages. Aside from the potential retention benefits, firms may also be able to leverage highly firm-specific incentives to achieve higher levels of employee effort and productivity – i.e. employees may exert greater effort to avoid losing the value from highly firm-specific incentives that is unavailable at rival firms (Akerlof 1984; Gerhart and Rynes 2003; Weiss 1990). Thus, exploring incentives that seem highly firm-specific may help to explain how some firms can realize human capital based competitive advantages.

The concept of firm-specific incentives, however, has not yet been fully developed or explored in the organizational literature. Human capital scholars have explored the

connection between human capital and competitive advantage (Hatch and Dyer 2004; Kor and Leblebici 2005; Wang et al. 2009), but have implicitly assumed that incentives are more or less created equal. As we shall see, explicitly allowing incentives to vary in specificity suggests an explanation for how some firms can realize human capital based competitive advantages even when extant human capital theory suggests that they should not. Scholars interested in worker incentives have primarily explored the individual level outcomes of various categories of incentives such as intrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), high-powered, tangible, social (Sauermann and Cohen 2008), and so forth, but for incentives to be sources of competitive advantage they must be valuable to workers and difficult for competitors to imitate, replicate and/or substitute (Barney 1991). These scholars have not explored the extent to which these various kinds of incentives meet such qualifications. As we shall see, firm-specificity cuts across extant categorizations such that incentives within these categories can vary substantially along this under-developed dimension. For example, the intrinsic rewards associated with working on some unique and proprietary technology may be highly firm-specific while the intrinsic rewards associated with teaching may be readily available at multiple institutions of higher learning. Additionally, incentives that are highly firm-specific may be very difficult to imitate, replicate and/or substitute.

This paper explores the strategic implications of firm-specific incentives through the following research questions: (1) what are firm-specific incentives and how are they distinct from other incentive categorizations and concepts in the organizational literature? (2) What makes some incentives highly firm-specific? And (3) what are the implications of firm-specific incentives for human capital based competitive advantage? These

questions are addressed in order followed by a discussion of how this new construct may enhance our understanding of how some firms can realize human capital based competitive advantage, even when traditional human capital theory predicts that they should not.

2.2. Defining Firm-Specific Incentives

Organizational scholars often focus on incentives that are pecuniary in nature and administered as part of formal compensation systems. Incentives need not be limited to such a narrow focus, however. A more general definition treats incentives as factors that may incite people to initiate desired actions (www.dictionary.com; www.merriam-webster.com) – e.g. joining the firm, increasing commitment to the firm, and/or exerting greater effort at work. These factors may be monetary in nature, but may also be intangible (Clark and J. Wilson 1961), intrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), and/or social (Sauermann and Cohen 2008). Incentives affect worker actions because they have some positive utility for those workers, and workers tend to behave in utility maximizing ways. Receipt of these incentives may be contingent upon specific actions, such as rewards for sales or production results, or contingent simply upon organizational membership, such as worker health benefits available to all full time employees. Some incentives may be excludable and offered only to a few workers, such as raises, bonuses or premium office spaces, while other incentives may be non-excludable and readily available to all workers, such as the positive reputation of the firm, the natural beauty surrounding the work complex, or the proximity of the office to desirable local attractions. A broader conceptualization of incentives allows us to conceptually account for the many factors that have positive utility for workers and that

motivate those workers to desired actions. Thus, rewards (Kerr 1975; 1999), benefits, inducements (Barnard 1938; Coyle-Shapiro and Conway 2005), high-powered incentives (Lazear 2000; O. Williamson 1985) and compensation (Gerhart and Rynes 2003) are all specialized forms of incentives.

Firm-specific incentives are *incentives that are more valuable to workers in the focal firm than similar incentives at worker's second best options, holding constant the cost of these incentives.* Firm-specificity is ultimately a continuum with ends anchored by purely firm-specific and purely general incentives. Purely firm-specific incentives are only valuable to workers in the focal firm and are essentially unavailable at other firms. Some incentives may be purely unique and so similar incentives may simply be unavailable elsewhere, making them highly firm-specific. Purely general incentives are equally valuable and readily available to workers across firms. An example of a highly firm-specific incentive is the natural beauty available to professors at the University of Hawaii. This beauty can be valuable to professors, relatively low cost for the university to provide, and nearly impossible for competing universities to replicate. An example of a highly general incentive is a monetary base wage. Money is valuable to workers, but is costly to provide and easy for competitors to replicate.

2.2.1. How the Story Differs from Conventional Human Capital Theory

Utilizing the language of firm-specificity invites an explicit comparison to human capital theory – i.e. purely firm-specific human capital only has use value to the focal firm while general human capital has use value to many firms in the labor market (G. Becker 1964). Just as firm-specific human capital describes worker knowledge, skills and abilities that create more value for the focal firm than for all other firms (G. Becker

1964), firm-specific incentives describe incentives that are more valuable to workers in the focal firm than in all other firms. In other words, firm-specific human capital captures differences in how much and what kind of value *workers* create for their firms relative to other firms, while firm-specific incentives capture differences in how much and what kind of value *firms* create for their workers relative to other firms.

Firm-specific human capital is important for competitive advantage both because of the importance of these skills for a firm's idiosyncratic knowledge and capabilities and the potential gap between the economic costs of holding workers in place and the economic value created from their skills (Hatch and Dyer 2004; Kor and Leblebici 2005; Wang et al. 2009). The conventional human capital story suggests that workers are compensated for the full value of their general human capital but may not be compensated for the full value of their firm-specific human capital (G. Becker 1964). This difference is due to the bi-lateral monopoly between firms and workers when workers have firm-specific human capital (O. Williamson 1975) – i.e. workers cannot take these skills elsewhere just as firms cannot hire workers off the street with these skills. Thus, the likely solution is for the firm to share the rents from firm-specific human capital with the worker (G. Becker 1964; O. Williamson 1975). Theoretically, however, the firm needs only to compensate the workers slightly above the value of their general human capital because only their general capital is marketable elsewhere. In other words, the theoretical cost of worker retention is equal to the value created from worker general human capital. Thus, the value created from firm-specific human capital represents economic profit, or value created in excess of economic costs (Peteraf and Barney 2003).

The greater the economic profit relative to competitors, the greater the human capital based competitive advantage (Peteraf and Barney 2003).

One important limitation of the conventional human capital story, however, is that it lacks explanatory power in competitive markets for general human capital, where workers receive incentives equal to the value their general human capital creates for the firm. In such conditions economic costs of retention are equivalent to the value created, leaving little room for economic profit and little room for human capital based competitive advantages. However, this conventional story implicitly assumes that incentives are more or less created equal - i.e. incentives have equal value to workers and similar costs for all firms. In other words, human capital scholars have allowed the type of value workers create for firms to vary by firm-specificity of human capital, but have essentially held constant the type of value firms offer to their workers. This assumption has allowed scholars to explore the independent effects of human capital on firm performance, but it has obscured the opportunity to explore how different kinds of worker incentives affect human capital based competitive advantages. In contrast to conventional models, the arguments presented here temporarily hold constant the firm-specificity of human capital in order to explore the implications of incentives that may also vary in firm-specificity.

Firms that offer more incentives that are highly firm-specific should be better positioned to realize human capital based competitive advantages because they can offer workers equivalent total utility for lower costs than competitors and/or higher total utility for the same costs as competitors. Just as firm-specific human capital creates a gap between the value the worker creates for the firm and the theoretical cost of retaining that

worker, firm-specific incentives create a gap between value created and the costs of offering incentives to keep workers in place. The more firms can leverage these low cost incentives, the greater the gap between the value created from human capital and the costs of holding workers in place.

Figure 2.1 visually depicts the parallel logics for how firm-specific human capital and firm-specific incentives can generate economic profits from human capital and, therefore, lead to human capital based competitive advantages. The total value created from human capital is held constant for all scenarios in figure 2.1. The left side of figure 2.1 shows the conventional story, assuming all incentives are more or less equally valued by workers and equal cost to firms. Firm A utilizes only general human capital while firm B utilizes a mix of general and firm-specific human capital. Retention costs are equal to the value created from general human capital and, therefore, are much lower for firm B[1]. The economic profit is the difference between the value created from human capital and the theoretical retention costs. Thus, economic profits are higher for the firm that utilizes firm-specific human capital. The right side of figure 2.1 shows the firm-specific incentives story, assuming homogeneity of general human capital while allowing incentives to vary in firm-specificity. Firm A uses only general incentives while firm C utilizes a mix of general and firm-specific incentives. Retention costs in this case are the costs of providing the incentive bundles to the workers. Since firm-specific incentives provide more value to workers in the focal firm than in competitor firms for similar costs, firm C can offer equivalent total utility to workers at lower costs - the economic profits

[1] For illustrative convenience it is assumed that the worker receives no compensation for firm-specific skills – i.e. the retention cost associated with firm-specific human capital is zero. In practice the firm will likely compensate workers for a portion of their firm-specific skills.

are equivalent to the costs avoided by utilizing these incentives. Thus, economic profits are higher for the firm that utilizes firm-specific incentives[2].

[INSERT FIGURE 2.1 ABOUT HERE]

2.2.2. How Firm-Specificity Differs from Extant Incentive Categorizations

Given the present focus on incentives, it is also useful to distinguish firm-specificity from the many extant incentive dimensions in the organizational literature. Prior dimensions such as intrinsic vs. extrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), high-powered vs. low-powered (Lazear 2000; O. Williamson 1985), tangible vs. intangible (Clark and J. Wilson 1961), social vs. non-social (Sauermann and Cohen 2008), concrete and symbolic (U. Foa et al. 1993), and so forth, clarify the nature, characteristics and/or sources of different incentives, but they do not capture the extent to which these incentives offer more value to workers in the focal firm than in all other firms nor do they address variability in costs by incentive type. Firm-specificity actually cuts across these extant dimensions such that incentives at either end of these existing spectrums can vary in firm-specificity. While a detailed discussion comparing each of these dimensions independently is beyond the scope of the present paper, the following paragraphs describe how firm-specificity cuts across one extant dimension as an illustrative example: intrinsic vs. extrinsic incentives[3].

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[2] Economic profits are shown as if firm-specific incentives are costless, an assumption applied for illustrative purposes. In practice, some firm-specific incentives have some cost to create and maintain. We should expect, however, that many of these incentives are cheaper than purely general incentives, as will be argued in subsequent sections.

[3] The intrinsic vs. extrinsic dimension is chosen due to the recent work of Gottschalg and Zollo (2007) to incorporate these distinctions into conversations of firm-level performance heterogeneity. This choice is for illustrative purposes only. Examples illustrating how firm-specificity cuts across additional dimensions such as high vs. low powered, tangible vs. intangible, pecuniary vs. non-pecuniary, and social vs. non-social are available upon request.

Scholars have long argued that both intrinsic and extrinsic incentives are important for worker decisions to join, stay and/or exert effort (Deci, Koestner, and Ryan 1999; Osterloh and Frey 2000). While there is substantial debate regarding the potential deleterious effects of extrinsic rewards on intrinsic motivation, there is strong support that both types of incentives are important for motivating workers (Osterloh and Frey 2000). Individuals prefer work environments where they have challenge, autonomy and variety (Hackman and Oldham 1974; 1980). However, intrinsic rewards due to the nature of work need not be firm-specific. For example, professors who love to teach experienced MBA students derive intrinsic value from interacting with these students. This value is specific to the *profession,* but not necessarily to the university. Presumably, professors can experience the same intrinsic value from teaching students at multiple universities with similar student quality. This value may motivate professors to exert effort (Hackman and Oldham 1974; 1980) and may bind them to their professions, but may not bind them to their specific organizations. While some intrinsic rewards from teaching cannot be firm-specific, this example illustrates that not all intrinsic rewards must be highly firm-specific. As a contrasting example, an individual may derive great intrinsic value from the opportunity to work on proprietary technology, such as Google's proprietary search algorithm. Due to the proprietary nature of the algorithm, workers who derive intrinsic value from associated tasks may not be able to receive similar intrinsic value anywhere else.

Likewise extrinsic incentives, while often material and quantifiable, need not always be readily available in the labor market. One such example is a tuition waiver for family members of university employees, especially when there are idiosyncratic matches

between student preferences and university educational offerings. In some cases, universities instill vesting restrictions that require a certain number of years before this benefit can apply in full. These discounts can be highly motivating because they have significant financial value. Consider an employee with a $100,000 salary who can avoid $30,000 per year in tuition for a college age child. Even half of this discount represents a $15,000 per year benefit during the years that child is in school, an effective 15 percent bonus for the worker. University employees may prefer to join and stay at the university so that they can take advantage of the tuition waver for one or more family members. When there are idiosyncratic matches between the educational preferences of the families and the particular universities, these tuition benefits become very difficult to replace and highly firm-specific. From the university perspective, such waivers may be advantageous forms of incentives because the cost of providing the benefit is substantially less than the cost to the employee of replacing the benefit making it difficult and costly for rivals to imitate or replicate, the employee will only utilize the benefit during limited time periods when immediate family members are in school, and the use of these incentives may help attract, motivate and keep the most talented workers. In contrast, tuition benefits that guarantee payment of tuition for family members up to a certain amount regardless of institution may not be firm-specific because the benefit is not tied to the university and the firm has no cost advantage in providing it. For example, St. Jude Children's Hospital provides employees with a $15,000 award to offset the cost of undergraduate educations, regardless of undergraduate institution. While highly valuable to employees, this award is easily replicable and very costly to provide.

The examples above illustrate how firm-specificity cuts across the intrinsic vs. extrinsic incentive dimension – i.e. incentives may exist anywhere on these dimensions and still vary substantially in firm-specificity. The conceptually distinct nature of firm-specificity is practically relevant when considering how firms invest in the value they create for their workers. Consider, for example, a situation where one firm offers intrinsic value from professional job characteristics and another firm offers intrinsic value from working on proprietary technology. Both firms offer intrinsic incentives, but only the latter should have an advantage over rivals in attracting, motivating and/or retaining talent because only the latter represents value that the worker cannot find elsewhere.

Another important distinction between firm-specificity and extant dimensions is that scholars utilizing prior categorizations tend to focus on how the levels of these incentives affect individual level outcomes – e.g. as non-pecuniary incentives increase, worker creative effort increases (Sauermann and Cohen 2008). When our focus shifts to firm-level heterogeneity in worker outcomes rather than individual level heterogeneity, our treatment of incentives may also need to shift. Specifically, explaining firm-level heterogeneity in worker quit rates may be better explained by relative rather than absolute incentive levels – i.e. workers should care more about the total utility available at their next best option in comparison to their current situation, rather than the absolute level of their current total utility (Rosen 1986).

2.2.3. How this Approach Builds on Extant Human Resource Practice Approaches

Strategic human resource (HR) management scholars have focused attention on the role of human resource systems in facilitating competitive advantage (Lado and M. Wilson 1994; Wright et al. 1994). The embedded logic in this literature is that the system

of HR policies and practices can enhance a firm's ability to attract, motivate and retain talented workers. In other words, the HR system can facilitate human capital based competitive advantages by helping the firm to create and maintain its critical human capital based resources. Some scholars have critiqued the strategic relevance of the HR systems because they represent variants of "best practice" approaches (e.g. B. Becker and Huselid 2006). These approaches emphasize individual best practices than can be relatively easy to adopt or sets of individual practices that are highly codified and easy to implement together. In other words, these approaches focus on policies and practices that are relatively easy to implement and, therefore, are more likely to facilitate competitive parity than competitive advantage. Unfortunately, empirical explorations of HR systems have primarily focused on policies and practices that are, in fact, quite easy to implement and replicate (e.g. Arthur 1992; 1994; Huselid 1995). While there is strong support for a relationship between these practices and firm performance, it is not yet clear that these empirical approaches demonstrate a relationship between HR systems and sustained competitive advantages. As a consequence, strategy scholars have remained skeptical of the relevance of the HR systems approach for theories of sustained competitive advantage (B. Becker and Huselid 2006; Chadwick and Dabu 2009).

The lack of compelling empirical support for the relationship between HR systems and practices and sustained competitive advantages does not negate, however, the underlying logic in the strategic HR approaches. HR systems can facilitate sustained advantages when made up of multiple inter-related policies that may be hard to imitate and replicate by virtue of their complexity (Barney and Wright 1998; Kor and Leblebici 2005; Lado and M. Wilson 1994; Wright et al. 1994) – i.e. difficult to imitate bundles of

practices. These bundles may be highly co-specialized with unique firm characteristics making them especially difficult to imitate. When these HR systems create value for workers that those workers cannot find elsewhere, then they create and facilitate incentives that are highly firm-specific. Thus, a natural extension of the logics in the strategic HR approaches is an explicit focus on the various sources of worker utility created, offered and/or leveraged by the firm and the extent to which those sources are highly firm-specific.

Such an extension suggests a shift in empirical focus from policies and practices that are relatively easy for firms to implement to incentives that may be very difficult to imitate or replicate even if firms are willing to invest resources to do so. For example, the value of an organizational reputation, geographic location or organization mission may affect worker decisions to join, stay and exert effort, and may be highly firm-specific. The value created for workers from these factors typically falls outside of the normal empirical purview of HR systems approaches, but is of central importance in the firm-specific incentives approach.

2.3. Explaining Firm-Specificity of Incentives

There are at least two overarching logics for why some incentives are more valuable to workers in the focal firm than in all other firms: (1) certain incentives are scarce in the labor market due to firm-level barriers to imitation and (2) certain incentives *seem* more valuable to workers in their current firms than at outside options due to psychological and emotional processes affecting worker perceptions.

2.3.1. Firm-Level Barriers to Imitation

There are at least three barriers to imitation that allow some firms advantages in offering particular incentives. First, firms may have path dependent attributes and/or characteristics that result from years of idiosyncratic decisions and actions (Barney 1991), what others have called time compression diseconomies (Dierickx and Cool 1989). By virtue of the time required for the resource and/or capability to develop and the path dependent nature of the development, competitors should find it very difficult to recreate or replicate these characteristics. Competitors may attempt to recreate such characteristics, but they will need time and investment as they try to reconstruct the unique path of the focal firm. When certain sources of worker utility are tied to these path dependent firm attributes, they may represent incentives that are highly idiosyncratic, relatively low cost to maintain and very difficult for competitors to imitate.

For example, firm reputation requires repeated interactions with individuals and other organizations and should be highly subject to these path dependencies (Fombrun and Shanley 1990; Rao 1994). Workers value their employers' reputations both because these reputations signal the overall quality of the firm and the likely future success of the firm and because affiliation with positive reputation firms can enhance worker self-esteem and self worth (Cable and Turban 2003; Dutton and Dukerich 1991). Cable and Turban (2003) find that employees are willing to accept up to 7 percent wage discounts to work for firms with positive reputations.

In addition to creating value for workers, reputations may also be relatively low cost for firms to maintain as worker incentives. Firms may invest substantially in improving their organizational reputations, but doing so is more likely focused on increasing product

market rather than labor market performance. Specifically, firms may invest in improving reputations so that they can increase sales and/or consumer satisfaction. The fact that the positive reputation also provides some non-pecuniary utility for workers is a side benefit – i.e. a positive economic externality. The firm will probably make such investments regardless of the positive utility for employees, so the benefit for employees is a relatively costless by-product of normal firm activities. The same may also be true for other path dependent firm characteristics that workers value, such as geographic location, organizational mission, and so forth. These characteristics likely arise out of normal business needs and have positive side benefits for workers. Thus, these kinds of incentives are relatively low cost for firms to maintain as incentives.

A special case of path dependency is the initial endowment an organization receives that may be difficult or impossible for competitors to replicate and that may become more valuable over time. For example, the University of Hawaii has the benefit of offering professors the opportunity to live and work in Hawaii – a highly sought after vacation destination due to its climate and natural beauty. While Hawaii has always been beautiful, the value of living there has increased over time, and has certainly increased at a greater rate than similar universities founded at the same time. East Carolina University in Greenville, North Carolina was also founded in 1907, but the value of living in Greenville has likely increased less dramatically than the value of living in Hawaii over the same time period. Other kinds of endowments may include the human or intellectual capital at founding that propels a firm forward into new technologies or market spaces. These unique endowments become part of a firm's unique history.

Social complexity refers to the value of certain resources that comes from social phenomena beyond the ability of the firm to control and reproduce (Barney 1991). These kinds of resources are difficult to imitate because complex social phenomena can rarely be re-created without relocating an entire team or group of workers, and even then it may be quite challenging to do so. One example of a complex social phenomenon that may be quite valuable to workers is the organizational culture (Barney 1986; Schein 2004). The norms and values that establish unspoken rules for repeated interactions between and among employees may create positive working relationships and desirable working conditions for employees. The tremendous success of Southwest Airlines is often attributed to the distinctive organizational culture, the high performance work relationships it facilitates and the resulting value these factors create for workers (Gittell 2005). Competitors have been unable to replicate the culture and, accordingly, the success. Like the Southwest example, firms that can offer incentives that are embedded in complex social phenomena may be better positioned to leverage these incentives in their efforts to realize human capital based competitive advantages.

Causal ambiguity refers to the difficulty in identifying the true source of a strategic resource and/or how that resource affects firm performance (Amit and Schoemaker 1993; King 2007; King and Zeithaml 2001). When applied to incentives, causal ambiguity describes the difficulty for rivals to identify (1) which factors are particularly valuable to talented workers and/or (2) how the focal firm is able to create and offer these valuable incentives. In many ways, causal ambiguity further exacerbates the advantages offered through incentives subject to time compression diseconomies and social complexity. Specifically, these incentives are not only path dependent and/or embedded in the

complex social systems of the firm, but they are also difficult to see. Thus, competitors may not even know which incentives to try to replicate and implement. For example, SAS Institute is well known for its excessive use of employee perks and benefits – it topped the list of *Fortune Magazine's* 100 Best Companies to Work For ratings in 2010 making the top 100 for the thirteenth straight year. While SAS is one of the most profitable software firms in the industry and sustains extremely low turnover, it is very difficult for competitors to nail down which specific incentives are most valuable to SAS workers and which incentives are most effective for driving business performance. Are the most strategically relevant incentives the onsite sports leagues, the onsite doctors, the onsite spas, the exceptional child care or some complex combination of the entire package? Some of these incentives may be truly important for business performance while others may simply be benevolent perks offered by a wealthy CEO who does not have to report to outside shareholders. Causal ambiguity makes it very difficult for competitors, and academicians, to identify clearly which SAS incentives are particularly responsible for their sustained human capital based performance.

2.3.2. Psychological and Emotional Processes Affecting Worker Perceptions

The prior section implicitly assumes that workers can observe and evaluate incentives available in the labor market and engage in rational decision processes when choosing which firms to join. Workers are not all-knowing perfectly rational actors (March and Simon 1958), however, and ambiguity in their surroundings may threaten their ability to fully assess their options (March 1994). When they cannot fully evaluate their options, psychological and emotional mechanisms may influence their perceptions of the value

available to them. There are at least three incentive characteristics that may affect these perceptions.

First, some incentives are very difficult to observe and evaluate in the labor market. If it is very difficult for workers to observe the presence of certain incentives at their outside options, they are more likely to believe those incentives are unavailable elsewhere, even if they are not. This creates a state of high Knightian uncertainty (Knight 1921) – i.e. workers are uncertain about the incentives available at their outside options. Quite simply, if workers cannot easily see particular incentives they are less likely to believe that they exist. An example is the set of interpersonal relationships with co-workers in the immediate social context – many firms may have good people to work with, but it may be impossible for individual employees to look into competing firms and adequately observe and evaluate the potential relational match with prospective co-workers. Positive co-worker relationships in the current firm are likely to seem more valuable than outside options in part because it is so difficult to determine ex-ante whether those relationships can be replaced when moving to a different firm. Hence, one of the most common explanations people give the author for why they stay with their firms is that they "love the people" even though they could probably "love the people" in many different contexts.

Second and closely related to the difficulties in observing some incentives at outside options, workers also face challenges comparing incentives across firms. Some incentives, such as firm reputation, may be highly visible to prospective employees due to press coverage, published rankings, and so forth, but still may be quite difficult for workers to compare. Incentives such as these may behave much like experience goods –

i.e. workers cannot fully determine the value they will derive from these incentives until after they have had opportunities to personally experience them. As comparability decreases for a particular incentive, the uncertainty regarding the potential utility available at rival firms for that incentive increases. Risk averse workers should prefer small gains and/or no losses with certainty over potentially large gains with the potential for large losses with high uncertainty (Tversky and Kahneman 1992). These workers discount the potential gains due to the uncertainty and potential losses. When there is high uncertainty workers are more likely to assume that the outside option offers lower utility from a certain incentive than the present option due to this uncertainty discount. All else being equal, lower comparability should lead to higher uncertainty in the potential value of incentives at alternative employers. This higher uncertainty, in turn, should lead workers to perceive lower utility at their outside options – i.e. they conservatively estimate the expected utility from those incentives. As a consequence, workers should be more likely to perceive their current incentives as being more valuable than similar incentives at outside options.

Third, in addition to the challenges with observing and comparing incentives, the value of some incentives may increase with time – i.e. the worker utility from these incentives may be subject to time compression diseconomies (Dierickx and Cool 1989). After joining organizations employees become more socially embedded and their interpersonal relationships may become more valuable to them (Lee et al. 2004; Mitchell et al. 2001). By nature, friendships develop over time and the time dependent strength of relationships can affect how valuable relationships are to workers. Additionally, employees become more socialized to the norms of their organizations over time

(Morrison 1993). As they become socialized they may come to value the specific work attributes of their organizations more. For example, the company mission may be intriguing at first, but through socialization the value employees place on that mission may increase. Even if employees can observe and compare certain sources of utility across firms in the labor market, they may still face short term losses in abandoning current value from incentives that take time to develop. Employees are likely to believe that the value from these increasing-with-time incentives is higher in the focal firm because they cannot immediately replace that value in a competitor firm. They will have to join the firm, become socialized and build new relationships to fully appreciate the value.

Since worker perceptions may be more important for worker actions, decisions and behaviors than objective realities (Rousseau 1990; 1995), incentives that are difficult to observe and compare across firms and that grow in value over time may enhance firm advantages. If all firms were equally able to create and leverage incentives with these characteristics, then we should not expect these incentives to provide any unique advantage to any firms – all firms would have workers who believed that they could not find their incentives elsewhere and there would be very low voluntary turnover in the labor market. However, many of the incentives that may be difficult to observe, difficult to compare and/or that increase in value over time may also result from unique firm histories, social complexities and/or causal ambiguity. If true, then these psychological mechanisms may further exacerbate the advantages firms realize from these incentives with high barriers to imitation. For example, a firm that can offer a culture of positive work relationships subject to path dependence and social complexity may have incentive

advantages because these relationships also grow in value over time, may be hard for workers to observe at other firms, and may be very difficult to compare across firms.

2.4. Strategic Implications of Firm-Specific Incentives

Human capital based competitive advantage follows when firms can attract, motivate and retain superior human capital at economic discounts relative to competitors (Chadwick and Dabu 2009; Coff 1997) – i.e. create more value for the same economic cost or create the same economic value for lower economic costs (Brandenburger and Stuart 1996). The following sections argue that firms that are better able to offer certain firm-specific incentives will have advantages attracting, motivating and retaining talented workers, leading to human capital based competitive advantages.

2.4.1. Retaining Human Capital

The overarching connection between firm-level reliance on firm-specific incentives and retaining talented workers is fairly straightforward. Since workers stay at firms where they can maximize their total utility (Rosen 1986), firms that offer workers more utility than those workers can receive elsewhere will be better able to retain human capital (Akerlof 1984; Gerhart and Rynes 2003; Weiss 1990). When firms offer workers more utility than they can receive elsewhere by utilizing highly firm-specific incentives then these firms achieve superior worker retention at discounts relative to competitors. In other words, firms that offer higher total utility through firm-specific incentives leverage the low cost nature of these incentives to realize cost discounts relative to rivals in their efforts to retain talented workers.

The potential difficulties with observing and comparing some incentives further enhance these retention advantages because workers tend to be risk averse. Risk averse

workers prefer to avoid losses even when there are potential gains (Holt and Laury 2002; Tversky and Kahneman 1992). These workers may prefer to keep their current incentive bundles when there is uncertainty about whether they can replace the utility from those bundles at their next best options. Thus, we should expect these retention advantages to be even greater when a firm offers firm-specific incentives that are also very difficult for workers to observe and compare ex-ante.

The retention advantages of firm-specific incentives may also be enhanced when these incentives tend to increase in value with time because workers tend to be impulsive (Postrel and Rumelt 1992) – i.e. they will discount the value of future goods relative to the value of immediate goods. The idea of time discounting is well established in economic utility theories (Fishburn 1970; Koopmans 1960; Samuelson 1937) and is one of the core concepts in the finance literature (Benzion, Rapoport, and Yagil 1989; Fisher 1930). While much of the economic research on time discounting has focused on monetary sums and calculable discount rates, the tendency to discount should also affect worker decisions regarding non-monetary incentives that may become more valuable over time. For example, the value employees derive from their interpersonal relationships at work likely increases over time as they become more familiar with their co-workers and as relationships become stronger (Holtom, Mitchell, and Lee 2006; Lee et al. 2004; Mitchell et al. 2001). Employees may expect the value from their relationships to increase over time, but they still may discount this future value ex-ante because there is some risk that relationships may not become valuable. In fact, there is a reasonable risk that relationships could turn negative with time (e.g. Labianca and Brass 2006). Thus, employees may prefer the current value of their work relationships over the potential

future value of work relationships at other firms. In other words, they discount the future value of relationships due to the potential risk of not realizing the expected value from those future relationships.

Worker impulsivity should also enhance retention for incentives that grow in value over time, however, even when employees have a high level of confidence that they will receive the full value of those incentives. For example, a worker may visit a potential employer and gain confidence that she can develop positive and meaningful relationships with her future co-workers. She recognizes, however, that the full value of these relationships will develop over time. It may take years for her to realize the full value of her work relationships. Even if she believes that the future value of her future relationships is greater than the current value of her relationships in her current firm, she still has to sacrifice current value in order to build the future value. In other words, there is a short term loss in value from relationships when making a move, even if the long term value will be greater (see figure 2.3). Impulsive workers will naturally prefer the current value of their incentives over the future value of incentives, even when the uncertainty about that future value is low. In the absence of other incentives to compensate for this short term loss, workers will be less likely to abandon their current incentives to pursue outside options. Thus, we should also expect the retention advantages from firm-specific incentives to be enhanced when these incentives tend to increase in value with time.

Firms do not offer incentives in isolation, however. Firms offer workers bundles of incentives that collectively make up the total worker utility. Holding constant the total utility firms offer to workers and the quality of those workers, firms that offer greater

portions of that total utility in the form of firm-specific incentives should have lower realized retention costs than competitors[4]. Alternatively, holding constant the realized retention costs across firms, firms that offer greater portions of their total utility in the form of firm-specific incentives should offer higher total utility and retain higher quality workers. Thus, firms that offer greater portions of firm-specific incentives in their incentive bundles should be better able to retain talented workers at a discount relative to competitors. In other words, firms that offer more firm-specific incentives should be better positioned to have higher retention rates at similar retention costs as competitors and/or similar retention rates at lower retention costs than competitors. Thus:

Proposition 1: Firms that offer more firm-specific incentives have retention advantages relative to rivals, ceteris paribus.

Empirical evidence of a firm's ability to retain talented workers at a discount may arise in analysis of worker wage-tenure slopes. Substantial research in labor economics shows a positive wage-tenure slope in organizations, which scholars have traditionally attributed to the accumulation of worker firm-specific human capital (Altonji and Williams 2004; Topel 1991). It seems clear from this wage-tenure slope research that firms generally pay higher wages as worker experience increases, but it is not clear that all employers must offer the same wage increases for additional years of service. For example, some scholars find that wage-tenure slopes systematically differ by firm size

[4] Note that an important limit to the current logic is that there is likely some threshold level of general incentives required to hold workers in place. Wage, for example, does not qualify as a firm-specific incentive under the present definition, but some baseline wage level is required to retain workers. Thus, the implicit assumption embedded in the present argument is that all firms meet the minimum threshold level on general incentives. Thus, advantages flow to firms that utilize higher proportions of firm-specific incentives after meeting this threshold level of general incentives.

(Fox 2009; Oi and Idson 1999). Firms may also vary in wage-tenure slopes according to their abilities to offer certain firm-specific incentives.

Since some firm-specific incentives are very difficult to observe and compare ex-ante, and some increase in value with time, it is reasonable to assume that the value workers derive from these incentives post-hire is substantially higher than the value they derive from these incentives pre-hire. Knowing this, firms may be able to offer high wages at the hiring interface in order to attract and hire talented workers, but offer lower than market wage increases to those workers over time. By doing so, the firm can slowly substitute firm-specific incentives for wages and achieve wage discounts for talented knowledge workers over time. These workers may still receive higher total utility from their incentive bundles than they could receive elsewhere, but the wage component of their incentive bundles may be lower than market levels for their skills and experience. More importantly for the firm, the cost of providing this higher than market total utility is likely equivalent to, or lower than, competitor costs to offer the same level of utility. In this way firm-specific incentives may help explain some of the systematic differences in wage-tenure slopes observed in prior research. Specifically, we should expect firms that have higher proportions of firm-specific incentives in their overall incentive bundles to substitute these firm-specific incentives for market level wage increases over time and, therefore, exhibit lower wage-tenure slopes. Stated formally:

Proposition 2: Firms with higher proportions of firm-specific incentives in their incentive bundles will exhibit lower wage-tenure slopes than competitors, ceteris paribus.

Scholars have made similar arguments related to employee acquisition of firm-specific human capital. By definition, general human capital is valued by many firms in

the labor market while firm-specific human capital is only valued by the focal firm (G. Becker 1964). According to traditional human capital theory, when knowledge workers make firm-specific human capital investments their market value decreases or stays the same. Specifically, the investment in firm-specific human capital represents an investment foregone in general human capital. Since the market traditionally does not value worker firm-specific human capital, these workers can only demand wages commensurate with their general human capital. However, as workers invest in firm-specific human capital, their value to the focal firm increases. Accordingly, the firm has incentive to pay actual wages that are higher than market wages in order to retain these valuable workers. The firm also has incentive, however, to offer actual wages that are lower than the workers' marginal products. Doing so allows the firm to retain a portion of the rents generated from the workers' firm-specific human capital investments (G. Becker 1964; Wang and Barney 2006). This "sweet spot" compensation level essentially traps these workers – they cannot leave the firm without sacrificing wages but they cannot obtain the full value of their human capital in the current firm.

According to this human capital story, the acquisition of firm-specific human capital presents an alternative explanation to the second proposition. Specifically, as workers gain more firm-specific human capital with time, the firm can offer wage increases at lower rates than the rates at which the workers' marginal productivities increase. Since the workers' market wage rates are lower than their actual wage rates, they will have to either accept the actual wage or sacrifice wages by moving. The more firms rely on firm-specific as opposed to general human capital, the more they should be able to leverage these investments by offering opportunistic wage rates. If we assume that firms will

behave opportunistically in this way, then firms with higher levels of firm-specific human capital may also exhibit lower wage-tenure slopes.

There is, however, an important conceptual difference between the firm-specific human capital and the firm-specific incentive arguments. In the firm-specific human capital story, workers are much more valuable in the focal firm than in any other firms because of their skills. It is important to note that the firm can pay lower wages than the maximum wage, but cannot pay lower wages than the market wage. If the firm offers lower wages than the market wage, then the workers would quickly leave – the next best options would actually be better, ceteris paribus. Thus, the limit of employer opportunism in the human capital explanation is offering actual wages slightly above the market wages for a worker's general human capital.

There is no such limit in the firm-specific incentives story. Workers can be equally or even more valuable to rival firms, but still feel that they cannot match their incentive bundles elsewhere. They may be able to receive equal or higher wages elsewhere, but they may not see these wage increases as reasonable compensation for the loss of firm-specific incentives by leaving. In other words, the firm *can* pay lower than market wages but still retain talented workers because there are other kinds of utility holding the workers in place.

2.4.2. Recruiting Human Capital

We should also expect firm-specific incentives to provide recruiting advantages when they are observable to prospective employees. If workers can see and evaluate these incentives ex-ante, and they are highly firm-specific, then they can positively affect worker decisions to join the firm. The straightforward expectation is that firms that offer

higher total utility at the hiring interface will be better positioned to hire top talent (Barber and Bretz 2000; Gerhart and Rynes 2003). If this higher utility is due to firm-specific incentives that are easy for prospective employees to observe and evaluate, then these firms can attract talent at equal or lower costs than rivals. As previously discussed, a positive reputation is one such example. Holding wages constant, firms with better reputations should attract better workers and holding worker quality constant, firms with better reputations should be able to offer lower wages (Cable and Turban 2003; Turban and Cable 2003). We should expect similar outcomes for other highly firm-specific incentives that are also easy to observe, such as geographic location or unique product offerings. Thus:

Proposition 3: Firms that offer more firm-specific incentives will have attraction advantages relative to competitors, ceteris paribus.

Firm-specific incentives that are difficult to observe ex-ante and/or that increase in value over time may not provide clear advantages at hiring, however. The prospective employees cannot observe or compare these incentives and/or may need to sacrifice value in their current firms by making the change to the focal firm. Thus, these incentives may be valuable for retaining talented workers, but may not provide clear advantages in attracting and hiring those workers precisely because workers cannot see them when deciding whether to join. Some firms may find ways to make these incentives more visible to outsiders in order to leverage these incentives. For example, a small billing department with a culture of positive work relationships invites prospective employees to come for interviews with groups of their future co-workers. These interviews allow the co-workers to evaluate the potential hires, but also give the prospective employees face-

time with a large percentage of the department. Additionally, the prospective hires experience a small part of the culture in the department, and observe a strong signal of the relationships available in the department.

Firms may also attempt to use different recruitment approaches in order to reduce applicant uncertainty about the future value of firm-specific incentives. Social network scholars have shown that the interpersonal networks of current employees can provide excellent information about potential employees, as evidenced by recent increases in employee referral programs. Firms appear to experience substantial hiring benefits such as better fit, higher employee quality, and lower subsequent turnover by using employee referrals (Fernandez, Castilla, and Moore 2000). Besides reducing uncertainty on the employer side, however, using employee social networks in hiring may also reduce employee uncertainty regarding future incentive value. While firms may find mechanisms to increase visibility and reduce the uncertainty about the availability of certain incentives, the argument remains unchanged. Specifically, in the absence of market mechanisms to increase incentive visibility, we should not expect incentives that are difficult to observe ex-ante to provide attraction and recruitment advantages.

2.4.3. Motivating Human Capital

Firm-specific incentives can lead to advantages in motivating human capital in productive ways by affecting employee commitment to the organization. Commitment is generally defined as employee affective, continuance and/or normative attachment to the organization (Allen and Meyer 1996; 1990; O'Reilly and Chatman 1986). These three forms of attachment generally refer to employees wanting to stay, needing to stay and feeling obligated to stay, respectively. Robust empirical findings show that

organizational commitment has positive effects on employee retention, organizational citizenship behaviors and job performance (Mathieu and Zajac 1990; Meyer, T. Becker, and Vandenberghe 2004; Meyer et al. 2002). We should expect organizations that can systematically create higher levels of organizational commitment to reap the human capital advantages associated with these benefits.

The connection between incentives and organizational commitment is best illustrated using the Rusbelt and Farrell (1981) investment model. According to this model, commitment can be expressed by the following equation:

$$COM_x = O_x + I_x - O_y$$

Where the subscripts x and y represent the focal firm and the next best alternative, respectively. COM_x is employee commitment to the focal organization – defined as the strength of employee identification with and involvement in the organization. O_x is the net value of the employee's incentive bundle in the current firm. I_x is employee idiosyncratic investments in the employment relationship – e.g. investments in firm-specific human capital. O_y is the total value available from the next best alternative in the labor market. According to this equation, commitment can be viewed as the net value from incentives plus the utility of the sunk costs in firm-specific investments minus the net value from the next best option in the labor market. Based on this equation, we should expect worker commitment to increase as a firm's ability to offer firm-specific incentives increases.

It is also important to note, however, that the net value from incentives in the equation above is actually the employee's *perceived* net value. In other words, the values of O_x and O_y should be replaced with PO_x and PO_y (P = perceived) because they are

subject to employees' abilities to observe and compare incentives and incentive bundles. Specifically, if employees perceive that O_x is much greater than O_y they will have increased commitment regardless of whether O_x is *actually* much greater than O_y. To make this connection explicit, let us consider that the actual net value of incentives contains both an easy-to-observe and a difficult-to-observe component such that:

$$O_x = EO_x + DO_x$$

$$O_y = EO_y + DO_y$$

Where EO is the easy-to-observe component and DO is the difficult-to-observe component. We can then write the perceived net value of incentives as:

$$PO_x = EO_x + DO_x$$

$$PO_y = EO_y$$

Note that the difficult-to-observe components of O_y drop off in the equation for PO_y because employees will not value these incentives ex-ante. In contrast, the difficult to observe components of O_x remain in the equation for PO_x because the workers have experienced these experience goods types of incentives – i.e. workers value them because they have experienced them and can observe and evaluate them. Thus, we can rewrite the equation above substituting the equations for PO_x and PO_y in for O_x and O_y respectively:

$$COM_x = EO_x + DO_X + I_x - EO_y$$

If we temporarily hold constant the cost of incentive bundles across firms, and hold constant the proportion of incentives that are easy to observe and difficult to observe, we now see that firm-specific incentives can positively affect employee commitment in two ways. First, when the easy to observe incentives that make up EO_x are highly firm-

specific, or when a higher proportion of these incentives are highly firm-specific, then we should expect EO_x to be greater than EO_y. Since worker commitment increases with EO_x and decreases with EO_y, commitment should increase as EO_x becomes increasingly larger than EO_y. Second, there is no adequate comparison set for highly firm-specific incentives that are difficult to observe outside of the focal firm – i.e. there is no comparison set for DO_x. In other words, DO_y drops out of the equation because workers cannot observe or evaluate these incentives. Even if these difficult to observe incentives are highly firm-specific at rival firms, workers at the focal firm cannot observe them in their comparisons. Thus, the existence of any difficult to observe incentives in the focal firm should increase commitment. However, when DO_x is made up of highly firm-specific incentives, then the expected magnitude should be larger than if it were only made up of purely general incentives. We should, therefore, expect the existence of any difficult to observe incentives to increase commitment, but the presence of highly firm-specific and difficult to observe incentives to increase commitment even more.

Since several meta-analyses have shown positive correlations between organizational commitment and motivation, effort and job performance (e.g. Allen and Meyer 1996; Meyer et al. 2002), we should expect organizations that can systematically create higher employee commitment to also create higher motivation, effort and job performance. Since firm-specific incentives enhance organizational commitment, we should expect firms that can offer firm-specific incentives to also have advantages in motivating their talented workers. Thus:

Proposition 4: Firms with higher proportions of firm-specific incentives in their incentive bundles should realize higher worker motivation at similar costs as competitors and/or realize similar worker motivation at lower costs than competitors, ceteris paribus.

2.5. Discussion and Future Research

This work makes several contributions to the organizational literature and has implications for several relevant conversations in the strategy literature. First, by explicitly connecting incentives to human capital based competitive advantage I begin to explain some of the micro-foundations of competitive advantage (Abell et al. 2008; Felin and Hesterly 2007; Teece 2007). Since incentives, and perceptions of incentives, operate primarily at the level of the individual worker, the present model proposes that a firm's ability to offer firm-specific incentives can lead to systematic differences in firm-level human capital outcomes. Specifically, firms that are better able to create, offer, and/or leverage firm-specific incentives should also be well positioned to realize human capital based competitive advantages. Advantages stemming from these incentives should also be very difficult for rivals to imitate or substitute. Since some of these incentives are difficult to see ex-ante, difficult to compare and/or increase in value over time, workers may prefer to stay in their focal firms even if rival firms *can* offer similar incentives. In other words, these incentives may not be unique in reality, but workers still perceive that they are unique, and this perception provides part of the basis of the advantage.

Second, the firm-specific incentives construct provides a complementary explanation to the firm-specific human capital story but without the same scope conditions. Firm-specific human capital enhances competitive advantage in knowledge intensive industries for at least two reasons: (1) firms rely on these idiosyncratic skills for the development of

unique firm knowledge and capabilities and (2) firms can compensate employees at the sweet spot compensation level leading to lower turnover and increased retention of rents from these skills. While this story has been well established in the strategy literature, it does not help to explain human capital based competitive advantage in industries that rely primarily on general or industry-specific human capital. If we rely on the traditional human capital story, firms relying primarily on general human capital should not realize human capital based competitive advantages because skills are not differentiated and employees will appropriate most of their value. Some firms in these general human capital intensive industries, however, do realize human capital based competitive advantages. For example, Starbuck's (1993) rich study of Wachtell, a prominent law firm, highlights how one firm creates abnormal returns due, at least in part, to its superior general human capital. Embedded in Starbuck's analysis we find several examples of firm-specific incentives that may help to explain Wachtell's success, such as its reputation for providing promotion opportunities for Jewish lawyers when other firms would not. A more recent example is the labor market sexism in Korea leading to plentiful stock of qualified, but undervalued, Korean women – traditional firms pay lower wages and offer less opportunity for promotion to these women (The Economist 2010). Firms that are willing to hire and promote these highly qualified women may not only enjoy the short term benefits of these undervalued human assets, but may also develop long term positive reputations for hiring women when traditional Korean firms would not. Like Wachtell, these firms may be able to leverage these positive reputations moving forward. One study of South Korean businesses showed that a 10 percent increase in women in the managerial ranks increased return on assets by one percentage

point (The Economist 2010). These situations cannot be explained using the conventional human capital story, but may be explained by examining firm level reliance on firm-specific incentives. Future research may seek to empirically explore these incentives specifically in contexts that rely primarily on general human capital.

Third, firm-specific incentives may have important theoretical implications for worker investments in firm-specific human capital. While firm-specific human capital may not explain human capital based competitive advantage in its entirety, it is clearly important for a firm's competitive performance in knowledge intensive environments. The paradox of firm-specific human capital, however, is that firms need employees to invest in firm-specific skills but employees prefer not to make such investments due to risks of employer opportunism (Wang and Barney 2006). Firms must find ways to motivate employees to make these investments. Given the potential for firm-specific incentives to increase employee commitment, and the positive effects of commitment on worker engagement in organizationally beneficial activities, it seems likely that firms that are better able to offer these firm-specific incentives may also have advantages in motivating employees to make these firm-specific investments. Future research may explicitly explore the relationship between firm-specific incentives and firm-specific human capital. We may find, for example, a reciprocal relationship between worker investments in firm-specific human capital and the creation of firm-specific incentives.

Fourth, since firm-specific incentives describe different ways that workers derive utility, they may have important implications for how rent is allocated among a firm's stakeholders. While several scholars have explored rent appropriation in human capital intensive firms (Asher, James Mahoney, and Joseph Mahoney 2005; Blair 1995; Coff

1999), these discussions have focused primarily on money as the primary value to be allocated. Expanding our conceptualization of value to more explicitly incorporate a broader spectrum of utility may help explain efficient allocation of value to various stakeholders. For example, firm-specific incentives are sources of utility for employees, but may not provide utility to shareholders, who may be primarily interested in financial returns. As stated in the logic supporting proposition 2 above, employees may accept tradeoffs between firm-specific and more general cash incentives. If true, then firms may allow non-monetary incentives to flow to workers, who are uniquely positioned to appropriate and value them and retain more of the monetary value for shareholders. Future research may explicitly explore the potential connection between firm-level reliance on firm-specific incentives and the ways that rents are divided among a firm's stakeholders.

Fifth, the focus on firm-specific incentives may further the conversation linking the strategic HR literature more directly to the strategy literature. While scholars have found consistent positive relationships between certain HR systems and firm-performance (Arthur 1994; B. Becker and Gerhart 1996), we still know little about the mechanisms through which these systems affect performance (B. Becker and Huselid 2006). Additionally, some bundles of HR practices may be easy to replicate. The study of firm-specific incentives may help to strengthen the bridge between these literatures because HR policies and practices may enhance worker perceptions of firm-specificity – i.e. even if certain HR practices are easy to replicate, they may still be a source of competitive advantage if they facilitate the creation of utility that workers perceive to be highly firm-specific. Rather than directly connecting practices to firm performance, future research

may explore the effect of practices on worker perceptions of relative incentive value and then the affects of these perceptions on subsequent performance. The explicit connection between HR policies and practices and worker perceptions of relative incentive value seems a highly relevant and fruitful path for future research.

2.5.1. Practical Implications

This research also has implications for practicing managers. While much of the practitioner oriented literature has put pressure on firms to adopt high performance and high investment work systems, or to create intangible rewards for employees, the present research suggests that these normative pressures may be misleading. Consider, for example, Google's practice of allowing employees to spend up to 20 percent of their working time on self motivated projects. This practice seems to attract and retain talented developers and also leads to the creation of new products and services that enhance Google's competitive positioning. It is possible that the practice of giving employees a percentage of work time to focus on work projects can, in and of itself, lead to substantial business performance, but the present argument suggests an alternative explanation.

Specifically, Google's performance may derive more from the scarcity of this practice elsewhere rather than the value of the practice itself. If all companies adopted this practice, would Google still have the same advantage? Maybe, but perhaps not. Practicing managers may be cautious in following prescriptive advice to adopt certain high investment practices and, instead, may benefit from examining the incentives that their companies are uniquely positioned to provide at a discount relative to competitors.

2.5.2. Limitations

This work is not without limitations and many of these limitations have been masked by offering propositions as ceteris paribus. One important limitation is that incentive systems can have substantial sorting effects. I have argued that firm-specific incentives may enhance the quality of attracted and hired applicants, but the nature of these incentives may attract certain segments of the labor market with idiosyncratic preferences. This sorting may be particularly problematic if employees sort based on personality traits that also affect their propensity to view incentives as firm-specific. For example, highly confident knowledge workers may rarely believe incentives are scarce because they are highly confident in their ability to find equivalent incentives anywhere. If certain kinds of firm-specific incentives attract a disproportionate portion of overconfident workers, then these incentives may not have the effects proposed here. Future work may explore the extent to which firm-specific incentives lead to labor market sorting beyond the unidimensional quality assumption adopted here.

Similar to the sorting concern, the logic of the present paper implicitly assumes that workers will tend to prefer their current options over outside options and, therefore, assumes away the "grass is always greener" phenomenon. This assumption may threaten the arguments presented here if there are systematic sorting effects that correlate with firm-specific incentives – i.e. if firms that offer more firm-specific incentives also tend to attract more workers who are naturally inclined to believe the grass is always greener, then firm-specific incentives may not have the proposed effects. Additionally, this assumption may threaten the arguments if workers are more likely to believe the grass is greener elsewhere when certain incentives are in place, or when incentives reach specific

levels. In other words, workers may prefer their current firms above some threshold level of value from interpersonal relationships, but may start to believe that the grass is greener elsewhere if that value drops below that threshold. Future research may explicitly explore connections between the tendency to view outside options as more desirable with the proposed firm-specific incentives logics.

2.5.3. Conclusion

In conclusion, firm-specific incentives may help to explain how some firms can realize human capital based competitive advantage, even in situations where extant human capital theories suggest that they should not. While much work remains to be done, this paper serves as a first attempt at exploring the strategic implications of incentives that are more valuable to workers in their focal firms than similar incentives at their next best options.

3. **RETAINING HUMAN CAPITAL AT A DISCOUNT**

3.1. Empirical Outcomes of Firm-Specific Incentives

Strategy scholars have long emphasized the importance of human capital as a source of sustainable competitive advantage (Barney 1991; Coff 1997; Hall 1993) and have focused on firm-specific human capital because it serves as a potential isolating mechanism to preserve advantages (Buchholtz, Ribbens, and Houle 2003; Hatch and Dyer 2004; Kor and Leblebici 2005). The prototypical logic in the strategy literature argues that firm-specific human capital can both restrict worker mobility and allow firms to retain workers at discounts relative to the use value of their skills (G. Becker 1964; O. Williamson 1975) – i.e. the firm can retain a portion of the rents generated from worker skills. Accordingly, firm-specific human capital is assumed to support sustained competitive advantage.

There are at least two important concerns with the firm-specific human capital logic, however, despite its theoretical appeal. First, this logic lacks explanatory power in industries that rely primarily upon general human capital for competitive advantage. If firm-specific human capital is not substantively important in these industries, then firms must leverage different mechanisms to hold talented workers in place. Second, if workers recognize that investing in firm-specific human capital leaves them open to firm opportunism, they may prefer to avoid such investments (Wang and Barney 2006). If firms cannot motivate workers to make firm-specific investments, then they cannot create the isolating mechanism deemed so important by extant strategy theory.

Firm-specific *incentives* may address both of the concerns mentioned above. These incentives are more valuable to workers in their focal firms than similar incentives elsewhere. In other words, these incentives represent positive utility that workers cannot find outside of their focal firms. Since firm-specific incentives are associated with positive worker utility, they may help to explain why some firms can realize human capital based competitive advantages even in industries that rely primarily upon general human capital – i.e. workers will prefer their incentive bundles in the focal firm over potential incentive bundles at rival firms. Workers will stay in their focal firms regardless of the external applicability of their human capital. Additionally, workers do not have to make at-risk investments when accepting firm-specific incentives like they would by investing in firm-specific human capital. Thus, accepting firm-specific incentives does not leave workers open to firm opportunism and the motivational problems articulated in the firm-specific human capital literature should not be evident. Firms that offer more firm-specific incentives should have advantages retaining talented workers. If these firms also have cost advantages in creating and leveraging these incentives then they can realize superior retention at discounts relative to rivals.

The remainder of this paper proceeds by introducing the firm-specific incentives construct, reviewing the importance of firm-specific human capital for competitive advantage and illustrating the value of this nascent construct, articulating why firms that offer more firm-specific incentives should have lower voluntary turnover rates and lower wage-tenure slopes than their rivals and testing these expectations in a sample of software firms and their software development professionals. Theoretical implications, practical implications and limitations of the present research are then discussed.

3.2. Firm-Specific Incentives and Competitive Advantage

3.2.1 What are firm-specific incentives?

Organizational scholars often implicitly focus on incentives that are pecuniary in nature and are administered as part of formal compensation systems. Incentives need not be limited to such a narrow focus, however. A more general definition treats incentives as factors that may incite people to initiate desired actions (www.dictionary.com; www.merriam-webster.com) such as joining the firm, increasing commitment to the firm, and/or exerting greater effort at work. These factors may be monetary in nature, but may also be intangible (Clark and J. Wilson 1961), intrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), and/or social (Sauermann and Cohen 2008). Incentives affect worker actions because they have some positive utility for those workers, and workers tend to behave in utility maximizing ways. Some incentives are contingent upon specific actions, such as rewards for sales or production results, while others are contingent simply upon organizational membership, such as worker health benefits available to all full time employees. Some incentives are excludable and offered only to a few workers, such as raises, bonuses or premium office spaces, while others are non-excludable and readily available to all workers, such as the positive reputation of the firm, the natural beauty surrounding the work complex, or the proximity of the office to desirable local attractions. A broader conceptualization of incentives allows us to account for the many factors that have positive utility for workers and that motivate those workers to desired actions

Firm-specific incentives are *incentives that are more valuable to workers in the focal firm than similar incentives at worker's second best options.* Firm-specificity is

ultimately a continuum with ends anchored by purely firm-specific and purely general incentives. Purely firm-specific incentives are only valuable to workers in the focal firm and are essentially unavailable at other firms – i.e. in some cases similar incentives may simply be unavailable outside of the focal firm. Purely general incentives are equally valuable and readily available to workers across firms. An example of a highly firm-specific incentive is the natural beauty available to professors at the University of Hawaii. This beauty can be valuable to professors, relatively low cost for the university to provide, and nearly impossible for competing universities to replicate. An example of a highly general incentive is a monetary base wage. Money is valuable to workers, but is costly to provide and easy for competitors to replicate.

While a complete conceptual development of the firm-specific incentives construct is provided elsewhere (Kryscynski 2011b), it is useful to quickly distinguish the construct from extant approaches to incentives in the organizational literature. Prior dimensions such as intrinsic vs. extrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), high-powered vs. low-powered (Lazear 2000; O. Williamson 1985), tangible vs. intangible (Clark and J. Wilson 1961), social vs. non-social (Sauermann and Cohen 2008), concrete and symbolic (U. Foa et al. 1993), and so forth, clarify the nature, characteristics and/or sources of different incentives, but they do not capture the extent to which these incentives offer more value to workers in the focal firm than in all other firms nor do they address variability in costs by incentive type. Firm-specificity actually cuts across these extant dimensions such that incentives at either end of these existing spectrums can vary in firm-specificity.

Firm-specific incentives may facilitate competitive advantages by introducing an isolating mechanism that holds workers in place regardless of worker human capital. If certain incentives are more valuable to workers in their focal firms than similar incentives at other firms, then workers will be more likely to stay in the focal firm. There are at least three barriers to imitation that allow some firms advantages in offering particular incentives. First, firms can have path dependent attributes and/or characteristics that result from years of idiosyncratic decisions and actions (Barney 1991), what others have called time compression diseconomies (Dierickx and Cool 1989). When certain sources of worker utility are tied to these path dependent firm attributes, they represent incentives that are highly idiosyncratic, relatively low cost to maintain and very difficult for competitors to imitate. Second, some incentives derive from socially complex phenomena in the firm (Barney 1991). These kinds of phenomena can rarely be re-created without relocating an entire team or group of workers, and even then it may be quite challenging to do so. One example of a complex social phenomenon that can be quite valuable to workers is organizational culture (Barney 1986; Schein 2004). Third, some incentives are subject to causal ambiguity (King and Zeithaml 2001; Reed and DeFillippi 1990). Specifically, rivals may have difficulty identifying (1) which factors are particularly valuable to talented workers and/or (2) how the focal firm is able to create and offer these valuable incentives. In many ways, causal ambiguity further exacerbates the advantages offered through incentives subject to time compression diseconomies and social complexity. These incentives are not only path dependent and/or embedded in the complex social systems of the firm, but they are also difficult to see and competitors may not know which incentives to try to replicate and implement.

3.2.2. Firm-Specific Incentives and Firm-Specific Human Capital

Utilizing the language of firm-specificity invites an explicit comparison to human capital theory. Just as firm-specific human capital describes worker knowledge, skills and abilities (hereafter skills) that have higher use value for the focal firm than for all other firms (G. Becker 1964; He and Wang 2009; Wang et al. 2009), firm-specific incentives describe incentives that are more valuable to workers in the focal firm than in all other firms. In other words, firm-specific human capital captures differences in how much and what kind of value *workers* create for their firms relative to other firms, while firm-specific incentives capture differences in how much and what kind of value *firms* create for their workers relative to other firms. Examples of firm-specific human capital include intimate knowledge of a firm's proprietary technology or knowledge of the social landscape in a particular company. In contrast, general human capital typically refers to skills that are broadly applicable outside the focal firm.

Firm-specific human capital is believed to enhance competitive advantage because it facilitates retention at discounts relative to the use value of worker skills (Helfat 1994; Kor and Leblebici 2005; Wang et al. 2009). Since rivals will not compensate workers for their firm-specific human capital, workers face income losses if they choose to leave (G. Becker 1964; O. Williamson 1975). The logical conclusion is that workers with firm-specific human capital will prefer to stay in their focal firms, ceteris paribus, and firms that rely more on firm-specific human capital should be better able to keep workers. Additionally, since rivals will not pay for firm-specific skills, focal firms also do not have to pay for the full use value of these skills – they can pay at a "sweet spot" compensation level that is above the compensation workers can demand in the labor market but below

their use value in the focal firm. In other words, firms can retain workers at discounted compensation rates.

The conventional firm-specific human capital story has at least two limitations, however. First, this logic lacks explanatory power in industries that rely primarily on general human capital. In such industries workers appropriate the full use value of their general skills and there is little room for the firm to generate rents from human capital. However, this conventional story implicitly assumes that incentives are more or less created equal - i.e. incentives have equal value to workers and similar costs for all firms. In other words, human capital scholars have allowed the type of value workers create for firms to vary by firm-specificity of human capital, but have essentially held constant the type of value firms offer to their workers. This assumption has allowed scholars to explore the independent effects of human capital on firm performance, but it has obscured the opportunity to explore how different kinds of worker incentives affect human capital based competitive advantages. In contrast to conventional models, the arguments presented here remain agnostic to the firm-specificity of human capital in order to explore the implications of incentives that may also vary in firm-specificity.

Second, given the logics described above, it is perplexing why workers would be willing to invest in firm-specific human capital (Wang and Barney 2006). Specifically, after investing in firm-specific skills workers face a classic hold-up problem (O. Williamson 1975) – i.e. firms can reduce wages after workers have made these firm-specific investments. Additionally, firm-specific human capital investments are typically based on some underlying firm-specific resource or capability, and there is always risk that the underlying resource will lose value (Wang and Barney 2006). Thus, firm-

specific human capital investments are a form of at-risk investments because they lose value if the worker is terminated and/or if the underlying value of the firm's resources dissipates. Given these risks, workers may choose not to invest in firm-specific human capital without substantial assurances against firm opportunism or protections against the potential value loss of the underlying asset. In contrast to investments in firm-specific skills, however, firm-specific incentives do not require workers to make at-risk investments. For example, realizing value from a firm's positive reputation only requires membership – i.e. investments are only required inasmuch as they are necessary for the worker to maintain employment. One might argue that interpersonal relationships require worker investments of time and energy, but these investments directly increase the value workers derive from their relationships. Workers should prefer to make these kinds of investments because they directly increase their own satisfaction, regardless of whether their improved relationships also enhance their productive value to the firm. Workers should not resist receiving firm-specific incentives in the same way that they resist making investments in firm-specific human capital.

3.2.3. Firm-Specific Incentives and Retaining at a Discount

The overarching connection between firm-specific incentives and retaining talented workers is fairly straightforward. Since workers stay at firms where they can maximize their total utility (Rosen 1986), firms that offer workers more utility through incentives than those workers can receive elsewhere will be better able to retain human capital (Gerhart and Rynes 2003; Shaw et al. 1998). Firms do not offer incentives in isolation, however. They offer incentive bundles that collectively make up the total worker utility. Controlling for all other incentives in the bundle, companies that offer firm-specific

incentives should have retention advantages over rivals because the total utility in that bundle is greater than the workers' next best options. Thus, workers in these firms should be less likely to leave voluntarily because they will prefer to keep the value from their firm-specific incentives. Reduced likelihood of voluntary turnover at the individual level should correspond to reduced collective turnover at the firm level and these firms should have lower voluntary turnover rates (Hausknecht and Trevor 2011). As the number of firm-specific incentives in the firm's incentive bundle increases relative to rivals, the expected retention advantages should also increase. Thus:

Hypothesis 1: Firms that offer more incentives that are highly firm-specific will have lower voluntary turnover rates than competitors, ceteris paribus.

While many scholars have explored the connections between collective turnover and performance (e.g. Arthur 1994; Huselid 1995; Shaw, Duffy, et al. 2005), simply having lower turnover rates is not sufficient for creating or sustaining human capital based competitive advantages. In order to support advantages, firms must be able to retain workers at discounts relative to rivals (Chadwick and Dabu 2009). In other words, firms must be able to retain workers at lower costs than rivals, holding constant worker quality, or firms must be able to retain workers of higher quality than rivals, holding constant the costs of retention (Brandenburger and Stuart 1996). Thus, firms may invest heavily in perks, benefits and incentives to increase retention of talented workers, but doing so may simply dissipate rents and may actually erode rather than sustain profits (Coff 1999). In order to facilitate human capital based competitive advantages, firm-specific incentives must enhance a firm's ability to retain talented workers at discounts relative to rivals.

Firms that offer more incentives that are highly firm-specific should be better positioned to retain workers at discounts relative to rivals. Workers are willing to accept tradeoffs between different incentives in their overall bundles and should accept lower cash compensation in exchange for higher value from firm-specific incentives, within reasonable limits (Rosen 1986). If firms can offer these firm-specific incentives at low cost relative to rivals, then they can substitute low-cost incentives for high-cost cash compensation and realize cost advantages.

Many firm-specific incentives are low cost for firms to maintain. For example, firm reputation may be highly firm-specific because reputations form over time through repeated and complex interactions in the product market (Fombrun and Shanley 1990; Rao 1994), and they are highly valued by workers (Cable and Turban 2003; Turban and Cable 2003). In addition to creating value for workers, reputations may also be relatively low cost for firms to maintain as worker incentives. Firms may invest substantially in improving their organizational reputations, but doing so is more likely focused on increasing product market rather than labor market performance. Specifically, firms may invest in improving reputations so that they can increase sales and/or consumer satisfaction. The fact that the positive reputation also provides some non-pecuniary utility for workers is a side benefit – i.e. a positive economic externality. The firm will probably make such investments regardless of the positive utility for employees, so the benefit for employees is a relatively costless by-product of normal firm activities. The same may also be true for other path dependent firm characteristics that workers value, such as geographic location, organizational mission, and so forth or for incentives that are created from socially complex and/or causally ambiguous phenomena. Thus, these kinds

of incentives are relatively low cost for firms to maintain *as incentives* even though firms may invest substantially in the underlying activities that create and sustain them.

Firms that offer more incentives that are highly firm-specific are likely to leverage these incentives in their incentive offerings, regardless of whether they are able to create and sustain these incentives at discounts relative to rivals. On average, these firms should offer workers lower than market level cash compensation because they can substitute firm-specific incentives for cash in the overall incentive bundle. In other words, workers should have lower than market level cash compensation in firms that offer more incentives that are highly firm-specific, ceteris paribus. Thus:

Hypothesis 2: Firms that offer more incentives that are highly firm-specific will have lower worker level cash compensation rates than rivals, ceteris paribus.

This hypothesis may not hold if workers are unable to observe and evaluate all incentives available to them in the labor market. Many firm-specific incentives are very difficult to observe and compare across firms ex-ante, and some increase in value with time (Kryscynski 2011b). For example it may be very difficult to assess the value of potential social relationships prior to joining the firm – these kinds of incentives may be similar to experience goods. Also, workers become more socially embedded in their organizations over time and the value of their interpersonal relationships likely increase accordingly (Lee et al. 2004; Mitchell et al. 2001). If true, then the value workers derive from these incentives post-hire should be higher than the value they derive from these incentives pre-hire. Knowing this, firms may offer competitive cash compensation rates at the hiring interface in order to attract and hire talented workers, but offer lower than market level compensation increases to those workers over time. By doing so, the firm

can slowly substitute firm-specific incentives for cash and achieve retention discounts. These workers may still receive higher total utility from their incentive bundles than they could receive elsewhere, but the cash component of their incentive bundles is lower than market levels for their skills and experience.

Labor economists have long studied increases in cash compensation over time through analysis of worker wage-tenure slopes. Substantial research in labor economics shows positive wage-tenure slopes in organizations and scholars have traditionally attributed these positive slopes to the accumulation of worker firm-specific human capital (Altonji and Williams 2004; Topel 1991). It seems clear from this wage-tenure slope research that firms generally pay higher wages as worker experience increases, but it is not clear that all firms must offer the same wage increases for additional years of service. For example, some scholars find that wage-tenure slopes systematically differ by firm size (Fox 2009; Oi and Idson 1999). Just as these slopes may vary by firm size, they may also vary by the firm-specificity of a firm's incentive offerings. According to the logic articulated above, firms that offer more incentives that are highly firm-specific may also exhibit lower wage-tenure slopes because they substitute these incentives for wages over time. More specifically, firms that offer more incentives that are highly firm-specific can offer smaller compensation increases than rivals as tenure increases while still holding workers in place. Stated formally:

Hypothesis 3: Firms that offer more incentives that are highly firm-specific will exhibit lower wage-tenure slopes than competitors, ceteris paribus.

Firm-level reliance on firm-specific human capital is an important alternative explanation to the third hypothesis. As mentioned above, labor economists typically

attribute positive wage-tenure slopes to worker acquisition of firm-specific human capital (Altonji and Williams 2004; Topel 1991). Barth (1997), however, shows that workers with more firm-specific human capital actually exhibit *lower* wage-tenure slopes than workers with purely general human capital. The implication for the present argument is that firms that rely more on firm-specific human capital can act opportunistically by offering workers lower compensation increases than they deserve based on their increasing firm-specific skills with time. If true, then firms that rely more on firm-specific human capital may exhibit lower wage-tenure slopes than their rivals, ceteris paribus. Doing so allows the firm to retain a portion of the rents generated from the workers' firm-specific human capital investments (G. Becker 1964; Wang and Barney 2006).

There is, however, an important conceptual difference between the firm-specific human capital and the firm-specific incentive arguments. In the firm-specific human capital story, the firm can pay lower wages than the overall use value of worker skills, but cannot pay lower wages than the external market value of worker general skills. If the firm offers lower wages than the market value of general skills, then workers would quickly leave – the next best options would actually be better, ceteris paribus. Thus, the limit of employer opportunism in the human capital explanation is offering actual wages slightly above the market value of a worker's general human capital. This limit may explain why workers still have positive wage-tenure slopes even when they have high levels of firm-specific human capital (Barth 1997) – i.e. firms must compensate them for their increases in industry-, profession- and task-specific human capital that they inevitably gain with experience and tenure.

There is no such limit in the firm-specific incentives story. Workers can be equally or even more valuable to rival firms, but still feel that they cannot match their incentive bundles elsewhere. They may be able to receive equal or higher wages elsewhere, but they may not see these wage increases as reasonable compensation for the loss of firm-specific incentives by leaving. In other words, the firm *can* pay lower than market wages but still retain talented workers because there are other kinds of utility holding the workers in place. Even if these workers gain industry-, profession- and task-specific human capital with experience and tenure, firms may not compensate them if they can substitute firm-specific incentives for cash increases. Thus, while firms that offer more firm-specific incentives should have lower compensation-tenure slopes than rivals, and firms that rely more on firm-specific human capital should have lower compensation-tenure slopes than rivals, the effect of firm-specific incentives should be stronger than the effect of firm-specific human capital. In other words, a single standard deviation increase in firm-specific incentives should depress the compensation-tenure slope more than a single standard deviation increase in reliance on firm-specific human capital.

3.3. Methods

The research sample consisted of 2874 U.S.-based firms in the software and related industries. These firms are drawn from three sources: (1) participants in the Culpepper and Associates (hereafter Culpepper) yearly compensation surveys, (2) software firms listed in the Hoovers Online industrial database and (3) software firms listed in the Esalesdata.com marketing database. The study focused on software development professionals in these firms because HR practices and incentives likely vary by occupational group (Lepak and Snell 1999) and software development professionals are

"core" employees for these firms (Arthur 1992; Delery and Doty 1996), are critical for a firm's competitive performance and likely occupy similar levels of strategic importance across firms in the sample[5]. The data collection reported here is part of a larger study that included both key informant and software developer surveys – the research design focused on achieving research depth through developer surveys rather than additional key informant surveys.

Data reported here rely primarily on single key informants from each participating firm. While single key informant approaches do have limitations (Gerhart, Wright, McMahan, et al. 2000) several aspects of the present study may mitigate these concerns. First, by focusing on a relatively narrow job classification, the survey avoids concerns about different incentive regimes for different workers within the same firm. Second, the focus on software development professionals limited the number of workers considered in each firm, increasing the probability of obtaining accurate results from a single key informant. Specifically, the median number of developers in the sample was 25 with over 89 percent of firms having fewer than 100 developers.

There were 778 firms drawn from the Culpepper surveys sample, and these firms were recruited through phone and internet contact. To identify the ideal key informants for the survey, a member of the study team conducted phone interviews with contacts at each company to identify the highest ranking individual who was knowledgeable about perks, benefits and incentives for software developers and who could also answer high level questions about company performance. In many cases this individual was the highest ranking human resources professional in the firm, but for many small firms

[5] The importance of developers was verified through in depth interviews with executives and developers at a subset of these firms.

without a formal HR function the key informant was a high level manager such as a Chief Technology Officer, Chief Operating Officer, President, or CEO. To develop and pre-test the survey used in the present study the author visited ten software development companies and interviewed executives, HR managers and developers. Additionally, two rounds of pilot surveys were administered to executive MBA students at a private southeastern university (first pilot n = 36, second pilot n = 52) to validate measure face validity and clarity. Survey responses were also validated using external data sources including company websites, Lexis-Nexis legal archives, Hoovers Online data listings and company profile data from Culpepper. The data obtained from the key informant surveys were consistent with data available from these other data sources.

The research team administered the key informant surveys using a slightly modified version of the procedure described by Gupta, Shaw and Delery (2000) and used by these authors in several studies (e.g. Shaw, Gupta, and Delery 2002; 2005; Shaw et al. 1998). First, a member of the research team called the Culpepper provided company contact and identified the ideal key informant in the organization. Second, a personalized announcement letter was sent to the key informant at each company specifying the purpose of the study and the potential benefits of participation. Third, a member of the research team called the key informant to announce survey distribution, answer questions and encourage participation. Fourth, surveys were sent electronically. Fifth, email reminders were sent one week after survey distribution. Sixth, a member of the study team called non-respondents again to remind them of the study. Seventh, a paper letter and final email reminder were sent. Of the 778 companies in the original sample, 164 submitted electronic key informant surveys for an overall response rate of 21.1 percent.

A logit model with a dummy for response as the dependent variable revealed no response bias in the sample based on observable variables.

The remaining 2096 firms were drawn from two industrial lists. Hoovers Online is a Dun and Bradstreet company that provides proprietary business data and is biased towards large and publicly traded firms. ESalesdata.com compiles contact lists for professionals in a broad array of industries for the purpose of targeted sales and marketing campaigns and is biased towards small and privately held firms. The data collection methodology for these additional firms was similar to the methodology described above, but only electronic recruitment was used in place of phone calls to identify and recruit key informants. The key informant surveys were identical to those used in the Culpepper sample for the key variables of the study. Of the original 2096 companies in the sample, 189 submitted electronic key informant surveys for an overall response rate of 9.0 percent[6]. A logit model with a dummy for response as the dependent variable revealed no response bias in the sample based on observable variables.

Responses from the two sources were combined and observations with missing data were dropped for an overall usable sample of 275 software firms[7]. A logit model with sample source as the dependent variable was estimated and revealed that firms from the Culpepper sample have more employees, on average, than firms from the Hoovers and Esalesdata.com sample but no other differences across samples were observed.

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[6] Response rate is likely much lower in this sample for at least two reasons. First, the formal relationship between Culpepper and Culpepper participants likely enhanced willingness to participate. Second, the phone based recruiting in the Culpepper sample likely enhanced participation rates.

[7] For robustness, measures were obtained for missing variables from websites and/or company profile data in Lexis-Nexis archives. When data could not be obtained through secondary sources missing values were imputed using median substitution. These efforts yielded a usable sample of 323 firms. Results from this sample were substantively identical to findings reported below.

In addition, employee level compensation data were obtained for 7770 software development professionals in 94 firms drawn from the Culpepper sample. These developers are individual contributors, not leaders or managers – i.e. they do not manage or supervise other developers.

3.3.1. Measures

Dependent Variables - The key firm-level dependent variable was developer voluntary turnover. Participants indicated the total number of developers employed in the firm in the prior year, and then indicated the number of developers who "left voluntarily" in the previous year. This measure was then converted to a turnover rate – i.e. the number of voluntary leavers divided by the total number of developers[8]. The wage-tenure slope models utilized the natural logarithm of the total individual level yearly cash compensation as the dependent variable. Yearly cash compensation was calculated as the sum of the developer base salary and cash bonus reported in the Culpepper and Associates yearly compensation survey for each software developer in the sample.

Independent Variable - The primary independent variable was the firm-specificity of incentives offered to developers at the focal firm. Constructing a measure of the firm-specificity of a company's incentives required a representative list of developer incentives. An ideal list of incentives would be (1) relevant for and important to software developers, (2) reflective of the total value developers receive at work rather than just

[8] The survey also asked participants to indicate the number of voluntary leavers who management would have preferred to keep to construct a measure of dysfunctional turnover. The correlation between voluntary turnover and dysfunctional turnover in this sample was 0.86 suggesting that most voluntary turnover was also dysfunctional. Due to this high correlation, results are substantively identical for voluntary and dysfunctional turnover rates. These results are available from the author upon request.

wages and traditional benefits and (3) short enough to be manageable in electronic surveys. This list was developed by iterating between interviews with software company executives and developers, academic research and practitioner research. The inducements measures commonly used in psychological contracts research (e.g. Coyle-Shapiro and Conway 2005) provided an ideal initial list because of the broad scope of incentives studied. The psychological contracts measures attempts to synthesize decades of organizational behavior research to focus on a subset of incentives that, together, are highly important for employee decisions to join, stay and exert effort.

One important weakness of the psychological contracts items, however, is that they focus almost entirely on incentives over which the firm can easily tailor for each employee. This focus ignores aspects of the firm or work environment that may be harder to manipulate but still be highly motivating for employees and very difficult to imitate. Since the present study focused on the strategic relevance of the overall value employees derive from their work, several additional factors were added that are relatively weak incentives that cannot be directly tied to daily performance but are likely to motivate workers nonetheless. Some examples of these incentives included interpersonal work relationships, company reputation and the ability of the worker to make an impact. Additionally, several items on the psychological contracts scale were less relevant for software developers based on field interviews, so these items were eliminated from the list. It is also important to note that some firms may have highly unique incentives that are important to software developers but that are not captured by the list. Therefore, 10 blank spaces were provided for participants to fill in additional incentives that are important in their firms.

The responses recorded in the blank spaces were analyzed by the author and a research assistant to develop emergent categories not represented in the list mentioned above. The author and research assistant categorized all incentives from these blank spaces into one of the 16 new categories, or into one of the 18 categories on the original list. Any ambiguous responses were omitted from analysis, and any discrepancies between the author and research assistant were discussed to achieve consensus. The full list of both original and emergent items is shown in appendix 1.

Not all incentives on the list are highly firm-specific, however. Some firms may be able to replicate certain incentives simply if they are willing and/or able to pay more – e.g. salary, cash bonuses, health benefits, etc. Other incentives are more firm-specific and could not be replicated even if rivals were willing to incur higher costs to create them. Thus, the incentives used for the firm-specific incentives index excluded financial incentives or benefits that could be imitated if rivals had the resources to do so. Hard to imitate incentives were identified through two complementary approaches. First, 13 experts rated each incentive on how difficult it might be for workers to observe the incentive at a rival firm, how difficult it may be to compare the value of the incentive across firms and the extent to which the incentive is likely to increase in value over time. Incentives that were difficult to observe and/or compare and that tend to increase in value over time were categorized as firm-specific. Second, study participants were asked to explain why they rated certain incentives as being very difficult for developers to find outside of the focal firm. Incentives that were hard to find elsewhere due to superior financial resources (e.g. higher salaries because of greater ability-to-pay) were not

included, but incentives that were hard to find elsewhere due to social, cultural, routine or visibility based reasons were included in the firm-specific incentives index[9].

For each incentive on the list, participants responded to the following question: "How difficult/easy is it for software development professionals to find better options outside of [COMPAY NAME] for each of the following factors?" Responses were coded on a five point Likert type scale anchored by "very easy" and "very difficult." The firm-specificity of incentives index was then constructed by averaging the difficulty score for each of the incentives categorized as difficult to replicate – a simple mean. Firms with higher scores offer more incentives that are very difficult for workers to find elsewhere, and that may be difficult for competitors to replicate. The firm-specific incentives score was mean centered in all empirical models. Given the newness of firm-specific incentives, four alternative logics were utilized to construct different versions of this measure. A detailed discussion of each of these alternatives is shown in appendix 2.

Control Variables – The control variable of highest theoretical importance is Firm-specific human capital, measured using a survey question asking how many months it takes for developers with "10-15 years of experience in your industry" to get up to speed and functioning in the organization[10]. Firms that reported higher adjustment times reflect greater need for workers to develop knowledge and skills that are not available to them as generally trained software development professionals or through their substantial industry experience. Thus, this measure reasonably approximated the extent to which the firm relies on worker human capital that is highly firm-specific – i.e. difficult to gain, transfer

[9] More detailed results for these complementary approaches to categorization are available upon request.
[10] Participants also rated the adjustment time for developers with different experience levels and these additional measures were used in alternative models for robustness. These alternative measures did not change the substantive results of the study.

and/or apply outside of the focal firm (Hatch and Dyer 2004; Wang and Barney 2006; Wang et al. 2009). Others have utilized worker tenure (e.g. Harris and Helfat 1997), on-the-job training (e.g. Hatch and Dyer 2004) or patent citations (e.g. Wang et al. 2009) as proxies for firm-specific human capital, but these measures may not be measuring firm-specific human capital alone. Workers may gain both firm-specific and general human capital as tenure increases through formal and/or informal on-the-job training, and patent citations may represent general rather than firm-specific knowledge – i.e. firms would not need to patent knowledge that had no external applicability. The present measure improves on these prior approaches by explicitly measuring the time of adjustment for a worker with substantial industry- and profession-specific human capital. The firm-specific human capital measure was mean centered in all empirical models.

Despite the improved measure for firm-specific human capital described above, the study also controls for alternative measures often attributed to human capital. Tenure was measured as individual level worker tenure in years. Workers with higher tenure should be less likely to quit voluntarily and typically receive higher wages. Given the robust finding in labor economics that wages increase with tenure, we should expect a positive coefficient on this control. The tenure variable was grand mean centered in all empirical models. Job family was a focused job classification code for each developer – there were 49 unique job families in the sample. Eligibility for overtime was a dummy variable coded as one if the employee was eligible to receive overtime pay – i.e. if the employee was categorized as hourly or salaried exempt. Workers that are eligible for overtime typically receive lower base rates than salaried exempt workers, so we should expect a negative coefficient for this control. Eligibility for short term incentives was a

dummy variable coded one if the worker was eligible to receive short term cash bonuses. We should expect the most critical workers to be eligible for short term incentives due to the motivational benefits of bonuses (Gerhart and Rynes 2003), and these critical workers are likely the highest paid. Thus, we should expect a positive coefficient on the eligibility for short term incentives dummy. Industry experience was a categorical indicator for each workers job level that served as a proxy for the years of industry experience. The categories were: 0-3 years, 4-5 years, 6-9 years, 10-14 years and 15 + years experience. Workers with more experience demand higher wages, so we should expect a positive coefficient on the industry experience variable.

Labor Productivity was measured as the natural logarithm of revenue per worker. Labor productivity may indicate a firm's ability-to-pay, and firms with greater ability-to-pay may simply pay higher wages and/or invest in more non-monetary perks and benefits for workers because they can afford to (Blanchflower, Oswald, and Sanfey 1996; Hildreth and Oswald 1997), and doing so leads to superior retention of talented workers (Barber and Bretz 2000; Gerhart and Rynes 2003). Additionally, workers are more likely to prefer to work for productive and successful firms. Thus, higher labor productivity could potentially affect both the incentives offered and the turnover outcomes.

Material restrictions was calculated as an average of three items indicating the percentage of developers who have stock, options and vesting restrictions for financial rewards. Workers in firms with high material restrictions scores have more material value to lose by moving to competitor firms. Firms may use these "golden handcuffs" (Cappelli 2000) to hold workers in place rather than relying on firm-specific incentives. Legal restrictions was calculated as an average of three items indicating the percentage of

developers who have signed intellectual property agreements, signed non-compete agreements and work-sponsored U.S. visas. Workers in firms with higher legal restriction scores may face restricted outside options for their human capital if they desire to leave (Marx, Strumsky, and Fleming 2009). Firms with these legal restrictions may also choose not to invest in firm-specific incentives but still be able to retain talented workers. Other incentives score was calculated as an index measure similar to the firm-specific incentives index, but included the incentives that were not firm-specific. The other incentives score was mean centered in all empirical models.

3.3.2. Model Specifications

For the turnover models, the turnover variable was a percentage turnover rate and was thus bounded by zero and one[11]. While it is highly unlikely to observe 100 percent turnover in this sample of professional knowledge workers, firms frequently experience zero percent turnover in the sample. Theoretically, some firms may be so attractive to workers that they would exhibit negative turnover rates if it were possible. Thus, the data reflects a censored sample where observations that might theoretically fall below the zero percent turnover mark are censored at zero percent. Thus, a Tobit model for data censored between zero and one was estimated using the following specification:

$$turnover_j = \alpha + \beta FSI_j + \boldsymbol{X\beta} + \varepsilon_j$$

Where turnover is voluntary turnover, *FSI* is the firm-specific incentives measure and $\boldsymbol{X}$ is a matrix of control variables, $\boldsymbol{\beta}$ is a vector of coefficients for the control variables, and the subscript j denotes the firm. We observe the actual turnover rate:

[11] It is possible to have turnover rates above 100 percent if there are more quits in a year than the total number of workers in the firm. For example, a firm could have 100 employees quit but only have 50 full time employees.

$$turnover_j = \begin{cases} \widehat{turnover_j}, & if\ \widehat{turnover_j} > 0 \\ 0, & if\ \widehat{turnover_j} \leq 0 \end{cases}$$

The discount predictions explore the effect of firm-specific incentives and worker tenure on worker cash compensation as well as how the relationship between tenure and wage varies by firm-specific incentives and firm-specific human capital. A multi-level model was estimated utilizing both firm-level and individual level error terms and explicitly allowing compensation-tenure slopes to vary by firm. The full model specification is shown below:

$$cashcomp = \beta_{0j} + \beta_{1j} tenure_{ij} + \boldsymbol{IND_j \beta} + r_{ij}$$

$$\beta_{oj} = \gamma_{00} + \gamma_{01} FSI_j + \gamma_{02} FSHC_j + \boldsymbol{FIRM\gamma} + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} FSI_j + \gamma_{12} FSHC_j + \mu_{1j}$$

Where the subscript i denotes the worker, the subscript j denotes the firm, cashcomp is the worker's total yearly cash compensation, tenure is the worker's tenure in the organization, ***IND*** is a matrix of individual level controls, ***FIRM*** is a matrix of firm level controls, FSI is the firm-specific incentives measure and FSHC is the firm-specific human capital measure. Thus β_{0j} is the intercept in the individual level equation and can be interpreted as the estimated baseline average yearly cash compensation within each firm. Likewise, β_{1j} is the beta coefficient on tenure and can be interpreted as the estimated wage-tenure slope within each firm. Both β_{0j} and β_{1j} are allowed to vary by firm and both are predicted based on firm-level characteristics. Thus, γ_{00} can be interpreted as the overall mean cash compensation for the entire sample of workers, the firm level predictors in the β_{0j} represent the adjustments to the overall mean to calculate the firm mean and μ_{0j} is the firm level error in predicting the firm level mean yearly cash compensation. Additionally, γ_{10} can be interpreted as the overall mean wage-tenure slope

for the entire sample of workers, the *FSI* and *FSHC* predictors in the $\beta 1_j$ represent the adjustments to the overall mean slope to calculate the firm level slope and μ_{1j} is the firm level error in predicting the firm level slope.

3.4. Results

3.4.1. FSI and Retention

Table 3.1 provides the means, standard deviations and correlations of the variables used in the turnover models. Several observations are worth noting from the table. First, firm-specific incentives (FSI) and firm-specific human capital were correlated at 0.01 and the correlation was not significant, indicating that they are empirically distinct constructs. Second, the largest correlation among independent variables was smaller than |0.50| so there is no indication that multi-collinearity will be a problem in the Tobit model.

Additionally, given the newness of the firm-specific incentives construct, it is useful to discuss observed correlations between the firm-specific incentives index measure and other variables in the model as well as the basic properties of the measure. Foreshadowing the results presented below, there is a negative and significant correlation between firm-specific incentives and voluntary turnover ($\rho = -0.18$, $p < 0.01$). There does not appear to be a significant correlation between firm-specific incentives and labor productivity, which is somewhat surprising. We might expect that firms with higher labor productivities are better positioned to invest in creating highly firm-specific incentives for their workers. Firm size does negatively and significantly correlate with the firm-specific incentives index ($\rho = -0.12$, $p < 0.05$) suggesting that smaller firms tend to offer more incentives that are highly firm-specific. Material restrictions on mobility do not significantly correlate with firm-specific incentives, despite the expectation that

material restrictions may substitute for FSI in a firm's efforts to retain workers. In contrast, legal restrictions on mobility negatively and significantly correlated with the FSI measure (ρ = -0.16, $p < 0.01$), suggesting that some firms may implement legal restrictions on mobility when they cannot leverage firm-specific incentives, or vice versa. The correlation between percentage ownership by employees and FSI was positive and moderately significant (ρ = 0.12, $p < 0.10$) suggesting that firms that are owned by employees may invest in creating incentives for workers that are highly firm-specific. Surprisingly, the private firm dummy is not significantly correlated with firm-specific incentives. We might expect private firms to have higher firm-specific incentives because they do not have the same public governance mechanisms in place at public firms. It does not appear from these data that ownership type systematically varies with firm-specific incentives.

The distribution of the firm-specific incentives score was approximately normal with a mean of 3.33, slightly above the midpoint of the Likert scale. The interpretation of this mean is that firms tend to report that their overall incentives are slightly more difficult for developers to find elsewhere than the neutral midpoint of the Likert scale. This score likely represents some over-estimation on the part of the key informants when identifying the extent to which developers can find better options elsewhere. The standard deviation was 0.45, almost one half the numerical distance between scale ratings. In other words, two standard deviations above the mean corresponds to a shift from an overall "neutral" response to an overall "difficult to find elsewhere" response on the Likert scales. The maximum score observed in these data was 4.5, indicating that this firm rated most

incentives as being difficult or very difficult for developers to find elsewhere. Additional distributional properties of the measure are shown and discussed in appendix 2.

[INSERT TABLE 3.1 ABOUT HERE]

Three equations were estimated for the Tobit model. The first model only included the firm-specific incentives construct to illustrate a main effect independent of other explanatory variables – i.e. to demonstrate that results are not likely driven by over fitting these particular data. The coefficient on firm-specific incentives was negative and significant (-0.114, $p < 0.001$). The second model included only the controls and the third model added the firm-specific incentives measure to the controls. These results are shown in table 3.2. The results provided support for the first hypotheses. Adding the firm-specific incentives measure to the controls model improved model fit significantly ($\chi^2 = 8.871$ with p-value = 0.003 on 1 DF) and the coefficient for firm-specific incentives was negative and significant (-0.094, p-value = 0.003).

[INSERT TABLE 3.2 ABOUT HERE]

The coefficients in a Tobit model must be decomposed into two parts for interpretation: (1) changes in the probability of observing an outcome above the censor point due to the explanatory variable - i.e. the change in probability of turnover rates above zero percent due to firm-specific incentives and (2) changes in outcome levels above the censor point due to the explanatory variable - i.e. the change in turnover rate due to the explanatory variable, conditional upon the turnover rate being above zero percent. The latter portion of the decomposition is equivalent to an OLS estimate if no censoring occurred in the data (McDonald and Moffitt 1980). Following the decomposition proposed by McDonald and Moffitt (1980), the percentage of the

estimated firm-specific incentives coefficient that explains changes in turnover rate above the censor point was calculated to be 0.728 – i.e. 72.8 percent of the coefficient represents an OLS type slope estimate. A one standard deviation increase in the firm-specific incentives index corresponds to a decrease in the turnover rate of 3.1 percentage points with a 95 percent confidence interval ranging from a decrease of 1.5 to 4.6 percentage points. This decrease is substantively significant given that the mean and median turnover rates in this sample are 10.1 percent and 6.7 percent respectively. Thus, a one standard deviation increase in firm-specific incentives cuts the voluntary turnover rate by more than 46 percent for the median firm in the sample. Robustness checks included a number of additional control variables[12] but these controls neither improved model fit nor changed the substantive interpretations of the results.

3.4.2. FSI and Retention Discounts:

Individual level compensation data were available for 7770 software development professionals in 94 firms in the overall sample. Basic statistics for this subsample, including individual level variables are shown in table 3.3 below[13]. While the correlations for firm-specific incentives were discussed previously for firm-level variables, the addition of individual level variables warrants additional discussion. Specifically, eligibility for overtime and FSI negatively and significantly correlate, suggesting that workers in higher FSI firms are less likely to be eligible for overtime. In other words, high FSI firms are more likely to have higher proportions of salaried exempt

[12] Additional control specifications included firm age, percentage of ownership held by non-executive employees, developer importance to business performance, number of competitors and flexibility in incentive offerings.

[13] Correlations between interaction terms are not shown, but the highest correlation among an interaction term and any other variable in the model was only -0.21, suggesting that multi-collinearity should not be a concern for these models.

workers. Also, FSI and eligibility for short term incentives are positively and significantly correlated, suggesting that workers in high FSI firms are more likely to be eligible for short term incentives. High FSI firms also appear to have workers with higher industry experience and higher tenure, supporting the expectation that firm-specific incentives may enhance retention and long term work relationships.

[INSERT TABLE 3.3 ABOUT HERE]

The dependent variable for the multi-level analyses was the natural logarithm of individual level yearly cash compensation. Before testing the second and third hypotheses, the variability in cash compensation that may be attributable to the firm level of analysis was estimated using a null model. The individual level variance was 0.032 and the firm level variance was 0.060 (χ^2 = 2417 on 1 DF, p-value < 0.0001). The ratio of firm-level to total variance yielded an ICC(1) of 0.294, indicating that 29.4 percent of the observed variance in cash compensation may be attributable to firm characteristics.

Five models were estimated and results are shown in table 3.4 below. The first model included only controls and significantly improved model fit over the null model (χ^2 = 6892 on 58 DF, p-value < 0.0001). The intercept, job family, eligibility for overtime, eligibility for short term incentives, job level and worker tenure variables were all statistically significant ($p<0.001$) in the controls only model and the direction of these effects were as expected. In addition, the coefficient on material restrictions was also positive and significant suggesting that firms with higher material restrictions also tend to pay higher levels of total cash compensation. The second model added the firm-specific incentives index measure. The model fit did not improve significantly and the coefficient

on firm-specific incentives was not significant. Thus, there was no support for the second hypothesis in this model.

The third model added the tenure by firm-specific human capital interaction – the main alternative explanation to the third hypothesis. Adding the interaction term significantly improved model fit over the second model (χ^2 = 158 on 3 DF, p-value < 0.0001) and the interaction was positive and moderately significant (p =0.071) indicating that firms that rely more on firm-specific human capital have higher wage-tenure slopes. The fourth model added the tenure by firm-specific incentives interaction without the firm-specific human capital interaction. Adding this interaction significantly improved model fit over the second model (χ^2 = 160 on 3 DF, p-value < 0.0001) and the interaction term was negative and significant (p = 0.026). The fifth model included all controls and interactions. The full model improved model fit significantly over both the third model (χ^2 = 6.84 on 1 DF, p-value = 0.009) and fourth model (χ^2 = 5.19 on 1 DF, p-value = 0.023). The coefficient on the firm-specific incentives interaction term was still negative and significant (p-value = 0.008) indicating smaller wage-tenure slopes in firms with higher firm-specific incentives index scores, controlling for the effects of firm-specific human capital. Thus, the third hypothesis was supported in the model[14]. Additionally, the coefficient on the firm-specific incentives measure was negative and moderately significant in the fifth model, providing weak support for the second hypothesis. In other words, when controlling for the interaction between firm-specific incentives and worker

[14] The results presented use grand mean centering for the tenure variable, but the wage-tenure slope estimate using grand mean centering contains both within and between firm variation, so the observed result could be explainable by between rather than within firm variation. To address this concern a model was estimated using group mean centering for the tenure variable, thus eliminating any between firm variance from the estimates. The results were unchanged indicating that the results were not artifacts of centering choices.

tenure, firms that offer more firm-specific incentives exhibit lower base compensation rates.

The sixth model was a stripped down model removing all controls in order to allay concerns about over fitting the model to these data. The model fit is much worse in this stripped down model, but still significantly better than the null model (χ^2 = 688.6 on 5 DF, p-value < 0.0001). The drastically different AIC, BIC and log Likelihood values are explained by the substantial decrease in explained variance when dropping the controls from the model, especially the individual level controls. The interaction term in the sixth model was still statistically significant suggesting that over fitting is not a concern when interpreting results for the third hypothesis. These findings were also robust to inclusion of additional firm level controls[15].

[INSERT TABLE 3.4 ABOUT HERE]

To illustrate the findings the wage-tenure slopes were calculated for fictional high and low firm-specific incentives firms – i.e. firms that have firm-specific incentives scores one standard deviation above and one standard deviation below the mean, but average scores for all other model variables. These calculations show that a one standard deviation increase in worker tenure corresponds to a cash compensation *decrease* of approximately $50 for high firm-specific incentives firms (i.e. firms with FSI one standard deviation above the mean). In contrast, a one standard deviation increase in tenure corresponds to a cash compensation increase of approximately $1580 for low firm-specific incentives firms (i.e. firms with FSI one standard deviation below the mean). The slope differences are shown below in figure 3.1. While it is unlikely that high FSI

[15] Additional controls included intensity of competition in the labor market percentage of company ownership held by employees, a dummy for private ownership and flexibility of incentive bundles.

firms actually decrease wages over time, these results illustrate the strong positive effect of tenure on wages for firms that offer fewer firm-specific incentives.

[INSERT FIGURE 3.1 ABOUT HERE]

It is also important to note the effects of firm-specific human capital in the models, since firm-specific human capital provides the main alternative explanation to the hypotheses developed here. Firm-specific human capital did not appear to have a main effect in any of the models – i.e. there was no evidence that firms that rely more on firm-specific human capital compensate pay workers at different base levels than rival firms. The third and fourth models did show a positive interaction between firm-specific human capital and tenure, which suggests that firms that rely more on firm-specific human capital have higher wage-tenure slopes than rivals. In other words, there is no evidence that these firms are opportunistically leveraging firm-specific human capital to offer lower than market level increases over time. Wage tenure slopes were calculated for fictional high and low firm-specific human capital firms as described above for firm-specific incentives. In these calculations a one standard deviation increase in tenure corresponds to an additional $1520 in a high firm-specific human capital firm but a decrease of approximately $20 in a low firm-specific human capital firm. These slope differences are also shown in figure 3.1.

3.4.3. Excludable and Non-excludable Firm-Specific Incentives

It is also important to note that the firm-specific incentives measure may have various sub-groupings that affect the hypothesized outcomes differently. For example, some of the incentives categorized as firm-specific vary in excludability – i.e. the extent to which key decision makers can exclude some workers from appropriating value from those

incentives. For example, flexibility in when and where to work is a potentially idiosyncratic work relationship that can be given to some workers but not to others (Rousseau et al. 2006). In contrast, the value of an organizational reputation is equally available to all workers and impossible for key decision makers to withhold from any current workers. It is possible that highly excludable firm-specific incentives may be more likely to substitute for other highly excludable incentives such as wages and cash bonuses. To explore the impact of these potential sub-categorizations, the list of firm-specific incentives was further sub-divided into clusters of incentives that were clearly excludable, potential excludable and non-excludable. These groupings are shown in appendix 3.

The coefficient on the non-excludable sub group was not significant in the Tobit models predicting turnover, but the potentially excludable and clearly excludable incentives were both negative and significant when included independently. When included together, only the clearly excludable incentives had a negative and significant coefficient. The substantive interpretations of the clearly excludable incentives are similar to those reported previously for the overall firm-specific incentives measure.

The non-excludable and potentially excludable incentives had no effect in the multi-level models – i.e. neither the main effects nor interaction terms were significant for these variables. However, the clearly excludable incentives demonstrated a persistent negative main effect that was at least moderately significant in all models. Additionally, the interaction was negative and significant suggesting that the reported wage tenure slope results may be driven primarily by the clearly excludable incentives in the overall firm-specific incentives index score.

Additionally the clearly excludable measure behaved differently depending on whether the dependent variable was the total cash compensation, which included high powered cash bonuses, or the base salary, which included only a relatively low powered but highly excludable incentive. Cash is a highly excludable incentive, but can be offered in a high powered form (e.g. cash bonus for performance) or a low powered form (e.g. base salary). The effect size in the total cash models was substantively larger than the effect size in the base salary models. In other words, the substitutive effect of clearly excludable firm-specific incentives appears to be more pronounced when predicting compensation that includes high powered cash incentives rather than only low powered cash incentives.

3.4.4. Other Sub-Groupings of Firm-Specific Incentives

In a related paper, Kryscynski (2011a) suggests that additional FSI sub-groups may differentially predict observable outcomes. To explore this possibility the incentives were divided into eight clusters discussed in detail by Kryscynski. These clusters are: (1) material rewards – i.e. incentives that have current material value, (2) job future rewards - incentives that enhance employee job opportunities moving forward, (3) positive company attributes – i.e. incentives that are relatively stable company attributes and easily observable to outsiders, (4) Intrinsic rewards – i.e. incentives that derive from the nature of the work, (5) ability to impact outcomes – i.e. incentives related to the workers' abilities to impact company and societal outcomes, (6) confidence in leadership – i.e. incentives that capture the value workers derive from their relationships with and confidence in key decision makers at the firm, (7) workplace culture – i.e. incentives that reside in the complex social fabric of the organization and the norms and values

perpetuated therein and (8) work related resources – i.e. incentives that capture the extent to which developers are given physical resources to help them accomplish their job tasks. The specific incentives included in each cluster are shown in appendix 4. Scores for each cluster were calculated by averaging the difficulty score for each individual incentive within the cluster. These clusters can be interpreted as interactions between extant incentive categorizations and firm-specific incentives. In other words, these clusters measure the extent to which these extant categorizations empirically vary in firm-specificity in the current sample.

These sub-group scores were included individually and collectively in the Tobit turnover models and only future material rewards, intrinsic incentives and workplace culture had negative and significant coefficients when included individually. No sub-group clusters were significant when included collectively, suggesting that the turnover may be more strongly predicted by the overall firm-specific incentives index score rather than any particular sub-grouping. The results were similar for the multi-level models including these sub-groups. Several sub-group measures had negative and significant main effects and several interactions with sub-group measures were negative and significant, but were no longer significant when the measures were included collectively.

3.4.5. Addressing Sorting Concerns

An important concerns with the results presented thus far is that workers may sort into firms that offer certain incentive configurations, and that the low turnover in high FSI firms may be more about initial selection then retention after joining the firm. To address this concern key informants were also asked to rate the importance of each incentive for retaining talented developers at the focal firm on a four point Likert type

scale. A set of importance scores were calculated for the overall FSI measure as well as for each of the sub-groupings previously discussed. The correlation between the overall FSI score and the FSI importance score was positive and significant ($\rho = 0.11$, $p<0.05$). However, the small correlation suggests that the importance score has high discriminant validity relative to the FSI index score. In other words, worker preferences do not appear to match closely with actual firm offerings.

The importance scores were included in all empirical models previously discussed, both with the FSI score and in place of the FSI scores. Inclusion of the importance scores did not change the overall results and did not have significant coefficients in any empirical models.

3.5. Discussion and Conclusion

3.5.1. Theoretical Implications

These findings suggest that when firms offer more firm specific incentives they will have lower voluntary turnover rates and lower wage-tenure slopes than rivals. Given the generally positive relationship between voluntary turnover rates and organizational performance (see Hausknecht and Trevor 2011 for a review) and the financial benefits of sustaining lower wage-tenure slopes, we should expect firms that offer more incentives that are highly firm-specific to have human capital based competitive advantages. In other words, these firms should be better able to retain talented workers at economic discounts relative to rivals.

This paper argues that firm-specific incentives may explain human capital based competitive advantages even when conventional firm-specific human capital arguments cannot. The empirical analysis controlled for firm-specific human capital and

demonstrated a significant effect of firm-specific incentives above and beyond any firm-specific human capital effects. One might argue that the software context is a context where firm-specific human capital plays a relatively small role. If so, then the empirical results can be interpreted as demonstrating positive outcomes in a context where firm-specific human capital theory lacks explanatory power. Regardless of the reader's opinion regarding the importance of general versus firm-specific human capital in this context, the empirical analysis demonstrated effects above and beyond any potential firm-specific human capital effects.

There are, however, significant effects on the firm-specific human capital interaction terms. Consistent with mainstream expectations from labor economics, these results show that firms that rely more on firm-specific human capital do exhibit higher wage-tenure slopes, likely reflecting increased wages as workers acquire more firm-specific skills. In other words, firms do not appear to leverage firm-specific human capital in order to offer lower than market level wage increases to workers over time. It may be that these positive wage-tenure slopes in high firm-specific human capital firms are required as a form of credible commitment to workers that they will be compensated for their investments in firm-specific skills (Shin-Hwan Chiang and Shih-Chen Chiang 1990; Wang and Barney 2006).

The present study also introduces a novel measure of firm-specific incentives that may be particularly valuable for strategy research. In contrast to HR systems research that surveys whether practices are in place (e.g. Arthur 1992; e.g. 1994), the present survey directly asked about the factors that workers tend to value in their work environments. In contrast to incentives research that tends to focus on factors that are

directly within the power of the organization to change (Gerhart and Rynes 2003), the present survey used a broad conceptualization of value and explicitly recognized that some factors are neither adjustable nor excludable by the firm and its managers. Finally, in contrast to measures asking key informants to rate their own firms in isolation, the present method explicitly asked key informants to compare the value workers derive from each factor to the value available from that factor at rival firms. In summary, this new and novel measure directly measures the different factors that workers value beyond simply the factors that firms and their managers can control, and directly asks key informants to compare the value in the focal firm to the value at outside options.

The empirical results also suggest that the overarching index score is important – i.e. the results are not simply explained by one incentive type that varies across firms. With the exception of the subsample analysis focusing on excludable firm-specific incentives, no other sub-grouping or clustering seemed to have explanatory power in these empirical models. In other words, the extent to which the firm offers an overall set of incentives that are highly firm-specific seems more important than which individual incentives the firm offers to workers. These firms may be assembling relatively idiosyncratic sets of highly firm-specific incentives and leveraging those unique bundles of incentives rather than adopting best practices or common incentive configurations. Future work may more carefully explore the specific incentive bundles utilized by these firms and explore the extent to which they are, in fact, idiosyncratic incentive sets.

3.5.2. Practical Implications

The practical implications for managers are not immediately obvious. An oversimplified analysis suggests that managers should seek to offer and leverage

incentives that are more valuable to workers in the focal firm than similar incentives at other options. Unfortunately, the very factors that make these kinds of incentives potentially strategic also make them very difficult to implement. For example, positive interpersonal work relationships may be very valuable to workers and may have a number of positive outcomes for the workers and the firm (Dutton and Ragins 2007). These positive relationships may be relatively costless for the firm to maintain, once in place. The presence of such relationships, then, may reflect a highly firm-specific incentive that the firm can leverage. Unfortunately, however, it may be very costly, and even prohibitive, for firms to change from a culture of negative work relationships to a culture of positive work relationships. While making such a change may be beneficial for the emotional well being of workers, it may be extremely costly and potentially fatal for the firm to try to engage such a change. Culture change may very well kill the organization, especially if the organization is small and lacks sufficient organizational slack to endure the change.

Therefore, this paper does not imply that all firms should invest in creating firm-specific incentives. Doing so may be very costly in the short term and may be detrimental to performance and survival. In contrast, this paper implies that firms should carefully consider which firm-specific incentives they already have in place and consider how to more effectively leverage those incentives.

Additionally, while not discussed in great detail here, some incentives may be highly firm-specific because workers *perceive* that they are unavailable elsewhere, even if they are. For example, positive interpersonal work relationships may seem very difficult to replace for a number of socio-emotional reasons (Kryscynski 2011b). Managers may

consider opportunities to enhance worker perceptions of firm-specificity for certain incentives.

3.5.3. Strengths, Limitations and Future Research

One of the key strengths of the present study is the multi-source methodology. Worker-level data was provided by Culpepper and firm-level data was obtained through key informant surveys administered by the author. The multi-level data provided a particularly rich analysis of the internal workings of each firm. Rather than examining the main effect of firm-specific incentives on the overall firm compensation strategy, these data allowed a more fine grained analysis of wage patterns in firms that rely more on these incentives.

Another key strength was a multi-faceted approach to measuring firm-specific human capital and more direct measure of firm-specific human capital than is often used in the organizational literature. As previously mentioned, scholars have used proxies such as tenure (e.g. Harris and Helfat 1997), on-the-job training (e.g. Ployhart et al. 2011) and patent citations (e.g. Wang et al. 2009) as indicators of firm-specific human capital. The present study directly measures firm-specific human capital by asking how long it takes for workers with substantial industry experience to get up to speed as contributing developers in the current organization. Workers with substantial industry- and profession-specific human capital should be able to quickly adjust in a new firm where firm-specific human capital is not important and/or not existent. The longer the adjustment time, the more firm-specific knowledge and skills that developer must acquire to contribute in the new firm.

An important limitation of the present study is that the data is cross-sectional. Thus, the technical interpretation of the wage-tenure slope models is that the difference in cash compensation for workers with high and low tenure in low firm-specific incentives firms is much greater than the difference in compensation for workers with high and low tenure in high firm-specific incentives firms. A true test of this theory would examine within person wage increases over time to calculate a true within-person wage-tenure trajectory, and use three level modeling approaches (worker years within workers and workers within firms) to explore the effects of firm-specific incentives on these trajectories. This leaves open an important avenue for future research.

Related to the cross sectional data concern, there is a possibility that the observed results are due more to worker sorting into firms that offer desirable incentives rather than the effects of the incentives themselves. In other words, workers may join firms with certain incentive configurations and retention is a result of efficient initial selection rather than the effect of these incentives on worker decisions to stay. There are, however, several reasons this may not be a concern in the present study. First, importance scores are calculated and included in all empirical models, and they neither change the reported outcomes nor are they statistically significant in any models. If worker ex-ante preferences were driving the outcomes we might expect the importance scores to behave similarly to the firm-specific incentives index scores in the models. Additionally, we would expect high correlations between the importance scores and the firm-specific incentives index scores. The data do not support these possibilities.

The wage-tenure slope results also suggest that sorting should not be a problem for interpreting these results. Specifically, workers may sort based on firm-specific

incentives, but initial sorting should not necessarily predict variation in subsequent firm-level wage-tenure slopes. In other words, sorting may explain any observed main effects in the multi-level models, but cannot directly account for variation in wage-tenure slopes over time.

The dependent variables in the present study are also limited to proximal outcomes rather than overall measures of firm performance. There may be strong support for the claims that firm-specific incentives correlates with turnover and wage-tenure slopes, but do these proximal outcomes really lead to sustained performance heterogeneity in the market? Another fruitful avenue for future research would be to explicitly connect firm-specific incentives to outcomes practically closer to common measures of sustained organizational performance.

The firm-specific incentives measure is also new and may require additional validation. Some concerns with the measure include the embedded empirical assumption that all measured incentives deserve the same weight in the index construction. Should the score for salary be averaged in with equal weight as the score for fun at work? Do these factors really carry the same weight? The present study partially addresses this concern empirically by measuring the importance of each incentive for retaining talented workers and then using these scores to weight the firm-specific incentives score when constructing the index. The results using these measures did not substantively change the results, but it is not clear that these importance weightings fully address the concern with equal weight being given to all incentives. Future work may continue to develop the firm-specific incentives measure and develop more sophisticated ways to weight the various factors considered in the index.

There are also reasonable concerns with the key informant methodology used for the present study. One might reasonably question whether a single key informant can provide adequate assessments of the extent to which software development professionals can find certain incentives outside of their focal firms. Future research may seek to use multiple key informants or to verify key informant responses using employee level survey data.

3.5.4. Conclusion

The present paper argues that firm-specific incentives may enhance competitive advantage, and shows that firms that offer more incentives that are highly firm-specific also have lower voluntary turnover rates and lower wage-tenure slopes. These results suggest that firm-specific incentives may provide an explanation for how some firms can realize human capital based competitive advantages regardless of the firm-specific human capital of workers in the firm. In other words, firm-specific incentives may help firms retain talented workers because the workers prefer their incentive bundles, not because workers have limited applicability of certain skills as in the firm-specific human capital story.

4. DO SMALL FIRMS HAVE ADVANTAGES OFFERING FIRM-SPECIFIC INCENTIVES?

4.1. Small Firm Advantages through Firm-Specific Incentives

Human capital challenges strike at the heart of entrepreneurship research because the relative impact of any individual is much greater in small firms (Baron, Hannan, and M. Burton 2001; Cardon and Stevens 2004). Managing these challenges is especially difficult for smaller firms given their resource restrictions (Stinchcombe 1965) - they cannot afford the same financial incentives as their more resource rich competitors and generally offer lower wages, benefits and job security (Brown, Hamilton, and Medoff 1990; Stinchcombe 1965). These less attractive incentive offerings likely exacerbate human capital challenges in small firms. Thus, we should expect small firms to have distinct human capital disadvantages – an expectation consistent with Stinchcombe's "liability of newness."

But smaller firms may be better positioned to realize human capital based advantages by offering worker incentives that are inherently "firm-specific" – i.e. more valuable to workers in their focal firms than similar incentives elsewhere. While others have suggested that small firms may have monitoring advantages allowing them to offer superior pay-for-performance (Rasmusen and Zenger 1990:e.g. ; Zenger 1994; Zenger and Lazzarini 2004), this prior research focuses on the firm's superior ability to offer an incentive that is generally valued by workers across contexts. In contrast, the present research explores firm-level variance in offering incentives that are differentially valued by workers across contexts. If, as Kryscynski (2011b) argues, these incentives are

inherently difficult for competitors to imitate and can be offered to workers at economic discounts, then smaller firms may be better positioned to create and sustain human capital based competitive advantages (Chadwick and Dabu 2009; Coff 1997).

The primary argument presented here is that smaller firms have advantages offering firm-specific incentives for at least two reasons. First, managers in small firms have access to superior information about worker preferences, allowing them to customize work arrangements and incentives to these preferences (Rousseau 2005; Rousseau et al. 2006). These customized work arrangements may be highly firm-specific because other firms are less likely to offer such customization ex-ante (Rousseau et al. 2006). Second, small firms offer more intangible incentives such as confidence in company leadership, greater ability to impact company and societal outcomes, intrinsic rewards and positive workplace cultures (Cardon and Stevens 2004). These incentives likely reside in socially complex phenomena that are subject to path dependencies (Dierickx and Cool 1989) and causal ambiguity (King 2007; Reed and DeFillippi 1990) making them very difficult for competitors to imitate (Barney 1986; 1991) and, therefore, highly firm-specific.

This paper proceeds as follows. The first section more fully introduces the firm-specific incentives construct and demonstrates its importance for the strategy literature. The second section reviews extant theory connecting firm size and incentives and then develops the main argument that smaller firms have advantages offering firm-specific incentives. The methods section then presents empirical support for the main hypothesis in a sample of firms in the software and related industries. The final section discusses implications for theory and future research.

4.2. Why Firm-Specific Incentives Matter

In order to understand how small firms might have advantages offering firm-specific incentives, it is important to understand what constitutes such incentives and why firm size matters in the development of incentive systems. While organizational scholars often focus on incentives that are pecuniary in nature and high powered, incentives need not be limited to such narrow assumptions. A more general definition treats incentives as factors that incite or tend to incite people to desired actions (www.dictionary.com; www.merriam-webster.com) – e.g. joining the firm, increasing commitment to the firm, and/or exerting greater effort at work. These factors may be monetary in nature, but may also be intangible (Clark and J. Wilson 1961), intrinsic (Benabou and Tirole 2003; Osterloh and Frey 2000), and/or social (Sauermann and Cohen 2008). Incentives affect worker actions because they have some positive utility for those workers, and workers tend to behave in utility maximizing ways. Receipt of these incentives may be contingent upon specific actions, such as rewards for sales or production results, or contingent simply upon organizational membership, such as worker health benefits available to all full time employees. Some incentives may be excludable and offered only to a few workers, such as raises, bonuses or premium office spaces, while other incentives may be non-excludable and readily available to all workers, such as the positive reputation of the firm, the natural beauty surrounding the work complex, or the proximity of the office to desirable local attractions. A broader conceptualization of incentives allows us to theoretically account for the many factors that have positive utility for workers and that motivate those workers to desired actions. Thus, rewards (Kerr 1975; 1999), benefits, inducements (Barnard 1938; Coyle-Shapiro and Conway 2005), high-powered incentives

(Lazear 2000; O. Williamson 1985) and compensation (Gerhart and Rynes 2003) are all specialized forms of incentives.

Firm-specific incentives are *incentives that are more valuable to workers in the focal firm than similar incentives at worker's second best options.* Firm-specificity is ultimately a continuum with ends anchored by purely firm-specific and purely general incentives. Purely firm-specific incentives are only valuable to workers in the focal firm and are essentially unavailable at other firms. Purely general incentives are equally valuable and readily available to workers across firms. An example of a highly firm-specific incentive is the natural beauty available to professors at the University of Hawaii. This beauty can be valuable to professors, relatively low cost for the university to provide, and nearly impossible for competing universities to replicate. An example of a highly general incentive is a monetary base wage. Money is valuable to workers, but is costly to provide and easy for competitors to replicate.

While many incentive categorizations exist in the organizational literature, such as extrinsic and intrinsic (Deci et al. 1999; Gottschalg and Zollo 2007), social and non-social (Sauermann and Cohen 2008), pecuniary and non-pecuniary (Akerlof and Kranton 2000; 2005; Fehr and Falk 2002), powerful and weak, and so forth, these categorizations are used primarily to describe individual level motivations and outcomes independent of labor market conditions. In other words, scholars utilizing these categorizations tend to focus on how the levels of these incentives affect individual level outcomes – e.g. as non-pecuniary incentives increase, worker creative effort increases (Sauermann and Cohen 2008). When our focus shifts to firm-level heterogeneity in worker outcomes rather than individual level heterogeneity, our treatment of incentives may also need to shift.

Specifically, explaining firm-level heterogeneity in worker quit rates may be better explained by relative rather than absolute incentive levels – i.e. workers should care more about the total utility available at their next best option in comparison to their current situation, rather than the absolute level of their current total utility (Rosen 1986).

These incentives may be particularly relevant for studying human capital based competitive advantages because workers tend to join and stay at firms where they derive the greatest utility (Rosen 1986; Shaw et al. 1998). Additionally, workers tend to exert greater effort in firms that offer the greatest utility (Akerlof 1984; Weiss 1990). Since firm-specific incentives are inherently more valuable to workers in the focal firm than similar incentives elsewhere, firms that offer more incentives that are highly firm-specific will be better positioned to retain and motivate their talented workers, controlling for worker utility from other incentive offerings (Kryscynski 2011b). If small firms are better able than their larger competitors to offer these incentives, then they should be better positioned to realize these motivation and retention advantages.

4.3. Small Firms Have Advantages Offering FSI

To clarify the importance of firm size in facilitating firm-specific incentives, it is first valuable to show how extant research exploring incentive differences by firm size fails to capture the firm-specificity dimension. Despite the broad conceptualization of incentives described previously, much of the empirical work exploring incentive differences by firm size focuses on incentives that are relatively easy to observe and quantify across firms. For example, Brown, Hamilton and Medoff (1990) show a persistent and, as they put it, unsettling wage differential between large and small firms even when controlling for job type, measurable working conditions, union status, training and so forth. Not only do

they find that large firms offer higher wages, but they also offer greater job security, better fringe benefits and greater career opportunities – i.e. superior incentives across the board. These firms simply have greater resources, greater slack and greater abilities to offer value to workers. If we assume that these relatively easy to observe and quantify incentives are the most important incentives to workers in the labor market, then we should generally expect large firms to have incentive advantages that lead to attracting, retaining and motivating talented employees.

Zenger's (1992; 1994) study of engineers who left two large technology companies still focuses on incentives that are relatively easy to observe and quantify, but offers a contrasting perspective on the effects of size. Specifically, he demonstrates that knowledge workers who leave large firms for small firms receive wage premiums. Smaller firms are better able to monitor workers and, as a consequence, are better able to offer pay commensurate with worker quality and performance – i.e. they are better able to offer high powered performance incentives. These incentives are more attractive to high quality workers because they also have greater confidence in their own abilities, and performance based systems tend to engender higher levels of effort and motivation.

But empirically exploring a broader range of incentives may reveal further human capital advantages that can accrue to smaller firms. Specifically, folk lore suggests that small firms may have advantages in offering certain intangible incentives. For example, Brown et al. (1990) quote Greene (1986: 156):

> Why does working for a smallish company turn people…on? Because of things that working for a big company can rarely offer: the proximity and guidance of an owner-founder, the potential for fast movement if the firm grows quickly, opportunities for a substantial equity interest somewhere down the line, and the ability to get involved in everything the company does.

Additional anecdotal evidence also comes from a recent story in The New York Times describing how Pandora, an internet radio station, stayed afloat. The article describes how Tim Westergren kept the company going even when he ran out of money: "By the end of 2001, he had 50 employees and no money. Every two weeks, he held all-hands meetings to beg people to work, unpaid, for another two weeks. That went on for two years." (Miller 2010) There was something about this small company that kept employees coming back to work, even when they weren't getting paid.

It is important to note that the incentives that kept employees coming back to Pandora every day can certainly not be characterized as "high-powered" in the traditional sense because they are not tied to specific performance or behaviors. In fact, the link between these incentives and performance may be unusually weak in this example. Nonetheless, these relatively weak incentives still have profound effects on sustained employee behaviors.

The important point in the Pandora example above is that there was something firm-specific about working for the company that kept workers coming back, despite the likelihood that these workers could have found other paying jobs at different firms of any size. While it seems obvious that there were some intangible incentives that these employees valued, simply categorizing them as intangible is not sufficient to explain the lack of employee mobility because intangible incentives may be available at many firms in the labor market. Specifically, there must have been something about these incentives that employees could not find outside of the focal firm – i.e. these incentives were highly firm specific.

As we shall see in the following sections, smaller firms should have distinct advantages offering firm-specific incentives for at least two reasons. First, these smaller firms are better able to customize incentive bundles for workers. Second, smaller firms are better positioned to offer intangible incentives that are particularly difficult to imitate and replicate.

4.3.1. Firm Size and Incentive Flexibility

The first reason small firms should have advantages offering firm-specific incentives is that they have greater flexibility in creating and maintaining idiosyncratic employment relationships, including customized incentive bundles (Rousseau et al. 2006; Zenger 1992; 1994). High level decision makers work more directly with employees and are better positioned to adjust bundles based on employee preferences. An example comes from a recent interview[16] with the COO of a small software firm. He describes an instance where a valuable employee received an offer from a competitor:

> We came to realize that he really wanted to live in a different city and that this new job offered him a chance to move. So, I went to the owner of the company and said that he was valuable and that we should try to keep him…let's say he was making $[XX] working for us here. We offered to pay for him to move to that city and work for us from there. In addition, we increased his salary to $[2.5 times XX]. The money was nice, but what really won him over was that we were willing to move him where he wanted to live. Now he is one of the most fiercely loyal employees we have and his performance went up after the move.

This story illustrates several differences between large and small firms that may facilitate higher flexibility. First, there were no bureaucratic layers between the COO and the employee in this 25 person company – i.e. less bureaucratic constraints (Graham,

[16] Qualitative interviews were conducted for measure development with executives in high technology companies.

Murray, and Amuso 2002). When the employee had another offer he was able to go directly to one of the main decision makers to discuss possibilities. The COO was able to determine exactly what was most important to the employee about the other offer. He was then able to use his influence with the owner to find a solution that met the most important needs of the employee while also giving him a higher salary. As organizations grow in size, the administrative distance between key decision makers and valued employees makes it more difficult to ascertain which aspects of the job are most valuable to the employee and what factors need to be adjusted to retain the most valuable employees.

Also important in this example is the knowledge the COO had about the quality of the employee. As Rasmusen and Zenger (1990) point out, as organization size increases the decision makers have less ability to gauge the quality of employees – it is more difficult to determine which employees are truly worth keeping. Thus, in addition to having greater ability to customize incentive bundles, these smaller firms are better able to identify when it is most appropriate to do so – small firms may be better able to offer flexible bundles when it matters most (Zenger 1992; Zenger and Lazzarini 2004).

Additionally, the costs of customization increase as size increases and standardization within job roles increases (Miner 1987). One of the advantages of increasing organizational size is the potential economies of scale associated with standardization. These economies of scale are clear in instances such as health insurance benefits where firms get volume discounts from insurance providers as their size increases. In other words, the more employees a firm has, the cheaper it is to offer health insurance to each employee. Also, the firm can centralize management and administration of the benefits

program making it relatively inexpensive to service internally. We can apply similar logic to other incentives that employers offer to employees – as the number of employees that qualify for a particular incentive increases, the firm's ability to leverage economies of scale in administering that incentive increases. When large firms offer customized incentive bundles they lose the scale economies associated with standardization. In other words, they sacrifice the scale benefits of size when they choose to customize and may face higher, rather than lower comparable costs as a result.

There are also employee satisfaction risks of bundle customization in large firms. Specifically, while customized incentive bundles are often seen as fair and equitable both by the receiving employee and the firm, other employees may perceive them to be unfair (Rousseau et al. 2006). In most cases only the employee and the employer are privy to the details of the customized arrangement. In the absence of public knowledge about the contract terms, other employees may see the arrangement as unfair or preferred treatment to the employee. As is well established in the justice literature, perceptions of inequity can lead to employee anger, withdrawal and/or retaliation (Colquitt and Greenberg 2003; Greenberg 1990).

Employee perceptions of inequity are less problematic in small firms because fewer employees have identical jobs. When each employee has idiosyncratic job characteristics and responsibilities it is easier to justify idiosyncratic incentive bundles for each individual. Employees are less likely to be concerned with incentive bundle differences when it is clear that contributions are different. In contrast, when firms have multiple employees with comparable jobs, differences in incentive bundles may be highly salient while differences in contributions are harder to observe. These differences may lead to

perceptions of inequity and subsequent negative employee outcomes. As firm size increases, the number of employees in comparable jobs increases and, accordingly, the risks of employee perceptions of inequity over bundle customization increases. These risks may make it much harder for larger firms to offer these customized incentive bundles.

Flexible incentive bundles are arrangements that are idiosyncratically negotiated between a worker and employer (Rousseau 2005; Rousseau et al. 2006). Since these customized arrangements are the result of bargaining between individual employees and their employers, Rousseau et al. (2006) suggest several antecedents to their occurrence. Employers are more likely to create customized bundles when their existing incentive systems are inadequate and when they face "hot" labor markets. Workers are more likely to request customized arrangements when they believe they are sufficiently valuable to warrant such customization.

As Rousseau et al. (2006) point out, the use of these customized arrangements is a strategic response to human capital needs in the organization. In order to be more competitive for individual knowledge workers, managers find ways to offer incentives that are uniquely valuable to those workers. This level of strategic customization challenges conventional models for labor market sorting where firms offer static incentive bundles and employees sort into jobs based on their preferences for those incentives (Rosen 1986). In the traditional model, the employee is forced to make tradeoffs because one firm may offer more of one valuable incentive while another firm offers more of another valued incentive. In the traditional model, these firms may offer identical total utility to the employee, but they do so through different combinations of

valued incentives. Presumably, some of the incentives offered by each firm are less important to the employee – these are provided inefficiently to the employee in the traditional models. If we relax the static incentive bundle assumption, however, then either firm can potentially eliminate incentives that are not valued by the employee and increase the incentives that are preferred. By so doing, the firm can increase the overall utility offered to the employee without necessarily increasing the cost of the incentive bundles.

These customized arrangements are important for firm-specificity for several reasons. First, since the arrangement seeks to maximize employee utility subject to some practical constraints, the likelihood that the employee can replace the utility by moving decreases – the higher the individual's total utility, the lower the probability of finding another arrangement that provides equal or higher utility. This effect is compounded by the Rousseau et al. (2006) proposition that ex-ante customized bundles are less common than those negotiated ex-post. Once knowledge workers and employers have sufficient information about each other, both parties can feel confident that a customized bundle will be mutually beneficial. If firms are reluctant to offer customized bundles in ex-ante negotiations, then workers with current customized bundles will have to accept standard bundles if they choose to move. Additionally, even if firms are willing to customize incentive bundles ex-ante, they may not have the necessary information about worker preferences to customize efficiently. Assuming some components of these standard bundles are offered inefficiently to the workers, then standard bundles offer lower utility than customized bundles, controlling for the cost of the bundles. In other words, customized bundles represent value to workers that is highly firm-specific.

Second, the employer's willingness to customize a bundle is, in and of itself, a valuable incentive to employees. This willingness signals to workers that they are individually valued by their employers and that their contributions are appreciated enough to warrant customization. The incentive value of this kind of recognition may be quite substantial for knowledge workers. Indeed, Hornung, Rousseau and Glaser (2008) find that certain kinds of customized bundles lead to higher employee affective commitment to the organization. This form of recognition may lead employees to perceive that they are uniquely valued in their current work contexts. Given the difficulty of evaluating the extent to which future employers will value contributions, employees are more likely to believe this form of recognition is, in and of itself, a scarce incentive. Thus, the utility maximization of the bundle combined with the recognition value of customizing a bundle should increase the likelihood that customized incentive bundles will be highly firm-specific. Thus, firms that are better able to offer customized bundles should be better positioned to offer firm-specific incentives and, therefore, better able to realize competitive advantages.

4.3.2. Firm Size and Intangible Incentives

The second reason small firms should have advantages offering firm-specific incentives is that they have advantages in offering socially complex intangible incentives that may be subject to path dependencies (Dierickx and Cool 1989) and/or causal ambiguity (King 2007; Reed and DeFillippi 1990). For example, small firms should have advantages in job design due to the interaction between closeness to leadership and inherent job characteristics. As mentioned before, the close proximity to key decision makers increases the detailed knowledge managers have about knowledge worker skills

and preferences (Rasmusen and Zenger 1990; Rousseau 2005; Rousseau et al. 2006). This knowledge increases the likelihood that managers in small firms will assign knowledge workers to the "right" job tasks – i.e. those over which the knowledge worker has particular skills, expertise and interest. When these tasks are also challenging, these highly customized assignments should result in increased employee interest, excitement, and feelings of competence (Hackman and Oldham 1974; 1980). In other words, highly customized work assignments should lead to job characteristics that are particularly pleasing to the individual – i.e. the job tasks provide intrinsic incentives. Small firms also generally have less bureaucracy leading to higher employee autonomy at work (Graham et al. 2002), further enhancing worker intrinsic rewards (Deci, Connell, and Ryan 1989).

The right job fit may be very important to workers, but may be very difficult for competitors to imitate because it takes time for the employer and worker to learn about each other and develop the right fit. The relationship between the worker and managers leading to such a fit can be highly socially complex, and the time it takes to develop such mutual knowledge represents path dependent mutual investments. Thus, fit with job tasks may be a valuable but highly firm-specific form of utility because achieving high fit may take time and experience to recreate in a new firm.

Small size also enhances worker sense of impact on firm level outcomes (Heneman, Tansky, and Camp 2000). The smaller the firm, the more substantial the impact of any individual worker's actions (Baron et al. 2001). While the connection between effort and outcomes may be similar in many small firms, the value from this potential impact may be particularly valuable when tied to other organizational attributes that may be highly

unique. A small firm like Pandora Radio may have an organizational mission that is particularly valuable to workers, and the ability to directly impact the realization of that specific mission may provide a highly firm-specific incentive to workers. Thus, the greater ability to impact outcomes in smaller firms may represent highly firm-specific incentives when embedded in the larger context of the organizational mission, vision and goals.

Additionally, greater proximity to key decision makers may enhance worker confidence in company leadership (Henderson et al. 2009). Greater distance between workers and key decision makers may enhance ambiguity around why organizational decisions are made, and the underlying challenges faced by the organization as a whole. Workers in large firms are often left "in the dark" and may lose confidence in leaders when they observe decisions but lack full information. The greater proximity to leaders in small firms should minimize the ambiguity because workers work more with the key decision makers and have more opportunities to see and understand the "big picture" surrounding key decisions. Their greater perspective may help them feel more connected to the organization, but also may help them feel more confident in the decisions made by key decision makers. This confidence, like the incentives previously discussed, is embedded in the complex social fabric of the organization and may take time to develop after the worker joins the firm. Thus, this value may be impossible for competitors to imitate or replicate.

Workers in small firms should also have higher cohesiveness and better work relationships due to the interaction between small size and goal attainment. One of the most accepted relationships in social psychology is that a common goal results in higher

group cohesiveness (Tajfel 1982). In small firms, knowledge workers can see a more direct link between their individual efforts and organizational outcomes (Heneman et al. 2000). A stronger direct link between individual effort and the ultimate organizational goal makes the goal seem more attainable to knowledge workers, which in turn should enhance motivation towards that goal (Locke and Latham 1990). Higher ability to influence the group goal should also make this goal more salient to organizational members. Additionally, competition in the marketplace can also enhance goal salience and cohesiveness, especially when the firm has lower status (Tajfel 1982). Given generally low status of small firms (I. Williamson, Cable, and Aldrich 2002), competition with large competitors may further enhance goal salience and higher group cohesiveness. Again, these relational aspects of workplace culture may be very difficult for competitors to imitate and replicate (Barney 1986).

Large firms may also have advantages in offering some intangible incentives such as positive firm reputations, job security, and career advancement opportunities (Brown et al. 1990). In contrast to the intangible incentives available in small firms that generally focus on intangible value for employees in the "here and now," these intangible incentives generally focus on the future benefits available to employees – i.e. rewards associated with prospects for future jobs. Specifically, reputations, job security and career advancement opportunities are highly valued by risk averse employees because they signal continued employment over time. In other words, these incentives provide assurance of continued employment into the future rather than specific value now.

While also intangible, and potentially difficult for competitors to imitate or replicate, these job future based incentives are different from the intangible incentives offered by

small firms because there are more reliable external signals to help employees observe and evaluate them. For example, it may be very difficult for workers to evaluate the potential work relationships at a future employer, but it may be quite easy to compare advancement opportunities, job security and likelihood of firm survival at a large international corporation to a small Silicon Valley start up. It also may be quite easy to compare these attributes across large firms given substantial public information about reputations, employment practices, firm operations and so forth. While a specific reputation may be scarce and valuable to employees, there is likely little uncertainty about that reputation in the labor market. Accordingly, competitors may have to directly compensate with wages or, similarly, employees at positive reputation firms may accept wage discounts (Cable and Turban 2003; Turban and Cable 2003). Even though some specific reputations are impossible to replicate and are, by definition, firm-specific, they may be more easily substitutable because they have such clear external signals.

In summary, small firms should have advantages offering incentives that are highly firm-specific because of their decreased bureaucratic constraints and the greater proximity between workers and key decision makers. These attributes of smallness enhance these firms' abilities to customize work arrangements and offer certain intangible incentives that are difficult for competitors to imitate or replicate. While large firms may also have advantages offering some intangible incentives, these incentives may be more easily substitutable due to the ease with which workers, prospective workers and competitors can observe and evaluate these incentives. Thus, we should expect small firms to offer more incentives that are highly firm specific. Stated formally:

Hypothesis: Firms with fewer employees will offer more incentives that are highly firm-specific.

4.4. Methods

The research sample consists of 2874 U.S.-based firms in the software and related industries. These firms are drawn from three sources: (1) participants in the Culpepper and Associates (hereafter Culpepper) yearly compensation surveys, (2) software firms listed in the Hoovers Online industrial database and (3) software firms listed in the Esalesdata.com marketing database. The study focuses on software development professionals in these firms because HR practices and incentives likely vary by occupational group (Lepak and Snell 1999) and software development professionals are "core" employees for these firms (Arthur 1992; Delery and Doty 1996), are critical for a firm's competitive performance and likely occupy similar levels of strategic importance across firms in the sample[17]. The data collection reported here is part of a larger study that included both key informant and software developer surveys – the research design focused on achieving research depth through developer surveys rather than additional key informant surveys.

Data reported here rely primarily on single key informants from each participating firm. While single key informant approaches have important limitations (Gerhart, Wright, McMahan, et al. 2000), several aspects of the present study may mitigate these concerns. First, by focusing on a relatively narrow job classification, the survey avoids concerns about different incentive regimes for different workers within the same firm. Second, the focus on software development professionals limited the number of workers

[17] The importance of developers was verified through in depth interviews with executives and developers at a subset of these firms.

considered in each firm, increasing the probability of obtaining accurate results from a single key informant. Specifically, the median number of developers in the sample was 25 with over 89 percent of firms having fewer than 100 developers.

There were 778 firms drawn from the Culpepper surveys sample, and these firms were recruited through phone and internet contact. To identify the ideal key informants for the survey, a member of the study team conducted phone interviews with contacts at each company to identify the highest ranking individual who was knowledgeable about perks, benefits and incentives for software developers and who could also answer high level questions about company performance. In many cases this individual was the highest ranking human resources professional in the firm, but for many small firms without a formal HR function the key informant was a high level manager such as a Chief Technology Officer (CTO), Chief Operating Officer (COO), President, or Chief Executive Officer (CEO). To develop and pre-test the survey used in the present study the author visited ten software development companies and interviewed executives, HR managers and developers. Additionally, two rounds of pilot surveys were administered to executive MBA students at a private southeastern university (first pilot n = 36, second pilot n = 52) to validate measure face validity and clarity. Survey responses were also validated using external data sources including company websites, Lexis-Nexis legal archives, Hoovers Online data listings and company profile data from Culpepper. The data obtained from the key informant surveys were consistent with data available from these other data sources.

The research team administered the key informant surveys using a slightly modified version of the procedure described by Gupta, Shaw and Delery (2000) and used by these

authors in several studies (e.g. Shaw et al. 2002; Shaw, Gupta, et al. 2005; Shaw et al. 1998). First, a member of the research team called the Culpepper provided company contact and identified the ideal key informant in the organization. Second, a personalized announcement letter was sent to the key informant at each company specifying the purpose of the study and the potential benefits of participation. Third, a member of the research team called the key informant to announce survey distribution, answer questions and encourage participation. Fourth, surveys were sent electronically. Fifth, email reminders were sent one week after survey distribution. Sixth, a member of the study team called non-respondents again to remind them of the study. Seventh, a paper letter and final email reminder were sent. Of the 778 companies in the original sample, 164 submitted electronic key informant surveys for an overall response rate of 21.1 percent. A logit model with a dummy for response as the dependent variable revealed no response bias in the sample based on observable variables.

The remaining 2096 firms were drawn from two industrial lists. Hoovers Online is a Dun and Bradstreet company that provides proprietary business data and is biased towards large and publicly traded firms. ESalesdata.com compiles contact lists for professionals in a broad array of industries for the purpose of targeted sales and marketing campaigns and is biased towards small and privately held firms. The data collection methodology for these additional firms was similar to the methodology described above, but only electronic recruitment was used in place of phone calls to identify and recruit key informants. The key informant surveys were identical to those used in the Culpepper sample for the key variables of the study. Of the original 2096 companies in the sample, 189 submitted electronic key informant surveys for an overall

response rate of 9.0 percent[18]. A logit model with a dummy for response as the dependent variable revealed no response bias in the sample based on observable variables.

Responses from the two sources were combined and observations with missing data were dropped for an overall usable sample of 271 software firms[19]. A logit model with sample source as the dependent variable was estimated and revealed that firms from the Culpepper sample have more employees, on average, than firms from the Hoovers and Esalesdata.com sample[20] but no other differences across samples were observed.

4.4.1. Measures

Dependent Variables - The primary dependent variable was the firm-specificity of incentives offered to developers at the focal firm. Constructing a measure of the firm-specificity of a firm's incentives required a representative list of developer incentives. An ideal list of incentives would be (1) relevant for and important to software developers, (2) reflective of the total value developers receive at work rather than just wages and traditional benefits and (3) short enough to be manageable in electronic surveys. This list was developed by iterating between interviews with software company executives and developers, academic research and practitioner research. The inducements measures commonly used in psychological contracts research (e.g. Coyle-Shapiro and Conway

[18] Response rate is likely much lower in this sample for at least two reasons. First, the formal relationship between Culpepper and Culpepper participants likely enhanced willingness to participate. Second, the phone based recruiting in the Culpepper sample likely enhanced participation rates.

[19] For robustness, measures were obtained for missing variables from websites and/or company profile data in Lexis-Nexis archives. When data could not be obtained through secondary sources missing values were imputed using median substitution. Missing SIC codes and uncertain ownership were not imputed. These efforts yielded a usable sample of 323 firms. Results from this sample were substantively identical to findings reported below.

[20] Since size is the key independent variable in the present study, subsample analysis was performed to verify results. There were no substantive differences in findings between subsample analyses and the overall sample analysis.

2005) provided an ideal initial list because of the broad scope of incentives studied. The psychological contracts measures attempts to synthesize decades of organizational behavior research to focus on a subset of incentives that, together, are highly important for employee decisions to join, stay and exert effort.

One important weakness of the psychological contracts items, however, is that they focus almost entirely on incentives over which the firm can easily tailor for each employee. This focus ignores aspects of the firm or work environment that may be harder to manipulate but still be highly motivating for employees. Since the present study focuses on the strategic relevance of the overall value employees derive from their work, several additional factors were added that are relatively weak incentives that cannot be directly tied to daily performance but are likely to motivate workers nonetheless. Some examples of these incentives included interpersonal work relationships, company reputation and the ability of the worker to make an impact. Additionally, several items on the psychological contracts scale were less relevant for software developers based on field interviews, so these items were eliminated from the list. It is also important to note that some firms may have highly unique incentives that are important to software developers but that are not captured by the list. Therefore, 10 blank spaces were provided for participants to fill in additional incentives that are important in their firms.

The responses recorded in the blank spaces were analyzed by the author and a research assistant to develop emergent categories not represented in the list mentioned above. The author and research assistant categorized all incentives from these blank spaces into one of the 16 new categories, or into one of the 18 categories on the original

list. Any ambiguous responses were omitted from analysis, and any discrepancies between the author and research assistant were discussed to achieve consensus. The full list of both original and emergent items is shown in appendix 1.

Not all incentives on the list are highly firm-specific, however. Some firms may be able to replicate certain incentives simply if they are willing and/or able to pay more – e.g. salary, cash bonuses, health benefits, etc. Other incentives are more firm-specific and could not be replicated even if rivals were willing to incur higher costs to create them. Thus, the incentives used for the firm-specific incentives index excluded financial incentives or benefits that could be imitated if rivals had the resources to do so. Hard to imitate incentives were identified through two complementary approaches. First, 13 experts rated each incentive on how difficult it might be for workers to observe the incentive at a rival firm, how difficult it may be to compare the value of the incentive across firms and the extent to which the incentive is likely to increase in value over time. Incentives that were difficult to observe and/or compare and that tend to increase in value over time were categorized as firm-specific. Second, study participants were asked to explain why they rated certain incentives as being very difficult for developers to find outside of the focal firm. Incentives that were hard to find elsewhere due to superior financial resources (e.g. higher salaries because of greater ability-to-pay) were not included, but incentives that were hard to find elsewhere due to social, cultural, routine or visibility based reasons were included in the firm-specific incentives index[21].

For each incentive on the list, participants responded to the following question: "How difficult/easy is it for software development professionals to find better options outside of [COMPAY NAME] for each of the following factors?" Responses were coded on a five

[21] More detailed results for these complementary approaches to categorization are available upon request.

point Likert type scale anchored by "very easy" and "very difficult." The firm-specificity of incentives index was then constructed by averaging the difficulty score for each of the incentives categorized as difficult to replicate – a simple mean. Firms with higher scores offer more incentives that are very difficult for workers to find elsewhere, and that may be difficult for competitors to replicate[22].

Independent Variables – The key independent variable was firm size, measured as the natural logarithm of the total number of employees in the firm.

Control Variables – Since firm size is the key independent variable, it is important to address the multiple underlying mechanisms for which firm size may be a very rough proxy. The logic presented in the present paper suggests that smaller firms are better able to offer firm-specific incentives because of their reduced bureaucratic constraints and the greater proximity between key decision makers and workers. Firm size may proxy for other factors as well, and these are addressed, where possible, through control variables. The first control variable was industry, measured using the four-digit SIC code. Some industry segments may have natural limits on firm size due to the nature of competition on that segment, and some segments may have different norms and standards for worker incentives. This variable was introduced as a set of dummy variables – one for each four-digit SIC code.

Percentage employee ownership measured the percentage of company ownership held by current employees of the company. Conventional approaches to the employment

[22] Given the newness of this construct, several other index measures were constructed and tested for robustness checks. These alternative index measures include weighting the difficulty score by a key informant rating of importance for each incentive and using an importance cutoff score to determine which incentives are included in the index measure. The substantive results are unchanged using these alternative measures. Results are reported based on the simplest of the constructions – i.e. a simple mean score. Detailed descriptions of alternative index measures are provided in appendix 2.

relationship assume that workers act as agents of the owners. But, as more workers also hold ownership stakes, the lines between owner and agent become less clearly drawn. Workers who are also owners may be indifferent between extracting rents from cash payouts as stockholders and extracting rents in terms of perks and benefits that ultimately show up as business costs. In some cases, these workers may prefer to appropriate rents through non-taxable and non-pecuniary benefits that show up as operational costs. For example, SAS institute's investments in onsite sports leagues are valuable to workers, an operational cost to the firm and non-taxable as income for the individual employees. The percentage of employee ownership may also influence firm size because these firms may have objectives other than pure revenue growth. Such firms may prefer to stay small and profitable rather than risk the pains of growth. Since small firms are more likely to be owned by employees, and more likely to have higher proportions of ownership held by employees, this control ensures that size is not simply a proxy for the percentage ownership held by workers.

Private was introduced as a dummy variable indicating whether the firm is privately held (dummy = 1) or publicly traded (dummy = 0). Private firms tend to be smaller than publicly traded companies and private firms may not face the same pressure to maximize value for stockholders. These firms may choose to share more rents with workers both through higher cash payouts but also through greater investment in non-monetary incentives. This control ensures that size does not proxy for ownership type in these models.

Firm age was measured as the natural logarithm of the number of years since company founding. Firms are more likely to grow with time, and may establish cultures,

reputations and routines over time that may be very difficult for competitors to imitate or replicate. Older firms may be larger and may also be more likely to exhibit firm-specific characteristics that are also valuable to workers. Controlling for firm age assures that size is not simply a proxy for newness in the sample.

Labor Productivity was measured as the natural logarithm of the ratio of revenues per worker. Labor productivity may indicate a firm's ability-to-pay, and firms with greater ability-to-pay may simply pay higher wages and/or invest in more non-monetary perks and benefits for workers because they can afford to (Blanchflower et al. 1996; Hildreth and Oswald 1997). More productive firms are also more likely to grow. Thus, higher labor productivity could potentially affect both firm size and incentive offerings.

4.4.2. Model Specification

The key dependent variable was approximately normally distributed in the sample, so ordinary least squares was utilized to estimate a model based on the following specification:

$$FSI = \alpha + \beta 1 industry + \beta 2 pct.ownership + \beta 3 Private + \beta 4 ln(age) + \beta 5 labor.prod + \beta 6 ln\,(employees) + \varepsilon$$

Where FSI is the firm-specific incentives index score, industry represents the set of industry dummies (shown as a single variable for convenience), pct.ownership is the percentage of company ownership held by employees, private is the dummy coded one if the company is private, age is the number of years since founding, labor.prod is the labor productivity as revenues per worker, and size is the natural logarithm of the size of the firm.

4.5. Results

Table 4.1 provides the means, standard deviations and correlations of the variables.

[INSERT TABLE 4.1 ABOUT HERE]

Three equations were estimated with firm-specific incentives as the dependent variable and results are shown in table 4.2. The first model included only the firm-size measure to address concerns with over fitting. The coefficient on firm size was negative and moderately significant (-0.027, p = 0.099) suggesting that any findings are likely robust to over fitting concerns. The second model only included controls. The coefficient on percent employee ownership was positive and significant, the coefficient on the private firm dummy was negative and significant and the overall effect of the industry dummies was statistically significant. These results suggest that firms with larger proportions of employee ownership and publicly traded firms offer more incentives that are highly firm-specific. The third model added the firm size variable and, as expected, the coefficient was negative and significant (-0.054, p = 0.008). The substantive effect of this finding is that a one standard deviation decrease in firm size correlates to a 0.64 standard deviation increase in associated firm-specific incentives index score. These results provide support for the main hypothesis that smaller firms offer more incentives that are highly firm-specific.

[INSERT TABLE 4.2 ABOUT HERE]

4.5.1. Robustness checks

While the main confounding variables are included in the model specification reported above, several other controls may also affect the observed relationships and are added to the model as robustness checks. These additional controls include: the intensity

of competition in the labor market, firm-level reliance on firm-specific human capital, the extent to which software development activities can be outsourced without threatening core business performance, the level of criticality of software development professionals to the business, the percentage of total employees that are developers, the extent to which the firm has legal restrictions (e.g. non-compete agreements) in place to restrict developer mobility, the extent to which the firm has material loss restrictions in place (e.g. vesting restrictions on monetary benefits) to prevent developer mobility, the extent to which the firm offers financial incentives and traditional benefits, the target compensation levels for developers relative to market levels, the percentage of developer cash compensation due to base salary, the firm financial compensation strategy, the life stage of the firm, the percentage of firm ownership held by non-executive employees, the percentage of the total firm operating costs due to labor costs, the percentage of the total firm operating costs due to research and development expenditures, the importance of innovation for the firm business strategy, the importance of incremental product improvements for the firm business strategy, whether the company has an official human resources (HR) department, the level of the most senior HR official, whether the senior most HR official participates on the executive team, and the size of the HR department. None of these controls change the substantive results of the models reported above[23]. Thus, these models appear to be robust to additional control specifications. Additionally, outlier analysis did not suggest that results are driven by abnormal observations.

[23] Some of these control variables were not measured in the Culpepper sample, so their inclusion reduces sample size by approximately 160 observations. In these models with smaller sample size, inclusion of some controls decreases the significance of the size coefficient from the $p<0.05$ level to the $p< 0.10$ level. The effect size is stable across control specifications.

It is also useful to explore different ways of measuring firm size. Revenues were highly correlated with the number of employees ($\rho = 0.92$, $p<0.0001$) and substituting the natural logarithm of revenues for the natural logarithm of the number of employees yielded identical results. Additionally, the natural logarithm of the number of developers was both included with and substituted for the natural logarithm of the total number of employees to explore whether the size effect was driven mostly by the overall size of the firm, or by the size of the employee segment studied. The number of developers was not significant in either model and did not change the previously reported size effect. These results suggest that the reported relationship is driven mostly by the structural aspects of overall firm size rather than the number of workers in any particular employee group.

4.5.2. Exploring the Mechanisms

While not formally hypothesized, the logic underlying the main hypothesis suggests that smaller firms may have advantages offering firm-specific incentives because they are better able to offer customized work arrangements and certain intangible incentives to workers. To measure the extent to which each firm offers customized work arrangements to developers a modified version of the I-DEALS scale was utilized in the key informant survey (Hornung et al. 2008; 2010). The original scale focused on the individual level of analysis and asked whether individuals have negotiated idiosyncratic work arrangements for a number of different work dimensions. Since the present study focused on the firm as the level of analysis, key informants were asked to approximate the percentage of developers in the firm who received customized work arrangements for each of these dimensions. The dimensions included are: (1) compensation packages, (2) benefits packages, (3) start and end times for the work day, (4) work week schedules, (5) selection

of on-the-job activities, (6) training and development plans, (7) special opportunities for skill development, (8) special opportunities for career development. The customized work arrangements measure was constructed by averaging the percentage of developers who received customization on these eight factors to create an overall indicator of the extent to which the firm customizes work arrangements for developers.

The customized work arrangements score was approximately normally distributed in the sample so an ordinary least squares model was estimated using this measure as the dependent variable and using the same predictor variables discussed previously. The overall model fit of this regression was poor with a non-significant f-statistic (1.222, $p = 0.153$) and the coefficient on firm size was not significant in the model. There is no evidence in these data that smaller firms offer more customized work arrangements than their larger rivals. These results are shown in table 4.3.

[INSERT TABLE 4.3 ABOUT HERE]

The other mechanism underlying the main hypothesis suggests that small firms are better able to offer certain intangible incentives such as intrinsic rewards, greater ability to impact company and social outcomes, confidence in company leadership and workplace culture. To explore these possibilities the incentives were divided into eight clusters based on ratings from the 13 expert raters previously mentioned. These clusters are: (1) material rewards – i.e. incentives that have current material value, (2) job future rewards - incentives that enhance employee job opportunities moving forward, (3) positive company attributes – i.e. incentives that are relatively stable company attributes and easily observable to outsiders, (4) intrinsic rewards – i.e. incentives that derive from the nature of the work, (5) ability to impact outcomes – i.e. incentives related to the

workers' abilities to impact company and societal outcomes, (6) confidence in leadership – i.e. incentives that capture the value workers derive from their relationships with and confidence in key decision makers at the firm, (7) workplace culture – i.e. incentives that reside in the complex social fabric of the organization and the norms and values perpetuated therein and (8) work related resources – i.e. incentives that capture the extent to which developers are given physical resources to help them accomplish their job tasks. The specific incentives included in each cluster are shown in appendix 4. Scores for each cluster were calculated by averaging the difficulty score for each individual incentive within the cluster.

The scores for each of these clusters were approximately normally distributed in the sample so an ordinary least squares model was estimated using these measures as dependent variables and using the same predictor variables discussed previously. Of these eight models, the coefficient on firm size was only significant in the intrinsic rewards model (-0.090, $p<0.01$) and moderately significant in the workplace culture model (-0.057, $p<0.10$). These findings lend partial support to the underlying argument that small firms are better positioned to offer work that is interesting, varying, and challenging with a high degree of autonomy and that small firms may be better able to create positive social environments for their workers. There is no evidence that firm size affects the other types of incentives measured. The results for these regressions are also shown in table 4.3.

The lack of an effect for firm size in the material rewards regression is notable given the substantial research finding that large firms tend to pay more and offer higher material benefits overall (Brown et al. 1990). To verify this result, individual level

compensation data was obtained for approximately 7770 software development professionals at 94 firms in the research sample[24]. A multi-level model predicting individual level total yearly compensation controlled for individual level wage predictors such as job-level, job family, industry experience, eligibility for overtime, eligibility for short term incentives, and worker tenure as well as the firm level predictors used in the models described above. Results confirmed that firm size did not significantly improve model fit in these multi-level models nor was the coefficient on firm size significant in these models. The lack of a firm-size effect in these models supports the findings described above using the key informant surveys[25].

4.5.3. Addressing the Sorting Concern

The key theoretical argument of this paper is not just that small firms are better able to retain talented workers than larger firms, but that small firms have advantages offering firm-specific incentives, and these firm-specific incentives give them advantages in retaining workers relative to all other firms, regardless of size. One potential concern with the present analysis, then, is that workers might vary in preferences and systematically sort themselves into large or small firms based on those preferences (Cardon and Stevens 2004; Schneider 1987). In other words, workers who prefer incentives available at small firms will naturally sort into small firms. Thus, it becomes important to explore potential variance in worker preferences to determine whether small firms actually have human capital advantages, or whether they simply exhibit labor market sorting by worker preferences.

[24] Culpepper provided employee level compensation data for approximately 600,000 employees in the research sample as part of a larger study.
[25] Detailed results for this robustness check are available from the author upon request.

To approximate worker preferences, key informants were asked to rate the importance of each incentive for retaining talented developers at the focal firm. Mean scores were calculated for each of the incentive clusters described in the prior section. Ordinary least squares regression was used to estimate the effect of size on these preferences. There is no evidence from these regressions that worker preferences vary by firm size – i.e. the coefficients on firm size were not significant in any of these regressions. While one might question the accuracy of key informants in assessing developer preferences, it is unlikely that key informant inaccuracies fully explain the lack of size effect in these data. Specifically, extant logic suggests that workers in large firms will prefer financial incentives more than workers in small firms. Thus, we should expect a positive and significant size coefficient in the model predicting worker preferences for current material incentives. To explain the absence of such an effect in these data, one must argue that key informants in small firms systematically over-emphasize the importance of financial incentives while key informants in large firms systematically under-emphasize the importance of these incentives. This systematic error is unlikely given extant theory. Specifically, we should expect key informants in small firms to under-emphasize the importance of financial incentives since they tend to offer lower levels of financial incentives (Brown et al. 1990), and vice versa for large firms. Thus, while we should not expect these key informants to be highly accurate, we should not expect their estimation errors to be systematically biased in a way that threatens the conclusions drawn here.

Despite the lack of evidence that firm size correlates with worker preferences for these different types of incentives, the worker preference measures were included as

controls in the regressions described previously as an additional robustness check. Including these preference measures had no effect on the previously reported results. These data suggest, then, that the observed size effects are not simply due to worker sorting based on preferences for certain incentives.

4.6. Discussion and Conclusion

4.6.1. Theoretical Implications

The present paper makes several contributions to the organizational literature. First, the results presented in the prior section suggest that small firms tend to offer more incentives that are highly firm-specific. These results provide support for the underlying argument that smaller firms should be better able to create and offer these incentives to workers by virtue of their smaller size. Specifically, their greater ability to customize incentives and work arrangements combined with the greater proximity between workers and key decision makers enhances the ability of these firms to offer incentives that workers have difficulty finding elsewhere. These findings are robust to inclusion of additional controls as well as different model specifications to address sorting concerns. Thus, in addition to the monitoring advantages identified by Zenger and Lazzarini (2004), and the pay-for-performance advantages identified by Zenger (1994), small firms may be inherently better at offering incentives that are highly firm-specific.

The empirical outcomes of firm-specific incentives were not explored in the present paper, but related research finds that firms that offer more incentives that are highly firm-specific have lower voluntary turnover rates and exhibit lower wage-tenure slopes for critical workers. With respect to retaining talented workers, then, smallness may not be so much of a liability after all. In contrast, smallness may enhance a firm's ability to

sustain low voluntary turnover and/or retain talented core workers at wage discounts relative to rivals. Future research may more explicitly explore the relationships between firm-size, firm-specific incentives and subsequent performance outcomes. Do these size advantages in offering firm-specific incentives translate into sustainable human capital based competitive advantages?

It is important to note, however, that the present paper argues that small firms should be better able to create and offer firm-specific incentives by virtue of the structural advantages of size, not that small firms must necessarily offer more incentives that are highly firm-specific. One might imagine a small firm led by a caustic and authoritarian owner whose leadership approach destroys many of the incentives associated with small firms in the present study. Though small firms may be better positioned to create and offer these incentives, to fully leverage their size advantages they will need managers who are willing and able to do so. In other words, successfully creating and leveraging these incentives may still rely on a certain level of competence and awareness on the part of key decision makers. Thus, future research may more fully explore the internal firm factors that determine which firms are more likely to choose to create and/or leverage firm-specific incentives and whether the choice to do so in fact leads to subsequent advantages.

The second main contribution is that the present paper systematically measures a broad set of incentives often discussed theoretically but rarely verified empirically (Gerhart and Rynes 2003). While scholars have suggested that small firms may have more flexibility in offering customized incentive bundles (Rousseau et al. 2006) and intangible incentives (Cardon and Stevens 2004), this is one of the first studies to

systematically explore these differences at the firm level. Accordingly, these results support the folk lore that small firms tend to offer more intrinsic incentives and more workplace culture based incentives, but do not find support for the folk lore that small firms offer a greater ability to impact company and societal outcomes or higher confidence in company leadership.

One surprising finding in these results was the persistent negative and significant effect of the private firm dummy on the firm-specific incentives index. It appears that private firms have lower firm-specific incentives scores across all models, and this effect was robust to multiple model specifications and inclusion of additional controls. Given the greater autonomy of owner/managers in privately held firms, we might expect these firms to be more likely to create and leverage incentives that are highly firm-specific. Future research may benefit from exploring the underlying mechanisms explaining why privately held firms may offer fewer incentives that are highly firm-specific than their publicly held competitors.

4.6.2. Limitations

One important limitation of the present study is the cross sectional nature of these data. While great care was taken to verify data across multiple sources, the key measures of interest come from cross sectional key informant surveys. Thus, the conclusions are limited to correlational comparisons between large and small firms in the sample. A better test of firm-size on incentive offerings would explore how incentives change over time in a sample of firms as they increase in size. Additionally, scholars have expressed legitimate concerns regarding reliance on single key informants (Gerhart, Wright, and McMahan 2000; Gerhart, Wright, McMahan, et al. 2000). The present study relies on

key informant assessments of how difficult it is for developers to find incentives outside of the focal firm as well as how important certain incentives are to developers in the focal firm. While great care was taken to identify knowledgeable key informants and to focus on a narrow class of workers, future research may more carefully construct incentive measures from bottom-up aggregations of employee surveys. Such approaches would provide higher levels of confidence in the accuracy of incentive and preference measures.

It is also important to note the lack of a size effect predicting the extent to which the firms in the sample offer customized work arrangements to software developers. Prior research (e.g. Rousseau et al. 2006) suggests that small firms should have distinct advantages to customization. It is possible that the measure used in the present study captured the extent to which firms customize without capturing the underlying ability of firms to customize. If firms are more likely to customize in order to retain their most talented workers, then we may be more strategically interested in the percentage of their top performers who receive customized arrangements rather than the percentage of all developers receiving such arrangements. Future work may more carefully explore customized arrangements by talent levels within firms.

Another limitation of the present study is the possibility that firm size is simply a proxy for other unmeasured factors that may explain variance in the firm-specific incentives score. While many size related factors are controlled in the main analysis or discussed in the discussion of robustness checks, other unmeasured size related factors may include the actual bureaucratic constraints the organization faces, direct measures of worker proximity to key decision makers, the importance of innovation, the extent to which the firm focuses on out of the box products versus customized solutions,

organizational complexity, dispersion, agency challenges or the internal labor market structure of the firm. Future work may more fully explore these factors empirically to better determine the underlying mechanisms explaining variance in firm-specific incentives at the firm level.

APPENDIX 1

This appendix lists the incentives rated by key informants. The first list shows the incentives categorized as "firm-specific" and the second list shows the remainder. Italicized incentives emerged from the coding of open ended responses.

Firm-specific incentives

- Fair procedures for establishing pay rates and bonuses
- Autonomy/freedom to do the job well
- Training provided to keep skills current
- Involvement in decisions that affect developers
- Interesting work
- Recognition, praise and appreciation
- Ability to impact company outcomes
- Ability to impact social and/or societal outcomes
- Positive company reputation
- Confidence in company leadership
- Relationships with co-workers and/or supervisors
- Job security
- Desirable career prospects and advancement opportunities
- Fun at work
- *Challenging work*
- *Effective software development methods/systems*
- *Ability to impact customer outcomes*
- *Healthy work/life balance*
- *Flexibility in when to work*
- *Flexibility in where to work*
- *Access to new tools and cutting edge technology*
- *Desirable geographic location*
- *Pleasant work environment*
- *High accessibility to relevant company information (e.g. performance data)*
- *Collaborative work environment*
- *Working with skilled, smart and capable colleagues*
- *Positive company culture*

Incentives not included in the firm-specific incentives index

- Salary and/or wage level
- Cash bonuses
- Traditional benefits (e.g. health insurance, 401K, etc.)
- Amount of paid time off
- *Long term incentives (stocks, options, etc.)*
- *Non-traditional benefits (e.g. massages, car washes, etc.)*
- *Material and financial resources to get the work done*

APPENDIX 2

The purpose of this appendix is to describe the various iterations used to construct and explore the firm-specific incentives measure utilized in the third and fourth chapters. As described in the chapters, a simple mean was utilized in all reported models. This simple mean was the average difficulty score for each incentive categorized as being relatively hard to replicate even if firms were willing to lay out the financial resources to do so. Thus, the firm-specific incentives index score represented the extent to which a firm's overall incentives are difficult for developers to find elsewhere. This approach is the first, and simplest, logic for constructing the firm-specific incentives index score.

In addition, the simple mean calculation was distributed approximately normally. The skewness was -0.215, falling within the -0.5 to 0.5 range to be considered approximately symmetrical, and the excess kurtosis was 0.618 falling within acceptable ranges to be considered close to normal. A histogram of this firm-specific incentives score is shown below in figure A2.1 and a qq plot showing the actual firm-specific incentives scores against theoretical scores for a normal distribution with identical mean and standard deviation is shown in figure A2.2. The histogram shows a distribution that appears approximately normal and the qq plot shows only slight deviations from normality. Thus, the distributional properties of the firm-specific incentives index score indicate no concerns utilizing this measure as an independent variable (third chapter) or as a dependent variable (fourth chapter).

Figure A2.1 Histogram of the Firm-Specific Incentives Index Score

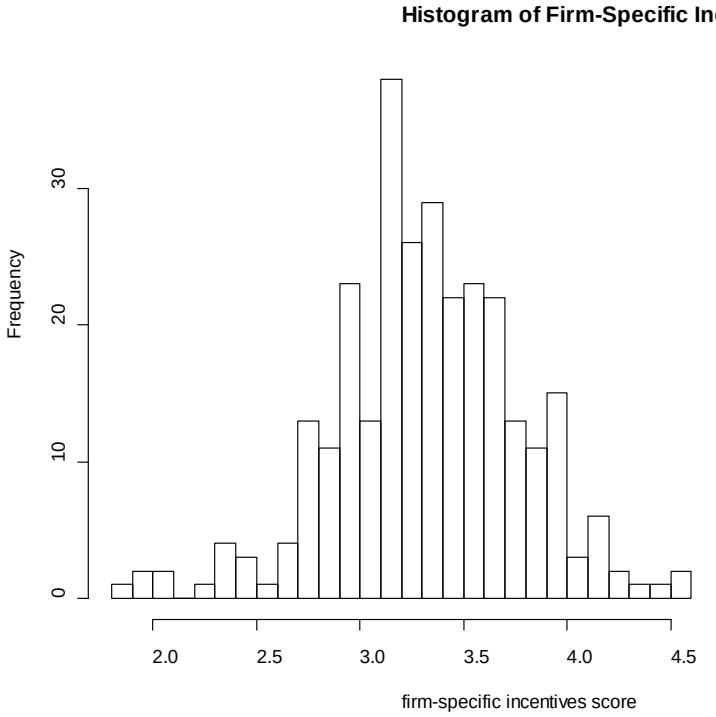
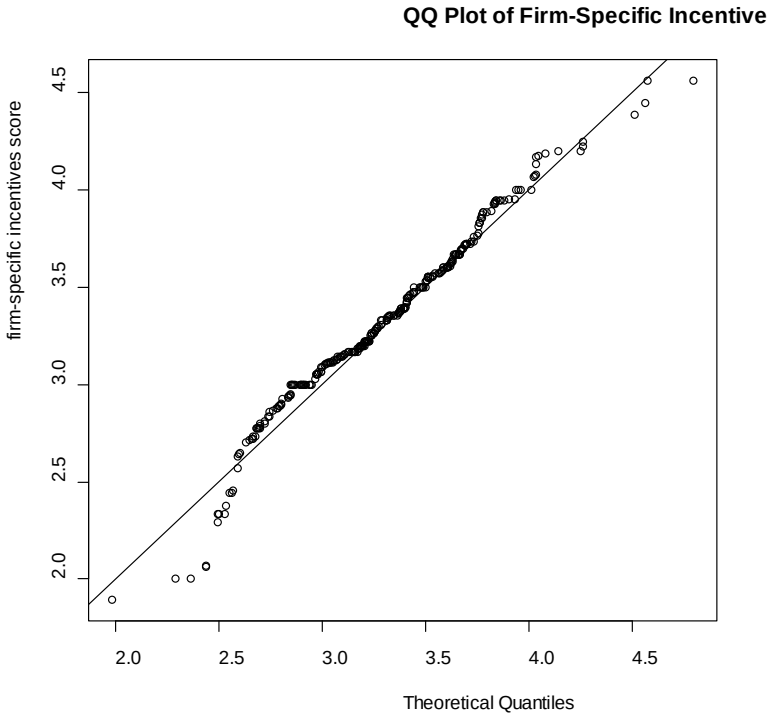


Figure A2.2 QQ Plot of the Firm-Specific Incentives Index Score



Four alternative logics were also utilized and these are discussed in detail below. They are: (1) fully weighted average difficulty, (2) fully weighted without penalty, (3) average difficulty by importance level, and (4) counts by difficulty level.

Fully Weighted Average Difficulty

In addition to the difficulty ratings, participants also rated the importance of each incentive for retaining talented developers. From a strategic perspective, we may not be concerned with certain incentives if they are not, in fact, important to software developers. Thus, the second underlying logic for constructing the firm-specific incentives index score weights each difficulty score by the corresponding importance score. In other words, this index was constructed by multiplying the difficulty score by the importance score for each factor, summing these products and dividing by the total number of incentives. The result is an index score indicating the extent to which each firm offers incentives that are both difficult to find elsewhere and important to developers. Incentives rated as unimportant received an importance score of zero and incentives rated extremely important received an importance score of zero. Thus, incentives that were rated as unimportant contributed nothing to the overall score, regardless of their difficulty score.

The inclusion of the importance scores enhances the potential match between the measure and the theory of firm-specific incentives. Specifically, we should not be as concerned about incentives that are hard to find elsewhere but that are unimportant. Thus, using the importance weighting we can discount unimportant incentives while emphasizing those that are particularly important. There are, however, several downsides to this measure. First, the weighting added a level of complexity in measure construction

that relied on two pieces of potentially imperfect information from participants rather than a single piece of imperfect information. Given our concerns about key informants, we might wonder both about their ability to accurately rate how difficult it is for developers to find better options elsewhere as well as the importance of each incentive to developers. When dealing with inaccurate participants, we potentially magnified the inaccuracy by multiplying the difficulty and importance scores together. Second, the weighting measure was more difficult to describe, and potentially distracts the reader from the substantive findings of the paper. Third, the importance scores were used in additional analyses in the third and fourth chapters to address potential sorting concerns. Including these item scores in the firm-specific incentives score precluded such analysis. Fourth, the fully weighted approach penalized firms that report a large number of incentives as being very low in importance because these incentives contributed nothing to the overall average regardless of their difficulty scores, while inflating the denominator for the overall index score.

Fully Weighted Average Difficulty without Penalty

The fully weighted approach without penalty corrected the concerns with penalizing firms that reported that many incentives were unimportant by adjusting the denominator. The new denominator was the sum of all incentives rated as somewhat important or above. This measure captured the weighted average difficulty score for all incentives considered at least somewhat important for developer retention. Two additional weighted scores were calculated using this approach, but different cutoffs for incentive importance. One incorporated only incentives that were rated as very important or above, and the other incorporated only incentives that were rated as extremely important. The latter had

undesirable empirical properties because many firms in the sample never rated incentives as being extremely important, so these firms had zero scores for this index measure, resulting in a bi-modal distribution. Thus, this measure was not analyzed in any empirical models. While correcting for the denominator penalty, this measure shared the remaining concerns with the fully weighted approach described above.

Average Difficulty by Importance Level

Instead of weighting the difficulty score by the importance score, another approach was to average the difficulty scores for each incentive within categories of importance. To calculate these measures the mean difficulty score was calculated for each within each of the four importance level. Thus, for all incentives rated as extremely important by a firm, the index score was calculated as the mean difficulty score for those incentives. Rather than magnifying potential inaccuracies through multiplication, this approach constructed four index scores for each firm – one score for each importance category. These four scores were included together for analysis to determine whether categorical importance levels differentially impacted observed outcomes. Additionally, index scores were calculated by averaging difficulty scores for all incentives rated as somewhat important and above as well as for all incentives rated as very important and above.

This approach has several downsides. First, it is difficult to interpret what the index scores mean when clustered by importance levels, especially given potential variance in participant interpretation of the importance scores. Second, like the previous measures, it is difficult to communicate to the reader and may distract from the overall contributions. Third, the use of importance scores also precludes the selection analyses presented in the third and fourth chapters.

Counts by Difficulty Level

The constructions discussed above utilized the importance scores in various ways to construct firm-specific incentives index scores. Given the sorting analyses from the third and fourth chapters that require independent use of these importance scores, however, several alternative constructions were utilized that did not require the importance ratings. The count variables were constructed in two ways. First, the counts are simply the number of incentives rated as very difficult to find elsewhere, the number of incentives rated as difficult to find elsewhere and the sum of those two. Second, each of these counts was divided by the total number of incentives rated by each firm to measure the fraction of total incentives offered that are at least difficult for developers to find elsewhere.

Like the category scores by importance levels, it is also difficult to interpret the meaning of two variables representing different categories of difficulty scores. Additionally, the count measures tended to display awkward distributions making them less desirable for statistical analyses, especially as dependent variables, as required in the fourth chapter.

Other Constructions

While not part of the five main logics described above, two other sets of incentive index scores were constructed for additional analysis. First, the firm-specific incentives were sub-grouped into eight clusters as described in the fourth chapter to explore the underlying mechanisms – i.e. to explore which firm-specific incentives may vary by firm size. Second the firm-specific incentives were sub-grouped based on excludability as

discussed in the third chapter for additional analyses of wage and bonus predictions. Correlations for these additional constructions are shown below.

Correlations

Table A2.1 below shows the measure names and descriptions. Table A2.2 shows the correlations between measures. Measure 1 (sc) is the measure used in the empirical models. The first column of able A2.2 shows high correlations between the utilized measure and the fully weighted measure (measure 2, wt), the weighted measure with adjustments (measure 10, iwt23), the difficulty by importance level measures (measures 7-8, i23 and i123) and the count measures (measure 13, 45ct and measure 16, 45pro).

Table A2.1 Measure Names and Descriptions

	Name	Description
1	sc	Mean difficulty score for all firm-specific incentives
2	wt	Fully weighted average score – sum of importance times difficulty scores
3	i0	Mean difficulty score for all incentives rated not important
4	i1	Mean difficulty score for all incentives rated somewhat important
5	i2	Mean difficulty score for all incentives rated very important
6	i3	Mean difficulty score for all incentives rated extremely important
7	i23	Mean difficulty score for all incentives rated at least very important
8	i123	Mean difficulty score for all incentives rated at least somewhat important
9	iwt123	Weighted score without penalty for incentives rated at least somewhat important
10	iwt23	Weighted score without penalty for incentives rated at least very important
11	4ct	Count of difficult to find elsewhere incentives
12	5ct	Count of very difficult to find elsewhere incentives
13	45ct	Count of incentives that are at least difficult to find elsewhere
14	4pro	Count of difficult to find elsewhere incentives, prorated by total incentives rated
15	5pro	Count of very difficult to find elsewhere incentives, prorated by total incentives rated
16	45pro	Count of incentives that are at least difficult to find elsewhere, prorated by total incentives rated
17	CE.sc	Clearly excludable firm-specific incentives mean score
18	PE.sc	Potentially excludable firm-specific incentives mean score
19	NE.sc	Non-excludable firm-specific incentives mean score
20	cmat.sc	Current material incentives mean score
21	fmat.sc	Future material incentives mean score
22	nat.sc	Intrinsic rewards mean score
23	char.sc	Company attributes mean score
24	imp.sc	Ability to impact outcomes mean score
25	lead.sc	Confidence in leadership mean score
26	cult.sc	Company culture mean score

Table A2.2 Correlations among Firm-Specific Incentives Measures

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	sc																									
2	wt	0.80																								
3	i0	0.01	-0.21																							
4	i1	0.32	0.02	0.01																						
5	i2	0.85	0.58	0.09	0.28																					
6	i3	0.33	0.54	-0.11	0.03	0.15																				
7	i23	0.94	0.69	0.08	0.28	0.89	0.31																			
8	i123	0.99	0.79	0.05	0.31	0.86	0.34	0.95																		
9	iwt	0.69	0.95	-0.15	-0.11	0.46	0.55	0.60	0.69																	
10	iwt23	0.94	0.69	0.08	0.28	0.89	0.31	1.00	0.95	0.60																
11	4ct	0.62	0.43	0.12	0.31	0.57	0.17	0.58	0.63	0.32	0.58															
12	5ct	0.65	0.63	0.11	0.15	0.54	0.35	0.66	0.66	0.57	0.66	0.13														
13	45ct	0.85	0.69	0.10	0.32	0.74	0.32	0.82	0.86	0.58	0.82	0.86	0.61													
14	4pro	0.62	0.43	0.09	0.31	0.57	0.17	0.58	0.63	0.34	0.58	1.00	0.12	0.86												
15	5pro	0.66	0.64	0.08	0.15	0.54	0.35	0.66	0.66	0.58	0.66	0.12	1.00	0.60	0.11											
16	45pro	0.85	0.69	0.07	0.32	0.74	0.32	0.82	0.86	0.59	0.82	0.85	0.60	1.00	0.85	0.60										
17	CE.sc	0.93	0.73	0.03	0.30	0.78	0.29	0.86	0.92	0.63	0.86	0.60	0.60	0.80	0.60	0.60	0.81									
18	PE.sc	0.79	0.70	-0.02	0.22	0.66	0.30	0.74	0.78	0.62	0.74	0.45	0.53	0.65	0.46	0.54	0.65	0.64								
19	NE.sc	0.82	0.62	0.01	0.27	0.72	0.25	0.78	0.82	0.52	0.78	0.50	0.52	0.68	0.51	0.53	0.69	0.62	0.50							
20	cmat.sc	0.46	0.34	-0.06	0.13	0.37	0.11	0.40	0.45	0.29	0.40	0.18	0.20	0.26	0.18	0.21	0.26	0.41	0.29	0.46						
21	fmat.sc	0.65	0.53	-0.02	0.21	0.56	0.16	0.53	0.63	0.44	0.53	0.42	0.32	0.51	0.42	0.32	0.51	0.68	0.41	0.50	0.47					
22	nat.sc	0.78	0.62	0.05	0.19	0.68	0.30	0.81	0.79	0.56	0.81	0.48	0.56	0.69	0.48	0.57	0.70	0.75	0.74	0.49	0.29	0.31				
23	char.sc	0.58	0.41	0.01	0.19	0.55	0.13	0.57	0.59	0.35	0.57	0.33	0.42	0.49	0.34	0.42	0.49	0.42	0.36	0.76	0.32	0.36	0.35			
24	imp.sc	0.63	0.54	0.05	0.19	0.51	0.19	0.56	0.61	0.46	0.56	0.33	0.46	0.51	0.33	0.46	0.51	0.60	0.66	0.35	0.11	0.35	0.48	0.21		
25	lead.sc	0.79	0.61	0.01	0.23	0.66	0.18	0.74	0.78	0.51	0.74	0.50	0.50	0.66	0.50	0.50	0.67	0.70	0.48	0.80	0.44	0.48	0.54	0.54	0.45	
26	cult.sc	0.70	0.59	-0.01	0.26	0.60	0.34	0.66	0.69	0.51	0.66	0.39	0.48	0.58	0.40	0.49	0.58	0.61	0.57	0.61	0.33	0.31	0.48	0.32	0.26	0.37

APPENDIX 3

This appendix shows the sub groupings of firm-specific incentives by excludability.

Clearly Excludable Incentives:

- Autonomy/freedom to do the job well
- Training provided to keep skills current
- Involvement in decisions that affect developers
- Recognition, praise and appreciation
- Ability to impact company outcomes
- Job security
- Desirable career prospects and advancement opportunities
- *Flexibility in when to work*
- *Flexibility in where to work*

Potentially Excludable Incentives:

- Interesting work
- Ability to impact social and/or societal outcomes
- Fun at work
- *Challenging work*
- *Ability to impact customer outcomes*
- *Healthy work/life balance*
- *Access to new tools and cutting edge technology*
- *High accessibility to relevant company information (e.g. performance data)*

Non-excludable Incentives:

- Fair procedures for establishing pay rates and bonuses
- Positive company reputation
- Confidence in company leadership
- Relationships with co-workers and/or supervisors
- *Effective software development methods/systems*
- *Desirable geographic location*
- *Pleasant work environment*
- *Collaborative work environment*
- *Working with skilled, smart and capable colleagues*
- *Positive company culture*

APPENDIX 4

This appendix shows the specific incentives included in each granular cluster.

Material Rewards

- Salary and/or wage level
- Cash bonuses
- Traditional benefits (e.g. health insurance, 401K, etc.)
- Amount of paid time off
- Non-traditional benefits (e.g. massages, car washes, etc.)

Job Future Rewards

- Long term incentives (stocks, options, etc.)
- Job security
- Training provided to keep skills current
- Desirable career prospects and advancement opportunities

Company Attributes

- Desirable geographic location
- Positive company reputation

Intrinsic Rewards

- Involvement in decisions that affect developers
- Interesting work
- Autonomy/freedom to do the job well
- Challenging work

Ability to Impact Outcomes

- Ability to impact company outcomes
- Ability to impact social and/or societal outcomes
- Ability to impact customer outcomes

Confidence in Leadership

- Fair procedures for establishing pay rates and bonuses
- Recognition, praise and appreciation
- Confidence in company leadership
- High accessibility to relevant company information (e.g. performance data)

Workplace Culture

- Relationships with co-workers and/or supervisors
- Fun at work
- Healthy work/life balance
- Flexibility in when to work
- Flexibility in where to work
- Pleasant work environment
- Collaborative work environment
- Working with skilled, smart and capable colleagues
- Positive company culture

Resources to do work

- Material and financial resources to get the work done
- Access to new tools and cutting edge technology

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TABLE 3.1: SAMPLE STATISTICS AND CORRELATION TABLE FOR TURNOVER MODELS

		Mean	Med.	St. Dev.	1	2	3	4	5	6	7	8	9
1	Turnover[a]	0.101	0.067	0.161									
2	Firm-specific incentives[b]	0.00	0.00	0.45	-0.18**								
3	Labor productivity[c]	292.6	228.1	228.4	-0.10+	-0.02							
4	Firm size[c]	754	116	2380	0.00	-0.12*	0.16**						
5	Firm-specific human capital	2.87	2.00	2.86	-0.07	0.01	-0.08	0.04					
6	Material restrictions	31.0	33.3	29.5	-0.08	0.00	0.12*	0.09	0.01				
7	Legal restrictions	56.3	66.7	22.3	-0.07	-0.16**	0.00	0.12+	0.07	0.12*			
8	Percentage ownership by employees	16.6	4.0	26.4	-0.13*	0.12+	0.07	-0.13*	0.03	0.15*	-0.04		
9	Private firm	0.73	1.00	0.44	0.04	-0.05	-0.21***	-0.47***	0.07	-0.18**	-0.02	0.10+	
10	Other incentives[b]	0.00	0.02	0.60	-0.09	0.40***	-0.07	-0.06	0.00	0.03	-0.11+	-0.04	-0.06

Notes: N = 275

(a) Turnover is shown as a fraction here (b) These variables are mean centered in the models (c)The raw means, medians and standard deviations are shown for these variables, but the natural logarithm of these variables were used to calculate correlations.

TABLE 3.2: TOBIT MODELS PREDICTING VOLUNTARY TURNOVER RATES

	Model 1	**Model 2**	**Model 3**
Constant	0.056***	0.226+	0.253*
	(0.013)	(0.126)	(0.124)
Labor Productivity		-0.030	-0.030
		(0.02)	(0.019)
Firm Size		0.010	0.006
		(0.009)	(0.009)
Firm-specific human capital		-0.006	-0.006
		(0.004)	(0.004)
Material restrictions		0.000	0.000
		(0.000)	(0.000)
Legal restrictions		0.000	0.000
		(0.001)	(0.001)
Percentage ownership by employees		-0.002**	-0.001**
		(0.001)	(0.001)
Private firm		0.006	-0.005
		(0.033)	(0.033)
Other incentives		-0.053*	-0.026
		(0.022)	(0.024)
Firm-specific incentives	-0.114***		-0.094**
	(0.029)		(0.032)
n	275	275	275
Wald	15.44	20.48	29.3
DF	1	8	9
p-value	<.001	0.009	<0.001

Notes: *** p-value <0.001, ** p-value <0.01, * p-value <0.05, Two-tailed tests

TABLE 3.3: BASIC STATISTICS FOR MULTI-LEVEL MODELS

		Means	Meds.	St. Devs.	n	1	2	3	4	5	6	7	8	9	10	11
1	Total cash compensation[a]	86.5	84.1	24.9	7770											
2	Firm-specific incentives[b]	0.00	0.02	0.50	94	0.04										
3	Eligible for overtime	0.01	0	0.10	7770	0.01	-0.12									
4	Eligible for short term incentives	0.44	0	0.50	7770	0.22	0.19	0.07								
5	Industry experience	1.43	1	0.99	7770	0.64	0.11	-0.03	0.09							
6	Tenure[b]	0.0	-2.5	6.4	7770	0.13	0.04	-0.05	-0.25	0.21						
7	Labor productivity[a]	271	229	218	94	0.04	0.00	0.01	0.33	-0.01	-0.17					
8	Material restrictions	33.4	33.3	29.8	94	0.09	0.06	-0.07	0.17	0.01	-0.12	0.13				
9	Legal restrictions	58.6	66.7	20.0	94	-0.07	-0.29	-0.04	-0.20	-0.17	0.00	0.16	0.14			
10	Voluntary turnover	8.04	6.67	8.00	94	0.04	-0.18	-0.01	-0.06	0.00	-0.01	-0.14	0.01	-0.03		
11	Firm-specific human capital[b]	0.00	-0.95	2.20	94	0.14	0.08	0.06	0.15	0.11	-0.02	0.04	0.05	0.06	-0.13	
12	Other incentives[b]	0.00	0.02	0.67	94	0.03	0.40	0.13	0.05	0.04	-0.02	-0.03	0.06	-0.25	-0.18	0.09

Notes:

Correlations with individual level variables above |0.02| are significant at the $p < 0.05$ level and correlations between firm level variables above |0.20| are significant at the $p<0.05$ level. (a) basic statistics for these variables are shown for raw values, but correlations are based on natural logarithms of the actual values. (b) these variables are mean centered.

TABLE 3.4: MULTI-LEVEL MODELS PREDICTING WORKER WAGES

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	11.17*** (0.164)	11.186*** (0.163)	11.193*** (0.163)	11.200*** (0.162)	11.197*** (0.162)	11.407*** (0.021)
Job Family[a]	Not shown***	Not shown***	Not shown***	Not shown***	Not shown***	
Eligibility for Overtime	-0.09*** (0.023)	-0.09*** (0.023)	-0.087*** (0.023)	-0.085*** (0.023)	-0.085*** (0.023)	
Eligibility for STI	0.179*** (0.011)	0.180*** (0.011)	0.181*** (0.011)	0.181*** (0.011)	0.181*** (0.011)	
Industry experience	0.176*** (0.002)	0.176*** (0.002)	0.178*** (0.002)	0.177*** (0.002)	0.177*** (0.002)	
Tenure	0.002*** (0.000)	0.002*** (0.000)	0.003* (0.001)	0.003** (0.001)	0.003** (0.001)	0.02*** (0.002)
Labor productivity	-0.026 (0.029)	-0.026 (0.029)	-0.027 (0.028)	-0.028 (0.028)	-0.027 (0.028)	
Material Restrictions	0.001+ (0.001)	0.001* (0.001)	0.001+ (0.001)	0.001+ (0.001)	0.001+ (0.001)	
Legal restrictions	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	
Turnover	0.208 (0.224)	0.167 (0.224)	0.144 (0.224)	0.136 (0.222)	0.145 (0.223)	
Firm-specific human capital	-0.002 (0.008)	-0.001 (0.008)	0.001 (0.008)	-0.001 (0.008)	0.002 (0.008)	
Other incentives	0.012 (0.027)	0.024 (0.029)	0.024 (0.028)	0.023 (0.028)	0.024 (0.028)	
Firm-specific incentives		-0.051 (0.039)	-0.051 (0.039)	-0.061 (0.039)	-0.065+ (0.039)	-0.032 (0.043)
Tenure X FSHC			0.001+ (0.000)		0.001* (0.000)	
Tenure X FSI				-0.005* (0.002)	-0.006** (0.002)	-0.016** (0.005)
Observations	7770	7770	7770	7770	7770	7770
Groups	94	94	94	94	94	94
AIC	-6293.5	-6293.2	-6445.6	-6447.3	-6450.5	-195.8
BIC	-5869.1	-5861.8	-5993.3	-5995.0	-5991.2	-140.1
Log Likelihood	3207.7	3208.6	3287.8	3288.6	3291.2	105.9

Notes: *** p-value <0.001, ** p-value <0.01, * p-value <0.05, Two-tailed tests. FSI = firm-specific incentives, FSHC= firm-specific human capital, STI= short term incentives. (a) job family dummy variables not shown for convenience.

TABLE 4.1: BASIC STATISTICS AND CORRELATIONS

		Mean	Median	St. Dev.	1	2	3	4	5
1	Firm-Specific Incentives	3.32	3.33	0.43					
2	Firm Size	823	120	2600	-0.071				
3	Percent ownership by employees	17.0	4	26.8	0.131*	-0.063			
4	Private firm	0.73	1	0.44	-0.063	-0.207***	0.110+		
5	Firm Age	21.7	16	21.7	-0.043	0.440***	-0.088	-0.238***	
6	Labor Productivity	296.6	228.3	229.2	-0.012	0.037	0.075	-0.198***	0.094

TABLE 4.2: OLS MODELS PREDICTING FIRM-SPECIFIC INCENTIVES

	Model 1	Model 2	Model 3
Constant		2.799***	3.129***
		(0.375)	(0.386)
4-digit SIC		Not shown***	Not shown***
Percent employee ownership		0.002*	0.002*
		(0.001)	(0.001)
Privately held firm		-0.137*	-0.189*
		(0.068)	(0.070)
Firm age		-0.035	-0.006
		(0.040)	(0.041)
Labor Productivity		0.016	0.017
		(0.041)	(0.041)
Firm Size	-0.027+		-0.054**
	(0.016)		(0.020)
n	271	271	271
r^2	0.010	0.360	0.381
Adjusted r^2	0.006	0.181	0.204
f-statistic	2.746	2.012	2.154
DF	1 and 269	59 and 211	60 and 210
p-value	0.098	<0.001	<0.001

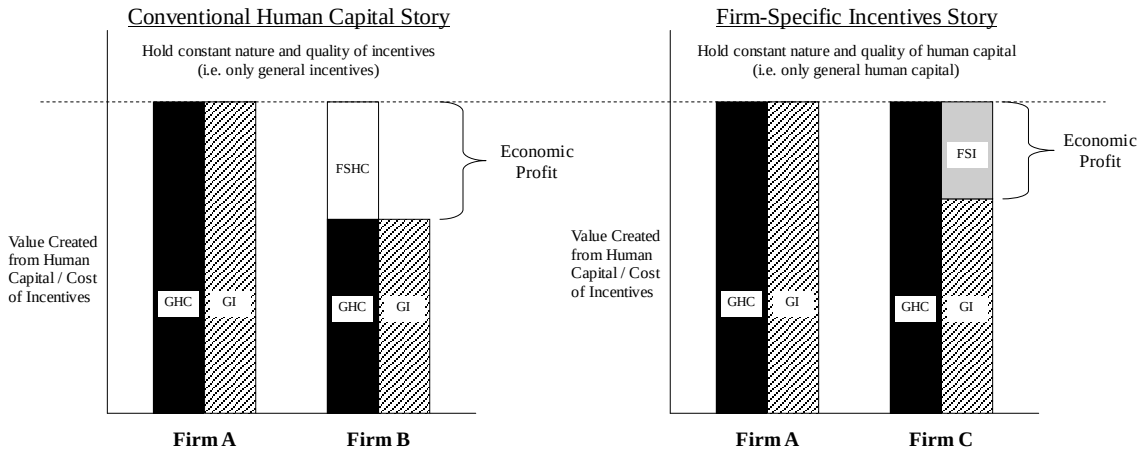
*** p<0.00, ** p<0.01, * p< 0.05, + p<0.10, two tailed tests.

TABLE 4.3: OLS MODELS PREDICTING CUSTOMIZED ARRANGEMENTS AND INTANGIBLE INCENTIVES

	Customized Work Arr.	**Material Rewards**	**Job Future Rewards**	**Intrinsic Rewards**	**Company Attributes**	**Ability to Impact Outcomes**	**Confidence in Leadership**	**Workplace Culture**	**Resources to do work**
Constant	39.508* (17.879)	3.579*** (0.587)	2.902*** (0.550)	3.749*** (0.559)	2.233** (0.786)	3.156*** (0.657)	2.888*** (0.551)	3.801*** (0.581)	5.876*** (1.074)
4-digit SIC	Not shown	Not shown+	Not shown+	Not shown**	Not shown**	Not shown+	Not shown**	Not shown***	Not shown+
Emp. Own.	0.054 (0.045)	-0.001 (0.001)	0.001 (0.001)	0.003* (0.001)	0.004* (0.002)	0.002 (0.002)	0.001 (0.001)	0.003* (0.001)	0.002 (0.002)
Private.	-0.88 (3.207)	-0.126 (0.105)	-0.202* (0.099)	-0.243* (0.100)	-0.094 (0.148)	-0.167 (0.122)	-0.058 (0.099)	-0.274* (0.106)	-0.395+ (0.221)
Firm age	-2.478 (1.857)	-0.001 (0.061)	-0.092 (0.058)	0.016 (0.058)	0.088 (0.085)	0.038 (0.07)	0.035 (0.057)	-0.041 (0.061)	-0.355** (0.118)
Labor Prod.	-1.718 (1.884)	-0.067 (0.062)	0.04 (0.059)	-0.004 (0.06)	0.016 (0.084)	-0.103 (0.07)	-0.003 (0.059)	0.022 (0.061)	-0.071 (0.11)
Firm Size	-0.449 (0.935)	-0.039 (0.031)	-0.034 (0.029)	-0.090** (0.029)	-0.003 (0.042)	-0.054 (0.035)	-0.038 (0.029)	-0.057+ (0.031)	-0.036 (0.058)
n	271	271	265	268	244	245	267	262	161
r^2	0.259	0.273	0.283	0.362	0.316	0.284	0.317	0.386	0.303
Adjusted r^2	0.047	0.266	0.077	0.181	0.130	0.080	0.118	0.211	0.115
f-statistic	1.222	1.432	1.374	2	1.7	1.394	1.592	2.204	1.612
DF	60 and 210	65 and 257	59 and 205	59 and 208	52 and 191	54 and 190	60 and 206	58 and 203	34 and 126
p-value	0.153	0.081	0.055	<0.001	0.005	0.054	0.009	<0.001	0.031

*** p<0.001, ** p<0.01, * p< 0.05, + p<0.10

FIGURE 2.1: HOW THE FIRM-SPECIFIC INCENTIVES STORY DIFFERS FROM THE FIRM-SPECIFIC HUMAN CAPITAL STORY



GHC = General human capital, FSHC = Firm-specific human capital, GI = general incentives, FSI = firm-specific incentives

FIGURE 2.2: FIRM-SPECIFICITY CUTS ACROSS EXTANT INCENTIVE DIMENSIONS

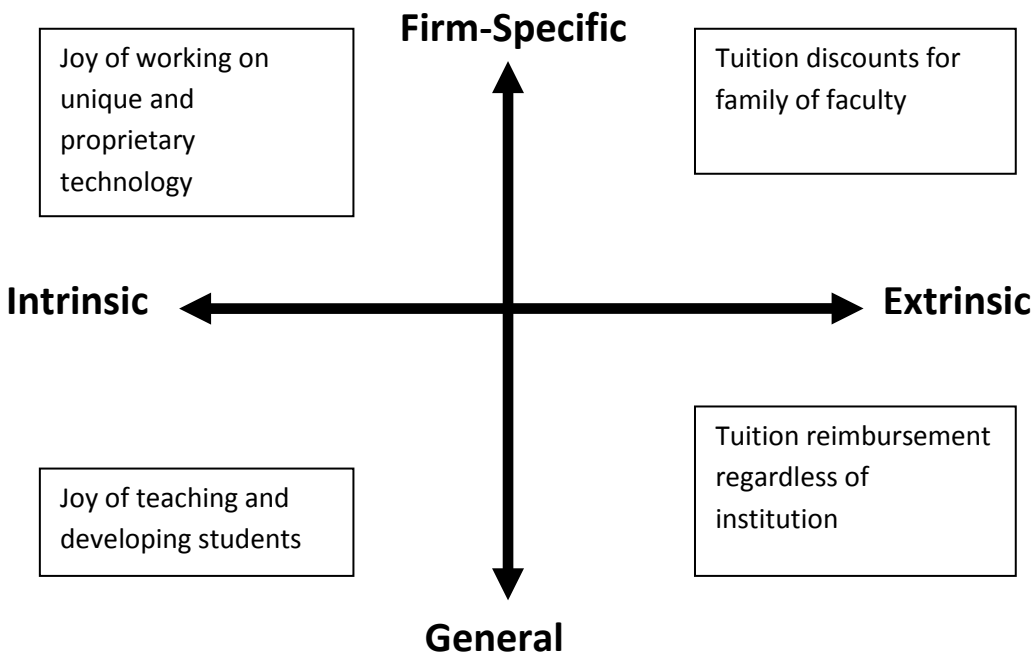


FIGURE 2.3: SHORT TERM LOSS IN INCENTIVE VALUE FOR INCENTIVES THAT INCREASE IN VALUE OVER TIME

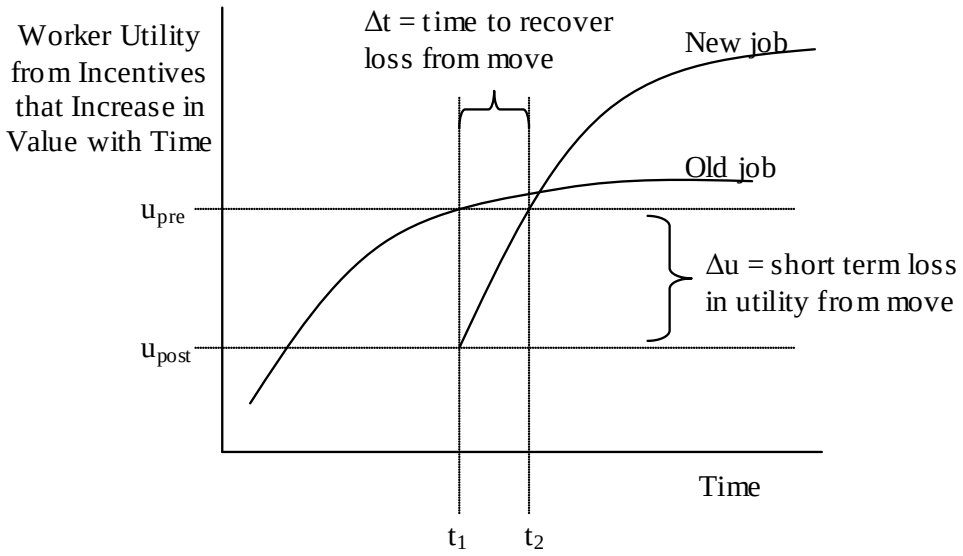


FIGURE 3.1: ILLUSTRATIVE WAGE-TENURE SLOPES