Institutional Flexibility and Entrepreneurship

Charles Eesley | Edward B. Roberts | Xiaocong Tian | Delin Yang

August 2014
Institutional Flexibility and Entrepreneurship

Delin Yang
Tsinghua University

Charles Eesley
Stanford University

Xiaocong Tian
Chinese University of Hong Kong

Edward B. Roberts
MIT

Abstract: This paper addresses a theoretical puzzle regarding how institutions enhance individual entrepreneurial behavior. We leverage a unique research setting to extend institutional theory into the realm of entrepreneurship by introducing and testing the concept of institutional flexibility. More flexible institutions foster entrepreneurship in allowing, rather than restricting individual choices. This paper explores the elimination of a constraint on institutional flexibility – the academic year system – by examining Tsinghua University’s (Beijing) adoption of a more flexible credit system in 1984 as a natural experiment. Using a differences-in-differences approach and controlling for changes in the economy, we find that a shift from rigid to more flexible institutional rules increases entrepreneurial behavior. Furthermore, we find that institutional change is likely to affect different types of individuals in distinct ways, which are consistent with flexibility but not with alternative explanations. The results contribute to the literature on institutional constraints on entrepreneurship while addressing the puzzle of how durable, stable institutions might foster processes of emergence by theorizing how choice can be institutionalized.

Introduction

The nexus of institutions and entrepreneurship is becoming increasingly important (Hoskisson et al. 2000, Sine et al. 2005, Haveman and Tolbert 2005, Lounsbury and Glynn 2001, Hiatt et al. 2009). Institutional theory offers important insights into this phenomenon and entrepreneurship is seen as having real world implications for economic growth. Prior work has shown that cognitive, normative and regulatory pillars all play important roles in condoning, habitualizing and legitimating certain choices and organizations over others (DiMaggio 1991, Scott 2014). There are two streams of research at this nexus. The first looks at how individuals within an institutional form engage in promoting change (i.e., institutional entrepreneurs) (Lounsbury 2002, Greenwood and Suddaby 2006). The second examines how institutional changes, such as regulatory change can change rates of entrepreneurship and who becomes an entrepreneur (Sine and Lee 2009, Hiatt et al. 2009). In this paper we examine another aspect of this nexus. The central concept is institutional flexibility. We define this by the degree to which institutions give individuals choice.
Traditional discussions of institutions have emphasized constraints, stability, rigidity, and effects of becoming standardized, taken-for-granted, or institutionalized. It is difficult for a practice to become institutionalized if it is not stable. Over time certain behaviors become social norms or rules as they become taken-for-granted by individuals in that institutional context. However in focusing on the importance of constraints and the impact of institutions, prior literature has had less to say about how institutions might facilitate rather than limit individual choice. The research question we ask is: how can institutions, which often constrain behavior, support individual agency (in the form of entrepreneurial behavior)?

A newer stream of institutional theory has focused on institutional entrepreneurs and the embedded agency of individuals who strive to alter existing institutions (Holm 1995, Lounsbury and Crumley 2007). Following this line of theorizing, scholars have pointed to the dilemma of embedded agency – how and when do individuals exert agency while under institutional constraints? Recent literature has pointed to ways individuals can avoid these constraints and exercise their agency by being located in particular social positions (Battilana 2006) or using different discursive strategies (Suddaby and Greenwood 2005). Yet, some scholars view the idea of institutional entrepreneurs as heroic change agents with skepticism given tendencies to commit the fundamental attribution error. Such scholars question whether this view endows actors with too much “strategic intentions, foresight, and well-rehearsed social skills” (Aldrich 2010, p. 330). However, instead of relying on individuals to act in contradiction to institutional embeddedness, it may be that some institutions are inherently more flexible than others, thereby allowing more room for choice. Institutions that are less rigid (more flexible) may open up possibilities for entrepreneurial action and ideas.

We define institutional flexibility as the characteristic of formal or informal institutions that permits individual choice.¹ When choice itself, rather than a specific behavior or action becomes the target of institutionalization then flexibility and freedom is built in and explicitly preserved. The preservation and protection of choice leads to and fosters more creative, innovative and entrepreneurial behaviors. It presents individuals with opportunities to choose new ways of

¹ We thank an anonymous reviewer for suggesting important edits to the definition of institutional flexibility, including that it may be permitted but not necessarily taken-for-granted to have initial effects.
experimenting and recombines ideas or resources into novel actions in the economy.

Studying the effects of institutional flexibility is difficult because environments that are more flexible often vary on many other dimensions as well. It is challenging to infer the effects of flexibility from alternative explanations if data were collected across regions or countries. When new concepts are initially introduced, it is often challenging to find a research design that offers a relatively clean causal identification of its effects. In addition to introducing the flexibility concept to the literature on institutional theory, this paper provides a research model that offers a more optimal and better-identified test of the causal effects of institutional flexibility on entrepreneurship.

We take advantage of a natural experiment in China where a major university increased the flexibility of its rules governing the curriculum. After a multi-year effort, we secured an agreement to administer the first comprehensive survey of all graduates of a Chinese university that allows collection of detailed individual level educational, career and entrepreneurship data. Individual level data allows us to test who was influenced most by the effect. Such detailed data enables us to use differences-in-differences estimation to provide a more rigorous test that not only examines differences before and after the reform but also takes into account differences between those that theory predicts would be more influenced by the reform relative to those less influenced. In addition, we were able to gather information on course transcripts of these students before and after the reform. Since we have transcript data alongside subsequent career and entrepreneurship information and the subsequent survey covering graduating cohorts from before and after the reform, this longitudinal nature of the data\(^2\) enables us a unique ability to observe the entire path from pre vs. post-reform effects on the variety of courses to actual career choices. Finally, data on the alumni population has an advantage of allowing us to carefully examine response bias and selection issues.

We highlight two key findings and contributions. First, we find that institutional flexibility during an individual’s university years has a lasting influence on his subsequent likelihood of entrepreneurship. We find an increase in both entrepreneurial behavior and intentions for individuals who graduated just after the reform increasing institutional flexibility relative to individuals

\(^2\) This is often referred to as a repeated cohort or synthetic panel.
graduating just before the reform. Second, this effect was particularly strong for ‘misfits’ (i.e., students with diverse interests, who were not at the higher end of the scholastic performance distribution). We interpret these results as demonstrating that certain institutional environments enable choice. This is particularly important for allowing university graduates to pursue their interests at the intersection of fields, enabling entrepreneurial ideas and activity even under different environments later in life. Our primary contribution to institutional theory is to introduce the concept of institutional flexibility as a mechanism that leads to entrepreneurial ideas and behavior. In doing so, we add to an important, growing stream within this literature that contributes to the micro-foundations of institutional theory by showing mechanisms by which institutions influence individual choices (Powell and Colyvas 2008). One example is scientists’ changing attitudes and behaviors towards technology transfer (Colyvas 2007, Colyvas and Powell 2006).

**Background Literature**

Institutions have been described by neoinstitutional theory as taken-for-granted understandings (Berger and Luckman 1967) or as rules of the game (Powell and DiMaggio 1991). Older literature in institutional theory, seeking to establish the role of institutions, frequently points to ways that institutions are constraining (Meyer and Rowan 1977, Powell 1991). Institutions constrain action by delineating the set of interpretations and actions available to an individual (DiMaggio 1997). Weber (1968) emphasized the stability and rigidity that bureaucratization and institutionalization can bring and the difficulty of changing organizations under its influence, prompting many scholars to subsequently write about the “iron cage”.

Institutional research has brought to light the importance and ubiquitous nature of standards, norms and rules in society (Brunsson and Jacobsson 2000). In institutional theory, we typically see institutions as a source of rigidity and the resulting standardization as benefitting organizations since clear rules and norms make it easier for internal and external constituents to provide resources (DiMaggio 1991). For example, organizations connected with a national activist organization benefitted from standardized techniques and practices (Loundsbury and Glynn 2001). Further examples of institutions constraining individual and organizational choices have been shown in educational publishing, grievance procedures and in science (Thornton 2002, Edelman et al. 1999,
Colyvas and Powell 2006).

Nonetheless, certain phenomena have been difficult to reconcile with this older view of institutions. For example, in contrast to the early focus of institutional theory, entrepreneurship is often associated with a belief in individual autonomy, locating agency in individuals as creating new activities and breaking free from habits and traditional ways of doing things (Aldrich 2010, Meyer and Jepperson 2000). Some work has suggested such views can only be reconciled by theorizing about opposite ends of a continuum from rational actor models to models of institutionalization at the other end (Tolbert and Zucker 1996).

The focus of this stream of literature has resulted in relatively less theoretical insight into questions of individual agency in the presence of institutional constraints (Hwang and Powell 2008). The paradox of embedded agency refers to how individuals are able to exert independent choices and action in the face of institutionalized constraints. Agency is defined as an individual’s ability to intentionally pursue interest, alter the rules or distribution of resources, and affects the social world (Scott 2014).

Recent literature has pointed to ways that individuals can overcome institutional constraints and exercise their agency by being located in particular social positions (Battilana 2006), using different discursive strategies (Suddaby and Greenwood 2005), or having awareness of other fields (Greenwood and Suddaby 2006, Greenwood et al. 2002). This literature often uses institutional entrepreneurship as an example (Lounsbury and Crumley 2007). Institutional entrepreneurs are individuals who strive to change institutional structure (e.g., Holm 1995, see Battilana et al. 2009 for a thorough review). While we are beginning to understand which individuals within the social hierarchy exert their agency (Battilana 2006, Greenwood et al. 2002) and by which strategies (Greenwood and Suddaby 2006, Strang and Sine 2002, Seo and Creed 2002), we lack an understanding of whether some institutional environments allow greater flexibility and individual agency to encourage individuals to act entrepreneurially. Thus, in contrast to this work on institutional entrepreneurs, we focus on how flexible institutional environments may foster entrepreneurship (new firm creation). Instead of relying on individual agents themselves to act in contradiction to institutional embeddedness, it may be that some institutions are inherently more flexible than others, allowing more room for choice. Individuals
who receive education and training under these flexible institutions by extension, carry this training forward in their careers and develop a greater tendency to act against institutional constraints even when under new environments.

We seek to build on this literature by proposing the idea that if institutions are more flexible, then an individual does not have to break free from the dominant institutional logic as in the institutional entrepreneurship work. When flexible institutions allow choice to be the focal action (under institutional flexibility), then agency becomes more embedded into the institutional context. While prior work looked at individual or organizational-levels alone, we build on this work by looking at the individual level as well as the institutional level. In contrast to prior work, we propose a novel mechanism from the institutional environment to entrepreneurial behavior, one that emphasizes the role of the type of institutional environment in an individual’s past, specifically whether they were educated under more flexible institutions. The contribution is a novel mechanism in which educational training under flexible institutions in the individual’s past develops his entrepreneurial intentions and behavior. This idea of cognitive and institutional flexibility offers a contribution to literature on institutions and entrepreneurship as a different mechanism to explain why certain institutional environments foster individual agency and entrepreneurship.

**Institutions and Entrepreneurship Literature**

A central finding of institutional theory is that new organizations prosper when they are congruent with their institutional environment as defined by belief systems, regulatory and normative structures (Meyer and Rowan 1977). To explain the phenomenon of entrepreneurship, institutional theory has largely relied on institutional change to create entrepreneurial opportunities. By altering formal regulations and social norms, society increases the legitimacy of new organizational forms helping to foster entrepreneurship after institutional change (Tucker et al. 1990, Dobbin and Dowd 1997). Being in line with the institutional environment allows an organization to gain commitment of constituents and to obtain resources as others see the organization and its activities as legitimate (Meyer and Rowan 1977). For example, Sine et al. (2005) find that the presence of social movement organizations predicts more supportive regulatory policies towards renewable energy and both of these factors are positively related to the level of entrepreneurial activity among renewable energy
producers following the passage of the Public Utilities Regulatory Policies Act (PURPA) in 1978. Changes in institutions have been found to lead to increased entrepreneurial opportunity as the old, misaligned firms lose resources and new firms rise to take their place, such as in the case of the soft drink industry (Hiatt et al. 2009). Existing theory in this stream assumes better aligned ventures will arise in these circumstances. Recent work examines how political and civil violence alters the strategies leading to firm survival (Hiatt and Sine 2014). However, institutional theory struggles to explain why or how some individuals find entrepreneurial ideas to fill those opportunities.

Just because entrepreneurial opportunities are created, it does not necessarily follow that entrepreneurial ideas will be generated or that new firms will fill those opportunities. This is only one possible outcome. Incumbent firms sometimes adapt or diversifying firms from related industries could enter. Even if institutions change, creating an opportunity for new firms, filling these opportunities still requires individuals to generate entrepreneurial ideas and for some individuals to decide to pursue commercialization of those ideas through the creation of new ventures. Thus, institutional theory needs further development to account for the remaining steps and aspects of this process. Prior work explains entrepreneurial opportunities, but not the emergence of entrepreneurial ideas or why some individuals pursue them. To create an institutional environment with more sustained levels of entrepreneurship would require either continued periodic institutional changes. However, this may be misleading. There may be other mechanisms to link institutions and entrepreneurial behavior. We seek to build on previous work on institutional effects by theorizing a novel mechanism: it is flexibility as a result of institutionalizing individual choice that can link institutions and entrepreneurial behavior.

We examine the impact of a shift towards greater flexibility. Choice must be permitted, but it does not need to be entirely legitimated. In this paper, we merely seek to establish the importance of some degree of institutional flexibility. Note that choice does not need to be taken-for-granted. However, it may become taken-for-granted over time. It is likely that questions may initially emerge

---

3If choice is permitted but illegitimate, then those who for various reasons do not need or care about legitimacy may take advantages of the permitted choice. If it is permitted but not fully legitimate, then only a small percentage of people will take advantage of the less legitimate choice.
as people are unsure about how to make the choice, its basis, and the implications of various choices. In part, this type of questioning produces the effects of institutional flexibility. It makes people aware that they have choices and options and allows them to undertake a planning process and a degree of creativity in designing and making their choices according to individual interests.

How can we tell if a given institution is flexible or not? One needs to examine choices individuals have or lack when that institution influences them. More flexible institutions foster agency and entrepreneurship in allowing, rather than restricting, individual choices. In contrast to institutional rigidity, whereas specific acceptable behavior would be legitimated, regulated into law and/or taken-for-granted as acceptable, institutional flexibility elevates choice as the acceptable behavior. In a flexible institutional environment, individuals have more (not less) freedom to choose the way of behaving so long as it generates the outcome expected by the institution.

Theory and Hypotheses

Flexibility in University Institutions

One of the unique contributions in this paper is examining the impact of the institutional environment of during university training as separate from the current institutional environment (at founding). University education profoundly impacts students’ career choices (Miller 1990) and helps them construct meaning and worldviews (Edelman and Suchman 1997, p. 499, Eesley et al. 2013). Flexible university institutions that provide students with opportunities to make their own choices may better train students to explore interests that recombine knowledge across majors as well as plan and think for themselves. This flexibility may better help them develop and pursue entrepreneurial intentions. We examine the adoption of the credit system of course selection as one example of a move from a rigid to a more flexible institutional arrangement. The unique advantage of the credit system is that it makes learning flexible, allowing students to choose courses according to their interests. The extent of restrictions in the system before the reform is exemplified well in the following quote. One alumnus, who graduated in 1986, before the reform, told us that, “When I was at Tsinghua, I had very little choice over my coursework and I considered my future career to be pretty much set from when I entered the university. The university told me which courses to take and I simply had to do my best in them. There wasn’t much choice involved. I know most of my friends, who
were studying under the same major as me, felt similarly that there were courses in other areas we wish we could have taken but could not.” This quote indicates that both variety and choice of coursework was restricted and that most friends were within the same major.

**Flexibility and Entrepreneurial Intentions**

Intentions are important to study alongside the act of creating a firm. There are several reasons for studying intentions alongside entrepreneurial action itself. First, intentions are at an earlier stage in the process of founding a firm. Many other factors may interfere with the process in between having entrepreneurial intentions and actually founding a firm. These include gathering the resources necessary to turn an idea into action, including skills, cofounders, social networks and access to capital. Intention is different from activity in that activity may need more inputs to be developed than intentions alone. This is why it is important to study both entrepreneurial intention and activity. Developing intentions is an initial step but entrepreneurial action may require something further. Thus in studying entrepreneurial activity alone, we may mistakenly miss or under-represent factors that have an influence if the steps from developing intentions to founding a firm are blocked or have not yet had time to occur. Some individuals have entrepreneurial intentions, but have not yet had an opportunity to found a firm or do not know how to implement their ideas. Effects on these individuals are missed by studies focusing only on founding activity. Finally, examining entrepreneurial intentions allows us to theorize about factors that lead to activity separate from intentions and break down the process into steps. Due to a lack of data on either intentions or on entrepreneurial activity, many studies examine only one or the other, limiting the potential insights available by studying both.

Institutional flexibility is likely to increase entrepreneurial intentions of individuals in several ways via the mechanism of giving choice. Simply giving choice to students (to pick courses in this case) helps to develop self-efficacy, confidence and individual interests. First, greater choice is likely to increase self-efficacy of individuals. Such choice will signal that leaders within institutions trust individuals with making appropriate choices. This confidence improves self-efficacy, which makes it more likely that individuals will have confidence to aspire to entrepreneurship (Chen et al. 1998).

Second, greater choice encourages individuals to develop their own individual interests. Aiding students in developing their own individualized interests allows them to develop entrepreneurial
intentions. This is because founding a firm requires that an individual break from established, common paths and pursue their own ideas and interests. When confronted with choice, students must take time to go through a process of discovering what they are most interested in out of the available courses. This choice exposes them to new possible interests and forces them to make a decision and choose one. As one alumnus put it, “It was not just that we could take classes across subjects, but it was the idea that the choice was up to us. It forced me to really stop and think about my interests and to do a bit of career planning. I’d say it was probably the first major decision I had to make on my own without the guidance of my parents.”

Greater flexibility and choice are also likely to foster the habit of questioning assumptions. As students are exposed to a variety of courses outside of their major, they are better able to question assumptions embedded in their coursework and as a result, their way of thinking. They become exposed to alternative, divergent ways of thinking about problems. Students freed from a more rigid academic course load may gain entrepreneurial intentions as they see ways to question previously hidden assumptions. Students may feel empowered to challenge the status quo as they are exposed to faculty from various fields that hold a different set of assumptions.

**Influence of Institutional Flexibility on Independent Decision-Making**

Besides aiding in finding opportunities, developing one’s individual interests also aids in making career decisions independent from one’s peers. Making different choices from one’s peers regarding coursework and academic interests instills confidence that students can exercise similar flexibility in behavior as alumni in their careers and as entrepreneurs. Students can get practice and gain confidence in making this type of differentiated decision if their university experience included making independent decisions about courses. Students who make different decisions from their peers regarding coursework may have an easier time with similar career decisions later on. Alternatively, students and alumni whose experience was that everything was planned out for them (they simply had to follow actions of others) would likely have more difficulty in making an independent leap contrary to legitimate, institutionalized pressures. In a similar logic, students and alumni who have found and developed their own individual career interests may have an easier time in the task of turning down other, more immediately lucrative job offers in favor of pursuing their own career and entrepreneurial
interests. Becoming an entrepreneur requires an individual to turn down job options and making a substantially different career decision from those around him who continue to work as an employee.

Thus, for a university alumnus, an individual who has been educated under a more flexible system that gives choice is more likely to build self-efficacy, confidence and individualized interests. Using that choice aids alums in questioning taken-for-granted assumptions and recombining ideas from across divergent fields; and to question traditional, disciplinary frameworks. All of these make it likely that she will hold entrepreneurial intentions because such an individual will encounter an entrepreneurial idea and have the mindset disposed towards pursuing opportunities beyond a single, discipline or conventional career ladder. Thus we propose:

*Hypothesis 1: There is a positive relationship between institutional flexibility and entrepreneurial intentions.*

Yet institutional standards, rules, and regulations do not apply or impinge equally on everyone. Whether an institution is binding or voluntary often depends on one’s membership in various groups or professions (Hwang and Powell 2008, p. 187). An important, growing stream within this literature contributes to the micro-foundations of institutional theory by showing mechanisms by which institutional change influences individual choices and behavior (Powell and Colyvas 2008). We argue that some students will be influenced more than others by institutional flexibility.

When institutions are highly structured then this tightly dictates specific behaviors, paths to be followed, and metrics for outcomes. However uniform the institutional environment might be, individuals are far from being uniform and homogenous products. Some have greater skills and abilities in one area; others have proclivities in a different area. As a result, there is a distribution of academic scores, with those who fit best into that particular institutional environment, whose skills, talents, motivations and interests are most aligned with the environment (those who excel in a rigid, disciplinary curriculum) at the top. In the academic environment, student’s academic achievement is often seen as a measure of status. The individuals whose interests, motivation, skills or talents lie outside of the current institutional environment (such as those with interdisciplinary or more applied, less disciplinary interests) may wind up at the bottom of the distribution by which that institutional environment measures them.
Research in a range of contexts from architecture (Brian 1991) and arts (Caves 2000) to software development (Beecham et al. 2008) suggests that different individuals are attuned to different details of the institutions and organizations under which they work. Emerging evidence, especially in settings where creativity is important, suggests workers sort into environments that fit them on the basis of preferences beyond skills. For instance, academia attracts (and socializes) those who value autonomy and connection to a broader community (Dasgupta and David 1994, Stern 2004). Boudreau and Lakhani (2011) show that individuals who were allowed to choose which type of institutional and competitive environment they wanted to join had higher performance on the task than those who were randomized into one institutional environment or the other.

Some students are likely to have interests that span fields. Such students may be more likely to take advantage of the option for increased flexibility. The institutional flexibility to choose courses helps students to pursue their independent interests. The ability to pursue one’s interests is vital for entrepreneurship. Our interviews with entrepreneurs indicated that their initial intentions for entrepreneurship were largely motivated by the pursuit of an idea or an interest. Those who are enabled to pursue their interests within their careers are more likely to develop expertise in a specific area, to turn down other, safer and more immediately lucrative job opportunities (which are unrelated to their core interests). Especially within educational institutions, flexibility allows students an opportunity to find and to develop their interests.

While a wide group of students may be motivated to have entrepreneurial intentions by increased institutional flexibility, we expect that students who take advantage of this flexibility to a greater degree who will be most influenced. Prior work has coined such individuals as tempered radicals or misfits, because it is not that they are not capable or talented, but rather their interests lie outside of those of the current organization (Meyerson and Scully 1995). Top students, who have focused on their academic work and done well, are likely to have good job opportunities and may not be tempted by entrepreneurship as a result. In contrast, other students may be more likely to be influenced by institutional changes favoring entrepreneurship since it opens a new and potentially attractive career path for them. We do not hypothesize about the direct effects of a student’s academic status (academic performance). Prior literature finds little effect of educational achievement on selection.
into entrepreneurship (Van der Sluis et al. 2008). However, general cognitive ability has been shown to result in higher financial returns to entrepreneurship relative to wage-based work (Hartog et al. 2010).

In addition, prior theory on middle status conformity suggests that it may be the middle status group who responds most readily to conform to institutions; whereas those at the lower and higher ends of the status hierarchy are more free not to conform (Phillips and Zuckerman 2001). This idea would suggest that it might be the middle status students who are more likely to shift their behavior to conform to the new institution and to take a broader variety of courses, resulting in an increase in entrepreneurial intentions.

Students who take advantage of the flexibility are more likely to develop entrepreneurial intentions. Such students have opted into the flexibility provided and have shown that they are interested in a wider variety of subjects. Also the possibility that they will recognize an entrepreneurial idea by a novel recombination is greater. Recognizing such an entrepreneurial idea is likely to lead them to entrepreneurial intentions. In comparison, students who do not take advantage of the increased flexibility offered are less likely to generate novel entrepreneurial ideas.

Hypothesis 2: After the implementation of an institutional change from a stricter to a more flexible system within the university context, lower status students will be more likely to be influenced relative to top students; and subsequently, are likely to have entrepreneurial intentions after graduation.

Institutional flexibility is likely to increase entrepreneurial activity (by which we mean starting a company) based on the mechanism of providing the resources of ideas, skills and social networks to start a company. First, the use of choice fosters entrepreneurship because exposing students to multiple areas of knowledge enables them to recombine knowledge in novel ways and to generate entrepreneurial ideas. Compared with an inflexible system, under which courses are strictly stipulated, the credit system allows students flexibility to select courses. When students are only exposed to a narrow curriculum within a single paradigm (i.e., a major in computer science), then they lack practice in the recombination of ideas across areas. Just as members of an organization become socialized to the organizational code and groups suffer from similar ways of thinking (March 1991), students who take courses in a single area begin to think in a more common, narrow way. If an
inflexible system dictated a specific set of diverse courses, then a similar problem arises since more novel recombinations would not occur. Students then have a chance and an inclination to think more deeply and to explore ways to combine ideas from other adjacent areas with their interest area when they can choose more classes according to their interests. Another entrepreneur, who graduated in 1990, told us that, “it was an insight from a class that I took in subject X (biology) that gave me the insight into how to solve a problem in subject Y (engineering).” This insight led to his desire to found a firm taking advantage of the opportunity when he saw how a problem in one area could be solved with a different approach from another discipline.

Alongside developing students’ individual interests, flexibility also enhances entrepreneurial intentions through exposing students to multiple disciplines and lenses through which to view problems and to generate potential solutions. Flexibility in university institutions can increase entrepreneurial intentions and activity via giving choice, which aids in entrepreneurial ideation. Once students are confronted with courses in a variety of disciplines, they may be likely to see and become accustomed to options for generating ideas by combining insights across fields, permitting them to generate entrepreneurial ideas and intentions.

For students in a rigid academic system, the mindset that gets imparted to the youth is a single way of thinking about problems, a unified set of skills, and a single set of assumptions about how the world operates. Such circumstances make it difficult to see opportunities that others have missed. Exposure to a variety of courses provides multiple lenses through which to view problems. This ability to view a problem through multiple lenses aids an individual in problem-solving and in recombining ideas in new ways. As a result it supports identifying entrepreneurial ideas. Developing this skill is likely to eventually result in the intention to pursue one of these entrepreneurial ideas.

These ideas were reflected in interviews with university alumni. One alumni entrepreneur told us about his experience in school, “I was able to choose other courses if I met the basic requirements. Actually, I took four courses beyond the requirements.” He went on to explain the benefits of this variety of courses to his entrepreneurial activities, “It’s quite beneficial for me. I got different things from different majors and degrees and they provided me with approaches to problems using different lenses. For example, chemical engineering gives me a systematic view of solving problems. MBA and
economics courses gave me a useful way to evaluate the practicality and value of a project. Material science provided me with a new understanding of technology from a different perspective than chemical engineering.”

Another alumus, an entrepreneur, who graduated in 1989, said, “My coursework at Tsinghua definitely had an impact on my entrepreneurial career. The classes that I took both in electrical engineering and in management and psychology helped me with developing ideas for running my own business. Taking classes across disciplines exposed me to new ways of approaching problems and taught me the benefits of looking at the world using different lenses for problem-solving.”

Prior work also recognizes the importance of recombination (Fleming 2001, Katila and Ahuja 2002) and has examined recombination within firms, but rarely at the individual level before a firm exists. Entrepreneurship scholars have long recognized that entrepreneurship often involves novel recombination of resources (Shane and Venkataraman 2000, Baker et al. 2003). However, it has shed less light on the types of institutions that support such recombination. By moving to a more flexible system, students are better able to take a diverse array of courses. Such boundary spanning enables them to conceive of ideas for novel recombinations rather than recombinations that have been used before. We theorize a previously unexplored link from flexibility in the institutional environment to recombination via cognitive flexibility from the coursework chosen by students.

Prior work has examined mechanisms for recombination via brokered collaborations (Fleming et al. 2007), spanning intra-organizational boundaries (Hargadon and Sutton 1997) and corporate restructurings (Karim and Kaul 2013). We propose an unexplored mechanism for knowledge recombination resulting in entrepreneurial ideas that do not require corporate restructuring or spanning intra-organizational boundaries. Institutional flexibility allows students to choose their own novel combinations of courses according to their unique interests, which then enables the generation of entrepreneurial ideas.

Another entrepreneur we spoke with also emphasized the importance of the variety of courses he took for providing opportunities for knowledge recombination and multiple lenses for problem solving. He graduated from the automotive engineering department in 2004 and told us, “I chose a lot of courses in computer science, such as data structure and software engineering.” He went on, “I
think these courses were beneficial for me because they are useful tools to solve practice problems and are related to what I do now as an entrepreneur.” This entrepreneur operates a business at the intersection of information technology and the automotive industry, so the influence of this particular combination of coursework is clear.

Second, institutional flexibility provides individuals with resources beyond ideas that they need to start firms – i.e., novel recombination of skills and social networks needed to start a business. In flexible institutions, students undertake course selection and career planning. These actions impact students’ independent decision-making abilities. Finding their individual interests aids them in developing their entrepreneurial ideas into action. As an individual develops their interest in an area, the individual develops unique expertise, skills and networks in this area.

Flexibility fosters entrepreneurial activity by developing specific skills that are important for entrepreneurship including ways of thinking and functional skills. Recombining ideas itself is a skill. When flexibility increases, students are exposed to multiple sets of assumptions. As a result, they not only pick up a variety of skills, but also various ways of thinking. They can then see not just one intellectual approach, but rather many to choose from. Even if a student does not generate entrepreneurial ideas at the time, the training and practice with recombining ideas makes it more natural for them to do the same thing later in their careers.

A related skill that is developed which aids entrepreneurial activity is cognitive flexibility. Due to high levels of uncertainty, entrepreneurs must be flexible in social situations. Yet, prior to successfully exhibiting flexibility in social situations, individuals must develop flexibility in cognition. Prior literature defines cognitive flexibility as, “a) awareness that in any given situation there are alternatives and options available; b) willingness to be flexible and adapt to the situation; and c) self-efficacy in being flexible” (Martin and Rubin 1995). Tasks that cognitive flexibility facilitates are similar to tasks facing the entrepreneur such as recombination of ideas and knowledge in new ways and multiple ways rather than single representations of problems. In ill-structured domains, (common in entrepreneurship), cognitive flexibility is critical for learning (Spiro et al. 1988). Practice in these skills gives students the confidence that they can act in a flexible way. Thus, more flexible institutions
foster cognitive flexibility.  

Finally, institutional flexibility increases entrepreneurship through providing students with a more diverse and unique social network. Alumni who took a rigid schedule of courses in their own major are more likely to develop a concentrated social network that includes people who have similar skills. In contrast, those under more flexible institutions also have an opportunity to make not only a wider variety of social connections, but to also create a unique combination of social ties of different types. Since entrepreneurship is aided by networking to find new ideas and varied skills, this broader social network also aids the prospective entrepreneur to turn his intentions into actions. Developing expertise in a specific area of interest also aids in networking. Colleagues and friends recognize this area of interest and introduce others who they know share this interest and who may have opportunities related to this area.

For these reasons, flexible university education is an important enabler of entrepreneurial action, beyond mere intentions. Under the credit system, students are free to choose electives in their course study. This flexibility contributes to improving their chances for a novel recombination of skills and social networks, in addition to entrepreneurial ideas. As a result it increases the probability of entrepreneurial activity. Thus, we propose:

_Hypothesis 3: Institutional change from a stricter towards a more flexible system contributes toward increasing the probability of actual entrepreneurial activity amongst alumni._

Flexibility in institutions may be especially important for potential entrepreneurs who do not fit well into narrowly defined institutional paths. We draw on insights from literature on “misfits” to contribute to institutional theory (Meyerson and Scully 1995). More flexible institutions may particularly benefit those “misfits” who do not fit well in a rigid institutional environment. On the other hand, students who do well in an academic environment (top students) may be less likely to take advantage of increased flexibility. They have great opportunities and are often not interested in

---

4We thank a participant at the Maryland Entrepreneurship conference for suggesting the link between institutional flexibility and cognitive flexibility. In the same situation, some individuals will be able to recognize multiple viable options and opportunities, whereas others may recognize only one correct interpretation and course of action (Canas et al. 2003). As a result, cognitive flexibility has been associated with creativity (De Dreu et al. 2011) in mathematics (Helson and Crutchfield 1970) and engineering (Rouse 1986). When the transferring or recombining and applying knowledge beyond the initial learning domain, cognitive flexibility theory is important (Spiro and Jehng 1990, p. 165). Entrepreneurs use these multiple representations to find new markets or to design and commercialize new products/services in existing markets that had not been thought of previously.
entrepreneurship, preferring to do well within a traditional career and academic discipline. Thus, with top students less likely to engage in entrepreneurship due to high opportunity costs, we expect middle and low status individuals to be most influenced to increase their entrepreneurial activity by increased institutional flexibility.

The high status, top student group is unlikely to be influenced by the reform to introduce greater institutional flexibility. High status students (assuming that academic achievement creates status in university environments) have other job opportunities and are more focused on maintaining their high level of academic achievement. As a result, such students more likely to continue to focus on courses within their department that they know they can do well in. They are not likely to conform to new institutional flexibility, but instead are likely to continue taking a more narrow set of courses within their department. Such students are more likely to be influenced by faculty advisors within their major who may guide them towards more classes within the department.

The lower status group is also influenced by the introduction of flexibility. One of the ways that individuals are likely to cope with low status and a lack of institutional flexibility is by engaging in activities that are outside of or tangential to the institutional context or that appeal to external audiences. Low status individuals who do not fit well within traditional boundaries of an institution may be referred to as “misfits”. Such individuals are already more interested in their extracurricular activities and in socializing and pursuing their interests with like-minded, entrepreneurial peers than in their coursework. It is not that they are unintelligent. Rather, they are organizing side projects, participating in student groups, lab work, part-time jobs, or other social activities, such that there is simply less time and emphasis on learning within the classroom. Often these students work on startup projects or other creative endeavors. There is likely a continuum of individuals, some of whom are already more prone than others to step outside of the status quo and are more eager to utilize flexibility to choose a different path. These low status “misfits” are likely to take advantage of alternative options and flexibility in choices.\(^5\) Such students are particularly likely to recognize the

\(^5\)One of the coauthors has personal experience with this phenomenon. While attending university as an undergraduate, he discovered a more flexible alternative to choosing a major. “Program 2” allowed students to create their own self-designed major. He took advantage of this extremely flexible program while also
benefits of entrepreneurship for free thinking “misfits” such as themselves.

Prior work has described such individuals as “misfits” or even as “tempered radicals” (Meyerson and Scully 1995). Entrepreneurship scholars have frequently used the term “misfits” to describe individuals who do not fit well into their employment situation. This idea is often conceptualized as a mismatch between firms and workers or mis-assignment of workers to tasks due to frictions in the labor market (Astebro et al. 2011, Min 1984). This research often thinks of fit as determined by the skills of the worker and those needed by the firm. If mismatches occur in the workplace and labor market, then they are even more likely to occur within educational institutions. This is because at this younger age, students have less information and knowledge about the world and their own interests to help guide their early choices and, in addition, educational institutions have less information about students. These factors make mismatches more likely, both between students and universities and between students and their chosen major.

Similarly, Meyerson and Scully (1995) introduce the term “tempered radicals” to describe individuals whose identities extend beyond their roles within an organization. They define tempered radicals as, “individuals who identify with and are committed to their organizations, and are also committed to a cause, community, or ideology that is fundamentally different from, or at odds with the dominant culture of their organization.” Such individuals encounter unique challenges and opportunities due to the tension they experience between the status quo and alternatives. Since their dual identity places them at the margins of the organization, they are motivated to seek change and alternatives due to their identity with causes extending beyond the organization. It is this type of individual that we see as being particularly encouraged by institutional flexibility to choose an alternative course of action. The flexibility to choose allows them to pursue their interests and identities that fall outside of the current status quo, yet remain within the organization. Misfit, low-status students are likely to be driven to try courses in a variety of departments and to recombine ideas in creative ways. Thus they would more acutely feel the constraints of an inflexible system, making them more likely to take advantage of increases in flexibility and course choices.

participating in many extracurricular activities and winning the business plan competition. His startup idea was a direct result of the flexibility that the self-designed major allowed.
Prior work examines which organizations are more likely to challenge existing institutional arrangements and finds that lower status organizations often create divergent organizational change. This is because relative to higher status organizations, they are less well-embedded in the organizational field and have less to lose by social deviance. They are less privileged by current, dominant institutional arrangements (Greenwood and Hinings 1996: p. 1036). In this case, with university reforms, flexible institutions may particularly benefit those who fit the profile of misfits or tempered radicals. After credit reform, the education system becomes increasingly flexible and gives such students, who might be labeled as “misfits” or “tempered radicals” an opportunity to have more choice. However, for misfits their interests, motivation, or skills were not a good fit under the traditional academic environment. With greater flexibility, they have an opportunity to combine different areas of coursework, to pursue their interests, and to pursue opportunities, such as in entrepreneurship that were not possible and certainly not measured in the previous more inflexible institutional environment.

In addition to lower status students, mid-status students may be influenced as well. Middle status conformity is the idea that conformity is high in the middle and low at the bottom and top of a status hierarchy (Phillips and Zuckerman, 2001).6 Middle status conformity theory would predict that after the change to institutionalize greater choice and flexibility, middle status students should be most likely to conform and choose classes with a greater variety. By conforming to the new institution and exercising choice to take a greater variety of courses, this should lead the middle status students to be more likely to become entrepreneurs. Interestingly, in this case, middle-status conformity with the new flexible institutional environment during the university years leads to a type of non-conformity (entrepreneurship) later in their careers, even if in a different environment. Just because these students were middle status while at the university in terms of academic achievement, it does not necessarily follow that they will wind up being middle status as alumni later in their careers. Thus, we do not see this prediction as contradicting prior theory, but rather as adding a new dimension that middle status conformity during the earlier, student years may actually lead to entrepreneurial behavior later in life.

6 We thank an anonymous reviewer for the suggestion that middle-status conformity may play a role here in explaining who is influenced by the reform to increase flexibility.
due to flexible university institutions and the influence on coursework choices.

The mid- to low status students are the ones that should be influenced more strongly than top students by the change in institutions to take entrepreneurial action later in their careers. Providing additional choices enables students who had not found their motivation, talents, or interest within a single discipline to explore a greater variety of coursework and increases the likelihood they find and pursue a passion at the intersection of fields (Schumpeter 1934, Fleming 2001) as well as build a broader network. This aids in not only finding but also taking action on entrepreneurial opportunities. For this reason, we expect that an increase in institutional flexibility will have a greater impact on those individuals who are middle status and misfits relative to the high status, high academic achieving students. Thus, we propose:

_Hypothesis 4:_ After the implementation of an institutional change from a stricter to a more flexible system, lower status students (relative to high status) within the university context are more likely to be influenced by increased flexibility and subsequently, to become entrepreneurs after graduation.

**Methods**

The university credit system reform provides us with a clear instance of increased academic institutional flexibility, which allows for cleaner identification of the causal effects of this type of institutional environment. We examine alumni from Tsinghua University to understand the linkage between university reform towards more flexibility and entrepreneurship because Tsinghua offers a natural experiment when the university changed from an academic year system to a credit system in 1984. This natural experiment enables us to compare the subsequent entrepreneurial intentions and activity of those who graduated just before and after the reform. This research design allows us to control for many other alternative explanations, such as gradual cultural shifts or macroeconomic changes. The research design has two key advantages. First, we were able to find a natural experiment which aids us in eliminating or reducing a number of alternative explanations. It provides exogenous variation in the flexibility in the institutional environment during the university years without a change in other factors that might influence entrepreneurship. Second, it allows us to control selection bias resulting from individuals who choose to be in more flexible environments.

Before 1984, Tsinghua University followed an academic year system, which had a rigid teaching schedule with a fixed number of courses in each year. The university arranged the courses taken by
students. Under this kind of education system, students completed their courses according to the requirements of each year’s teaching outlines; students could not select courses according to their interests or change their majors. One alumnus who graduated before the reform told us, “There was not much choice when I was an undergraduate. In fact, I must follow the requirements ... so it was a very rigid system.”

In 1984, the credit system reform in Tsinghua University relaxed restrictions on courses, the length of study and change in majors and as a result increased the flexibility of the education system. Under a credit system, students could select courses according to their interests as long as they finish the specified number of credits. Choice was institutionalized as part of the system because students had to choose which courses to take to meet the required number of credits rather than having them prescribed for them. Each department offers elective courses and students could pick courses to obtain a prescribed number of credits. The numbers of courses in almost all the departments also increased significantly in this period.\(^7\) Compared to an academic year system, a credit system allows more flexibility in the choice of courses. We do not make an argument about degree or level, for example, that this change made course selection completely flexible. Simple exposure over time to some degree of choice is sufficient. Zajonc (2001) shows how “mere exposure” (referred to as the familiarity principle in social psychology) is often enough to generate significant, positive effects on individuals. Fear and anxiety may first result when an individual is exposed to a significant individual life choice. Yet repeated exposure results in an effect producing familiarity and a more positive reaction.

We conducted several interviews with Tsinghua alumni from both before and after the reform to verify whether they experienced the credit system as rigid or flexible and how this impacted the courses that they were able to choose. One alumnus, who graduated before the reform (in 1987) and majored in electrical engineering (EE) told us, “I had to choose my major when applying to college and didn’t know much about EE, other than that it sounded good.” She went on, “There was not much choice, everything was planned for the students. They had largely the same classes, the EE majors all

\(^7\)For example, in 1981 the numbers of courses in Department of Mechanical Engineering and Department of Electronics were 52 and 48 respectively; however, in 1990, the numbers had increased into 101 and 123 (Fang and Zhang 2001). Source of data: Tsinghua University Archives.
stayed in the same dorm and did everything together.” She added, “It was not easy to change your major and I didn’t know anyone who changed. In the first year you could choose one or two classes and that was all.” She concluded by telling us that students at Tsinghua in later years have significantly more choice than in her day (she currently works at Tsinghua University and regularly interacts with students).

Sample

To empirically study the relationship between institutional flexibility and entrepreneurship, we conducted a survey of alumni who graduated from Tsinghua University between 1930 and 2007. The questionnaire included two parts: the alumnus’ basic information and entrepreneurial information. Through the Tsinghua Alumni Association, questionnaires were distributed to nearly 30,000 alumni in June 2007. We received 1,620 and 2,026 questionnaire responses respectively via the Internet and postal mail, with a total response rate of 12%. This investigation has three main advantages. First, most alumni have special emotional connections with their alma mater, which urges them to have strong identification with and wish to make contributions to the university (Weerts and Ronca 2008, Mael and Ashforth 1992, Ashforth and Mael 1989). If a survey is conducted by their alma mater rather than other individuals or institutions, respondents will be more willing to disclose their real personal information as they may view it as a form of contribution to the university. Besides, respondents may have incentives to under-report entrepreneurship in earlier decades if the survey is conducted by government, in that entrepreneurship had not gain much regulative legitimacy at that time (Puffer and McCarthy 2010, Tsang 1996). Therefore, the university-conducted survey has advantages over surveys conducted by unrelated individuals or institutions, as well as datasets collected by government. Second, the survey covered alumni within a relatively long time period, who all together went through the main development process of the university and thus are excellent subjects when conducting a longitudinal study on the institutional reform of the university. Third, the university we chose undertook credit system reform (which is a more flexible system compared with the former academic year system) during its development process, and this natural experiment allows us to better estimate the causal impact of more flexible institutions.

To test whether respondents of our survey were representative of the population of Tsinghua
graduates, we compared survey responses to archive data on graduates from Tsinghua University in aspects such as major, gender and degree. The school claims 62.5 percent of students major in engineering disciplines, 11.9 percent in sciences and 12.9 percent in humanities (architecture, medicine and law comprise the remainder). Our survey sample contains 62.2 percent engineering, 10.6 percent sciences, and 13.7 percent humanities. Traditionally, Tsinghua has been a male dominated university and our Tsinghua sample reflects this with only 12.2 percent of the responses from women.

In recent years, Tsinghua reports that 25-30% of its students are female, and in our survey sample, the percentage of women in recent graduating cohorts ranges from 11 percent in 2000 to 28 percent in 2007. Tsinghua has 19.2 percent of its alumni graduating from doctorate degree programs. In the survey sample we have 19.3 percent. Tsinghua claims 53.4 percent of its students are enrolled in graduate (Master’s or Doctorate) programs and the survey sample shows 53.9 percent. From those comparisons, it appears that there were no statistically significant biases in respondents.

Furthermore, we performed a test using the extrapolation procedure, which is a commonly used method to assess non-response bias (Donald 1960, Filion 1975, Armstrong and Overton 1977, Rogelberg and Luong 1998). In this method, the survey is split on the basis of survey return dates. The test examines mean characteristics of respondents who were among the first 90 percent to respond and compares them with the last 10 percent of respondents who answered after multiple reminders. This method rests on the assumption that non-respondents share characteristics with late responders. We ran t-tests of the null hypothesis that the average (observed) characteristics of responders and non-responders are roughly the same statistically. Older founders appear to have been equally likely as younger founders to respond. The 10th, 25th, 50th, 75th, and 90th percentiles of graduation years were also checked and are similar. These results offer reassurance that there were no systematic non-response biases in the survey.

**Dependent Variables**

Our study examines two dependent variables: entrepreneurial intention and entrepreneurial activity. We measured *entrepreneurial intention* by a dichotomous variable. We obtained this measure from a survey question and therefore entrepreneurial intentions are measured at the time of the survey (year 2007). We measured *entrepreneurial activity* by whether the individual had founded
a firm as indicated on the alumni survey.

**Statistical Analyses**

Since entrepreneurial intention is a dichotomous variable, we use logistic regression to test the hypotheses on this variable (hypotheses 1 and 2). We include the sub-sample of non-entrepreneurs (with and without entrepreneurial intentions) in this analysis. By doing so, we reduce or eliminate any concern of the influence of country-level entrepreneurial environment factors since all non-entrepreneurs face the same environment when reporting entrepreneurial intentions at the time of the survey.

We employ Cox hazard regression models to test hypotheses 3 and 4 regarding entrepreneurial activity since the model takes into account timing of events and adjusts for right-side censoring in the data. Right-side censoring arises since more recent alumni may in the future start firms, but have not had sufficient time from graduation until the time of the survey. Similar to prior literature, we employ a stratified random sample of the alumni dataset since founding a firm is a relatively rare event (Hsu et al., 2007). First, all individuals with complete data who are known ex post to have founded a firm were selected. We then matched these individuals in a five to one ratio with randomly selected alumni who had not founded a firm as of 2007, conditioning only on birth year. The statistics literature (e.g., Breslow et al. 1983) suggests little loss of efficiency so long as approximately 20 percent of a sample has experienced the event of interest. The “failure” years of those non-entrepreneurs were right-censored to the year of the survey. We set the year of graduation as the base point, and the incidence of entrepreneurial activity as the “hazard”. Thus, the “survival” time of an alumnus would be the time from graduation to the time when she started her first business (i.e. year of founding the first firm minus year of graduation). Cox hazard model was chosen because it is semi-parametric and has the advantage of estimating without the requirement of making an assumption about the baseline hazard function. Our differences-in-differences estimates come from the interaction of the post-reform time period with our variable *status at school*. The two differences are those who graduated before vs. after the reform and then the difference between higher and lower status students.

**Independent Variables**
Institutional flexibility. We use credit system reform (a more flexible educational system compared with former academic year system) in 1984 as a natural experiment to measure a relatively exogenous increase in institutional flexibility. Because alumni who enrolled as undergraduates in 1984 would have graduated in 1988, year 1988 was taken as the dividing line to separate alumni who went through flexible educational system (i.e. graduated in and after 1988) from those who did not (i.e. graduated before 1988). We assigned institutional flexibility values of 1 to alumni who went through flexible educational system, and 0 otherwise.

Status at school. For hypotheses 2 and 4, we use GPA as proxy variable of status at school. We gathered GPA data directly from Tsinghua University. At universities, GPA is particularly important to students because students with higher GPAs are viewed more capable, knowledgeable and are more positively evaluated by other students, professors, and even outsiders (Dika and Singh 2002, Hansford and Hattie 1982). For this reason, GPA is a good proxy for academic status before graduation. Recent studies suggest that general cognitive ability is associated with higher income in entrepreneurship (Hartog, Van Praag, Van der Sluis 2010). However, we do not hypothesize about the direct effects of this variable.

Control Variables

Based on the previous literature, we control for five categories of alternative explanations.

1. Basic demographic factors

a) Age. Since our natural experiment is based on the graduation year, an alternative explanation is that it is picking up an age effect. A number of studies have suggested that age may play a role in both the intention and the decision to start a new venture, with very young individuals less likely to start firms and an “aging out” phenomenon affecting older individuals (Levesque and Minniti 2006, Roberts 1991). In testing hypotheses on entrepreneurial intentions, we use the age of an alumnus in the survey year (2007). In testing hypotheses on entrepreneurial activity, we use the age when an alumnus started his/her first business for entrepreneurs, and the age in the survey year for non-entrepreneurs.

b) Gender. Former studies show that gender is an important factor influencing entrepreneurship, where men are more likely to found firms (Zhang et al. 2009). Thus gender is also
set as a control variable. It is assigned to 1 if the respondent is male; and 0 if the respondent is female.

    c) Party member. Communist Party members may have stronger capabilities and may be more likely to become entrepreneurs compared with non-party members in China. Therefore we also account for this variable and assign it value of 1 if the respondent is a Communist party member and 0 for non-Communist party members.

2. Other educational-related factors

    a) Degree. Students with a master’s or doctorate degree are more likely to planning for a research career. Therefore it is less likely to for them to have entrepreneurial intentions or to become entrepreneurs. Master’s degree is controlled and assigned to 1 if a respondent has a master degree and 0 otherwise, and PhD is assigned to 1 if a respondent has a doctorate degree and 0 otherwise.

    b) Multi-disciplinary. Lazear (2004) found that entrepreneurs are generalists who tend to have broader knowledge about many disciplines. Therefore we control for multi-disciplinary study. Alumni who studied in different disciplines were assigned the value of 1 and those who studied only in one discipline were assigned the value of 0.

    c) Broad major. We expect that alumni who studied in broad majors (such as mathematics and physics) where more courses were offered might already have had more flexibility in coursework and are more likely to have entrepreneurial intention and activity. Therefore we controlled for broad major as equal to one if the total number of courses provided by the department was larger than the median; and 0 otherwise. Also, an alternative explanation might be that entrepreneurial students were choosing broader majors.

    d) New major. We created the variable “new major” to control for the fact that after the reform some new majors were established in Tsinghua University. An alternative explanation is that students were more likely to be entrepreneurs if they chose a newer major. We assign 1 if the student majored in these new majors (Computer Science, Law, Economics, and Management) and 0 otherwise.

    e) Overseas returnees. Overseas student returnees typically have been exposed to more

---

8 We thank an anonymous reviewer for the suggestion to control for broader majors and new majors.
advanced technology and management philosophy that would influence their likelihood of entrepreneurship (Kenney et al. 2013). Thus we include overseas returnee as a dummy variable equal to 1 for returnees.

f) Leader. Since student leaders are more likely to have stronger leadership capabilities which are important for entrepreneurs, we control for leader in our analysis. It is assigned to 1 if the respondent used to be a student leader in Tsinghua University; and 0 otherwise.

3. Family-related factors

a) Family status. Family background and income can positively influence entrepreneurship decisions in that alumni from affluent and powerful families can get more financial support, as well as more opportunities to build social networks with potential stakeholders (Dunn and Holtz-Eakin 2000). Thus, we add alumnus’s pre-entrepreneurship family financial status as a control variable. We assign this variable the value of 1 if his/her family has above average financial status; and 0 otherwise.

b) Entrepreneurial parent. People who have entrepreneurial parents may be more likely to start a business due to genetics and upbringing. Thus they are more pre-disposed to become entrepreneurs than others (Gimeno et al. 1997, Duchesneau and Gartner 1990). Therefore we also control for entrepreneurial parent. We assign this variable the value of 1 if one of the respondent’s parents is an entrepreneur; and 0 otherwise. Controlling for family-related factors also controls for the possible alternative explanation that after the reform, individuals who were more pre-disposed to entrepreneurship chose to join Tsinghua University. Entrepreneurial parents or family should be highly correlated with these entrepreneurial tendencies due to genetics and upbringing.

4. Work-related experience

a) Work type. The type of career an individual had also may have influenced entrepreneurship. Those who had worked in business (compared with those who worked in government sectors, hospitals or universities) should be more likely to found firms because they are likely to access knowledge regarding running a business. We assign it to 1 if the respondent worked in business before; and 0 otherwise.

b) Number of job positions. People with different work experiences often have different
entrepreneurial intentions and activities (Bird 1988). Therefore the number of job positions prior to entrepreneurship was also controlled.

5. Broader macro-environmental factors

a) Developed city. In China, certain cities are more developed than others in both economic and institutional levels, and have an atmosphere and policies that are beneficial to entrepreneurship. Alumni in those cities may be more likely to have entrepreneurial intentions and activities (O'Farrell 1986). We add developed city as a control variable to exclude the influence of the development level of cities. Alumni in developed cities (Beijing, Shanghai, Shenzhen, Guangzhou, and Tianjin) were assigned the value of 1, and those in other cities were assigned the value of 0.

b) Macro-environment. While our natural experiment controls out the influence of gradual changes in the macro-environment (since those who graduated just before and after the reform have been exposed to similar national changes), we also include controls for this alternative explanation as well. Since the open up policy in 1978 and a series of polices afterwards, entrepreneurship has become increasingly legitimate in China (Li 1998). To capture the time series variation in national entrepreneurship environment, we use GDP as a proxy variable in our models (based on the year that an alumnus started his/her first business). In robustness tests, we include the undergraduate entrepreneurship percentage and stock market index as additional macroeconomic controls and find consistent results.

Results

Table 1 displays the descriptive statistics and correlation coefficients. We see that 78 percent of the alumni graduated after the reform. The mean age at the time of founding a firm was 36 and age at the time of the survey (when intentions were measured was 40). Concerns of multi-collinearity are reduced since few of the pairwise correlations are above 0.20. We note that multi-disciplinary is correlated with Master’s degree at 0.43. Yet this is consistent with the fact that it is more common to be multi-disciplinary across multiple degrees. Testing our first two hypotheses, Table 2 presents the results of logistic regression models predicting entrepreneurial intention. Table 2, Model 1 includes the control variables; Model 2 adds status at school and its squared term; Model 3 adds institutional flexibility; and Model 4 further adds the interaction between institutional flexibility and status at
Hypothesis 1 argues that entrepreneurial intentions will increase as a result of increase in institutional flexibility. As shown in Model 3 of Table 2, the positive and significant coefficient of institutional flexibility (p<0.001) strongly supports the argument that institutional flexibility positively influences entrepreneurial intentions. Alumni who experienced a more flexible education system are more likely to have entrepreneurial intentions compared with those who experienced a less flexible education system. Hypothesis 1 is supported.

Hypothesis 2 predicts that lower status students will be more strongly influenced by the reform towards flexibility. Our results do not support Hypothesis 2. The results in model 2 reveal that the coefficient of status at school squared is positive, but it is only marginally significant (p < 0.1). After adding institutional flexibility and the interaction effect, the coefficient of status at school squared becomes insignificant. In Model 4, the coefficient of the interaction term between institutional flexibility and status squared is negative but not significant.

Next, we test the hypotheses on entrepreneurial activity. Table 3 present the results of Cox regression models predicting entrepreneurial activity. Similar to the models in Table 2, Model 1 in Table 3 includes all control variables; Model 2 adds status at school and its squared term; Model 3 adds institutional flexibility; and Model 4 further adds the interaction between institutional flexibility and status at school, as well as the interaction between institutional flexibility and status at school squared.

Hypothesis 3 suggests that institutional flexibility contributes toward increasing the probability of actual entrepreneurial activity amongst alumni. The results in Table 3 provide strong support for this hypothesis. In both Model 3 and Model 5, the coefficients of institutional flexibility are positive and highly significant (p<0.001), indicating that alumni who went through a more flexible education system are more likely to start a new business after graduation compared with those who went through a less flexible education system.

Finally, we examine the moderation effect of institutional flexibility on the relationship between status at school and entrepreneurial activity. First, we examine the main effects of the variables. In Models 2, 3 and 4 of Table 3, our results show that the coefficients of status at school are positive and
insignificant and the squared term are all positive and significant (p < 0.01), indicating an upward curve. To gain further insights into the U-shaped relationship between status at school and entrepreneurial activity, we plot Figure 1 to present the relationship. It is obvious in Figure 1 that both in low and high flexibility environments, middle status alumni are less likely to start new business compared with low and high status alumni.

Hypothesis 4 argues that the influence of institutional flexibility is stronger for lower status students relative to top students. As shown in Model 4 of Table 3, the coefficient of the interaction between institutional flexibility and status squared is negative and significant (p < 0.05), offering support for hypothesis 4. However, the interaction between institutional flexibility and status at school is negative and insignificant. Figure 1 allows us to get a better understanding of the moderation effect. The dash line A (B/C) in Figure 1 indicates the difference between entrepreneurial activity of middle status (low status/high status) alumni who went through a more flexible system and that of middle status (low status/high status) alumni who went through a less flexible system. The size of the effect represented by line B does not have a significant difference from that of line A. The size of the effect represented by line C is significantly smaller than that of line A (p<0.01) and line B (p<0.01), suggesting that after the reform to a more flexible education system, the probability of starting a new business increases more for middle and low status alumni than for high status alumni.

**Robustness Tests**

To ensure consistent results, we run robustness checks to test alternative measures and alternative statistical tests. For a subset of 547 of the alumni, we were able to obtain detailed course transcript data from the university. This allowed us to plot Figure 2, examining the relationship between status at school and the variety of courses taken, as measured by the number of department codes in which the student took classes. We were only able to obtain such data for students who graduated after the reform. The missing data prevents us from including this variable in the regression models. Interestingly, Figure 2 shows that it is the middle and lower status students who appear to have taken greatest advantage of the increased flexibility to take a greater variety of courses, relative to the top tier students in the distribution. This provides further evidence that supports the mechanisms that we hypothesize from flexibility to greater variation in coursework and to certain
students being more influenced by the reform. Simple t-tests on this data confirm that students who took above the mean in their variation in courses were significantly more likely to become entrepreneurs (p<0.01) as has been found in prior literature (Lazear 2004).

To ensure the robustness of our results regarding entrepreneurial intention, we divide our sample into four subsamples according to graduation year and rerun the models. Narrowing the analysis to the sub-sample of alumni who graduated just before and after the reform, increases the precision of our estimates. It also allows us to provide further evidence against alternative explanations that the results are due to general cultural trends or subsequent macro-economic effects and reforms. Operationally, we use 1984 (the year of credit system reform) and 1987 (one year before the graduation of the first batch of students who experienced more flexible system) as benchmark years to decide which observations should be included in each subsample. In Table 4, we add 20 years respectively before the left benchmark year and after the right benchmark year (1964 to 2007) and alumni who graduated during this time period are included in Model 1, we narrowed the sample to 15 years (1969 to 2002) in Model 2 and in Model 3 we narrowed the sample to 10 years (1974-1997), and in Model 4 we narrowed the sample to only those 5 years before and after the benchmark years (1979-1992). The results in Table 4 are basically the same as those in Table 2. This provides strong support to Hypothesis 1 and no support to Hypotheses 2.

a) Proxy variable for macro entrepreneurial environment. Although we control for GDP to exclude the potential influence of macro entrepreneurial environment, we cannot capture all of the changes in the macro environment. Therefore, we use GDP per capita and stock market index as proxy variables of macro environment respectively in Model 1 and Model 2 of Table 5 to check the robustness of our results on entrepreneurial activity. The results in Table 5 are consistent with the former results which used GDP as proxy variable for the macroeconomic environment, offering additional support to Hypotheses3 and 4. The results provide even stronger support for Hypothesis 4 in that the interaction effects for both the status at school variable and its squared term are statistically significant.

b) Potential Endogeneity. An alternative explanation of our results is that entrepreneurial activity of people who graduated from universities as a whole increases more rapidly than that of people who
never went to universities or due to some type of cultural change. Such unequal change in segments of society may lead to an endogeneity problem since our sample only includes university alumni.\textsuperscript{9} We sought to provide a test of this alternative. Although one can think of our results as generalizing to university educated alumni, rather than to those who never attended higher education. In addition, our natural experiment and estimation methods limit possible alternative explanations to changes contemporaneous with the 1984 reform. To further rule out this possibility, we use a Google Search to obtain proxy variables for university student entrepreneurship. We assume that if the ratio of undergraduate entrepreneurs to total entrepreneurs raises or cultural values towards universities and entrepreneurship change, attention to undergraduate entrepreneurship will increase and people will discuss it relatively more frequently online. Operationally, we search “undergraduate entrepreneurship (daxuesheng chuangye)” and “entrepreneurship (chuangye)” respectively for each year. We record the number of web links which include mentions of “undergraduate entrepreneurship” and which include “entrepreneurship” in the title. Then, we create two variables undergraduate entrepreneurship (measured using the number of web links which include “undergraduate entrepreneurship” in title) and undergraduate entrepreneurship percentage (measured using the ratio of the number of web links which include “undergraduate entrepreneurship” to the number of web links which include “entrepreneurship” in the title) and include them as control variables. The results presented in Model 3 and Model 4 of Table 5 indicate that although undergraduate entrepreneurship percentage has a significant positive influence on entrepreneurial activity, we can still get conclusions consistent with our earlier results supporting H1, H3 and H4, but not H2. The positive and significant result for undergraduate entrepreneurship percentage supports the idea that there has been a general societal trend towards entrepreneurship. In addition, in the more developed cities, the likelihood of entrepreneurship is also significantly higher ($p<0.05$). However, as the GDP per capita and the stock market index increase, we find significantly lower likelihood of entrepreneurship ($p<0.001$), consistent with the findings of Hsu et al. (2007). This is perhaps because economic growth provides more high paying jobs, increasing the opportunity costs of entrepreneurship. Yet controlling for these

\textsuperscript{9}We would like to thank an anonymous reviewer for drawing our attention to this point.
effects, we still find that the reform to increase institutional flexibility had the expected effects.

For other alternative explanations to be consistent with our results, it would have to include a change in the university around the time of our reform. All individuals more generally would experience a change outside of the university in society and affect all equally, regardless of graduation year and thus would not produce this pattern of results. A plausible alternative explanation to our reform in the university would also have to occur around the same time as our reform since even when we narrow the analysis to a shorter window of time around the reform, we still see a positive, significant effect of the reform variable. One of the coauthors was at Tsinghua during this time. He interviewed university officials and alumni who indicate no other major changes in the university curriculum around this timeframe other than the credit reform that we analyze.

To address this concern further, particularly that new industries might be driving the results, we re-ran the analysis to only include entrepreneurs who founded firms in “old” industries and excluded new industries (in our case the new industries in our sample that emerge in the late 1990s are software and internet since electronics firms occur throughout the sample). The results remain the same, failing to support the idea that the new industries are causing the change. We included a control variable for new major, which also addresses this concern. We included five categories of ages to further control for age (20-29, 30-39, 40-49, 50-59, and above 60 as the reference group). The results showed that younger individuals are more likely than older individuals to found firms. However, controlling for age categories and also for whether the individual majored in a new major, we continue to find significant effects over and above these controls for whether the individual was educated under an academic year system vs. the more flexible credit system. We even find these results when we narrow the sample to the five graduating classes just before and after the reform (and before the new industries emerged in our sample). The alternative explanation for our results that older alumni have skills that are less relevant for entrepreneurship in new or changing industries over time due to different changes in the curriculum is not supported.

Discussion

Institutional flexibility increases entrepreneurial behavior due to the way it aids individuals in finding and developing their own interests; exposes them to multiple lenses to choose from to view
problems and pursue solutions; provides experience in making independent decisions from others; and exposes individuals to a more diverse social network.

Existing work has shown that processes of institutionalization create taken-for-granted behaviors (Berger and Luckman 1967: p. 152), constraints on action (Ingram and Clay 2000), stability as well as standards (Garud et al. 2002). As a result, scholars point out the dilemma of explaining embedded agency. Prior work elucidates the social position characteristics of individuals who are more likely to act in contrast to institutional pressures (Battilana 2006, Greenwood and Suddaby 2006, Greenwood et al. 2002) and discursive strategies they use (Suddaby and Greenwood 2005). However, this work has inherently assumed that institutions must constrain behavior and limit choice.

In contrast, we define a new concept of institutional flexibility as the characteristic of institutions that permits individual choice. Rather than relying on individuals to act in ways that contradict institutional constraints, we propose another solution to the problem of institutional embeddedness and individual agency. Our concept of institutional flexibility allows some institutions to be inherently more flexible, allowing for individual choice. We contribute in advancing prior work on institutional theory and individual agency that left an incomplete explanation of how specific types of individuals free themselves of institutional constraints that inhibit the behavior of others. In this way, our paper adds to recent work theorizing on embedded agency of those who strive to change institutions (Battilana 2006, Holm 1995, Lounsbury and Crumley 2007).

First, we outline key contributions of the paper for institutional theory. Next, we indicate contributions to the literature on entrepreneurship. Then, we suggest boundary conditions for the theory, including how institutional flexibility differs from related concepts. Finally, we point out some high potential areas for future work.

**Implications for Institutional Theory**

Institutional research has brought to light the ubiquitous and important roles of norms, standards and rules for organizations and well-functioning societies (Brunsson and Jacobsson, 2000). Organizational sociologists have shown the influence of regulatory, cognitive and normative environments by emphasizing how organizations are conditioned by the constraints provided by existing political institutions (Edelman and Suchman 1997, Dobbin and Dowd 1997). Prior literature
focuses on institutional mechanisms resulting in mechanisms of mimicry and homogeneity (Dacin et al. 2002, Mizruchi and Fein 1999). Extending institutional theory into the context of entrepreneurship aids our understanding of a large category of emergence and change processes from an institutional perspective (of which entrepreneurship is one example), which institutional theory has previously struggled with. Our primary contribution is the concept of institutional flexibility and an alternative institutional mechanism.

We benefit from and build on older work on microfoundations of institutional theory (Goffman 1967, Berger and Luckman 1967, DiMaggio and Powell 1991). Relatively few studies have theorized about the dimensions or characteristics of institutions that foster individual agency. Such work has focused on institutional entrepreneurs and efforts to change institutions and legitimize new organizational forms (Battilana et al. 2009, David et al. 2012). We are among the first to argue that prior institutional environments, in particular, more flexible regulatory institutions during their prior educational experience, can play a role in enabling certain individuals to break free of current institutions.

**Institutions and Entrepreneurship.** Prior research identifies elements of cognitive institutions as combinations of both theoretical tenets and practical routines and habits (Tolbert and Zucker 1996). Scholars that have examined how regulative institutions affect organizations have tended to focus on *incentives* as the central mechanism (Grief 2006, Scott 2014). These scholars assert that institutions affect how organizations behave by altering the returns of a certain behavior (North, 1990). On the other hand, scholars that have studied the institutionalization of ideas have focused on *objectification* as the central mechanism (Berger and Luckmann 1967) and conceptualized institutionalization as a process where certain ideas acquire “a reality of their own” as the result of repeating and habitualizing an activity (Tolbert and Zucker 1996).

We respond to recent calls in the literature for more research to understand linkages between institutional theory and entrepreneurship (Tolbert et al. 2010). Much of the work in this stream highlights how institutional changes allow opportunities for firm creation and survival. Frequently, this work examines cases where cognitive and normative institutional changes led to social movements and crystallized as regulatory changes that shape entrepreneurial activity. For instance, a
social movement led by the Women’s Christian Temperance Union leading to the Prohibition laws and entrepreneurial opportunities in soft drinks as a result (Hiatt et al. 2009). We contribute to recent work by institutional theorists shedding light on how institutions and regulatory changes can create entrepreneurial opportunities (Sine et al. 2005, Hiatt et al. 2009, Lounsbury 2001, Sine and Lee 2009). In focusing on institutional changes that lend support to a specific and often initially highly uncertain industry (i.e., wind power, recycling, soft drinks, educational publishing), we see that a change in institutions can spark entrepreneurial opportunities. Prior work largely focuses on a specific choice that is permitted, taken-for-granted, and/or increasingly viewed as the legitimate choice. Yet, less work has explored how institutions during university training might support flexibility and choice, leading to new entrepreneurial ideas to fill those opportunities via the recombination of ideas and resources. Prior literature has said relatively less about general characteristics of institutions that foster entrepreneurship on an on-going basis at the individual level (Tolbert et al. 2010, Scott 2008).

We show that when the institutional environment is rigid, increased flexibility increases entrepreneurial behavior. This characteristic of flexibility in institutions has not previously been explored. By introducing the concept of institutional flexibility, we extend institutional theory with a new explanation to resolve the paradox of embedded agency and provide a novel mechanism linking institutions and entrepreneurship. We also contribute by examining who was affected most by this type of institutional change. Shifting to more flexible institutions had the greatest effects on middle status individuals who conformed more to the change and also low-status, “misfit” individuals who did not fit the previous one-size-fits-all institutional environment.

Since H2 was not supported, it appears that while institutional flexibility may result in a wide swath of alums having entrepreneurial intentions, taking action on those intentions requires something more. It may be that a low level of variety in courses or the option for choice itself can lead many to develop entrepreneurial intentions. However, for intentions to develop into entrepreneurial action, it may require students to be exposed to a higher level of variety in coursework and to take greater advantage of the flexibility offered in courses such that they develop the novel combinations of skills and networks necessary to take action on their intentions and ideas.

**Past Institutional Influence on Future Behaviors.** Institutional theory has predominantly looked
at the influence of institutions on founding rates immediately following institutional change. We contribute to institutional theory by highlighting a mechanism by which institutions may have a more lasting effect and influence careers. Prior institutional theory highlights three related roles of institutions in career choice – status markers, cultural carriers and enablers of professions. Institutions can act as status markers and allow the creation of new practices, such as active fund management in the mutual fund industry (Lounsbury and Crumley 2007). In a related way, institutions act as carriers of culture as in the example of professional factions with different models of organizing museums (DiMaggio 1991). Institutions also act as constraints and enablers of professions, as in the example of publishing (Thornton 2002). However, we connect this work on career choice more directly with a stream of work theorizing about the embedded agency, knowledge recombination, and the role of individual choice within institutions. Reforms to educational institutions allow us to theorize about how institutional changes imprint students through their educational experience and influence behavior years later.

When institutional flexibility influences individuals early in their lives and they are exposed to it during their educational training, over time it can become embedded into the individual’s values and way of thinking as well. In this way, regulatory institutions can wind up influencing cognitive and normative institutions. In this way, the institutional environment an individual is exposed to during their education has a long-lasting influence on behavior.

In addition, rather than examining institutions in settings with high levels of ambiguity, we contribute by examining the other of the theoretical spectrum – increasing flexibility where there was a high degree of structure. This university reform allows us to examine the impact of adding institutional flexibility without specifically affecting the legitimacy of entrepreneurial behavior.10

**Implications for Academic Entrepreneurship Literature**

Literature on educational institutions and entrepreneurship focuses on the determinants of faculty and technology transfer (Dahlstrand 1997, Nicolaou and Birley 2003, Rothenberg et al. 2007). Yet the university’s entrepreneurial influence extends to its students as well. Prior work has shown

---

10In fact, in the years just after the reform there was a backlash against economic reforms towards privatization culminating in the Tiananmen Square incident.
that university training and social environments vary in the extent to which they socialize students into the values and norms of entrepreneurship (Roach and Sauremann 2013, Hsu et al. 2007, Brown and Scase 1994). Many university graduates start enterprises that contribute towards technological progress and economic growth (Roberts and Eesley 2011, Eesley and Miller 2012).\(^\text{11}\) Astebro and Bazzazian (2010) estimate that alumni startups outnumber faculty spin-offs by as much as 48 to 1. Roberts and Eesley (2011) present evidence indicating that the bulk of economic impact from the university originates from former students (Hsu et al. 2007, Roberts 2004).

Prior work on entrepreneurial intentions has mainly examined the individual level, cognitive variables (Krueger 2000, Liñán and Chen 2009, Lee and Wong 2004, Chen et al. 1998), with relatively little attention to university or institutional factors (Bird 1988, Lüthje and Franke 2003). We contribute by theorizing that while many alumni are influenced to hold entrepreneurial intentions, it is the middle status group that is most influenced to take a broader variety of courses and as a result to convert those intentions into entrepreneurial action. This finding reinforces our novel theoretical mechanism by linking the reform to changes in coursework variety and then to entrepreneurship. The impact of university institutions has been left largely unexplored, despite the proliferation of entrepreneurship courses (Katz 2003). Few have linked the content of education to entrepreneurship. Our results contrast with a large body of prior work that had found little relationship between the level of schooling and the propensity for entrepreneurship (van der Sluis et al. 2008).

**Related Concepts.** Two related, yet distinct concepts exist in institutional theory. These are institutional complexity and proto-institutions. Institutional complexity occurs when an organization confronts multiple institutions or logics in their environment, thereby producing competing demands (Greenwood et al. 2011). The response chosen by actors to such a “hybrid context” has been argued to depend on the extent of identification with each institution (Pache and Santos 2013). This concept is related to institutional flexibility in that individuals might have more choice of which institution to follow. However, the conflict between the multiple institutions and how individuals resolve that

\(^{11}\) A study of MIT alumni concludes that its alumni have created over 25,800 companies, generating over 3 million new jobs and $2 trillion in worldwide sales (Roberts and Eesley 2011). An ongoing study of Stanford University alumni appears to be showing comparable outcomes (Eesley and Miller 2012).
conflict has been the aspect that is emphasized. With flexible institutions, there is no need for conflict or multiple institutions to be present. In addition, this work has not focused on embedded agency or on entrepreneurial behaviors resulting from institutionally complex environments. Also, rather than the current institutional environment, we focus on the influence of a past environment. Multiple, heterogeneous institutional forces operating at the same time allow individuals a degree of choice and flexibility over which set of institutional norms and rules to follow. This results in divergent organizational change (D'Aunno et al. 2000). Yet, institutionally complex environments may also be very inflexible if they constrain individual choice and behavior from multiple angles simultaneously (for a review, see Clemens and Cook 1999).

Similar to institutional complexity, institutional polycentrism describes institutional environments that are a result of the confluence of multiple different types of interrelated institutions (Ostrom 2005). For example, recent work examines implications of a weak, inefficient confluence of institutions on social networking strategies and performance of entrepreneurs (Batjargal et al. 2013). Institutional polycentrism is distinct from institutional flexibility in that polycentric institutions may be either flexible or inflexible. It may actually result in less flexibility and constrain individual choice more fully along multiple dimensions.

Second, proto-institutions is a related concept describing emerging institutions. The environment when institutions are not fully formed may provide greater flexibility or less flexibility. In our paper, we examine the impact of an institution after it has been put into place, rather than the process leading to emergence or the stage of a proto-institution. Yet, when new institutions are created, not everyone will follow the new institutions immediately, temporarily creating opportunities and flexibility for individuals to act in new ways, such as in the case of French cuisine (Rao et al. 2003). However, this is a temporary situation and temporary, rather than institutional, flexibility. Unlike proto-institutions, institutional flexibility can be a stable, long-lasting characteristic of institutions.

Closely related to proto-institutions is the concept of fluid institutions. This describes institutions that may be in flux. During that state of change, individuals struggle to make sense of what is going on. Also, there are no clear rules yet. This type of situation is very different from the one that we analyze here, where there were clear rules allowing students to choose between alternatives.
Situations of fluid institutions may also display this element or characteristic of flexibility and allow individuals to have more choice. If so, then such institutions may also result in more innovative, entrepreneurial behavior since individuals are more free to exercise their individual agency in this type of environment. However, fluid institutional environments may also be inflexible. These environments with transitioning rules are unclear and this may restrain and delay choice rather than fostering it as a result of the fear of making a choice that soon becomes one that is not legitimate. Fluid institutions are different from the type of stable, yet flexible institutional environment that we theorize in our setting.

Cutting across all of these cases, institutional flexibility is a distinct dimension and may or may not be present in each of the prior types of institutional contexts. Thus, institutional flexibility is a wholly distinct concept, worthy of further study.

*Boundary conditions.* More flexibility is not universally better. Too much flexibility, generates chaos and the loss of all structure. Some level of structure and rigidity may be necessary to restrain choice and provide sufficient order and legitimacy in a field for resource providers and entrepreneurs to move in. In the case of regulatory institutions to address pollution, a more rigid institution might restrict choice by mandating that all firms adopt a particular technology for reducing pollution. An example of a more flexible institution would be a cap and trade system, where firms have a choice of any existing or new technology to reduce their emissions, or to buy credits from other firms. This more flexible institution is likely to lead to more entrepreneurship since it allows an array technologies and methods for reducing emissions which ventures can then sell to the established firms. Too much flexibility, however, such as the case with no environmental regulations at all might be expected to hinder entrepreneurship due to too much uncertainty (Sine et al. 2005).

Rather than examining institutions in settings with low legitimacy or structure, we examine the opposite end of the theoretical spectrum – increasing flexibility in settings with a high degree of structure. Our change is binary, from a rigid, mandated coursework system to a more flexible credit system. In this range of change we find the impact of increased flexibility to be positive. Institutional flexibility is relatively more important when more creative and innovative behavior is desired, as opposed to greater standardization and homogeneity.
Furthermore, institutional flexibility is not likely to be a dichotomous state. There are degrees of flexibility. In some cases, a very small level of flexibility may be given (between two choices only). In other cases, a great deal of flexibility in choice may be possible (if there are 10 choices). In some cases, just a small amount of flexibility may be enough to produce effects in that individuals only need to be made aware that there is a choice possible. An interviewee reinforced this idea, “Although the engineering curriculum is very full, even having incrementally more choice makes a big difference because it gives you that chance to make independent decisions about your life and also to see what opportunities are out there,” she told us.

In other cases, a larger level of choice and greater latitude in the dimensions of choice may be given or necessary to produce effects. Future work may seek to examine hypotheses regarding degrees or levels of flexibility, where the level of legitimacy and the proportion of the population are relevant questions. There must be a point of diminishing returns in flexibility. What if an educational institution, had gone further, perhaps to have no constraints at all in course selection, or to let students choose whether or not to be graded? Would those far more extreme degrees of choice and flexibility still produce positive effects on entrepreneurship or must there be a point of diminishing or negative effects? Clearly, further research is needed to cover a wide range of changes in flexibility.

Future work. We leave a full accounting of the link between the context in which flexibility is institutionalized and its mechanisms of action to future work. First, we might also consider the role of institutional flexibility within a commercial organization, for instance, a startup firm. The initial means for achieving revenues or profits are often portrayed as an emphasis on focus – an apparent constraint on choice and flexibility. However, in order to grow the firm must experiment with new products, marketing campaigns, revenue models, and eventually new market opportunities – all variants of possible choices.

Second, within an established firm, examples of greater flexibility include the use of flextime where employees are permitted to use a certain percent of their time for their own projects. Another example, still related to our theme, is the process of new business development in the major corporation. Overall goals may well be fixed, but the VP of New Business Development may be constrained to one of the following, or may be given varying degrees of flexible choice among them:
“conventional” internal R&D; specialized internal venture teams with separated locations, and varied managerial organization and incentives; outsourcing to high-tech developers or alliances with smaller specialized suppliers; or venture capital strategic investments in young startups with subsequent acquisitions. Will increasing flexibility of choice of means improve the attainment of corporate goals? Again, further research is called for to identify the benefits and harm as a result of institutional flexibility.

We examine a particular case – flexibility in educational institutions. Due to training an individual receives and early life stage when in school, prior work has found that educational institutions play an important and lasting role in socializing individuals and preparing them with skills and ways of thinking that shape their future careers (Austin, 2002). In this case, the mechanism leading from flexibility to increased entrepreneurship is directly related to that training effect. There may be cases that future scholars could explore where more flexible institutions also lead to entrepreneurship but through other mechanisms beyond the training mechanism.

While our research design has the advantage of a natural experiment, eliminating all possible sources of endogeneity is rarely possible using observational data alone. While general societal trends towards entrepreneurship are unlikely to be a plausible alternative explanation since we examine individuals who graduated just before and after the reform, to eliminate all alternative explanations may require laboratory-based randomization experiment. Such a controlled, longitudinal experiment might also allow future researchers to disentangle if institutional flexibility has a greater effect on boosting entrepreneurial tendencies or if an inflexible environment is suppressing the natural entrepreneurial tendency of individuals. One limitation of our study is that both interpretations are possible and may be going on simultaneously. There is an inherent trade-off between the generalizability that survey data afford and ruling out any alternative explanation in a laboratory experiment.

Institutional flexibility may also have implications for the role of entrepreneurship in industry evolution, including category emergence, eras of ferment, standards battles and so on. For example, flexible institutions might result in entrepreneurial firms that have characteristics, such as being more innovative or disruptive. Flexible institutions might also influence certain entrepreneurial outcomes
such as venture capital interest and hinder others (i.e., industry stability or longevity).

Instead of increasing institutional flexibility, one could imagine an alternative, if the university had put in place a rigid system where students had to take a specific variety of classes. Then one would get the variety in content effect without the flexibility in choice effect that is indicated by our quotes. We would not expect to see similar effects because students would not have an opportunity to practice making independent decisions, explore and develop their interests, or pursue their own interests at the intersection of particular fields. However, they may still develop some degree of cognitive flexibility as a result of the variety of classes and perspectives. Future work could possibly disentangle these two mechanisms. Due to the stronger effects on “misfits”, we believe that it is the choice effect that matters most.

Future work should examine institutional flexibility in a variety of other settings. At times, regulatory institutional changes have flexible mandates or lack clear standards of compliance, allowing for choice (Sutton and Dobbin 1996). Civil Rights laws made it clear that the goal of the government to eliminate discrimination in employment. Yet the policies were unclear in terms of the criteria for compliance. Employers had to make choices and experiment with compliance mechanisms and strategies since no particular choice of how to comply was legitimized in the law initially. This was merely a temporary rather than more permanent form of institutional flexibility as it eventually became clear how enforcement would work via the courts and choice (thus flexibility) was again reduced. A variety of innovative organizational practices such as due-process governance (Sutton and Dobbin 1996, Edelman 1990), internal labor markets (Dobbin et al. 1993), grievance procedures (Edelman et al. 1999), and sex discrimination and maternity leave policies (Kelly and Dobbin 1999) were created as a result. In a more contemporary example, satellite radio regulations created entrepreneurial opportunities by specifying desired ends, but not dictating the means toward achieving those ends. Licenses for satellite radio firms involved regulatory criteria, standards and deadlines but left firms with few restrictions over how to achieve them. This flexibility (put in place well before the category and its norms, practices and conventions were deemed legitimate) allowed a proliferation of entrepreneurial activity extending beyond the firms that became the market leaders in satellite radio (Navis and Glynn 2010, p. 450).
In addition to the effect we explore in this paper, there may be other, longer-term effects of changes in institutional flexibility. For example, there may be important effects of attraction and selection into more flexible environments by creative and entrepreneurial individuals. Our findings contribute to prior work on institutional theory and extend it to entrepreneurship research. We also seek to understand whether institutional change in the direction of fostering entrepreneurship is likely to affect different types of individuals in distinct ways. Given institutional theory’s older focus on durability and the benefits of standardization (Scott 2008, Hwang and Powell 2008, Royston et al. 1996), the idea that an institution could be designed with greater flexibility rather than strict guidelines for specific behaviors, may seem counter-intuitive. Contrary to prior work, it is not merely a change in institutions itself that drives entrepreneurship via the creation of misalignment with incumbent firms, but it is also inherent characteristics of institutions themselves that shapes individual choices for entrepreneurship. Institutional characteristics, such as flexibility can foster more innovative, divergent, entrepreneurial behaviors by protecting individual choice. While we focus on flexibility, there may be other characteristics applicable across institutions that allow individual-level entrepreneurial behaviors. For instance, given the apparent effects of enabling students to choose and create novel recombinations, institutions that emphasize the variation rather than selection and retention stages of evolutionary theory may deserve greater focus (Aldrich, 1999). Without such a theory, institutional theory struggles for a middle ground between heroic actors and cultural dopes. Furthermore, it requires an exogenous shock for people to escape their habits or to explain how social movements, disruption and deviance occurs. In addition, prior work had suggested that diversity in organizations is reduced as institutions develop (DiMaggio and Powell 1983). This strand of institutional theorizing would suggest that individual behaviors and firms would eventually converge in greater and greater similarity. Less work in institutional research has examined mechanisms that increase diversity (Haveman and Rao 1997). Yet, we find that more flexible institutions that permit individual choice, play a role in bringing more diversity in the creation of new organizations by involving new types of individuals. While prior work does not easily allow us to extrapolate whether a new institutional change is likely to reduce or increase entrepreneurship, we build on prior work to suggest that looser or more flexible institutions may enable innovation and entrepreneurship. In
simple terms, we advance a view that it is incorrect to associate stability with the institutional level; and change purely with the individual.
References


Austin, A.E. 2002. Preparing the next generation of faculty: Graduate school as socialization to the academic career. The Journal of Higher Education73(1) 94-122.


Seo, M.G., W.D. Creed. 2002. Institutional contradictions, praxis, and institutional change: A


The interaction effect of institutional flexibility and status at school on entrepreneurial activity

Figure 2. Effects on the number of different department codes as a measure of the variety of coursework by status at school.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Institutional flexibility</td>
<td>0.78</td>
<td>0.42</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Status at school</td>
<td>-0.47</td>
<td>3.93</td>
<td>-0.07</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Age</td>
<td>36.33</td>
<td>9.93</td>
<td>-0.46</td>
<td>0.14</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Gender</td>
<td>0.95</td>
<td>0.22</td>
<td>0.07</td>
<td>-0.05</td>
<td>-0.12</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Party member</td>
<td>0.50</td>
<td>0.50</td>
<td>0.00</td>
<td>-0.02</td>
<td>0.01</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Master’s degree</td>
<td>0.55</td>
<td>0.50</td>
<td>0.08</td>
<td>0.28</td>
<td>-0.20</td>
<td>0.00</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. PhD degree</td>
<td>0.10</td>
<td>0.29</td>
<td>0.05</td>
<td>0.14</td>
<td>-0.08</td>
<td>0.00</td>
<td>0.01</td>
<td>0.13</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Multi-disciplinary</td>
<td>0.20</td>
<td>0.40</td>
<td>0.09</td>
<td>0.11</td>
<td>-0.08</td>
<td>-0.03</td>
<td>-0.02</td>
<td>0.43</td>
<td>0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Broad major</td>
<td>0.32</td>
<td>0.47</td>
<td>0.07</td>
<td>0.02</td>
<td>-0.10</td>
<td>-0.11</td>
<td>0.04</td>
<td>0.19</td>
<td>-0.04</td>
<td>0.29</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. New major</td>
<td>0.62</td>
<td>0.49</td>
<td>0.00</td>
<td>-0.05</td>
<td>-0.13</td>
<td>-0.04</td>
<td>0.00</td>
<td>0.18</td>
<td>0.02</td>
<td>0.17</td>
<td>0.17</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Overseas returnees</td>
<td>0.48</td>
<td>0.50</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.15</td>
<td>0.13</td>
<td>0.12</td>
<td>0.09</td>
<td>0.16</td>
<td>0.06</td>
<td>0.05</td>
<td>0.15</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Leader</td>
<td>0.51</td>
<td>0.50</td>
<td>0.01</td>
<td>0.15</td>
<td>-0.06</td>
<td>-0.02</td>
<td>0.10</td>
<td>0.23</td>
<td>0.15</td>
<td>0.05</td>
<td>0.09</td>
<td>0.10</td>
<td>0.18</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Family status</td>
<td>0.47</td>
<td>0.48</td>
<td>-0.11</td>
<td>0.04</td>
<td>0.06</td>
<td>-0.15</td>
<td>0.03</td>
<td>0.04</td>
<td>0.03</td>
<td>0.04</td>
<td>0.01</td>
<td>0.08</td>
<td>0.11</td>
<td>-0.03</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Entrepreneurial parent</td>
<td>0.01</td>
<td>0.10</td>
<td>-0.07</td>
<td>0.05</td>
<td>0.04</td>
<td>-0.02</td>
<td>-0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.04</td>
<td>-0.02</td>
<td>-0.05</td>
<td>0.00</td>
<td>-0.05</td>
<td>-0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Work type</td>
<td>0.77</td>
<td>0.42</td>
<td>0.05</td>
<td>-0.05</td>
<td>-0.25</td>
<td>-0.04</td>
<td>0.14</td>
<td>0.09</td>
<td>-0.02</td>
<td>0.10</td>
<td>0.05</td>
<td>0.27</td>
<td>0.11</td>
<td>0.10</td>
<td>0.10</td>
<td>-0.06</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Number of job positions</td>
<td>2.52</td>
<td>1.66</td>
<td>-0.02</td>
<td>-0.03</td>
<td>0.03</td>
<td>-0.13</td>
<td>0.13</td>
<td>0.01</td>
<td>-0.03</td>
<td>0.12</td>
<td>0.06</td>
<td>0.19</td>
<td>0.15</td>
<td>0.13</td>
<td>0.11</td>
<td>-0.05</td>
<td>0.55</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Developed city</td>
<td>0.80</td>
<td>0.40</td>
<td>0.02</td>
<td>0.09</td>
<td>-0.09</td>
<td>0.03</td>
<td>0.00</td>
<td>0.05</td>
<td>0.02</td>
<td>-0.08</td>
<td>-0.05</td>
<td>0.06</td>
<td>0.07</td>
<td>0.02</td>
<td>0.12</td>
<td>-0.01</td>
<td>0.10</td>
<td>0.07</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>18. GDP (Trillion yuan)</td>
<td>16.63</td>
<td>6.83</td>
<td>0.21</td>
<td>-0.03</td>
<td>0.20</td>
<td>-0.03</td>
<td>-0.07</td>
<td>-0.02</td>
<td>-0.01</td>
<td>0.06</td>
<td>0.00</td>
<td>-0.09</td>
<td>0.02</td>
<td>-0.05</td>
<td>-0.06</td>
<td>-0.12</td>
<td>-0.21</td>
<td>-0.19</td>
<td>0.11</td>
<td>1.00</td>
</tr>
<tr>
<td>Variables</td>
<td>M1</td>
<td>M2</td>
<td>M3</td>
<td>M4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hypothesized independent variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional flexibility</td>
<td></td>
<td></td>
<td>0.882*** (0.081)</td>
<td>0.894*** (0.103)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status at school</td>
<td>-0.022 (0.018)</td>
<td>-0.009 (0.020)</td>
<td>-0.003 (0.022)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status at school squared</td>
<td>0.004+ (0.003)</td>
<td>0.003 (0.003)</td>
<td>0.003 (0.004)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional flexibility × Status at school</td>
<td></td>
<td></td>
<td>-0.016 (0.023)</td>
<td>-0.001 (0.004)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Basic demographic control variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.475*** (0.099)</td>
<td>-0.453*** (0.100)</td>
<td>-0.747*** (0.107)</td>
<td>-0.752*** (0.108)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.614*** (0.170)</td>
<td>0.597*** (0.171)</td>
<td>0.681*** (0.177)</td>
<td>0.678*** (0.177)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Party member</td>
<td>0.037 (0.121)</td>
<td>0.027 (0.122)</td>
<td>0.053 (0.128)</td>
<td>0.049 (0.129)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other educational-related control variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master’s degree</td>
<td>0.326* (0.130)</td>
<td>0.362** (0.132)</td>
<td>-0.058 (0.146)</td>
<td>-0.060 (0.147)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PhD degree</td>
<td>-0.253 (0.166)</td>
<td>-0.208 (0.168)</td>
<td>-0.373* (0.171)</td>
<td>-0.368* (0.171)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-disciplinary</td>
<td>0.170 (0.175)</td>
<td>0.149 (0.175)</td>
<td>0.000 (0.177)</td>
<td>0.006 (0.177)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad major</td>
<td>0.140 (0.139)</td>
<td>0.137 (0.140)</td>
<td>0.071 (0.147)</td>
<td>0.074 (0.148)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New major</td>
<td>-0.179 (0.125)</td>
<td>-0.172 (0.125)</td>
<td>-0.103 (0.133)</td>
<td>-0.108 (0.134)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas returnees</td>
<td>0.347** (0.129)</td>
<td>0.327* (0.130)</td>
<td>0.089 (0.141)</td>
<td>0.088 (0.141)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>0.538*** (0.119)</td>
<td>0.565*** (0.120)</td>
<td>0.385* (0.127)</td>
<td>0.385** (0.127)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family-related control variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family status</td>
<td>-0.098 (0.122)</td>
<td>-0.098 (0.122)</td>
<td>-0.110 (0.128)</td>
<td>-0.108 (0.128)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial parent</td>
<td>1.258* (0.539)</td>
<td>1.221* (0.531)</td>
<td>1.229* (0.573)</td>
<td>1.224* (0.584)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work-related control variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work type</td>
<td>0.461*** (0.131)</td>
<td>0.468*** (0.132)</td>
<td>0.266+ (0.142)</td>
<td>0.266+ (0.142)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of job positions</td>
<td>-0.042 (0.045)</td>
<td>-0.043 (0.045)</td>
<td>0.096+ (0.050)</td>
<td>0.095+ (0.050)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Broader environmental control variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed city</td>
<td>0.091 (0.133)</td>
<td>0.084 (0.133)</td>
<td>-0.034 (0.140)</td>
<td>-0.037 (0.141)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1.104*** (0.252)</td>
<td>-1.162*** (0.254)</td>
<td>-1.203*** (0.270)</td>
<td>-1.200*** (0.272)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>1363</td>
<td>1363</td>
<td>1363</td>
<td>1363</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.069</td>
<td>0.073</td>
<td>0.146</td>
<td>0.146</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-848.953</td>
<td>-845.371</td>
<td>-779.357</td>
<td>-779.082</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001, One tail for hypothesized independent variables, two tail for other variables.
<table>
<thead>
<tr>
<th>Hypothesized independent variables</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional flexibility</td>
<td>1.443*** (0.171)</td>
<td>1.584*** (0.185)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status at school</td>
<td>0.010 (0.017)</td>
<td>0.003 (0.017)</td>
<td>0.030 (0.030)</td>
<td></td>
</tr>
<tr>
<td>Status at school squared</td>
<td>0.007** (0.002)</td>
<td>0.006** (0.002)</td>
<td>0.016** (0.006)</td>
<td></td>
</tr>
<tr>
<td>Institutional flexibility * Status at school</td>
<td>-0.033 (0.035)</td>
<td></td>
<td></td>
<td>-0.012* (0.006)</td>
</tr>
</tbody>
</table>

| Basic demographic control variables                |                  |                  |                  |                  |
| Age                                                 | -0.240*** (0.018) | -0.237*** (0.019) | -0.206*** (0.020) | -0.208*** (0.020) |
| Gender                                              | -0.023 (0.241)   | -0.101 (0.230)   | -0.138 (0.218)   | -0.160 (0.226)   |
| Party member                                        | 0.061 (0.113)    | 0.047 (0.112)    | -0.016 (0.108)   | -0.022 (0.107)   |

| Other educational-related control variables         |                  |                  |                  |                  |
| Master’s degree                                     | 0.363** (0.120)  | 0.368** (0.126)  | 0.504*** (0.120) | 0.512*** (0.121) |
| PhD degree                                          | 0.051 (0.196)    | 0.075 (0.201)    | 0.111 (0.167)    | 0.088 (0.168)    |
| Multi-disciplinary                                   | 0.126 (0.143)    | 0.157 (0.143)    | 0.053 (0.142)    | 0.065 (0.143)    |
| Broad major                                         | 0.048 (0.114)    | 0.048 (0.115)    | 0.013 (0.113)    | -0.007 (0.113)   |
| New major                                           | 0.021 (0.114)    | 0.005 (0.111)    | -0.048 (0.110)   | -0.042 (0.111)   |
| Overseas returnees                                   | 0.069 (0.112)    | 0.069 (0.114)    | 0.164 (0.109)    | 0.173 (0.110)    |
| Leader                                              | 0.002 (0.110)    | 0.009 (0.110)    | -0.037 (0.109)   | -0.050 (0.109)   |

| Family-related control variables                    |                  |                  |                  |                  |
| Family status                                       | -0.284** (0.109) | -0.307** (0.110) | -0.249* (0.110)  | -0.272* (0.111)  |
| Entrepreneurial parent                              | 0.370 (0.431)    | 0.457 (0.422)    | 0.633* (0.257)   | 0.637* (0.246)   |

| Work-related control variables                      |                  |                  |                  |                  |
| Work type                                           | 0.116 (0.231)    | 0.152 (0.227)    | 0.045 (0.211)    | 0.065 (0.211)    |
| Number of job positions                             | 0.059* (0.035)   | 0.052 (0.035)    | 0.027 (0.035)    | 0.022 (0.036)    |

| Broader environmental control variable              |                  |                  |                  |                  |
| Developed city                                      | 0.268* (0.158)   | 0.306* (0.162)   | 0.374* (0.153)   | 0.378* (0.152)   |
| GDP (Trillion yuan)                                 | -0.018* (0.009)  | -0.020* (0.009)  | -0.045*** (0.010) | -0.045*** (0.010) |
| \(N\)                                               | 340              | 340              | 340              | 340              |
| Log likelihood                                      | -1322.812        | -1320.430        | -1296.021        | -1295.244        |

\(p<0.10, *p<0.05, **p<0.01, ***p<0.001. One tail for hypothesized independent variables, two tail for other variables.\)
## Table 4 Robustness tests for hypotheses on entrepreneurial intention

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional flexibility</td>
<td>1.008*** (0.121)</td>
<td>0.870*** (0.188)</td>
<td>0.811** (0.255)</td>
<td>1.014** (0.375)</td>
</tr>
<tr>
<td>Status at school</td>
<td>-0.003 (0.025)</td>
<td>0.062* (0.034)</td>
<td>0.088* (0.044)</td>
<td>0.107* (0.061)</td>
</tr>
<tr>
<td>Status at school squared</td>
<td>0.003 (0.004)</td>
<td>0.012* (0.006)</td>
<td>0.019** (0.008)</td>
<td>0.014 (0.012)</td>
</tr>
<tr>
<td>Institutional flexibility × Status at school</td>
<td>-0.021 (0.026)</td>
<td>-0.013 (0.033)</td>
<td>0.010 (0.039)</td>
<td>0.065 (0.054)</td>
</tr>
<tr>
<td>Institutional flexibility × Status at school squared</td>
<td>-0.002 (0.005)</td>
<td>0.002 (0.006)</td>
<td>0.006 (0.008)</td>
<td>0.005 (0.011)</td>
</tr>
</tbody>
</table>

### Basic demographic control variables

| Age                  | -0.908*** (0.160)  | -0.874*** (0.251)  | -0.844* (0.328)     | -0.995* (0.437)     |
| Gender               | 0.645*** (0.192)   | 1.025*** (0.298)   | 1.172** (0.373)     | 1.488** (0.459)     |
| Party member         | 0.120 (0.139)      | 0.166 (0.192)      | 0.341 (0.241)       | 0.345 (0.327)       |

### Other educational-related control variables

| Master’s degree       | -0.133 (0.163)     | -0.167 (0.213)     | -0.092 (0.280)      | 0.079 (0.356)       |
| PhD degree            | -0.433* (0.182)    | -0.415* (0.250)    | -0.215 (0.331)      | -0.198 (0.418)      |
| Multi-disciplinary     | 0.071 (0.188)      | 0.046 (0.266)      | -0.168 (0.342)      | -0.132 (0.426)      |
| Broad major           | 0.027 (0.155)      | 0.085 (0.206)      | 0.134 (0.265)       | 0.240 (0.325)       |
| New major             | -0.069 (0.148)     | -0.201 (0.208)     | -0.432* (0.256)     | -0.753* (0.312)     |
| Overseas returnees    | 0.190 (0.154)      | -0.041 (0.212)     | -0.188 (0.267)      | -0.382 (0.325)      |
| Leader                | 0.335* (0.140)     | 0.284 (0.189)      | 0.229 (0.241)       | 0.625* (0.314)      |

### Family-related control variables

| Family status         | -0.136 (0.139)     | -0.065 (0.187)     | -0.292 (0.235)      | -0.149 (0.300)      |
| Entrepreneurial parent| 1.412* (0.742)     | 0.000 (0.000)      | 0.000 (0.000)       | 0.000 (0.000)       |

### Work-related control variables

| Work type             | 0.326* (0.157)     | 0.175 (0.216)      | 0.438 (0.269)       | 0.512 (0.314)       |
| Number of job positions| 0.164*** (0.056)  | 0.241*** (0.067)   | 0.219** (0.084)     | 0.125 (0.103)       |

### Broader environmental control variable

| Developed city        | -0.088 (0.159)     | -0.045 (0.213)     | 0.227 (0.267)       | 0.359 (0.334)       |
| Constant              | -1.485*** (0.321)  | -1.895*** (0.443)  | -2.115*** (0.540)   | -2.372*** (0.682)   |
| N                    | 1140               | 580                | 384                | 237                |
| Pseudo R²             | 0.132              | 0.112              | 0.134              | 0.135              |
| Log likelihood        | -650.055           | -351.071           | -228.345           | -142.001           |

*p < 0.10, **p < 0.05, ***p < 0.01, ****p < 0.001. One tail for hypothesized independent variables, two tail for other variables.
Table 5 Robustness tests for hypotheses on entrepreneurial activity

<table>
<thead>
<tr>
<th>Hypothesized independent variables</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional flexibility</td>
<td>1.584*** (0.185)</td>
<td>1.393*** (0.196)</td>
<td>1.579*** (0.187)</td>
<td>1.585*** (0.190)</td>
</tr>
<tr>
<td>Status at school</td>
<td>0.030 (0.030)</td>
<td>0.021 (0.031)</td>
<td>0.031 (0.030)</td>
<td>0.037 (0.032)</td>
</tr>
<tr>
<td>Status at school squared</td>
<td>-0.033 (0.035)</td>
<td>-0.018 (0.035)</td>
<td>-0.033 (0.035)</td>
<td>-0.033 (0.036)</td>
</tr>
<tr>
<td>Institutional flexibility × Status at school</td>
<td>0.016** (0.006)</td>
<td>0.015** (0.005)</td>
<td>0.016** (0.006)</td>
<td>0.016** (0.006)</td>
</tr>
<tr>
<td>Institutional flexibility × Status at school squared</td>
<td>-0.012* (0.006)</td>
<td>-0.010* (0.006)</td>
<td>-0.011* (0.006)</td>
<td>-0.012* (0.006)</td>
</tr>
<tr>
<td>Basic demographic control variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.208*** (0.020)</td>
<td>-0.212*** (0.020)</td>
<td>-0.209*** (0.020)</td>
<td>-0.214*** (0.020)</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.160 (0.226)</td>
<td>-0.087 (0.247)</td>
<td>-0.159 (0.226)</td>
<td>-0.186 (0.216)</td>
</tr>
<tr>
<td>Party member</td>
<td>-0.023 (0.107)</td>
<td>0.024 (0.112)</td>
<td>-0.022 (0.107)</td>
<td>-0.056 (0.106)</td>
</tr>
<tr>
<td>Other educational-related control variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master’s degree</td>
<td>0.512*** (0.121)</td>
<td>0.519*** (0.125)</td>
<td>0.505*** (0.118)</td>
<td>0.494*** (0.121)</td>
</tr>
<tr>
<td>PhD degree</td>
<td>0.088 (0.168)</td>
<td>0.081 (0.177)</td>
<td>0.082 (0.168)</td>
<td>0.053 (0.168)</td>
</tr>
<tr>
<td>Multi-disciplinary</td>
<td>0.065 (0.143)</td>
<td>0.080 (0.143)</td>
<td>0.071 (0.140)</td>
<td>0.103 (0.142)</td>
</tr>
<tr>
<td>Broad major</td>
<td>-0.006 (0.113)</td>
<td>-0.026 (0.122)</td>
<td>-0.006 (0.113)</td>
<td>0.029 (0.109)</td>
</tr>
<tr>
<td>New major</td>
<td>-0.042 (0.111)</td>
<td>-0.036 (0.114)</td>
<td>-0.043 (0.110)</td>
<td>-0.003 (0.114)</td>
</tr>
<tr>
<td>Overseas returnees</td>
<td>0.173 (0.110)</td>
<td>0.089 (0.116)</td>
<td>0.177 (0.111)</td>
<td>0.157 (0.109)</td>
</tr>
<tr>
<td>Leader</td>
<td>-0.050 (0.109)</td>
<td>-0.077 (0.112)</td>
<td>-0.052 (0.108)</td>
<td>-0.071 (0.106)</td>
</tr>
<tr>
<td>Family-related control variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family status</td>
<td>-0.272* (0.111)</td>
<td>-0.280* (0.113)</td>
<td>-0.268* (0.110)</td>
<td>-0.260* (0.107)</td>
</tr>
<tr>
<td>Entrepreneurial parent</td>
<td>0.640*** (0.246)</td>
<td>0.706*** (0.204)</td>
<td>0.645*** (0.245)</td>
<td>0.844*** (0.295)</td>
</tr>
<tr>
<td>Work-related control variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work type</td>
<td>0.067 (0.211)</td>
<td>0.020 (0.209)</td>
<td>0.061 (0.214)</td>
<td>0.092 (0.215)</td>
</tr>
<tr>
<td>Number of job positions</td>
<td>0.022 (0.036)</td>
<td>0.018 (0.038)</td>
<td>0.022 (0.036)</td>
<td>0.020 (0.035)</td>
</tr>
<tr>
<td>Broader environmental control variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed city</td>
<td>0.377* (0.152)</td>
<td>0.377* (0.163)</td>
<td>0.375* (0.152)</td>
<td>0.320* (0.150)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>-0.061*** (0.014)</td>
<td>-0.043 (0.057)</td>
<td>-0.120*** (0.026)</td>
<td></td>
</tr>
<tr>
<td>Stock market index</td>
<td>-0.804*** (0.212)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduates entrepreneurship</td>
<td>-0.000 (0.001)</td>
<td></td>
<td>0.254** (0.087)</td>
<td></td>
</tr>
<tr>
<td>Undergraduates entrepreneurship percentage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>340</td>
<td>340</td>
<td>340</td>
<td>340</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-1295.248</td>
<td>-1300.381</td>
<td>-1295.174</td>
<td>-1292.020</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

One tail for hypothesized independent variables, two tail for other variables.