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The Impact of Education on Entrepreneurial Entry in Rural Areas: The Role of Village Entrepreneurial Intensity and Clan Culture in Emerging Economies

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Authors' Contributions
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Ethical Approval
The data collection process adhered to standard ethical principles, including obtaining informed consent from all respondents.

Data Availability
The datasets generated and/or analysed during the current study are not publicly available due to confidentiality agreements with Sun Yat-Sen University. However, the data can be made available by the corresponding author upon reasonable request.

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Abstract

Drawing on human capital theory, this study investigates how formal education, village entrepreneurial intensity, and clan culture shape entrepreneurial entry in rural areas, using large-scale longitudinal data from the China Labour Dynamic Survey (2012–2018). The analysis reveals an inverted U-shaped relationship between formal education and both necessity-driven and opportunity-driven entrepreneurship, indicating that additional education initially increases but eventually decreases the likelihood of entrepreneurial entry. Moreover, village entrepreneurial intensity broadens access to opportunity-driven entrepreneurship by lowering the educational threshold required to recognize and pursue opportunities, while clan culture exerts a stronger influence on necessity-driven entrepreneurship by enabling individuals with limited formal education to start businesses through kinship-based support. The findings underscore that the impacts of education on entrepreneurship are context dependent, offering new insights into the boundary conditions of human capital in rural entrepreneurship.

Keyword: rural entrepreneurship, formal education, clan culture, necessity, opportunity.

1. Introduction

Rural areas in emerging economies face persistent social and economic challenges, including limited employment opportunities and underdeveloped infrastructure (Llorent-Bedmar et al., 2021; Williams et al., 2021). In response, entrepreneurship has attracted growing attention from policymakers and scholars as a strategy to promote inclusive growth and revitalize local economies (Pato & Teixeira, 2016; Korsgaard et al., 2015; McElwee & Smith, 2014; Xiao & Wu, 2021). However, the capacity to foster rural entrepreneurship is constrained by shortages of human capital, particularly as younger and better educated individuals continue to migrate to urban centers (Li et al., 2025).

In this context, formal education is a critical dimension of human capital that merits closer examination. It equips individuals with cognitive and analytical skills, enhances problem-solving, and supports the ability to recognize and exploit opportunities, all of which are often regarded as important for entrepreneurial entry (Becker, 1994; Unger et al., 2011; Qian et al., 2013). Yet the evidence on the role of formal education remains mixed. Several studies report a positive association between formal education and entrepreneurial activity (Davidsson & Honig, 2003; Colombo & Piva, 2020; Xiao & Wu, 2021), while others find insignificant or even negative effects (Buenstorf et al., 2017; Tamvada et al., 2022). These inconsistent findings suggest that the effect of formal education may vary depending on the type of entrepreneurship and the context in which it occurs.

One explanation for the mixed evidence is that much of the literature treats entrepreneurship as a single, homogeneous phenomenon and pays limited attention to differences in the motivation underlying entrepreneurial entry, particularly in rural contexts (Xiao & Wu, 2021; Gaddefors & Anderson, 2019). In practice, both necessity-driven and opportunity-driven entrepreneurship coexist in rural economies. Necessity-driven entrepreneurship arises when individuals engage in self-employment because other options are scarce (Amorós & Cristi, 2011), while opportunity-driven entrepreneurship reflects efforts to exploit market gaps and innovation (Williams & Williams, 2014). Although necessity-driven entrepreneurial activities are often more prevalent in rural areas due to structural disadvantages and weak labour markets, opportunity-driven entrepreneurial activities are increasingly evident

as rural markets evolve, technologies diffuse, and connectivity improves. What unites both forms is the initial transition into entrepreneurship, commonly conceptualized as entrepreneurial entry. Understanding who undertakes this transition and under what conditions is a central question for rural development and entrepreneurship research. However, existing research has seldom investigated the extent to which educational attainment differentially influences necessity and opportunity driven entrepreneurial entry, a heterogeneity that remains conceptually undertheorized and empirically underexplored within rural contexts (Block et al., 2015).

This gap highlights the need for research that examines how formal education influences different forms of entrepreneurial entry in rural areas. Addressing this issue is important not only for advancing theory by clarifying the role of education, but also for informing rural development and education policies aimed at fostering inclusive and sustainable growth. Drawing on human capital theory (Estrin et al., 2016; Xavier-Oliveira et al., 2015) and longitudinal data from the China Labour Dynamic Survey (2012–2018), we analyse whether the effect of formal education on entrepreneurial entry varies between necessity- and opportunity-driven entrepreneurship. We also consider two contextual factors that may condition this relationship: village entrepreneurial intensity and clan culture. Village entrepreneurial intensity reflects the extent to which entrepreneurship is common within a community and may alter the influence of education by strengthening norms, reducing uncertainty, and generating demonstration effects that lower perceived risk (Zhou & Xu, 2024). Similarly, clan culture, rooted in patrilineal kinship ties, highlights the enduring importance of family networks in entrepreneurial activities. Such networks provide bonding social capital, informal credit, guidance, and coordinated labour that facilitate entrepreneurial entry (Cao et al., 2022; Cheng et al., 2021; Zhang, 2020; Putnam, 2001; Lyons, 2022).

This study contributes to the literature in three important ways. First, it advances knowledge of rural entrepreneurship in emerging economies, a setting that remains underexplored despite its increasing relevance for development and policy (Cao & Shi, 2021; Foo et al., 2020). Second, it clarifies the role of formal education by demonstrating an inverted U-shaped relationship with both necessity-driven and opportunity-driven entrepreneurship,

thereby helping to reconcile the mixed findings of previous studies and enriching the existing understanding of how education shapes entrepreneurial entry (Patel, 2025; Tamvada et al., 2022; Buenstorf et al., 2017; Van der Sluis et al., 2008). Third, it demonstrates that local contexts, specifically village entrepreneurial activities and community embeddedness in the form of clan culture, moderate this relationship. In doing so, the study extends human capital theory by specifying boundary conditions that shape how formal education translates into entrepreneurial action and contributes to a more contextually grounded understanding of education's role in entrepreneurship (Busse et al., 2017; Maimone Ansaldo Patti et al., 2016).

2. Context and Theoretical Framing

Rural regions across many emerging economies play essential roles in agricultural production, environmental stewardship, and the preservation of cultural heritage. At the same time, they face persistent challenges such as low-income levels, limited access to education and healthcare, and demographic pressures caused by youth outmigration to urban centres (Cao & Shi, 2021; Liu et al., 2019). Rural China, home to more than 560 million residents as of 2018 (National Bureau of Statistics of China, 2019), exemplifies these dynamics.

In response to these challenges, rural entrepreneurship has become central not only to China's development strategies but also to broader global efforts to stimulate local economies, generate employment, reduce poverty, and foster community resilience (Long et al., 2023; Cui et al., 2017; Xiao & Wu, 2021). Yet, in many emerging economies, entrepreneurial activity in rural areas remains constrained by the limited pool of individuals both able and willing to enter entrepreneurship (Liu et al., 2021). These constraints underscore the critical role of human capital, particularly formal education, in equipping individuals to recognize opportunities, overcome barriers, and make the transition into entrepreneurship.

Drawing on human capital theory, prior research distinguishes between non-task-related human capital and task-specific human capital (Becker, 1994; Unger et al., 2011; Qian et al., 2013). Formal education is typically considered a source of non-task-related human capital, equipping individuals with broad cognitive abilities such as critical thinking, problem-solving, and information processing. While these capabilities are not directly tied to

entrepreneurial tasks, they form the foundation for learning, decision-making, and adaptation in uncertain environments (Marvel et al., 2016; Canavati et al., 2021; Patel & Ganzach, 2019; Lyons et al., 2020). In contrast, entrepreneurship education builds task-specific human capital by providing targeted knowledge and skills directly related to venture creation and business management (Lyons et al., 2021; Neck & Greene, 2011).

Although task-specific human capital, such as entrepreneurship education, may have a more immediate effect on entrepreneurial entry, it is rarely available in the rural settings of emerging economies. Formal education, by contrast, reaches a much wider population and may indirectly foster entrepreneurship by strengthening general capabilities (Debarliev et al., 2022). This study therefore focuses on formal education as a form of non-task-related human capital to examine how general human capital shapes entrepreneurial entry across rural contexts, a question that is particularly relevant not only for rural China, which serves as the empirical setting of this study, but also for rural areas in other emerging economies.

2.1 Formal Education and Entrepreneurial Entry: An Inverted U-Shaped Relationship

Formal education plays a central role in shaping entrepreneurial capabilities by enhancing cognitive and social skills such as opportunity recognition, problem solving, and information processing, while also fostering self-confidence, risk tolerance, and access to broader social and informational networks (Becker, 1994; Davidsson & Honig, 2003; Chen et al., 1998; Marvel et al., 2016; Unger et al., 2011). These attributes are critical for navigating the uncertainty and complexity inherent in starting new ventures. Accordingly, formal education is widely recognized as a key enabler of entrepreneurship.

However, despite its acknowledged importance, empirical evidence on the relationship between formal education and entrepreneurial entry remains mixed, suggesting that the relationship may not follow a simple linear pattern. Haans et al. (2016) argue that non-linear relationships often arise from a trade-off between benefits and costs. In rural contexts, this trade-off is particularly evident. At early stages, formal education equips individuals with basic literacy, numeracy, and problem-solving skills that help them overcome cognitive and administrative barriers to entrepreneurship (Becker, 1994; Unger et al., 2011). Even modest

education enables essential tasks such as maintaining accounts, comparing prices, and interpreting buyer requirements, thereby facilitating the operation of small-scale ventures (Debarliev et al., 2022; Jiménez et al., 2015). These early gains in knowledge explain the initial upward slope in Figure 1a, where increasing education enhances entrepreneurial entry. Consistent with Davidsson and Honig (2003), such human capital strengthens self-efficacy and confidence, and facilitates the mobilization of resources, reinforcing the positive association between formal education and entrepreneurial entry.

As educational attainment rises, access to secure and attractive wage employment opportunities expands. This increases the opportunity cost of entrepreneurial entry and reduces the relative appeal of self-employment. Figure 1b illustrates this dynamic, showing that the costs associated with entrepreneurship grow more rapidly at higher levels of education. Individuals with advanced education therefore weigh these opportunity costs more carefully when deciding between launching a new business and pursuing salaried careers (Parker, 2009, 2012; Van Praag et al., 2013). Indeed, the literature has shown that although education improves entrepreneurial performance once entry occurs, its effect on the decision to enter is limited, as highly educated individuals often prefer the stability of wage employment (Van der Sluis et al., 2008). Taken together, these dynamics explain the inverted U-shape in Figure 1c, which captures how education initially encourages but eventually discourages entrepreneurial entry.

We expect this inverted U-shaped relationship to occur in both necessity-driven and opportunity-driven entrepreneurship, although the mechanisms through which it unfolds differ. In necessity-driven entrepreneurship, even modest education enhances individuals' ability to establish small ventures by providing basic literacy and numeracy. In such cases, entrepreneurship often emerges as a survival strategy in the absence of viable alternatives (Baptista et al., 2014), compelling individuals to enter entrepreneurial activity even at relatively low levels of education.

By contrast, opportunity-driven entrepreneurship typically requires greater skills, broader knowledge, and the capacity to navigate more complex processes (Block & Wagner, 2010). In this context, formal education plays a stronger role, as it equips individuals with the cognitive abilities needed to identify and exploit market opportunities. Compared to necessity-

driven entrepreneurship, the effect of opportunity costs is less immediate. Better-educated individuals may still engage in entrepreneurship if they recognize promising opportunities and opt to defer participation in wage employment. However, as education increases further, the pull of secure and rewarding professional careers can outweigh the appeal of entrepreneurial risk-taking, leading to the eventual downturn in entry.

These arguments suggest that although both necessity-driven and opportunity-driven entrepreneurship follow inverted U-shaped relationships with education, the curves differ in their location, with opportunity-driven entrepreneurship peaking at higher levels of education than necessity-driven entrepreneurship. Our objective is not to compare the two directly, as each reflects a distinct process shaped by different motivations, but rather to establish whether both conform to an inverted U-shaped pattern of entrepreneurial entry. Accordingly, we hypothesize:

H1a. There is an inverted U-shaped relationship between formal education and necessity-driven entrepreneurship.

H1b. There is an inverted U-shaped relationship between formal education and opportunity-driven entrepreneurship.

Figure 1 here

2.2 Moderating Role of Village Entrepreneurial Intensity

Village Entrepreneurial Intensity (VEI) reflects the concentration and visibility of entrepreneurial activity within a rural community. It captures the extent to which business establishments are present and actively operating, including both the frequency of new venture creation and the persistence of existing firms. In rural areas, where institutional infrastructure is often weak and formal support mechanisms are limited, VEI plays a critical role by expanding the range of opportunities for new venture creation. The presence of many active businesses stimulates demand for suppliers, services, and complementary activities, thereby

shaping the conditions under which entrepreneurship emerges and thrives (Muñoz & Kimmitt, 2019; Frazier & Niehm, 2004).

Following the framework proposed by Haans et al. (2016), moderators can influence curvilinear relationships in two ways. First, they may alter the degree of curvature by flattening or steepening the relationship between formal education and entrepreneurial entry. Second, they may shift the turning point, which determines the level of education at which entry is most likely to occur. In the next sections, we apply this framework to develop hypotheses about how VEI moderates the education–entry relationship for necessity-driven and opportunity-driven entrepreneurship.

2.2.1 VEI and Necessity-Driven Entrepreneurship

In rural areas, necessity-driven entrepreneurship often emerges as a survival strategy when wage employment opportunities are scarce, and individuals must turn to entrepreneurship to secure a livelihood (Khosravipour & Shoeibi, 2022). Such entry can be further shaped by the surrounding entrepreneurial environment. In villages with high entrepreneurial intensity, where entrepreneurial activity is widespread and visible, the relationship between education and necessity-driven entrepreneurship is expected to flatten, with the turning point shifting leftward.

In high-VEI contexts, even individuals with limited formal education are embedded in environments where entrepreneurship constitutes a common response to economic challenges, providing them with exposure to the day-to-day practices of running small businesses. The basic literacy, numeracy, and problem-solving skills acquired through modest education may be sufficient to operate local shops, provide simple services, or engage in low-capital trading activities. The widespread visibility of entrepreneurial activity reduces the cognitive and informational barriers that education would otherwise need to overcome, allowing those with limited education to develop the confidence and practical know-how necessary to pursue entrepreneurship (Fritsch & Wyrwich, 2014; Spigel, 2017; Stam, 2015). Moreover, in high-VEI villages where entrepreneurship is widespread and socially esteemed, even highly educated individuals may find salaried employment less attractive. As a result, the curve tends

to flatten, with participation in necessity-driven entrepreneurship becoming more evenly distributed across different levels of education (Figures 2a and 2b).

High VEI also shifts the turning point of the curve to the left. In high-VEI contexts, necessity-driven entrepreneurship is widely regarded as a viable livelihood strategy, even for individuals with limited formal education. Local entrepreneurial ecosystems reduce the risks of entry and help compensate for resource gaps that formal education would otherwise be expected to address (Spigel, 2017; Stam, 2015). As a result, individuals are able to engage in necessity-driven entrepreneurship earlier in their educational trajectory. The turning point of the curve therefore occurs at lower levels of education, reflecting a reduced threshold at which necessity entrepreneurship becomes viable (Figure 2c). Accordingly, we hypothesize:

H2a. Village entrepreneurial intensity moderates the inverted U-shaped relationship between formal education and necessity-driven entrepreneurship such that higher levels of VEI flatten the curve and shift the turning point to lower levels of formal education.

Figure 2 here

2.2.2 VEI and Opportunity-Driven Entrepreneurship

Similar to the previous arguments, in villages with high entrepreneurial intensity, the relationship between education and opportunity-driven entrepreneurship is expected to flatten because opportunities become more visible and accessible. High VEI fosters dynamic local markets where the presence of many businesses generates demand for suppliers, service providers, and complementary activities (Shane & Venkataraman, 2000; Marvel et al., 2016). This environment provides fertile ground for opportunity-driven entrepreneurship, as both existing firms and newly emerging ventures create spillover effects that expand the range of potential opportunities. Such opportunities can be identified even by individuals with modest education, who benefit from the visibility of successful businesses and the demonstration of entrepreneurial practices in their community. In these contexts, local market dynamics

substitute for some of the advantages typically gained through formal education. While education continues to support opportunity recognition and exploitation, its marginal benefits are reduced because many of the resources, knowledge, and role models it would otherwise provide are already available through the strong presence of entrepreneurial activity in the village (Stuetzer et al. 2014). The result is a flatter curve, where entrepreneurial participation is more evenly distributed across education levels (Figures 2a and 2b).

VEI can also shift the turning point of the education–entry curve to the left, although the mechanism differs from necessity-driven contexts. In high-VEI settings, opportunities are not only more numerous but also easier to identify due to the constant presence of business activity, visible market gaps, and demonstrated examples of viable ventures. This environment accelerates the readiness of individuals with low to moderate education to pursue opportunity-driven entrepreneurship, thereby lowering the educational threshold at which entry becomes feasible. Moreover, the strong legitimacy of entrepreneurship in such contexts fosters confidence in pursuing new ideas and encourages these individuals to engage in entrepreneurial activity at earlier stages of education (Figure 2c). Based on this reasoning, we hypothesize:

> *H2b. Village entrepreneurial intensity moderates the inverted U-shaped relationship between formal education and opportunity-driven entrepreneurship such that higher levels of VEI flatten the curve and shift the turning point to lower levels of formal education.*

2.3 Moderating Role of Clan Culture

In rural China, clan culture represents a deeply embedded form of kinship-based social organization that plays a central role in shaping local norms, interpersonal trust, and access to informal economic resources (Zhang, 2020, 2019). Rooted in ancestral lineage, clan culture creates tightly knit networks that support mutual aid, facilitate information exchange, and enable collective decision-making (Cao et al., 2022; Zhang, 2019). In settings where formal institutions are weak or absent, these networks often serve as informal substitutes, lowering the barriers to entrepreneurial entry by providing labour, informal credit, and community recognition (Yu et al., 2013).

While clan culture is uniquely embedded in the Chinese context, its underlying social function parallels other forms of bonding social capital found in rural communities globally (Foster, 1969; Loureiro, 2015; Busch and Mudida, 2024), where economic activity depends heavily on trust-based relationships (Putnam, 2001; Lyons, 2022). What sets clan culture apart is its hereditary and non-voluntary nature, which results in particularly stable and tightly knit networks (Patulny & Lind Haase Svendsen, 2007). Similar kinship-based structures and informal institutional arrangements are also evident in countries such as India, Vietnam, Kenya, and Brazil, where strong familial ties and local norms play a central role in shaping entrepreneurial behaviour (Gaddefors & Anderson, 2019; Muñoz & Kimmitt, 2019). As such, the insights from this study contribute to a broader understanding of how deeply embedded social capital conditions the relationship between formal education and entrepreneurship in rural settings.

Given its distinctive and globally relevant role, clan culture offers a valuable lens for examining how informal social structures interact with formal education to shape entrepreneurship in rural areas. Following the framework of Haans et al. (2016), we view clan culture as a moderator that can influence curvilinear relationships in two ways: first, by altering the degree of curvature, thereby flattening or steepening the effect of education on entry, and second, by shifting the turning point, which determines the level of education at which entrepreneurship is most likely to occur. In the next sections, we develop these arguments for necessity-driven and opportunity-driven entrepreneurship.

2.3.1 Clan Culture and Necessity-Driven Entrepreneurship

Clan culture provides mechanisms that directly compensate for the low levels of formal education, which is particularly consequential for necessity-driven entrepreneurs who engage in self-employment primarily as a survival strategy (Baptista et al., 2014). In such settings, kinship ties often supply start-up capital, shared labour, reputational legitimacy, and access to initial customers (Zhou & Xu, 2024). These forms of support reduce the risk of entering entrepreneurship, since trust and reciprocity embedded in clan structures can substitute for formal institutions, lowering transaction costs, facilitating resource mobilization, and enabling

entrepreneurs with limited education to sustain small-scale ventures. Moreover, family-based mentoring and the imitation of peers within the clan allow individuals with limited education to acquire practical know-how, from managing daily operations to handling buyers and suppliers. Such mechanisms give less-educated individuals the confidence and capacity to start small-scale businesses that might otherwise be inaccessible to them. As these supports substitute for some of the advantages typically gained through education, the marginal benefit of each additional year of education is reduced, producing a flatter curve in which necessity-driven entrepreneurship is more evenly distributed across education levels.

For individuals with higher levels of education, clan culture also moderates the downward side of the curve. While advanced education provides access to salaried jobs and professional careers, the support embedded in clan networks helps mitigate entrepreneurial risks (Cheng et al., 2021; Zhang, 2019). As a result, the decline in necessity-driven entrepreneurship among the more educated is less pronounced than it would be in the absence of such support, since the social and economic safety net offered by kinship ties continues to make entrepreneurship a viable option even for those with attractive alternatives.

In addition to flattening the curve, clan culture also lowers the threshold of education at which necessity-driven entrepreneurship becomes viable. Because clan-based support reduces the minimum level of human capital required to sustain a business, individuals are able to pursue entrepreneurial entry even if they have only low to moderate education. This dynamic shift the turning point of the education–entry curve to the left, reflecting a reduced educational threshold at which entrepreneurship emerges as a feasible strategy. Based on this reasoning, we hypothesize:

> *H3a. Clan culture moderates the inverted U-shaped relationship between formal education and necessity-driven entrepreneurship such that stronger clan culture flattens the curve and shifts the turning point to lower levels of formal education.*

2.3.2 Clan Culture and Opportunity-Driven Entrepreneurship

In rural economies, opportunity-driven entrepreneurship often emerges by recognizing and acting on gaps in local markets and services (Korsgaard et al., 2015). These opportunities are

typically linked to complementary activities, such as supplying agricultural inputs, providing services, or developing value-added products for industries like farming, food processing, or transportation. Clan culture plays a central role in this process by both revealing opportunities and providing the support needed to pursue them (Zhang, 2019). Through informal discussions and shared experiences, clan members introduce one another to potential ventures that align with local demand. For instance, a household engaged in farming may reveal opportunities for small-scale processing, or a trader may demonstrate new distribution methods that relatives can replicate. Such exchanges not only generate entrepreneurial ideas but also facilitate their realization by offering informal credit, reputational legitimacy, and access to established customer or supplier networks (Zhang, 2020; Cheng et al., 2021).

For individuals with low to moderate levels of education, clan culture substitutes for many of the capabilities normally acquired through formal education. Access to market insights, informal mentoring, and family-based support helps them overcome capability gaps that might otherwise prevent them from identifying or exploiting business opportunities. For more highly educated individuals, the advantages of education become less critical in strong clan environments, since many of the same benefits are already embedded in kinship ties. As a result, the marginal contribution of education diminishes across the spectrum. This dynamic broadens participation in opportunity-driven entrepreneurship and flattens the inverted U-shaped curve, with entrepreneurial entry more evenly distributed across education levels.

Clan culture also shifts the turning point of the education–entry curve to the left. In this case, the shift is driven less by risk absorption and more by the availability of opportunities that become visible through clan-based networks. Clan culture provides exposure to emerging business ideas and channels of information that would otherwise require higher levels of education to access. Through these mechanisms, individuals with modest education can identify and evaluate opportunities earlier than they otherwise would. By lowering the cognitive threshold needed to pursue a venture, clan culture makes entrepreneurship a viable pathway at lower levels of education. Consequently, the peak of the curve occurs at earlier stages of education. Based on this reasoning, we propose the following hypothesis:

H3b. Clan culture moderates the inverted U-shaped relationship between formal education and opportunity-driven entrepreneurship such that higher levels of clan culture flatten the curve and shift the turning point to lower levels of formal education.

3. Method

3.1.Data

Our study draws on data from the China Labour Force Dynamic Survey (CLDS), a nationally representative longitudinal survey that captures demographic characteristics, employment outcomes, and household and community contexts across urban neighbourhoods (*juweihui*) and rural villages in 25 provinces and four municipalities in China. The CLDS is particularly valuable for studying entrepreneurial entry due to its longitudinal design, which tracks individuals, households, and communities over time and allows for the analysis of transitions from non-entrepreneurial roles into entrepreneurship across survey waves.

The CLDS is conducted biennially using a multi-stage cluster, stratified, and probability proportional to size (PPS) sampling method. Since its launch in 2012, the survey has completed five waves, with the latest in 2020. For this study, we utilize data from the first four waves (2012, 2014, 2016, and 2018). This design produces unbalanced panel data in which a portion of respondents are revisited in subsequent waves while new samples are added. Such a structure enables us to observe entrepreneurial transitions over time.

Following prior research on rural entrepreneurship in China (e.g., Cheng et al., 2021; Li et al., 2025), we define an individual as an entrepreneur if they report being self-employed or an employer. Because our focus is on entrepreneurial entry, we restrict the sample to individuals residing in villages who were not entrepreneurs in the previous wave but became entrepreneurs in the subsequent wave, following the approach of Liu et al. (2019). After excluding cases with missing values, the final analytic sample comprises 9,103 individuals and 14,568 individual-year observations across 277 villages.

3.2.Variables

Necessity-driven and opportunity-driven entrepreneurship. To distinguish between necessity-driven and opportunity-driven entrepreneurship, we rely on respondents' self-reported motivations for founding their current businesses. Specifically, each individual was asked: "Was your current entrepreneurial venture driven by finding a good business opportunity, or because you did not have better job options?" The survey provided four response categories: (1) seizing a good business opportunity, (2) not having better job options, (3) both of the above, and (4) good job positions were available, but the entrepreneurial opportunity was even better. Individuals who selected option 2 are classified as necessity-driven entrepreneurs. Necessity-driven entrepreneurship is coded as 1 if the individual was not engaged in entrepreneurship in the previous survey wave but became necessity-driven entrepreneur in the current wave, and 0 otherwise (e.g., Liu et al., 2019; Li et al., 2025). This approach captures the dynamic transition from wage employment, other types of work, or unemployment into entrepreneurship.

Individuals selecting options 1, 3, or 4 are classified as opportunity-driven entrepreneur. Opportunity-driven entrepreneurship is coded as 1 if the individual was not engaged in entrepreneurship in the previous survey wave but became opportunity-driven entrepreneur in the current wave, and 0 otherwise. It is noteworthy that although Option 3 indicates both necessity and opportunity motives, we classify these cases as opportunity driven. Prior research shows that entrepreneurial entry often reflects mixed motivations (Block & Wagner, 2010; Williams & Youssef, 2014), and, as Block & Wagner (2010) argue, when both motives are present the pull of an opportunity provides the stronger signal of opportunity-driven entrepreneurship. In rural contexts especially, individuals rarely choose between pure necessity and pure opportunity; instead, necessity often coexists with the pull of an opportunity. Following this reasoning, we treat respondents selecting "Both of the above" as opportunity-driven entrepreneurs.

Formal education. Formal education is measured as the total number of years of schooling completed by an individual. While not specific to entrepreneurship, the capabilities developed through formal education are central to enabling individuals to initiate and manage entrepreneurial activities effectively. Measuring education in years allows for precise

comparisons across individuals and captures incremental effects across the full range of educational attainment. This approach is particularly valuable in rural settings, where education levels vary widely and where formal degrees may be less common than in urban contexts.

Village entrepreneurial intensity. Following prior research on rural entrepreneurship in China (Peng, 2004; Zhou and Xu, 2024), we use the number of enterprises per square kilometre in a village as an indicator of local entrepreneurial development. Because most rural firms in China are small and medium-sized enterprises owned by individuals or groups of households (Zhou and Xu, 2024), this measure reflects both the prevalence of entrepreneurial activity and the availability of local support and resources such as infrastructure, opportunities, and networks that are essential for new venture creation.

Clan culture. In alignment with recent literature on clan culture in Chinese context (e.g., Cao et al., 2022; Chen et al., 2024; Zhang, 2020), we measure the strength of clan culture using genealogies. A genealogy is a record book that details the history of a clan. It documents the historical and cultural processes of each clan, covering the lives, descendants, marriages, beliefs of its members, as well as the clan's code of conduct. The number of genealogies serves as an effective indicator of a clan's strength and vitality since the compilation of genealogies is a crucial activity for clans (Zhang, 2020). Our measure utilizes the Shanghai Library's collection of genealogies[1]; specifically, we follow Cao et al. (2022), Chen et al. (2024) and Zhang (2020) to use genealogies per 10,000 residents and take the logarithmic transformation (log of one plus) to address the skewed distribution of genealogies. To prevent reverse causality, we follow the existing studies to restrict our analysis to genealogies compiled prior to 1950. This approach ensures that the measure of clan is predetermined, thereby avoiding potential bias in our analysis.

Control variables. We incorporate a comprehensive set of control variables at both individual and village levels, as identified in the literature as factors influencing entrepreneurial entry. At the individual level, we include the demographic characteristics of individuals, including *age*, *gender, a*nd *marital status,* which are standard control variables in studies of

[1] Existing studies on clan culture in China have used two sources of genealogies, the Shanghai Library collection of genealogies and the Chinese Family Tree Database maintained by Huazhong Normal University. While we primarily use the data from the former, we have obtained consistent results using the latter as well.

entrepreneurial entry (Klyver et al., 2020; Greidanus and Liao 2021). Additionally, we account for factors directly influencing the decision to start business including individuals' *health status* and *party membership* (Cheng et al. 2021). *Employment status* in the previous wave, i.e., being an employee, farmer, or unemployed, is also controlled due to its differentiated impact on entrepreneurial entry (Laffineur et al. 2020; Klyver et al., 2020). Family-level variables, including *family education* and *family income*, are included to capture the effects of human capital and financial capital, respectively (Au and Kwan 2009; Bird and Wennberg 2016; Klyver et al., 2020). Table 1 provides detailed descriptions and operational definitions of all variables used in the study.

Table 1

At the village level, we control for geographical characteristics and physical infrastructure that may influence entrepreneurial activity. Specifically, we include variables such as highway accessibility (*Village highway*), distance to the nearest economic center (*Village distance to county*) (Zhou & Xu, 2024), and the availability of *Village facilities*, including banks, credit unions, retail shops, and markets. To account for unobserved heterogeneity across time and regions, we incorporate province and survey year fixed effects, which capture region-specific institutional and economic trends as well as time-varying national shocks. In addition, we control for industry fixed effects to address systematic differences in entry rates across sectors. Since industry conditions strongly shape entrepreneurial opportunities and constraints, including these controls ensures that the effects of education and contextual moderators are not confounded by sectoral variation.

3.3. Data preparation and analysis

To capture the dynamics of entrepreneurial entry and reduce concerns of reverse causality, we lag individual and family-level time-invariant variables by one survey period. Extreme high

and low values were adjusted to create more balanced distributions and prevent them from exerting disproportionate influence on the results. We include a squared term for age to account for the non-linear relationship between age and entrepreneurial entry, as documented in prior research (Kautonen et al., 2014). Entrepreneurial entry tends to rise with age as individuals accumulate experience and resources but declines later in life as opportunity costs increase and risk tolerance decreases, which justifies a quadratic specification. To address skewed distributions and mitigate the effect of outliers, we applied logarithmic transformations to variables such as family income, village highway access, and village entrepreneurial intensity. These transformations improved balance in the data, enhanced model stability, and allowed interpretation in proportional rather than absolute terms. Diagnostic tests confirmed that these adjustments improved model fit and supported key regression assumptions, including the normality of residuals and constant variance.

Table 2 presents the descriptive statistics for all variables included in the analysis. Table 3 reports the Variance Inflation Factors (VIFs) for the independent variables. All values are well below the conventional threshold of 10 and remain under the more conservative benchmark of 5, confirming that multicollinearity does not pose a concern for our models.

Table 2 & 3 here

The analysis is conducted using logit regression, which is appropriate for modeling the dichotomous outcome of entry into necessity-driven or opportunity-driven entrepreneurship. However, because individuals are nested within villages, observations are unlikely to be fully independent, raising concerns of correlated error terms within the same village. To address this potential intra-cluster correlation, we employ cluster-robust standard errors at the village level. This approach is particularly suitable given our focus on estimating population-average effects of education and clan culture on entrepreneurial entry, rather than modelling variance across higher-level units such as provinces or survey years. Although the data have a nested structure,

the relatively small number of higher-level clusters limits the reliability of multilevel modelling for estimating random effects (McNeish & Stapleton, 2016). Clustering at the village level corrects for intra-cluster correlation, accounts for unobserved village-level heterogeneity, and ensures valid statistical inference. With 271 villages in the sample, we exceed the threshold typically recommended for robust cluster correction (Cameron & Miller, 2015). This approach is widely applied in micro econometric research (MacKinnon, 2019) and aligns with best practices when examining individual behaviour within localized contexts.

4. Results

4.1. Hypothesis testing

Table 4 presents the regression results for necessity-driven and opportunity-driven entrepreneurship, including the interaction effects with village entrepreneurial intensity and clan culture. For necessity-driven entrepreneurship, Model 1 includes control variables, a linear term, and a squared term for education. The coefficient for the linear term is positive and significant ($\beta = 0.180$, $p < 0.05$), indicating that additional years of education generally increase the likelihood of entrepreneurial entry. The squared term is negative and highly significant ($\beta = -0.019$, $p < 0.01$), consistent with an inverted U-shaped relationship. Applying the three-step procedure of Haans et al. (2016), detailed in Appendix A, we confirm that the turning point lies within the observed range of education and that the slopes differ significantly below and above this point, providing strong support for the hypothesized curvilinear effect.

Turning to opportunity-driven entrepreneurship, Model 4 shows that the coefficient on education is positive but statistically insignificant ($\beta = 0.143$, n.s.), while the squared term is negative and significant ($\beta = -0.015$, $p < 0.01$). These results suggest an inverted U-shaped pattern, but the evidence is weaker compared to the necessity-driven case. Following Haans et al.'s (2016) procedure, we find that the low end of the slope is only marginally significant ($p < 0.10$), while the high end is strongly negative ($p < 0.01$). This provides qualified support for the hypothesized curvilinear relationship in the opportunity-driven entrepreneurship.

Overall, the findings provide strong support for Hypothesis 1 in the context of necessity-driven entrepreneurship and more moderate support in the case of opportunity-driven

entrepreneurship. Entrepreneurial entry is most likely among individuals with moderate levels of education, whereas both very low and very high levels of education reduce the likelihood of entry. Applying Haans et al.'s (2016) three-step procedure confirms the presence of curvilinear effects, while also highlighting differences in the strength and robustness of evidence across the two types of entrepreneurships.

Table 4

In evaluating the role of VEI and clan culture as moderators of the relationship between formal education and entrepreneurial entry, this study follows the two-step procedure outlined by Haans et al. (2016). First, we test whether the coefficient of the squared interaction term (β_4) is positive and statistically significant, which would suggest a flattening of the curve. Second, we assess whether the turning point shifts by examining the numerator of the derivative ($\beta_1\beta_4 - \beta_2\beta_3$), where a negative value indicates a leftward shift and a positive value indicates a rightward shift. Full details of these calculations are provided in Appendix A.

For necessity-driven entrepreneurship, Hypothesis 2a predicted that VEI would flatten the education–necessity-driven entrepreneurship curve and shift the turning point leftward. Model 2 provides no evidence in support of this expectation. The squared interaction term is negative and not significant ($\beta_4 = -0.001$, n.s.), indicating no flattening effect. The turning point analysis also reveals no statistically meaningful leftward shift. Overall, these results suggest that the presence of more entrepreneurial activity in a village does not substantially change how education influences necessity-driven entrepreneurship. Put differently, local entrepreneurial intensity does not appear to reduce the educational threshold required for individuals to pursue necessity-based ventures.

Hypothesis 2b proposed a similar moderating role of VEI for opportunity-driven entrepreneurship. Here, the evidence is somewhat more supportive but not fully robust. Model 5 shows a positive coefficient for the squared interaction term ($\beta_4 = 0.003$), which is marginally

significant ($p < 0.10$), suggesting a tendency toward curve flattening. The turning point derivative is negative, consistent with a leftward shift, but this result is not statistically significant. Taken together, these results imply that in villages with high entrepreneurial activity, individuals may reach the peak of opportunity-driven entrepreneurship at lower levels of education, although this finding should be interpreted cautiously given its weaker statistical support.

Turning to clan culture, Hypothesis 3a predicted that it would flatten the education–necessity-driven entrepreneurship curve and shift the turning point leftward. The results provide strong support for this expectation. Model 3 shows a positive and significant squared interaction ($\beta_4 = 0.005$, $p < 0.05$), indicating a clear flattening of the curve, while the derivative of the turning point is negative, confirming a significant leftward shift. These results suggest that in communities with strong kinship networks, the educational requirements for necessity-driven entrepreneurship are reduced.

Finally, Hypothesis 3b anticipated that clan culture would also moderate the relationship between education and opportunity-driven entrepreneurship. Model 6, however, shows no significant effect. The squared interaction term is not significant ($\beta_4 \approx 0.000$), indicating no flattening. While the turning point derivative is negative, consistent with a potential leftward shift, the absence of a significant curvature change means there is insufficient evidence to support this hypothesis.

In sum, VEI shows moderate evidence of a moderating effect in the case of opportunity-driven entrepreneurship, whereas clan culture demonstrates a stronger and more robust influence in necessity-driven entrepreneurship. These results underscore the importance of local context, while also highlighting that its effects depend both on the type of contextual factor and the form of entrepreneurial motivation. While entrepreneurial-rich environments may reduce the reliance on higher education for opportunity-driven ventures, strong kinship structures appear particularly effective in enabling necessity-driven entrepreneurs to enter and sustain business activity.

4.2 Testing for Endogeneity Using an IV Approach

To address potential endogeneity in estimating the effect of education on entrepreneurial entry, we employed an instrumental variables (IV) approach (Bascle, 2008). Specifically, we used community-average mother's education and its squared term, as well as community-average family education and its squared term, as instruments. The diagnostic results in Appendix B confirm the validity of these instruments. The first-stage F-statistics for necessity-driven entrepreneurship (229.02 and 240.58) and opportunity-driven entrepreneurship (231.06 and 243.55) are well above the conventional threshold of 10, indicating strong instrument relevance. The Sargan test yields p-values of 0.195 and 0.017 for necessity-driven and opportunity-driven entrepreneurship, respectively, suggesting that the instruments are exogenous and valid.

The comparison between the IV and logit estimates shows that the relationship between education and entrepreneurial entry remains consistent. Both models reveal a positive linear term and a negative quadratic term, supporting an inverted U-shaped pattern. However, the magnitude of the coefficients decreases after accounting for endogeneity. For necessity-driven entrepreneurship, the coefficients on education and education squared decline from 0.160 and –0.017 in the logit model to 0.011 and –0.001 in the IV estimation. For opportunity-driven entrepreneurship, the coefficients fall from 0.124 and –0.013 in the logit model to 0.008 and –0.001 in the IV model. These reductions indicate that the baseline results overstate the true effect of education, suggesting an upward bias likely caused by omitted variables or reverse causality.

The IV estimates therefore provide a more conservative and credible assessment of the causal relationship. Education continues to show a statistically significant, non-linear association with entrepreneurial entry, but its effect is smaller than in the baseline models. This implies that some of the strong positive association observed earlier reflects unobserved characteristics such as ability, motivation, or access to networks, which influence both education and entrepreneurship. After correcting for this bias, the inverted U-shaped pattern remains but with smaller coefficients, indicating that education encourages entrepreneurial participation up to a point, beyond which its marginal effect diminishes.

Overall, the IV analysis enhances the robustness and credibility of the findings. Even after accounting for potential endogeneity, education remains an important, though more moderate, determinant of both necessity- and opportunity-driven entrepreneurship. This provides stronger support for a causal interpretation and reinforces the validity of the study's conclusions.

5. Discussion

Previous research on the relationship between formal education and entrepreneurial entry has produced mixed results, with studies finding positive, negative, or insignificant effects (Patel, 2025; Cheng & Smyth, 2021; Tamvada et al., 2022; Hayward et al., 2022; Van Der Sluis et al., 2008). Our study helps reconcile these inconsistencies by showing that the effect of formal education on entrepreneurial entry is not linear. Specifically, we find strong evidence of an inverted U-shaped relationship between formal education and necessity-driven entrepreneurship, and more limited yet suggestive evidence of a similar non-linear pattern for opportunity-driven entrepreneurship in rural emerging economies.

This finding implies that formal education initially contributes to entrepreneurial entry by enhancing knowledge, literacy, and problem-solving skills (Debarliev et al., 2022). However, beyond a certain point, higher levels of education reduce the likelihood of entry, particularly in rural settings. Individuals with greater educational attainment are more likely to pursue attractive wage employment or professional careers (Liu et al., 2021; Block et al., 2015; Baum et al., 2011; Wu et al., 2024). They may also be more aware of the risks associated with entrepreneurship and more attuned to the limited scalability of ventures in rural economies, making salaried work relatively more appealing (Amit et al., 1995; Jimenez et al., 2015).

Our results provide strong evidence for this curvilinear pattern in the case of necessity-driven entrepreneurship, where even modest education equips individuals with knowledge that lower barriers to self-employment, while higher levels of education increase the opportunity costs of entrepreneurship. For opportunity-driven entrepreneurship, however, the evidence is more moderate. While the quadratic term is statistically significant, the slopes at the lower end of the education distribution are only marginally significant. This suggests that the benefits of

education for recognizing and exploiting opportunities are less consistent at lower education levels, and that opportunity-driven entrepreneurship becomes more viable primarily for those with moderate rather than minimal education.

We also examined how VEI and clan culture moderate the non-linear relationship between formal education and entrepreneurial entry. The findings indicate that these contextual moderators operate differently depending on whether entrepreneurship is necessity- or opportunity-driven. In the case of VEI, we find suggestive evidence of a moderating effect for opportunity-driven entrepreneurship, but no evidence of moderation for necessity-driven entrepreneurship. Necessity entrepreneurs typically engage in small-scale, subsistence activities due to a lack of alternatives (Baptista et al., 2014). In such cases, the presence of more entrepreneurs in the village provides limited additional benefits because the barriers to entry are already low and the growth potential is constrained. By contrast, opportunity entrepreneurs seek to exploit market gaps and innovation (Block & Wagner, 2010). In this context, higher levels of entrepreneurial activity in the community can generate knowledge spillovers, reduce information asymmetries, and facilitate access to customers, suppliers, and credit (Morris et al., 2024; Duta & Forbes, 2024). These mechanisms appear to lower the educational threshold required to pursue opportunity-driven ventures, though the evidence is moderate rather than definitive.

Clan culture, in contrast, demonstrates a more substantial influence in the context of necessity-driven entrepreneurship. Our results show that strong kinship ties both flatten the education–entrepreneurship curve and shift the turning point to the left, reducing the educational threshold required to enter entrepreneurship. Clan networks provide informal credit, shared labour, reputational legitimacy, and mutual support (Zhou & Xu, 2024; Cao et al., 2022). These resources substitute for the capabilities that would otherwise be acquired through formal education, thereby broadening entrepreneurial participation across lower levels of education. However, for opportunity-driven entrepreneurship, we find little evidence of moderation by clan culture. While family networks may facilitate necessity-based ventures, they are less well suited to the demands of growth-oriented opportunities that often require diverse networks, external financing, and greater autonomy (Cheng et al., 2021; Zhang, 2020).

In some cases, strong clan expectations may even constrain experimentation and discourage deviation from traditional economic activities, dampening the pursuit of more innovative ventures.

Overall, the findings highlight an important asymmetry. VEI exerts a moderating influence primarily in opportunity-driven entrepreneurship, whereas clan culture plays a stronger and more consistent role in necessity-driven entrepreneurship. This suggests that the impact of local contexts depends not only on the type of contextual factor but also on the motivation underlying entrepreneurial entry (Maimone Ansaldo Patti et al., 2016). By distinguishing between necessity- and opportunity-driven pathways, our study advances understanding of how education and local institutions jointly shape entrepreneurial entry in rural emerging economies.

6. Contributions and Conclusion

6.1 Theoretical and Practical Contributions

Our study makes several contributions to the literature. First, it advances scholarship on rural entrepreneurship by examining the relationship between formal education and entrepreneurial entry in the context of emerging economies. These settings are often characterized by weak institutional support and limited resources for entrepreneurial activity (Li et al., 2025). Within such environments, understanding the role of formal education, conceptualized as a form of general, non-task-related human capital (Becker, 1994; Unger et al., 2011), is particularly important. Unlike task-specific forms of human capital such as entrepreneurship education, formal education is more relevant to rural areas where access to specialized training is often limited. In this way, our study deepens understanding of how education influences entrepreneurship in contexts that remain underexplored despite their increasing importance (Cao & Shi, 2021; Foo et al., 2020; Osman et al., 2023; Leitch et al., 2012).

Second, our research contributes to the human capital and entrepreneurship literature by identifying a non-linear relationship between formal education and entrepreneurial entry. Prior studies have produced conflicting results: some report a positive relationship, others no

effect, and still others a negative association (Davidsson & Honig, 2003; Van Der Sluis et al., 2008; Buenstorf et al., 2017; Tamvada et al., 2022; Hayward et al., 2022). By showing an inverted U-shaped pattern, our findings help reconcile these divergent results. Education enhances entrepreneurial participation up to a point, after which its influence declines as greater education expands access to attractive wage employment and professional careers (Hoogendoorn et al., 2024).

Third, this study identifies two boundary conditions that are especially salient in rural emerging economies: village entrepreneurial intensity and clan culture. These factors shape how education translates into entrepreneurial entry, though their effects differ between necessity-driven and opportunity-driven entrepreneurship. In particular, our analysis highlights the role of social capital, with clan culture emerging as a central influence on necessity-driven entrepreneurship. In rural China, dense kinship networks reduce educational thresholds by supplying credit, labour, legitimacy, and access to markets. Comparable kinship-based systems exist elsewhere, including tribal networks in the Middle East and North Africa, lineage systems in Sub-Saharan Africa (Busch & Mudida, 2024), and biradari networks in South Asia (Loureiro, 2015). These parallels underscore the broader relevance of our findings and point to new opportunities for research on how kinship and community-based structures interact with education to shape entrepreneurship across diverse institutional settings. In extending theories of human and social capital, our findings emphasize the importance of recognizing how network structures condition the entrepreneurial returns to education. This responds to calls for a more relational and multi-level understanding of human capital (Bamberger, 2008; Busse et al., 2017; Maimone Ansaldo Patti et al., 2016) and contributes to more context-sensitive interpretations of entrepreneurial entry (Xavier-Oliveira et al., 2015; Lofstrom et al., 2014; Jimenez et al., 2015).

From a practical perspective, our findings suggest that expanding formal education alone is unlikely to directly stimulate rural entrepreneurship. Local contextual factors play a critical role in lowering entry barriers, particularly for individuals with limited education. Policy interventions should therefore move beyond a narrow focus on education and place

greater emphasis on strengthening local ecosystems and community-based supports that foster inclusion and reduce inequality in entrepreneurial participation.

At the same time, in contexts where such supportive conditions are absent, investments in education remain especially important. Beyond formal education, experiential and skill-based initiatives such as vocational training, mentorship programs, and practice-oriented entrepreneurial learning can equip individuals with the practical capabilities needed for self-employment. Combining ecosystem development with targeted educational initiatives can broaden entrepreneurial opportunities across diverse educational backgrounds and help build more resilient rural economies.

Finally, greater attention should be given to the retention and engagement of highly educated individuals. Although our results indicate that local contextual supports exert limited influence on this group's entrepreneurial entry, their involvement is vital for providing advanced skills, professional management, and innovative capacity. Rural development policies should therefore create opportunities that align more closely with their skills and aspirations, ensuring that highly educated individuals view rural entrepreneurship as a viable and rewarding career path rather than seeking opportunities elsewhere.

6.2 Limitations and Directions for Future Research

While this study offers important contributions, several limitations warrant acknowledgement and point toward promising avenues for future research.

First, this study uses formal education as the sole proxy for human capital, which limits the scope of the analysis. Given that human capital is multidimensional, future research could incorporate both task-specific and non-task-related forms (Unger et al., 2011). Including factors such as vocational training, analytical ability, and interpersonal competence would offer a more comprehensive understanding of how different dimensions of human capital influence entrepreneurial entry across necessity- and opportunity-driven entrepreneurship.

Second, although our hypotheses and analyses consider both necessity and opportunity driven entrepreneurship, particularly in relation to how moderating variables may flatten or shift the turning point, we do not directly compare the two. For example, we do not assess

whether the curve representing opportunity driven entrepreneurship is positioned differently from that of necessity driven entrepreneurship. Future research could undertake such comparative analysis to clarify these distinctions and enhance understanding of how formal education influences the motivation to engage in different forms of entrepreneurship.

Third, although we identify moderating effects of village entrepreneurial intensity and clan culture, the mechanisms through which these contextual factors operate remain only partly understood. Our findings suggest that these moderators influence necessity driven and opportunity driven entrepreneurship differently, but the specific channels of influence are unclear. Future research should develop stronger theoretical models to explain, for example, why entrepreneurial intensity affects opportunity driven entrepreneurship more than necessity driven entrepreneurship, and why clan culture lowers thresholds for necessity entrepreneurship but has weaker effects in opportunity contexts. Such work would deepen understanding of how local ecosystems and kinship networks translate educational attainment into entrepreneurial action.

Finally, this study's focus on rural China provides valuable insights into how institutional diversity and strong kinship traditions shape entrepreneurial behavior. Future research could extend this analysis by adopting comparative and longitudinal approaches to examine how these relationships evolve across different rural contexts and over time, revealing how modernization and institutional change influence the entrepreneurial value of formal education.

6.3 Concluding Remarks

This study demonstrates that the relationship between formal education and rural entrepreneurial entry follows an inverted U-shaped pattern shaped by contextual factors. For necessity-driven entrepreneurship, we find strong evidence of such a relationship, while for opportunity-driven entrepreneurship the evidence is more moderate. Our findings also uncover that village entrepreneurial intensity moderates the link between education and opportunity-driven entrepreneurship, whereas clan culture moderates the link between education and necessity-driven entrepreneurship. Overall, these results demonstrate that the effects of formal

education on entrepreneurial entry vary depending on the type of entrepreneurship and the regional context in which it occurs.

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Table 1. Variable definitions

Variable	Definition
Key variables	
Necessity-driven entrepreneurship	Dummy variable, 1 if an individual was not involved in entrepreneurship in the previous survey wave but became a necessity-driven entrepreneur in the current wave and 0 otherwise.
Opportunity-driven entrepreneurship	Dummy variable, 1 if an individual was not involved in entrepreneurship in the previous survey wave but became an opportunity-driven entrepreneur in the current wave and 0 otherwise.
Formal education	The years of formal education an individual has received
Village entrepreneurial intensity	The number of firms located in a village per square kilometre, log taken
Clan culture	The number of genealogies per 10,000 residents in the prefecture, log taken
Control variables	
Age	The number of age
Gender	Dummy variable, 1 if an individual is male and 0 otherwise
Marital status	Dummy variable, 1 if an individual is married and 0 otherwise
Party membership	Dummy variable, 1 if an individual is a CCP member and 0 otherwise
Health	Self-evaluated health status on a scale of 1-5
Employment	Dummy variable, 1 if an individual's job status is employee or farming and 0 otherwise
Family education	The years of formal education family members received on average
Family income	The family income of an individual, log taken
Village highway	Dummy variable, 1 if a village has highway and 0 otherwise
Village distance to county	The distance from a village to the county, log taken
Village facilities	Measures the availability of key village amenities (e.g., bank, shops, market). Each facility is coded 1 if present, 0 otherwise; summed to form an index where higher values indicate better local service access.

Table 2. Descriptive statistics

Variable	Mean	Std. dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.Necessity-driven entrepreneurship	0.024	0.152	1															
2.Opportunity-driven entrepreneurship	0.025	0.155	-0.024	1														
3. Formal education	6.838	3.832	0.085	0.104	1													
4. Village entrepreneurial intensity	-0.544	2.531	-0.01	0.001	0.066	1												
5. Clan culture	2.757	1.478	-0.006	0.006	0.034	0.056	1											
6. Age	49.314	11.912	-0.064	-0.064	-0.351	-0.032	0.031	1										
7. Gender	0.508	0.500	0.054	0.084	0.26	0.005	0.001	0.111	1									
8. Marital status	0.916	0.277	-0.004	0.001	-0.095	-0.031	0.007	0.202	-0.077	1								
9. Party membership	0.059	0.236	0.018	0.046	0.202	0.001	0.006	0.06	0.173	0.012	1							
10. Health	2.491	1.008	-0.017	-0.054	-0.191	-0.02	0.001	0.234	-0.086	0.021	-0.05	1						
11. Employment	0.984	0.127	-0.13	-0.07	-0.031	-0.015	-0.001	0.036	0.02	0.025	0.006	0.004	1					
12. Family education	7.408	2.486	0.056	0.069	0.539	0.045	0.03	-0.099	-0.011	0.01	0.133	-0.114	-0.026	1				
13. Family income	7.575	4.318	0.008	0.007	0.032	0.039	0.014	-0.092	-0.166	0.011	0.002	-0.031	-0.003	0.091	1			
14. Village highway	0.962	0.191	0.01	0.005	0.035	0.025	-0.022	-0.027	0.001	-0.021	0.011	-0.005	0	0.037	0.013	1		
15. Village distance to county	2.982	1.184	-0.013	-0.023	-0.068	-0.02	-0.053	0.004	0.029	-0.009	-0.017	0.078	0.014	-0.076	-0.062	0.015	1	
16. Village facilities	1.200	0.626	0.017	0.011	0.072	0.007	-0.139	-0.043	0.014	-0.015	0.016	-0.03	-0.061	0.083	-0.005	-0.037	0.061	1

Table 3. Variance Inflation Factors

Variable	VIF	1/VIF
1. Age	1.36	0.73
2. Gender	1.25	0.80
3. Marital status	1.06	0.94
4. Party membership	1.08	0.93
5. Health	1.09	0.91
6. Employment	1.01	0.99
7. Family education	1.52	0.66
8. Family income	1.05	0.96
9. Village highway	1.01	0.99
10. Village distance to county	1.02	0.98
11. Village facilities	1.04	0.96
12. Formal education	1.94	0.51
13. Village entrepreneurial intensity	1.01	0.99
14. Clan culture	1.03	0.97

Table 4: Necessity-drive entrepreneurship vs. opportunity-driven entrepreneurship

VARIABLES	Necessity-driven entrepreneurship (1)	(2)	(3)	Opportunity-driven entrepreneurship (4)	(5)	(6)
Control variables						
Age	0.062	0.062	0.065	0.011	0.011	0.013
	(0.066)	(0.066)	(0.068)	(0.057)	(0.056)	(0.058)
Age squared	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Gender (Male)	0.321	0.321	0.311	0.308	0.309	0.305
	(0.288)	(0.290)	(0.287)	(0.286)	(0.287)	(0.286)
Marital status (Married)	0.640	0.619	0.655	0.772*	0.775*	0.800*
	(0.448)	(0.451)	(0.455)	(0.435)	(0.439)	(0.441)
Party membership	-0.463	-0.632	-0.495	-0.561	-0.602	-0.546
	(0.558)	(0.565)	(0.563)	(0.591)	(0.592)	(0.596)
Health	-0.044	-0.033	-0.033	-0.112	-0.109	-0.107
	(0.112)	(0.112)	(0.111)	(0.115)	(0.116)	(0.115)
Employment	-4.083***	-4.110***	-4.113***	-3.954***	-3.987***	-3.984***
	(0.538)	(0.530)	(0.543)	(0.425)	(0.423)	(0.423)
Family education	0.078	0.079	0.076	0.070	0.075	0.068
	(0.054)	(0.055)	(0.056)	(0.055)	(0.055)	(0.056)
Family income	-0.040	-0.038	-0.040*	-0.072***	-0.072***	-0.073***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Village highway	0.410	0.384	0.333	0.239	0.222	0.213
	(0.631)	(0.623)	(0.621)	(0.427)	(0.425)	(0.416)
Village distance to county	-0.122	-0.121	-0.129	-0.106	-0.107	-0.110
	(0.110)	(0.115)	(0.113)	(0.109)	(0.112)	(0.109)
Village facilities	0.014	-0.010	0.039	-0.113	-0.123	-0.119
	(0.174)	(0.174)	(0.176)	(0.178)	(0.178)	(0.175)
Hypothesized variables						
Education (years)	0.180**	0.163*	0.418***	0.143	0.140	0.291**
	(0.088)	(0.090)	(0.156)	(0.093)	(0.094)	(0.142)
Education (years) squared	-0.019***	-0.018***	-0.034***	-0.015***	-0.015**	-0.017*
	(0.006)	(0.006)	(0.011)	(0.006)	(0.006)	(0.009)
Village entrepreneurial intensity		0.064			0.074	
		(0.076)			(0.088)	
Education * Village entrepreneurial intensity		-0.010			-0.039**	

		(0.016)			(0.019)	
Education squared * Village entrepreneurial intensity		-0.001			0.003**	
		(0.001)			(0.001)	
Clan culture			0.322**			0.340***
			(0.135)			(0.132)
Education * Clan culture			-0.073**			-0.042
			(0.028)			(0.028)
Education squared * Clan culture			0.005**			0.000
			(0.002)			(0.002)
Constant	-5.331***	-5.295***	-6.226***	-2.674	-2.675	-3.613**
	(2.034)	(2.012)	(2.111)	(1.674)	(1.670)	(1.733)
Province FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	11,385	11,385	11,361	11,410	11,410	11,385

Notes: Standard errors clustered at village level; standard errors reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Figure 1: The mechanism of the inverted-U shaped relationship: net effect of education on entrepreneurial entry

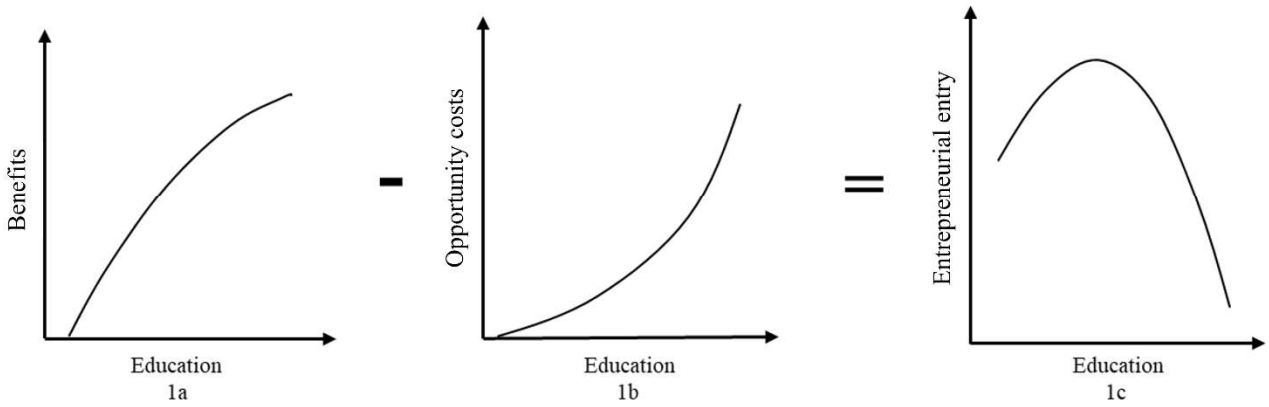
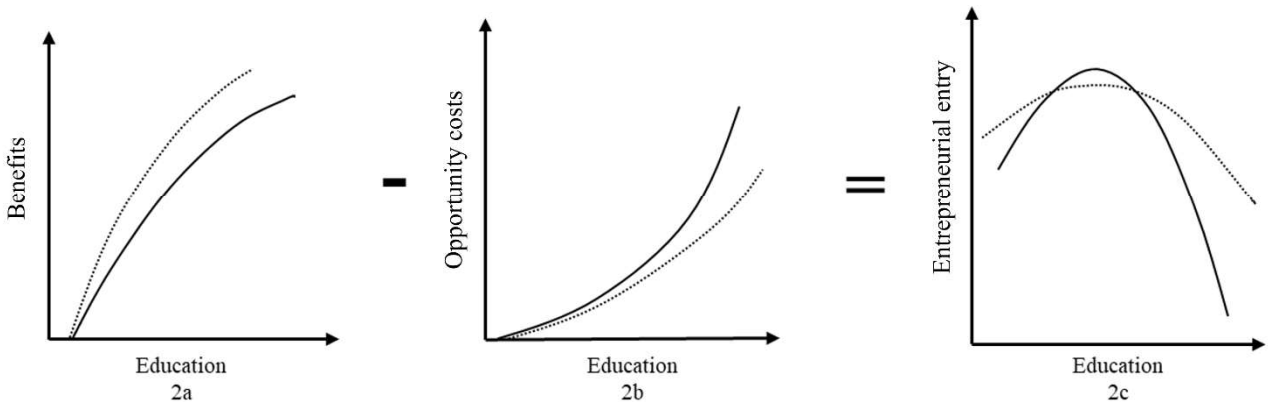


Figure 2: The mechanism of the moderating effect: turning point shift and flattening of the inverted U-shaped relationship



Appendix A: Three step procedure (Haans et al., 2016)

Step 1: Significance of the Quadratic Term for both necessity-driven and opportunity-driven entrepreneurship

From Column 1 and 4 of Table 4, we observe that the quadratic term of education (Education squared) is statistically significant at the 1% level (Coeff. = -0.019, p = 0.005 for necessity-driven entrepreneurship and Coeff. = -0.015, p = 0.005 for opportunity-driven entrepreneurship). This confirms a statistically significant quadratic term for education, satisfying the necessary (but insufficient) condition for an inverted U-shaped relationship (Haans et al., 2016).

Step 2a: Significance and Direction of Slopes at Data Extremes (for necessity-driven entrepreneurship)

For necessity-driven entrepreneurship, with clan culture as the moderating variable, the results are presented below, and the corresponding marginal effects are illustrated in Figure 1.

We evaluated the slopes at ±1 standard deviation from the mean of our explanatory variable (Mean = 6.84, SD = 3.83):

Low-end slope (Education = 3.01):
Coeff. = 0.274, p = 0.001 (significant at the 1% level).

High-end slope (Education = 10.67):
Coeff. = −0.203, p = 0.019 (significant at the 5% level).

While the low-end slope shows a statistically significant positive effect, the high-end slope demonstrates a strongly significant negative effect, aligning with theoretical expectations.

Step 3a: Turning Point Within Data Range (for necessity-driven entrepreneurship)

Turning point (β_1 represents the linear term coefficient and β_2 denotes the quadratic term coefficient):

$$X^* = -\frac{\beta_1}{2\beta_2} = 7.41 \text{ (p< 0.01, 95\% CI: [5.62, 9.20])}.$$

Data range: Education spans [0, 19], confirming the turning point lies within observed values.

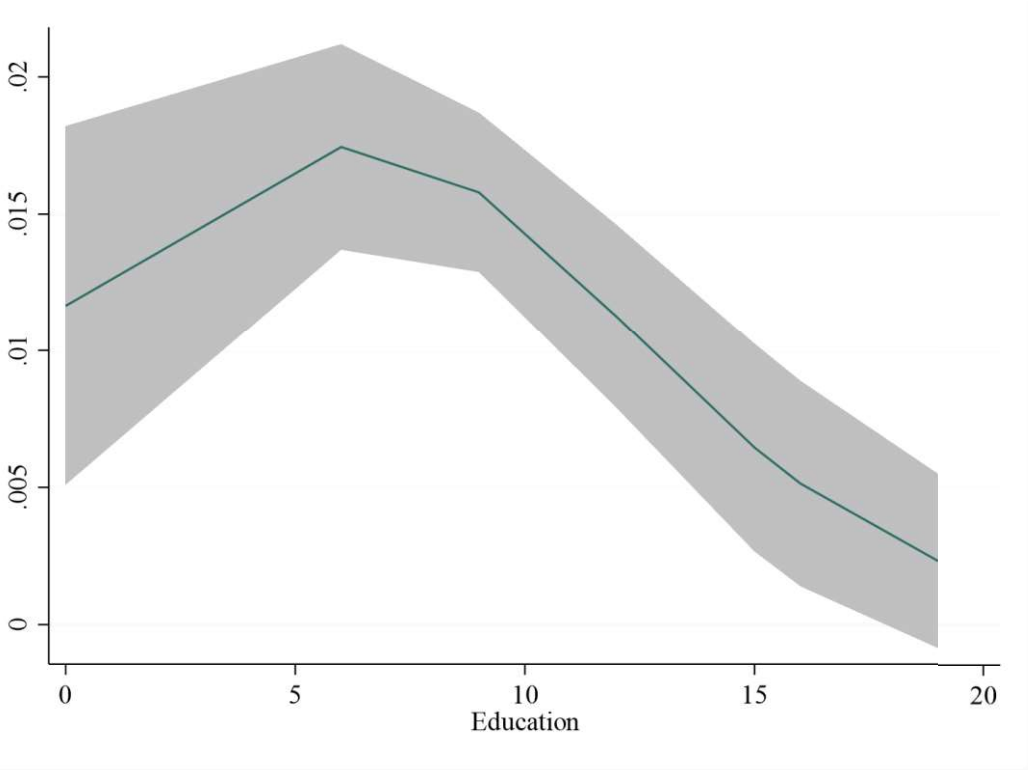


Fig.1 Marginal Effects of Education on necessity-driven entrepreneurship: CC moderating

Turning Point Dynamics: The analysis reveals a statistically significant shift in the turning point across clan culture levels:

The turning point decreases from 7.08 years (low CC) to 5.00 years (high CC), indicating a leftward shift as clan culture strengthens.

Determining the turning point shift using Haans et al.'s (2016) appendix 3 formula:
The directional test coefficient ($\beta_1\beta_4 - \beta_2\beta_3 = -0.0004$) is negative, though not statistically significant (p = 0.141). This negative sign is consistent with the observed leftward movement.

Curvature Modification: The significant positive coefficient for the three-way interaction term ($\beta_4 = 0.0047$, p = 0.012) demonstrates that stronger clan culture systematically alters the education-entrepreneurship curve's shape.

For an inverted U-shape, the curve becomes flatter (flattening) as clan culture increases as shown in figure 2 below.

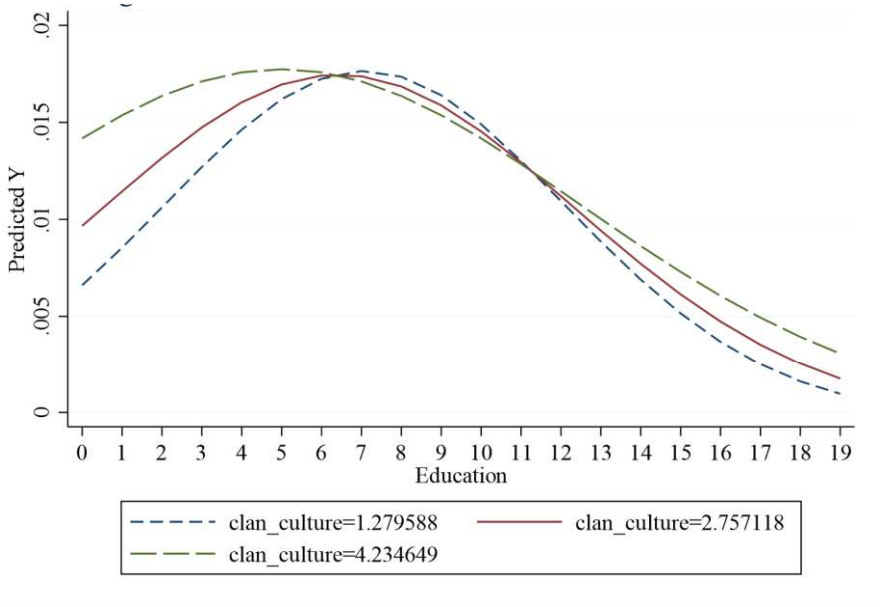


Fig 2. Marginal effect of formal education at different clan culture levels

Step 2b: Significance and Direction of Slopes at Data Extremes (for opportunity-driven entrepreneurship)

For opportunity-driven entrepreneurship, with village entrepreneurial intensity as the moderating variable, the results are presented below, and the corresponding marginal effects are illustrated in Figure 3.

We evaluated the slopes at ±1 standard deviation from the mean of our explanatory variable (Mean = 6.84, SD = 3.83):

Low-end slope (Education = 3.01):
Coeff. = 0.061, p = 0.091 (significant at the 10% level).

High-end slope (Education = 10.67):
Coeff. = −0.145, p = 0.005(significant at the 1% level).

While the low-end slope shows a statistically significant positive effect, the high-end slope demonstrates a strongly significant negative effect, aligning with theoretical expectations.

Step 3b: Turning Point Within Data Range (for opportunity-driven entrepreneurship)

Turning point (β_1 represents the linear term coefficient and β_2 denotes the quadratic term coefficient):

$$X^* = -\frac{\beta_1}{2\beta_2} = 5.26$$ (p< 0.01, 95% CI: [2.25, 8.26]).

Data range: Education spans [0, 19], confirming the turning point lies within observed values.

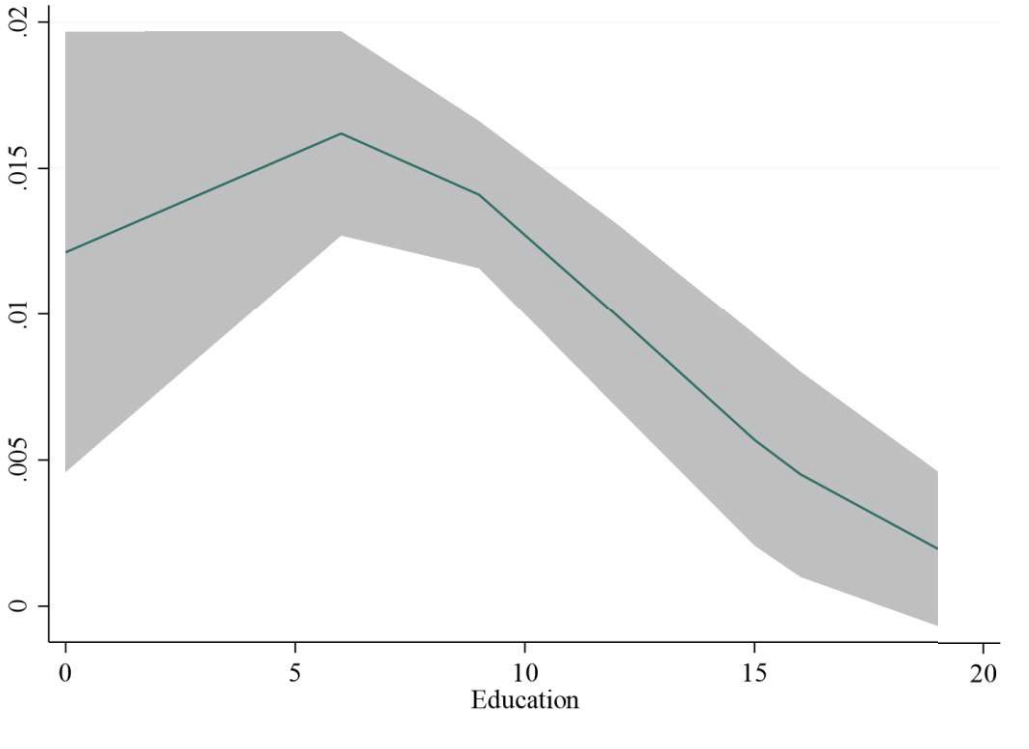


Fig.3 Marginal Effects of Education on opportunity-driven entrepreneurship: VEI moderating

Turning Point Dynamics: The analysis reveals a statistically significant shift in the turning point across clan culture levels:

The analysis shows the turning point moves from 6.78 years (low entrepreneurial intensity) to 3.42 years (high entrepreneurial intensity), suggesting a leftward shift as entrepreneurial intensity increases.

Determining the turning point shift using Haans et al.'s (2016) appendix 3 formula:
The directional test coefficient ($\beta_1\beta_4 - \beta_2\beta_3 = -0.0002$) is negative and this negative sign is consistent with the observed leftward movement.

Curvature Modification: The significant positive coefficient for the three-way interaction term (β_4 =0.0017, p = 0.082) demonstrates that stronger entrepreneurial intensity systematically alters the education-entrepreneurship curve's shape.

For an inverted U-shape, the curve becomes flatter (flattening) as entrepreneurial intensity increases as shown in figure 4 below.

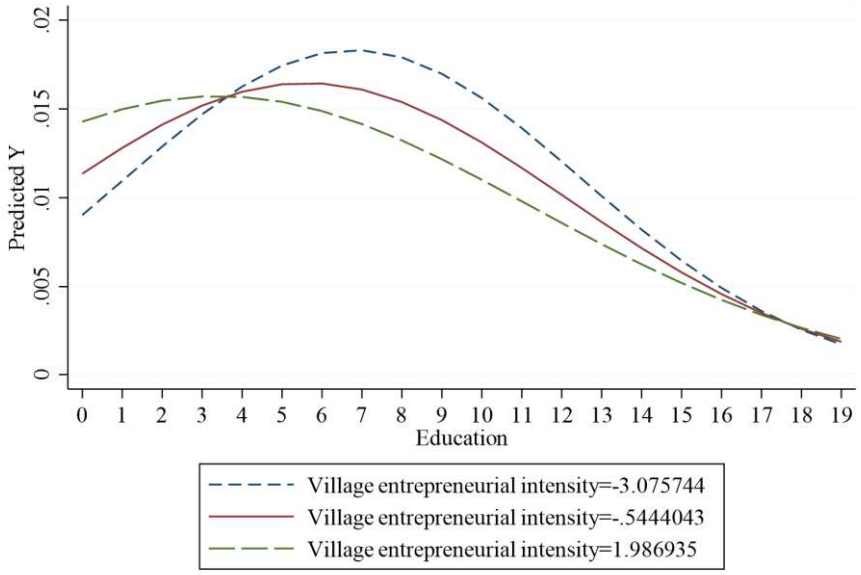


Fig.4 Marginal effects of formal education at different VEI levels

Appendix B: Endogeneity - IV Test

Table B1: IV Test for necessity-driven entrepreneurship

Variable	(1) 2SLS-1st stage Education	(2) 2SLS-1st stage Education squared	(3) 2SLS-2nd stage entrepreneurial entry	(4) Logit entrepreneurial entry
Control variables				
Age	-0.216***	-3.958***	-0.001	0.035
	(0.014)	(0.181)	(0.001)	(0.058)
Age squared	0.001***	0.029***	0.000	-0.000
	(0.000)	(0.002)	(0.000)	(0.001)
Gender (Male)	2.188***	22.617***	0.008	0.104
	(0.052)	(0.668)	(0.006)	(0.219)
Marital status (Married)	0.233**	-1.357	0.001	0.334
	(0.096)	(1.238)	(0.004)	(0.378)
Party membership	1.457***	24.859***	0.016*	-0.218
	(0.112)	(1.451)	(0.008)	(0.426)
Health	-0.012	0.198	0.001	0.052
	(0.026)	(0.332)	(0.001)	(0.099)
Employment	0.017	1.977**	-0.015***	-0.675***
	(0.074)	(0.950)	(0.003)	(0.229)
Family education	0.632***	7.512***	0.004*	0.074
	(0.011)	(0.148)	(0.002)	(0.049)
Family income	-0.009	-0.063	-0.000*	-0.036*
	(0.006)	(0.076)	(0.000)	(0.020)
Village highway	-0.006	-2.044	0.005	0.398
	(0.132)	(1.707)	(0.006)	(0.514)
Village distance to county	-0.044	-0.209	0.001	-0.149
	(0.029)	(0.377)	(0.001)	(0.108)
Village facilities	-0.114***	-1.020*	0.002	0.078
	(0.043)	(0.555)	(0.002)	(0.137)
Hypothesized variables				
Education (years)			0.011**	0.160*
			(0.004)	(0.088)
Education (years) squared			-0.001***	-0.017***
			(0.000)	(0.006)
Family's average education (years)	1.194***	2.487		
	(0.145)	(1.872)		
Family's average education(years) squared	-0.061***	0.090		
	(0.010)	(0.129)		
Mean of mother's education (years)	0.372***	0.519		
	(0.079)	(1.022)		
Mean of mother's education (years) squared	-0.033**	0.271		
	(0.014)	(0.184)		
Constant	3.469***	113.101***	0.036	-8.337***
	(0.753)	(9.729)	(0.050)	(1.707)
First-stage F	229.02	240.58		
Over-id p-value (Sargan)			0.195	
Province FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	12213	12213	12213	11385

Notes: Standard errors clustered at village level; standard errors reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table B2: IV Test for opportunity-driven entrepreneurship

Variable	(1) 2SLS-1st stage Education	(2) 2SLS-1st stage Education squared	(3) 2SLS-2nd stage entrepreneurial entry	(4) Logit entrepreneurial entry
Control variables				
Age	-0.221***	-4.055***	-0.002	-0.020
	(0.014)	(0.181)	(0.001)	(0.055)
Age squared	0.001***	0.030***	0.000	0.000
	(0.000)	(0.002)	(0.000)	(0.001)
Gender (Male)	2.161***	22.134***	0.011*	0.064
	(0.052)	(0.671)	(0.006)	(0.218)
Marital status (Married)	0.225**	-1.578	0.001	0.353
	(0.096)	(1.247)	(0.004)	(0.377)
Party membership	1.444***	24.647***	0.014*	-0.379
	(0.112)	(1.450)	(0.008)	(0.474)
Health	-0.019	0.138	-0.001	-0.064
	(0.026)	(0.334)	(0.001)	(0.101)
Employment	0.018	2.092**	-0.013***	-0.639***
	(0.074)	(0.957)	(0.003)	(0.234)
Family education	0.633***	7.562***	0.005**	0.069
	(0.011)	(0.149)	(0.002)	(0.049)
Family income	-0.007	-0.057	-0.001***	-0.062***
	(0.006)	(0.076)	(0.000)	(0.020)
Village highway	-0.066	-2.808	-0.000	-0.001
	(0.132)	(1.714)	(0.006)	(0.449)
Village distance to county	-0.037	-0.138	0.000	-0.112
	(0.029)	(0.379)	(0.001)	(0.110)
Village facilities	-0.110**	-0.803	0.001	-0.040
	(0.043)	(0.558)	(0.002)	(0.141)
Hypothesized variables				
Education (years)			0.008*	0.124
			(0.004)	(0.084)
Education (years) squared			-0.001***	-0.013**
			(0.000)	(0.006)
Family's average education (years)	1.227***	2.932		
	(0.145)	(1.882)		
Family's average education(years) squared	-0.063***	0.048		
	(0.010)	(0.130)		
Mean of mother's education (years)	0.410***	1.166		
	(0.079)	(1.023)		
Mean of mother's education (years) squared	-0.039***	0.170		
	(0.014)	(0.184)		
Constant	3.709***	119.081***	0.096*	-5.041***
	(0.746)	(9.680)	(0.051)	(1.493)
First-stage F	231.06	243.55		
Over-id p-value (Sargan)			0.017	
Province FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	12226	12226	12226	11410

Notes: Standard errors clustered at village level; standard errors reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.