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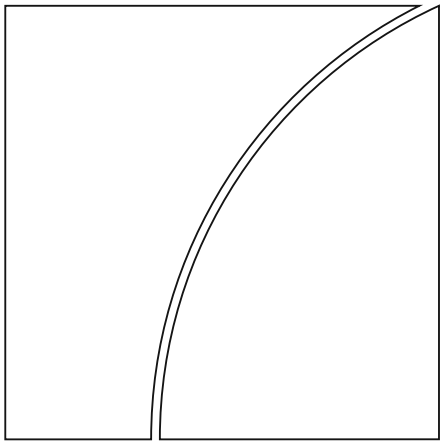

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Investing like conglomerates: is diversification a blessing or curse for China's local governments?[1]

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Abstract

This paper examines how China's local governments make investment via financing vehicles (LGFVs) and provides new insights on often-criticised LGFVs from a different perspective. Using data of 4,432 LGFVs from 1,225 counties across China between 2005 and 2018, we show that since 2014 the function of LGFVs has changed from financing conduits to conglomerate platforms with more salient diversified investments. While a certain level of diversification can be a blessing for local economic growth, over-diversification is a curse. Such an inverted U-shaped relationship depends on the economic conditions of the local economy. Over-diversification may lead to rising local debt and crowding-out effects on private investment.

Keywords: local government financing vehicle, diversified investment, government debt, conglomerate.

JEL classification: E61, G21, H72, O17.

[1] The views expressed here are those of the authors and do not necessarily reflect those of the Bank for International Settlements.

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1. Introduction

Conventional rhetoric holds that China's government investments usually lead to economic distortions. Common criticisms include that inefficient investments lead to overcapacity in certain sectors, crowd out opportunities in others, and build up risks at the local government level, just to name a few. In the literature, local government financing vehicles (LGFVs) are largely viewed as off-balance sheet financing conduits for local governments, and most research focuses on local government debt (Chen et al (2020)) and crowding-out effects of local government borrowing on private investment (Huang et al (2020)). However, there is little empirical evidence on how local governments make investments via such financing vehicles, let alone analysis on the efficiency of their investments and their impact on economic growth.

Anecdotal evidence suggests that some local government investments have been quite successful. Hefei, the capital city of Anhui Province, has transformed from a relatively underdeveloped city to the fastest growth city in China with several high-tech clusters. It also made into the top 10 most attractive cities for three consecutive years, according to a survey by the State Administration of Foreign Experts Affairs titled "*Charming China*". Surprisingly, the miracle has been largely created by successful local government investments. As such, the Hefei government is crowned as "the best venture capital (VC) investor", alongside with tech giants Huawei and Alibaba.[2] In contrast, there are examples on the other extreme, where excessive and inefficient government investment has triggered a debt crisis and dragged economic growth. Dushan County in Guizhou Province, a mountainous area with a total population of 360,000, was under the spotlight recently. The county's party secretary was put under investigation after excessive investments pushed the county to the edge of bankruptcy.[3]

A question then arises as to what makes good government investment. Is the success purely out of luck, or is there a secret recipe? This is an important question, because market-oriented transformation of LGFVs has repeatedly made to headline news, and is now on policymakers' agenda as well. One proposal is to transform LGFVs into regular state-owned enterprises (SOEs), alongside the fiscal reform which looks to swap local governments' implicit debt into explicit debt. Some suggest that the reform aim to create China's Temasek's, which can cultivate emerging champions and shape economic growth. Yet others advocate that LGFVs should transform into financial holding companies. Decoding the secret of LGFVs' success may provide some insights on the direction of LGFV reform. We leverage on the corporate diversification literature for inspiration.

By examining the relationship between diversified investment of LGFVs and local economic growth, we contribute to three strands of literature. First, we extend the institution and reform literature and consider local governments as business

[2] Some of Hefei's signature investments include the following: (i) in 2007, it invested CNY6 billion (equivalent to around one third of Hefei's fiscal revenue at the time) in BOE Technology, now one of the world's largest LCD TV and monitor producer; (ii) in 2017, it invested CNY13.5 billion (75% stake) in the joint venture with Changxin, then in 2018 Hefei Changxin launched its DRAM project production; (iii) in April 2020, it bailed out a cash-strapped China's electric vehicle maker, NIO, with CNY7 billion. These investments all turned out lucrative, with CNY10 billion, 100 billion and 45 billion estimated profits, respectively. With these fruitful investments, Hefei has promoted local economic growth and is now on track to join the "Trillion Yuan Club" in terms of the city's annual GDP.

[3] It has accumulated CNY40 billion of debt, ie, 40 times of its annual fiscal revenue. The Dushan government has at least 5 financing vehicles, which invested in 34 companies spreading 18 sectors.

corporations. Oi (1992) coins the name "local state corporatism" when studying China's rural industrialisation, where local governments are viewed as business corporations. Xu (2011) characterises China's institution as "regionally decentralised authoritarianism" (RDA). Maskin et al (2000) capture the feature of the RDA regime with a stylised hierarchical organisation model, which also applies to large corporations. Xu (2011) argues that an RDA regime provides a fundamental institutional condition for regional competition and experiments, which explains why China is the only country where local governments have played a leading role in increasing economic growth. The regional competition makes local governments behave like corporates in many ways. Despite the success of RDA as a transitional institution, Xu (2011) believes that reforming RDA is critical to China's future growth.

Built upon these studies, we view that local governments operate like conglomerates with multiple lines of businesses. They need to make active financing and investment decisions, and their executives are evaluated based on economic performance. Yet we approach this question from an angle not previously focused in the literature. The literature on China's institutions and reforms mainly scrutinises the difference between China and eastern European countries, as to why Kornai's (1979) influential theory of soft budget constraints, born out of the failure of Hungarian reforms, does not apply to China (Walder (1995)). Moreover, the literature does not explore how local governments boost growth, besides acknowledging the path-dependent growth (Xu (2011)). We aim to provide micro-level evidence on LGFVs' investment strategies and their impact on economic growth, by leveraging on the literature on corporate diversification.

Second, our study adds to the literature on diversification strategy in finance. Davis et al (1994) analyses US companies' diversification in the 1980s. They find that more diversified firms were taken over at a higher rate and broken up, while less diversified peers survived. As a result, the firm-as-portfolio model has faded in the United States after the 1980s. Researchers have explored how diversification affects firm value and proposed that it can generate premium or discount under different scenarios. Diversification premium may be created via several channels (Stein (1997), Tate and Yang (2015)). On the other hand, diversification discount is also well documented and analysed in the literature such as Lang and Stulz (1994), Berger and Ofek (1995) and Scharfstein and Stein (2000). Later research questions interpretations and even the validity of the diversification discount (see Graham et al (2000). Mansi and Reeb (2002) and Schoar (2002)). Using international data, Lins and Servaes (1999) find mixed evidence: there is no significant diversification discount in Germany, while the discount is significant in Japan (10%) and UK (15%). They believe that different corporate governance across countries affects diversification effect on firm value. Hartzell et al (2014) focus on the degree to which large shareholders affect such relationship and find that the diversification discount is lower for firms with more institutional ownership, especially when these institutions tend to be active investors.

The diversified investment of LGFVs has not been explored. One important aspect to emphasise is that LGFVs function not only as financing special purpose vehicles (SPVs), but also as investment conduits. Local governments, as LGFVs' controlling shareholders, have actively involved in the investment decisions, because local cadres are mostly evaluated on their economic performance. They have the objective of economic growth maximisation, similar to value maximisation by senior executives of commercial corporates. We explore whether and under what conditions LGFVs' growth facilitates or hinders economic growth, and through which channels the effects have been moderated.

More importantly, we provide new insights on often-criticised LGFVs from a different perspective. Zhang and Barnett (2014) construct a time series for augmented fiscal deficits and debt to include LGFV activities. Bai et al (2016) argue that local governments have made use of LGFVs to facilitate favoured businesses' access to capital, potentially worsening the overall efficiency of capital allocation. They forecast that the long-run effect of off-balance sheet spending by local governments may be a permanent decline in the growth rate of aggregate productivity and GDP. Chen et al (2020) show that China's post-stimulus experience exhibits similarities to financial market development during the US National Banking Era. Huang et al (2020) find that local public debt crowded out the investment of private firms between 2006 and 2013. This literature has mainly focused on the negative impact of LGFV borrowings, but little has been done with respect to their investment behaviours. We show the change in the function of LGFVs from a pure financing platform to an investment platform, and contribute to the debate on what investment style could be beneficial or detrimental to local economic growth.

Using data of 4,432 LGFVs of 1,225 counties across China between 2004 and 2018, we identify under-appreciated facts about LGFVs. Data show that LGFVs only invest some 20% in public goods and that diversified investment of LGFVs during China's post-stimulus period exhibits similarities to the behaviour of conglomerates. Their diversified investment is not all bad. In particular, our analysis shows that the level of LGFV diversification has an inverted U-shaped relationship with local economic growth. A certain level of diversification accelerates growth, while over-diversified investment hinders growth. Moreover, the effect of diversification on economic growth has become much more salient since 2014, and also depends on the fundamental economic conditions of a local economy. LGFV investment diversification is largely debt-financed. Over-diversification may lead to rising local debt and hamper long-term growth. At the same time, over-diversified investment seems to coincide with an overall decrease in the number of industrial firms, suggesting a crowding-out effect of government debt on private investment. These findings also point to important policy implications.

The rest of the paper is organised as follows. Section 2 introduces the institutional background and the data we use to map out the LGFV conglomerate structure, as well as our measure of investment diversification. Section 3 presents the empirical method, including hypotheses and empirical models. Section 4 shows the main results, uses a difference-in-differences (DID) test for policy shocks, and investigates the sensitivity of our results with respect to different sub-samples. It also explores mechanisms and channels generating the results. Section 5 concludes.

2. Background and data

2.1 Institutional background

Local government financing vehicles (LGFVs) mushroomed following the Four Trillion Stimulus plan (Bai et al (2016), Chen et al (2020), Huang et al (2020)). Only CNY1.18 trillion came out of the central government budget, while the rest was contributed by local governments. Constrained by budgets while not allowed to borrow by themselves, local governments established LGFVs to borrow from banks and later from capital markets. Initially those funds were mainly invested in infrastructure projects, consistent with the design of the stimulus plan.

LGFVs have gone through functional changes since the Great Financial Crisis (GFC). They were primarily financing conduits for local governments implementing the stimulus plan. Over time, however, LGFVs diverged from their original mandate of funding public goods investment, and expanded into other business domains. The change was partly driven by the central government's effort to rein in reckless borrowing by local governments and the attempt to transform LGFV functions. An important circular was issued by the Minister of Finance in September 2014 (Cai Jin 76 [2014]). This circular aims to promote and apply in a standardised manner the Public-Private Partnership, which increases the diversification by LGFVs. Indeed, diversification seems a norm rather that an outlier nowadays. Our data show that only 20% of LGFV portfolio companies are in public goods. For the rest 80%, LGFVs make investments directly or indirectly via VC/private equity funds in a wide spectrum of industry sectors. LGFVs can be the sole or majority shareholders of the firms in their portfolio.

Take the example of Dushan County again: its largest LGFV, Dushan County State-owned Capital Operation Co., Ltd., operates in 12 sectors, including both those providing public goods such as electricity and heat production & supply, health, social security, common goods sectors, software and IT services, retail, wholesale and real estate (see Table A1 in the appendix). By straddling many sectors, Dushan County tripled its GDP and fiscal revenue in eight years, from CNY2.46 billion and CNY135 million in 2010 to CNY9.43 billion and CNY480 million in 2018, respectively.

Diversified investment can to some extent help government officials window dress their economic performance, setting the foundation for career advancement. Yet excessive investment and the consequent build-up of risk can harm both the local economic growth and officials' political career. Similarly, the "sin" of over-diversification is documented in the corporate arena. CEOs of large corporates might be motivated to pursue a diversification strategy at the cost of reduced firm value (Amihud and Lev (1981)). In the 1980s, conglomerate firms lost momentum in the United States, when massive takeovers targeting such firms and better performance by less-diversified firms made such an organisational form deinstitutionalised (Davis et al (1994)).

We consider county-level local governments and their LGFVs in our study. There are four levels of local governments in China. The first level is directly under the central government, including provinces, autonomous regions and municipalities; under them are cities and autonomous prefectures; the third level includes counties and autonomous counties; and the last one has townships and ethnic townships.[4] We choose the third level in consideration of accessibility of macroeconomic statistics as well as large samples of LGFVs and their subsidiaries.

2.2 Data

We obtain macroeconomic statistics from the CEIC database and "China Statistical Yearbook: Country level". Macroeconomic statistics such as the GDP growth rate, the number of industrial firms in a county, the industrial structure (defined as share of secondary industry in local GDP), the degree of financialisation *(*measuring the relative importance of financial sector to the economy, proxied by the ratio of

[4] Autonomous prefectures, autonomous counties and ethnic townships are autonomous administrative divisions, or specific areas associated with one or more ethnic minorities that are designated as autonomous within China.

outstanding loan balance of local financial institutions to local GDP), the fiscal expenditure to GDP ratio, local population, hospital beds per 10,000 population, and transfer payments from the central government are either directly available or constructed based on the aforementioned datasets.

LGFV data are derived from multiple sources. First of all, there is no definitive categorisation of LGFVs. Our country-level LGFV data are obtained by combining WIND and the China Banking and Insurance Regulatory Commission (CBIRC) lists. WIND, a leading data vendor specialising in China's financial and economic data, classifies onshore LGFV bonds following ChinaBond Pricing Centre, which was established by the China Central Depository and Clearing Co., Ltd., a wholly state-owned financial institution approved and funded by the State Council of China. A list of LGFVs is extracted from onshore LGFV bonds. County-level LGFVs are filtered out according to the issuers' regular reports. The CBIRC also maintains a list of LGFVs, based on information reported by creditor banks. We then combine the two lists and delete duplicates.

Bond-issuing LGFVs regularly disclose firm-level information, including the place of registration, registered capital, the shareholding structure, business lines, key staff, subsidiaries etc. For non-issuers, we use Qcc.com, Qixin.com and Tianyancha.com, which are registered enterprise credit information agencies to extract similar information as bond issuers. Based on controlling shareholder information, we identify 4,432 LGFVs established by 1,225 counties.

We construct measures of diversification based on investments made by an LGFV, its direct subsidiaries and second-tier subsidiaries. We incorporate second-tier subsidiaries, because it is not uncommon for LGFVs to set up holding companies or private equity fund management firms (direct subsidiaries) for investment purposes. We extract investment information from the aforementioned enterprise credit information agencies. The company registry includes industry classifications. Our sample LGFVs cover all of the 20 level I industries and 96 level II industry sections, with substantial variation in terms of diversification across LGFVs.

The following four measures are constructed. Diver1 counts the number of level II industry sections that an LGFV invests in a given year. Diver2 is the entropy index of LGFV investment in a given year, measured as $\sum p_i * \ln(1/p_i)$, where p_i is the share of investment in industry i with respect to all investment amount in a given year. The higher the entropy index, the more diversified an LGFV is. If an LGFV makes no investment or only invests in one industry in a year, the index takes the value 0. Diver3 is the number of projects LGFVs make investments in in a given year. Finally, Diver4 is the amount of LGFV equity investment divided by GDP.

Combining the macroeconomic and LGFV-level micro variables, we get our final dataset. It includes 1,225 counties across China between 2005 and 2018, which accounted for around 80% of the aggregate GDP of all counties. Table 1 presents all variables and their summary statistics. Our sample represents counties with a wide variety of economic development. Across year and across counties, the annual GDP growth rate has an average of 14.0%, varying between -48.0% and +57.0%. The average share of secondary industries in GDP is 42%, similar to that at the national level at 39% in 2019, with the minimum of 1% and the maximum of 80%. The diversification variables also show a substantial level of difference in LGFV investment. In peak years, active LGFVs' investment can spread across 20 different sectors, while others may make zero investment. In terms of the number of new investments in each year, the maximum value in our sample is 67. It is also worth noting that for all diversification measures, the median value is zero, and the 75th percentile is fairly

small, suggesting that in general, diversified investments by LGFVs have been rare among county-year observations. Transfer payment from the central government also has high variability, with the average being 14.4% of the county GDP, the smallest zero and the largest almost 72 times of the country GDP.

Table 2 shows correlation statistics of key variables. The first three diversification measures have significantly negative correlation with GDP growth, while the last one (aggregate equity investment by LGFVs in a county in a year) has positive relationship with economic growth. Two implicit local government debt measures (ie, per capita implicit debt and the ratio of implicit debt to local government revenue) are negatively correlated with economic growth, yet positively correlated with all diversification measures.

Table 3 presents the results from a mean difference test, with the upper panel showing growth rate difference between counties with LGFV equity investment and those without, and the lower panel showing growth rate difference between counties making diversified LGFV investment and those not. We also split the sample into two subsamples using 2014 as the cutoff year. Interestingly, after 2014 counties making LGFV equity investment witnessed the average GDP growth rate 1.02 percentage point higher than the others; while counties having diversified LGFV investment enjoyed a 1.03 percentage point higher growth rate. Both differences are statistically significant. However, the results are opposite before 2014 yet statistically significant, though the difference is smaller both in absolute and relative terms. Since this is a preliminary test without control variables, we will conduct formal and detailed analysis in the next section.

3. Empirical method

3.1 Hypotheses development

In the literature, diversification can affect firm value and generate premium or discount under different scenarios. Stein (1997) constructs a theoretical model for internal capital market, which implies that when focusing on a small set of projects, a corporate headquarter may pick winners more successfully than external capital market, thereby eases credit constraints for the selected projects. In contrast, Lang and Stulz (1994) show that throughout 1980s, highly diversified firms significantly lower median and average Tobin's q than single-segment firms. Berger and Ofek (1995) estimate an average loss in firm value of 13% to 15% in relation to diversification over the 1986–91 sample period. They find that overinvestment and cross-subsidisation contribute to the loss, but that the loss is mitigated when the diversification is within related industries.

Scharfstein and Stein (2000) develop a two-tiered agency model to explain how rent seeking behaviour by division managers leads to inefficient internal capital market operation and destroys firm value. However, the jury is still out there as later studies indicate subtlety of the diversification discount story. Graham et al (2000) analyse a sample of hundreds of firms expanding via acquisition. Excess value reduction by the acquiring firms in their sample is attributable to acquisition of already-discounted business units, instead of diversification discount. Mansi and Reeb (2002) argue that diversification discount represents the risk effects of diversification, because corporate diversification lowers firm risk. They find evidence that value loss in diversification is a function of firm leverage. In a subsample of all-

equity firms (defined as those with less than one per cent in long-term debt), they do not find any evidence of a diversification discount. Schoar (2002) has interesting findings with longitudinal data. Her cross-sectional comparison shows that diversified firms have higher productivity than stand-alone peers, while over time, firms that diversify experience net reduction of productivity. She concludes that diversified firms are not bad per se, but diversification as a corporate strategy is.

We hypothesise that LGFV diversification would have an inverted U relationship with economic growth for the following reason. LGFVs provide infrastructure and other public goods to supplement the official government investment. In addition, LGFVs diversify in related and sometimes unrelated sectors such as property development and IT, with a goal to generate positive cash flows while fulfilling the role of stimulating economic growth. Dushan County might be an extreme case of diversification, but it is not uncommon for LGFVs to straddle both public and private goods sectors. Effective provision of public goods, which may spread over several sectors such as infrastructure and business services, is essential for economic development. However, over-diversification could drag economic growth, likely due to inefficient resource allocation and cross-subsidisation, reduced productivity etc., which is similar to those proposed in the corporate diversification literature. We hypothesise that diversification up to a certain level facilitates economic growth.

H1: The level of LGFV diversification has an inverted U-shaped relationship with local economic growth. Diversification up to a certain level accelerates growth, but over-diversified investment hinders growth.

We view the Cai Jin 76 [2014] Circular issued by the Minister of Finance in September 2014 as a watershed policy which enables the change in the role of LGFVs from dominantly financing conduits to investment platform-oriented SPVs. We introduce the second hypothesis below:

H2: The 2014 policy shock facilitates functional changes of LGFVs from financing conduits to investment platforms, and the diversification effect becomes salient after 2014.

The inverted U-shaped relationship may depend on the level of economic development. Under-developed regions have insufficient public goods. Under the assumption of a production function with non-constant returns to scale, a lack of public goods may lead the economy to a poverty trap, while an exogenous push by the government can move the economy to a growth path (Abe (1995)). With unbalanced regional development within China, we envision that the effect of diversification on economic growth is heterogeneous with respect to the level of economic development, such as the economic structure or the level of financialisation. We then propose the following third hypothesis:

H3: The effect of diversification on economic growth depends on the fundamental economic conditions of a local economy.

In addition, it is important to examine what channels facilitate the diversification effect. Mansi and Reeb (2002) show that diversification discount is evident in firms with high levels of debt, partly because conglomerates diversity via merger and acquisition, largely relying on debt financing. Similarly, local governments borrow to support their expansion into multi-sectors. Debt-financed diversification may affect long term growth. We propose the following hypothesis:

H4: Over-diversified investment by LGFVs will lead to both rising government debt and slowing growth.

Finally, Huang et al (2020) find that local public debt crowded out the investment of private firms between 2006 and 2013. We hypothesise that over-diversified LGFV investment may crowd out industrial firms:

H5: Over-diversified investment by LGFVs has a crowding-out effect on private industrial firms, which is the main channel of the "curse".

3.2. Empirical model

Our baseline regression is set out in equation (1), which corresponds to Hypothesis 1:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 {Diver_{it-1}}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is the GDP growth rate. $Diver_{it-1}$ is the first diversification measure on the sector count of new investment (Diver1) at t-1 and ${Diver_{it-1}}^2$ is the squared value of $Diver_{it-1}$ at t-1. $year_t$ and $county_i$ are the year and county fixed effects. We use five control variables, all taking logarithm transformation: the number of hospital beds per 10,000 population as a proxy for public goods stock; industrial structure; financialisation; fiscal expenditure over GDP; and local population. Log transformation is conducted to take care of skewed original data of these variables as mentioned in Section 2.2. We expect β_1 to be positive, while β_2 negative, illustrating an inverted U-shaped relationship between diversification and economic growth. We expect the share of secondary industries to be positively correlated with GDP growth. China's rapid rise has been a miracle transformation from an agricultural society to an industrial powerhouse (Wen (2016)). Hence, the share of secondary industry in GDP reflects county-level economic development. The number of hospital beds per 10,000 population, a proxy for stock of public goods, is expected to be positively correlated with economic growth. The literature has mixed evidence on how financialisation affects growth, though recent studies imply a negative relationship between financialisation and growth (Moosa (2018)).

For Hypothesis 2, we run a DID model to test the 2014 policy shock on LGFV functional changes:

$$Diver_{it} = \alpha_0 + \alpha_1 Treat_i + \alpha_2 Policy + \alpha_3 Treat_i * Policy + \sum \alpha_j \, control_{jit} + \alpha_{J+1} year_t + \alpha_{J+2} county_i + \varepsilon_{1it} \quad (2)$$

$$Y_{it} = \Upsilon_0 + \Upsilon_1 Treat_i + \Upsilon_2 Policy + \Upsilon_3 Treat_i * Policy + \sum \Upsilon_j \, control_{jit} + \Upsilon_{J+1} year_t + \Upsilon_{J+2} county_i + \varepsilon_{2it} \quad (3)$$

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 {Diver_{it-1}}^2 + \beta_3 Diver_{it-1} * Policy + \beta_4 {Diver_{it-1}}^2 * Policy + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{3it} \quad (4)$$

where the treatment variable, Treat, takes value 1 for "highly diversified areas", defined as the top one-third counties in terms of the average LGFV diversification level before 2014, and 0 for the rest of the counties. The Policy variable takes value 1 for year 2014 and onwards, and 0 before 2014. For equation (2), we expect the coefficient estimates of Policy (α_2) and the interaction term Policy*Treat (α_3) to be significantly positive. This illustrates the functional changes of LGFVs, especially for counties proactively making such changes. The proactive functional changes should

propel economic growth, such that the estimates of the coefficients on Treat (Υ_1) and the interaction term, Policy*Treat (α_3), should be positive in equation (3). In equation (4), the inverted U-shaped relationship shall be amplified after the policy shock. Thus, we expect β_3 to be significantly positive, while β_4 significantly negative.

For Hypothesis 3, we use the same specification as in equation (1), but run the regression on split sub-samples based on different economic conditions. In general, local economy can only benefit from LGFVs' diversified investment if the fundamental economic conditions have reached certain levels. Hence, the inverted U-shaped relationship should be more salient in relatively more developed regions.

To test how debt modifies the diversification effect, we run the following regressions for Hypothesis 4:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 Diver_{it-1}{}^2 + \beta_3 Diver_{it-1} * debt_{it} + \beta_4 Diver_{it-1}{}^2 * debt_{it} + \beta_5 debt_{it}{}^2 * Diver_{it-1} + \beta_6 debt_{it} + \beta_7 debt_{it}{}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{it}. \quad (5)$$

Bai et al (2016) predict that off-balance sheet local government spending (LGFV investment) would drag long term economic growth due to inefficient resource allocation. Consistent with this prediction, the estimated coefficient on debt (β_6) should be negative. Debt is not all evil, as local governments have financed their off-balance sheet spending mostly via debt so far despite the efforts to bring in more equity financing post the policy shock (Cai Jin 76[2014] Circular). We predict that debt is a magnifier for the inverted U-shaped relationship between diversified investment and economic growth, similar to that in conglomerate setting, where companies with higher leverage witness more diversification discount (Mansi and Reeb (2002)). Hence, β_3 should be positive while β_4 negative.

For the crowding-out effect, we run two additional regressions besides the baseline equation for Hypothesis 5:

$$\mathrm{Log}(Industry\ No)_{it} = \alpha_0 + \alpha_1 Diver_{it-1} + \alpha_2 Diver_{it-1}{}^2 + \sum \alpha_j \, control_{jit} + \alpha_{J+1} year_t + \alpha_{J+2} county_i + \varepsilon_{1it} \quad (6)$$

$$Y_{it} = \theta_0 + \theta_1 Diver_{it-1} + \theta_2 Diver_{it-1}{}^2 + \theta_3 \log(Industry\ No)_{it} + \sum \theta_j \, control_{jit} + \theta_{J+1} year_t + \theta_{J+2} county_i + \varepsilon_{2it}. \quad (7)$$

For equation (6), we expect diversification has the same inverted U-shaped relationship with the number of industrial firms in the county, ie, $\alpha_1 > 0, \alpha_2 < 0$. In equation (7), after we add the number of industrial firms, the main results hold, ie, $\theta_1 > 0, \theta_2 < 0$, while the number of industrial firms should be positively correlated with economic growth.

4. Empirical results

4.1 Main results

We start our analysis of Hypothesis 1, and show the results of specification (1) with the Diver1 measure in Table 4. As shown in Table 1 and discussed in Section 2.2, several variables have substantial observations with value 0, so we show the results from the full sample in columns (1)-(4), and from the non-zero subsample in columns

(5)-(8). In columns (1) and (5), we simply regress local GDP growth on diversification with county and year fixed effects but without controls. The result for the full sample suggests a significantly positive relationship between diversification and local GDP growth, but the significance goes away in the non-zero subsample. Columns (2) and (6) add controls of observed county attributes and find the consistent result, again only in the full sample. The coefficients on control variables are consistent with our expectations too. In columns (3) and (7), we regress local GDP growth on diversification and its squared term with county and year fixed effects but without controls. The relationship between lagged LGFV investment diversification and local GDP growth is positive at the 5% significance level, while the coefficient on the squared term of diversification has a negative sign at the 5% significance level, both in the full sample and the non-zero subsample. It presents evidence that LGFV diversification has an inverted U-shaped relationship with local economic growth. Having controlled the observed county attributes, we find that the inverted U-shaped relationship remains statistically significant at the 5% level for both the full sample (column (4)) and the non-zero subsample (column (8)).

In terms of economic significance, the coefficient estimates of diversification and its squared term, 0.229 and –0.018, respectively, in the full sample suggest that local GDP growth increases when LGFVs of a county invest in no more than 6.36 (=0.229/0.018*2) level-II industries in a given year. However, local GDP growth decreases when the LGFVs of a county invest in more than 6.36 level-II industries. The turning point comes at a smaller value in the non-zero subsample at 5.88. Given that the full sample and the non-zero subsample have means of Diver1 at 1.01 and 2.18, and its standard deviations at 1.72 and 1.96, respectively, the turning point for the full sample is an outlier above two standard deviations higher than the mean; and the turning point of the non-zero subsample is between one and two standard deviations above the mean. Our interpretation is that, in most cases, diversified investment by LGFVs contributes to local GDP growth. It should be noted that here we have not evaluated the efficiency of resource allocation, in the sense whether the local economy might be better off with a less proactive local government.

We perform robustness checks for our results, using alternative diversification measures in Table 5. Again, we show the results for both the full sample and the non-zero subsample. Columns (1) and (4) use the entropy index diversification measure (Diver2), columns (2) and (5) the count of new LGFV investment projects each year as a measure of diversification (Diver3), and columns (3) and (6) the ratio of equity investment to GDP as an alternative diversification measure (Diver4). Except column (4) where the entropy index is used as diversification measure for the subsample, we get the same inverted U-shaped relationship between each of the three alternative measures of LGFV investment and local GDP growth under at the 5% significance level. In terms of economic significance, the inversion points occur at the entropy index value of 0.679 (0.567), project count of 15.25 (10.125) and equity investment to GDP ratio of 1.06 (1.066) for the full sample (subsample). Comparing these threshold values with the means and standard deviations of Diver2, Diver3 and Diver4 in Table 1, we conclude that diversified investments are largely beneficial to local economic growth.

4.2 Difference-in-differences test for a policy shock

As discussed in Section 2.1, LGFVs have transformed from a predominantly financing SPV to a conglomerate platform proactively making investment. The change was partly driven by central government measures, originally out of concerns over rising

implicit local government debt, intended to rein in reckless borrowing. The central government conducted two national auditing of local government debt in 2011 and 2013, and then attempted to transform LGFV functions. The Cai Jin 76 [2014] Circular issued by the Minister of Finance in September 2014 manifests this effort.

Figure 1 (left-hand panel) shows that the most active counties in terms of LGFV investment diversification before 2014, have become even more active afterwards, as illustrated by the widening gap of investment diversification between them and the other counties. The right-hand panel indicates that proactive functional change and diversified investment support economic growth, although nation-wide GDP growth has been slowing down since 2010. The impact on the economic growth rate may have started earlier than the 2014 policy shock.

Formally, we perform a DID test for the policy shock and report the results in Table 6. In Column (1), we first regress the diversification measure on two dummy variables of Treat and Policy and their interaction term, which is defined as the top one-third counties in terms of the average LGFV diversification level before 2014, as well as control variables. As expected, the estimated coefficients on Policy (α_2) and the interaction term, Policy*Treat (α_3), are significantly positive. This is strong evidence supporting Hypothesis 2 that the impact of functional changes of LGFVs from financing conduits to conglomerate platforms on diversified investment has become much more salient since 2014, especially for counties proactively making such changes. In Column (2), we further run a DID test with GDP growth as dependent variable. The estimated coefficients on Treat (Υ_1) and the interaction term, Policy*Treat (α_3), are significantly positive, suggesting that proactive functional changes with more salient diversified investments propel economic growth.

In Columns (3) and (4), we add county and year fixed effects while excluding the Treat dummy, and find that the interaction term, Policy*Treat, are still significantly positive, consistent with Hypothesis 2. In Columns (5) and (6), we replace Treat with the diversification measure. In these two regressions, the interaction term, Policy*Diver1, is significantly positive, indicating that more diversified investment supports economic growth after the 2014 policy shock. Moreover, in the last column with the squared value of the diversification measure and its interaction with the policy dummy, the estimate of β_3 is significantly positive while the estimate of β_4 is significantly negative. It suggests that the inverted U-shaped relationship between LGFV diversification and local GDP growth has been amplified after the policy shock.

4.3 Heterogeneity tests

Next, we examine whether the inverted U-shaped relationship between LGFV diversification and economic growth is robust in different subsamples. More importantly, we investigate whether our results are sensitive to the fundamental economic conditions of a local economy, depending on a variety of categorisations, namely, the level of local financialisation, GDP per capita, and the local government's financial self-sufficiency (measured as the ratio of local government budget revenue to expenditure). Panel A of Table 7 divides the sample counties based on the level of financialisation. County-level data do not include assets of financial institutions nor the share of financial sector in GDP, so we the use ratio of the outstanding loan balance of local financial institutions to GDP to illustrate the importance of financial sector to GDP, ie financialisation. Generally speaking, more developed regions have higher levels of financialisation. Panel B uses the straightforward variable of GDP per capita to measure economic development. Panel C divides the sample counties by

their financial self-sufficiency. Again, less developed counties usually have lower self-sufficiency.

For all three panels, we run regression (1) for the full sample, the subsample between 2009 and 2013 (post-GFC, pre-policy shock), and the subsample between 2014 and 2018 (post-policy shock). The subsample choice is consistent with the rise and transformation of LGFVs. China rolled out the Four Trillion Stimulus Plan in November 2008, right after the GFC. However, contrary to the common belief, most LGFVs did not emerge with the stimulus plan: 3,724 out of the 4,432 county-level LGFVs were founded before 2009. That said, LGFVs became widely known after 2009. Because some CNY3 trillion was funded by local governments, who had to resort to LGFVs for financing given constraints on direct borrowing by governments that time. 2009 hence marked the massive surge of LGFVs (mainly as financing SPVs). Over the years and especially after 2014, LGFVs have transformed into investment platforms, behaving more like conglomerates.

The results are consistent: in the full sample (columns (1) and (2)), the inverted U-shaped relationship between LGFV investment diversification is statistically significant for more developed counties, and the inversion point of straddled sectors per year is located in the range of 6 to 8, beyond which diversification may drag economic growth. Such a relationship does not hold in less developed counties, which may not have the resources, both in terms of the stock of necessary public funds or funding, to engage in diversified investment. We obtain similar results in the subsample of 2014-2018 (columns (5) and (6)), although the inversion points are at smaller values. The subsample of 2009-2013 (columns (3) and (4)) does not exhibit the inverted U-shaped relationship, potentially because during this period, LGFVs behaved somewhat homogeneously, i., predominantly as financing conduits with public goods investment.

4.4 Mechanisms and channels

We have seen strong evidence of an inverted U-shaped relationship between LGFV diversification and economic growth. In this section, we will explore mechanisms and channels through which LGFV diversification affects economic growth.

Many LGFVs rely on debt financing. Hence, the rise of LGFVs coincides with the build-ups of implicit local government debt. Proactive LGFV investment may further exacerbate the debt problem. At the national level, when debt exceeds a certain threshold, it may drag long-term economic growth (Reinhart and Rogoff (2010)). For conglomerates, high leverage also coincides with diversification discount (Mansi and Reeb (2002)). We use two measures here: Table 8 uses normalised LGFV debt, defined as the ratio of total LGFV borrowing by local governments to land transfer revenue and fiscal revenue, while Table 9 uses LGFV debt per 10,000 population, to test Hypothesis 4. Column (8) in Tables 8 and 9 show the regression results of equation (5) in Section 3.2. As expected, debt magnifies the inverted U-shaped relationship between diversification and economic growth. In Table 8, the estimated coefficients on diversification and diversification squared are statistically significant, but not in Table 9. When LGFV debt per 10,000 population is used, the negative effect of debt on economic growth is statistically significant.

In the literature on China's local governments, Huang et al (2020) document the crowding-out effect in terms of government borrowing on private investment. We test a related relationship, where we see the crowding-out effect arises from the level of LGFV investment diversification and the number of industrial firms in a county. That

is, we test our Hypothesis 5, using the number of industrial firms to measure the crowding-out effect. Table 10 presents results for our analysis of the crowding-out effect. We again run regressions based on equations (1), (6) and (7) in Section 3.2 on the full sample, the 2009-2013 subsample and the 2014-2018 subsample. The 2009-2013 subsample (columns (4)-(6)) does not show statistically significant results, while the full sample and, to a lesser extent, the post-policy shock subsample do. Diversification has an inverted U-shaped relationship with both the economic growth and the number of industrial firms. It is likely that a certain level of diversification plays an augmenting or leading role in crowding in private firms, but too much diversification eventually hurts economic development and crowds out private firms.

4.5 Discussion on potential selection bias

Specification (1) may suffer from an endogeneity problem. Since counties choose whether or not to let their LGFVs engage in diversified investment, the same county-level characteristics that guide this decision could also affect the economic performance of the county. For example, the governance framework may play a role in an LGFV's diversification decision and affect firm performance, which further transmits into local economic performance, analogous to the findings of Lins and Servaes (1999) in the corporate setting.

To assess whether potential endogeneity affects our regression results, we first conduct a selection bias test (Table A2), and then choose several instrumental variables (IVs) to deal with the potential endogeneity in diversification measures. Following Laeven and Levine (2007), we use the average value of diversification variables in other counties within the same provinces but not the same city as the first IVs. This is to abstract from county factors that induce diversification. Another IV that we choose is the central government special transfer payment 10 years ago. These transfer payments are designated for public goods provision, such as healthcare and education. In general, less developed areas enjoy a higher level of special transfer payment. Table A3 reports the results from two-stage least squares regressions using Diver1 as the diversification measure and two instrumental variables: the diversification level of neighbouring counties, and the central government transfer payment to the county 10 years ago.

Overall, there is no red flag from the selection bias test when county-level control variables are included in the regression. IV regression shows robustness of the inverted U-shaped story.

5. Conclusions

This paper provides a different perspective and new insights on often-criticised LGFVs, which most have viewed as pure financing SPVs, attributing mounting risks to local governments. In particular, we show the functional change of LGFVs from a pure financing platform to an investment platform, examine the similarities of investment behaviours between LGFVs and conglomerates, which has not been explored in the literature, and contribute to the debate on what investment style could be beneficial or detrimental to local economic growth.

We document the inverted U-shaped relationship between LGFV diversified investment and local economic growth, using county-level data from China. Our

results are robust to different measures of diversification, as well as to a variety of subsample heterogeneity tests. The finding that some diversification is a blessing but too much is a curse might be explained by associated debt build-ups and the crowding-out effect of private firms. Future studies can explore further on how this effect occurs, such as in the literatures of private equity and venture capital investment. Finally, our research may shed some light on the future reform of LGFVs in China.

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Table 1: Summary statistics

Table 1 reports summary statistics of the regression variables. Our sample includes 1,832 counties across China from 2005 to 2018, among which 1,225 counties have LGFVs on the CBIRC LGFV list. These 1,225 counties accounted for 80.2% of the aggregate GDP of all counties in 2018. **GDP growth** is the percentage of economic growth. **Industry No.** is the number of industrial firms. **Per debt** is LGFVs' debt per 10,000 population. **Debt ratio** is the normalised LGFV debt, defined as the ratio of total LGFV borrowing by local governments to land transfer revenue and fiscal revenue. Due to data limitations, only 370 counties have such data from 2005 to 2018. **Diver1** is the number of industry sectors that LGVFs invest in a given year. **Diver2** is the entropy index of LGFVs invest in a given year, measured as $\sum p_i * \ln(1/p_i)$, where p_i is the share of investment in industry i with respect to all investment amount in a given year. The higher the entropy index, the more diversified an LGFV is. If an LGFV makes no investment or only invests in one industry in a year, the index takes the value 0. **Diver3** is the number of projects LGFVs make investments in a given year. **Diver4** is the amount of LGFV equity investment divided by GDP. **Bed per 10,000 population** is the number of hospital beds per 10,000 population. **Industrial structure** is the share of secondary industry in GDP. **Financialisation** is the ratio of the outstanding loan balance of local financial institutions to GDP. **Fiscal level** is the ratio of fiscal expenditure to GDP. **Population** is the number of people in county (in 10,000s). **Diver1_iv** is average value of diversification variables in other counties within the same province but not the same city. **CP ratio** is the ratio of the central government's transfer payment to GDP 10 years ago.

	Variable	N	mean	std.	min	25%	50%	75%	max
Dependent variables	GDP growth	23767	13.96	10.25	-48.63	8.125	13.19	19.77	56.91
	Industry No.	15820	129.824	195.749	1	29	65	143	2413
	Per debt	5170	0.522	1.335	0	0	0.0120	0.407	14.526
	Debt ratio	4655	0.087	0.211	0	0	0.0140	0.0970	5.026
Independent variables	Diver1	17150	1.010	1.720	0	0	0	1	20
	Diver2	17150	0.096	0.263	0	0	0	0	2.026
	Diver3	17150	1.454	3.184	0	0	0	1	67
	Diver4	16729	0.761	2.166	0	0	0	0.391	20.824
Control variables	Bed per 10,000 population	21514	29.86	17.07	0.243	18.60	26.44	37.02	374.3
	Industrial structure	23100	41.80	15.48	1.037	30.76	41.94	52.77	80.00
	Financialisation	23260	0.548	0.370	0.010	0.320	0.468	0.670	8.830
	Fiscal level	23275	0.278	0.321	0.040	0.119	0.186	0.313	16.73
	Population	21697	48.05	35.58	0.700	22.34	39.50	64.52	243.3
Instrumental variables	Diver1_iv	17150	1.010	1.206	0	0.250	0.667	1.333	12.750
	CP ratio	15547	0.144	1.094	0	0.0290	0.0650	0.138	71.591

Table 2: Correlation analysis

This table reports correlation statistics. The key variable are defined in Table 1. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	GDP growth	Diver1	Diver2	Diver3	Diver4	Per debt	Debt ratio	Industry No.	Industrial structure	Financialisation	Bed per 10,000 population	Fiscal level
Diver1	-0.097***											
Diver2	-0.083***	0.750***										
Diver3	-0.084***	0.907***	0.669***									
Diver4	0.022***	0.369***	0.237***	0.359***								
Per debt	-0.222***	0.378***	0.238***	0.364***	0.139***							
Debt ratio	-0.218***	0.242***	0.163***	0.228***	0.072***	0.857***						
Industry No.	-0.054***	0.445***	0.319***	0.502***	0.087***	0.108***	0.041***					
Industrial structure	0.049***	0.126***	0.101***	0.124***	-0.011	-0.061***	-0.061***	0.313***				
Financialisation	-0.183***	0.187***	0.123***	0.191***	0.074***	0.381***	0.213***	0.106***	-0.130***			
Bed per 10,000 population	-0.222***	0.240***	0.176***	0.224***	0.0120	0.352***	0.279***	0.080***	0.079***	0.291***		
Fiscal level	-0.054***	-0.108***	-0.060***	-0.112***	0.013*	0.192***	0.112***	-0.324***	-0.393***	0.308***	0.089***	
Population	-0.047***	0.187***	0.133***	0.171***	0.025***	-0.070***	-0.046***	0.408***	0.039***	-0.118***	-0.182***	-0.306***

Table 3: Mean difference test – economic growth rate (in percentage points)

This table presents results from the mean difference test of the economic growth rate depending on different LGFV investment behaviour. In the upper panel, we divide the sample counties by whether LGFVs of a county make equity investments in a given year; and in the lower panel, we divide the sample counties by whether LGFVs of a county invest in at least two different sectors in a given year. We further divide each subgroup by time, because there could potentially be changes in the behaviour of LGFV investment since 2014, triggered by the release of a new rule governing LGFV investment, ie, "Notice by the Ministry of Finance of Issues Concerning Promoting the Application of the Public-Private Partnership Mode", No. 76 [2014] of the Ministry of Finance. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

LGFV investment	Yes	No	Mean difference
Before 2014	17.098	17.659	*-0.561***
Since 2014	8.148	7.124	*1.024****
LGFV investment diversification	Yes	No	Mean difference
Before 2014	16.816	17.545	*-0.728***
Since 2014	8.387	7.359	*1.028****

Table 4: The impact of diversified investment on GDP growth

This table reports the results of the following regressions:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 Diver_{it-1}{}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{it}$$

where Y_{it} is **GDP growth**, $Diver_{it-1}$ is **Diver1** in the previous year and $Diver_{it-1}{}^2$ is the squared value of **Diver1** in the previous year. **Diver1** is the number of industry sectors that LGVFs invest in a given year. $year_t$ is year fixed effect; $county_i$ is county fixed effect; ε_{it} is the residual. Columns (1)-(4) show regression results on the full sample; Columns (5)-(8) show the results of the subsample where a county observes LGFV investment in a given year. *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	GDP growth							
	Full sample				Non-zero subsample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diver1	0.100**	0.090*	0.254**	0.229**	0.019	0.027	0.269**	0.247**
	(1.98)	(1.75)	(3.15)	(2.79)	(0.33)	(0.45)	(2.41)	(2.17)
Diver1 squared			-0.020**	-0.018**			-0.024**	-0.021**
			(-3.14)	(-2.74)			(-3.10)	(-2.67)
Log(Bed per 10,000 population)		0.660*		0.619*		0.969**		0.892*
		(1.81)		(1.69)		(2.02)		(1.84)
Log(Industrial structure)		4.196***		4.185***		3.420**		3.413**
		(5.26)		(5.26)		(2.76)		(2.76)
Log(Financialisation)		-1.638***		-1.639***		-1.144*		-1.142*
		(-4.33)		(-4.34)		(-1.89)		(-1.88)
Log(Fiscal level)		-0.405		-0.414		0.070		0.063
		(-0.73)		(-0.74)		(0.08)		(0.07)
Log(Population)		3.943***		3.957***		3.089		3.251
		(3.57)		(3.57)		(1.48)		(1.56)
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	16406	15233	16406	15233	7610	7148	7610	7148
Adj R^2	0.357	0.372	0.358	0.372	0.357	0.365	0.357	0.366

Table 5: Robustness test of LGFV diversification on GDP growth

This table reports the results of the following regressions:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 Diver_{it-1}{}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{it}$$

where Y_{it} is **GDP growth**, $Diver_{it-1}$ is **Diver2**, **Diver3** or **Diver4** in the previous year and $Diver_{it-1}{}^2$ is the squared value of **Diver2**, **Diver3** or **Diver4** in the previous year. Because the ratio of equity investment to GDP has extreme values, Log(**Diver4** + 1) is used. Columns (1)-(3) are the results of the full sample which have LGFVs information; Columns (4)-(6) are the results of the sample which LGFVs have investment in a given year. *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	GDP growth					
	Full sample			Non-zero subsample		
	（1）	（2）	(3)	(4)	(5)	(6)
Diver2	1.592**			0.853		
	(2.59)			(1.31)		
Diver2 squared	-1.172**			-0.752		
	(-2.43)			(-1.51)		
Diver3		0.122**			0.081*	
		(2.91)			(1.70)	
Diver3 squared		-0.004***			-0.004**	
		(-3.37)			(-2.69)	
Log(Diver4 + 1)			1.022**			0.919**
			(2.96)			(2.12)
[Log(Diver4 + 1)] squared			-0.482**			-0.431**
			(-3.03)			(-2.38)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	16406	15233	16406	15233	16290	15129
Adj R^2	0.358	0.372	0.358	0.372	0.362	0.376

Table 6: Difference-in-differences estimation of the 2014 policy shock

To formally test the impact of the PPP policy shock on LGFV investment behaviour, we assign "highly diversified areas" with the treatment variable **Treat** = 1, while the rest with **Treat** = 0. The **Policy** variable takes value 1 for year 2014 and onwards, and 0 before 2014. We set up the following two difference-in-differences models:

$$Diver_{it} = \alpha_0 + \alpha_1 Treat_i + \alpha_2 Policy + \alpha_3 Treat_i * Policy + \sum \alpha_j \, control_{jit} + \alpha_{J+1} year_t + \alpha_{J+2} county_i + \varepsilon_{1it}$$

$$Y_{it} = \Upsilon_0 + \Upsilon_1 Treat_i + \Upsilon_2 Policy + \Upsilon_3 Treat_i * Policy + \sum \Upsilon_j \, control_{jit} + \Upsilon_{J+1} year_t + \Upsilon_{J+2} county_i + \varepsilon_{2it}$$

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} * Policy + \beta_2 {Diver_{it-1}}^2 * Policy + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{3it}$$

where $Diver_{it}$ is **Diver1**, and Y_{it} is the **GDP growth rate.** $Treat_i * Policy$ is the interaction term of **Treat** and **Policy.** $Diver_{it-1} * Policy$ is the interaction term of **Diver1** and **Policy.** *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	Diver1 (1)	**GDP growth** (2)	**Diver1** (3)	**GDP growth** (4)	**GDP growth** (5)	**GDP growth** (6)
policy	-0.142***	-9.710***	0.330***	-3.085***	-3.119***	-3.288***
	(-7.15)	(-49.70)	(6.72)	(-8.44)	(-8.39)	(-8.73)
Treat*policy	1.096***	1.163***	1.143***	1.057**		
	(18.27)	(4.42)	(16.03)	(3.10)		
Treat	0.290***	0.373*				
	(14.18)	(1.77)				
Diver1*policy					0.262***	0.493***
					(3.31)	(3.35)
[Diver1 squared]*policy						-0.025*
						(-1.94)
Diver1					-0.149*	0.003
					(-1.74)	(0.02)
Diver1 squared						-0.012
						(-1.03)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	No	No	Yes	Yes	Yes	Yes
Year fixed effect	No	No	Yes	Yes	Yes	Yes
N	15673	15233	15673	15233	15233	15233
Adj R^2	0.589	0.245	0.488	0.372	0.371	0.372

Table 7: Heterogeneity tests using economic conditions

This table reports the results of heterogeneity tests in three panels: in Panel A, we divide our sample into two subsamples based on the average level of local financialisation (defined as the ratio of the outstanding loan balance of local financial institutions to GDP), in Panel B on the average level of GDP per capita, and in panel C on the average revenue-to-expenditure ratio, measuring to what extent a county can use its budget revenue to cover budget expenditure. Within each panel, we further split our sample by time periods: columns (1) and (2) provide results for the full sample; columns (3) and (4) for the subsample between 2009 and 2013; and columns (5) and (6) for the subsample between 2014 and 2018. *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	All sample		Between 2009 and 2013		Between 2014 and 2018	
Panel A: by financialisation	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Diver1	0.040	0.424***	0.316	0.359*	-0.002	0.330**
	(0.31)	(4.01)	(0.95)	(1.93)	(-0.01)	(2.16)
Diver1 squared	-0.003	-0.030***	-0.101	-0.018	-0.010	-0.022**
	(-0.26)	(-3.98)	(-1.51)	(-1.40)	(-0.62)	(-2.18)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	7716	7517	2714	2621	2819	2752
Adj R^2	0.398	0.352	0.369	0.323	0.123	0.071
	All sample		Between 2009 and 2013		Between 2014 and 2018	
Panel B:by GDP per capita	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Diver1	0.186	0.311**	0.407	0.194	-0.213	0.237*
	(1.43)	(2.84)	(1.17)	(1.01)	(-0.93)	(1.83)
Diver1 squared	-0.009	-0.019**	-0.059	-0.008	0.043	-0.026**
	(-0.65)	(-2.48)	(-0.60)	(-0.58)	(1.22)	(-2.74)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	7427	7806	2600	2735	2647	2924
Adj R^2	0.346	0.407	0.357	0.345	0.074	0.160
	All sample		Between 2009 and 2013		Between 2014 and 2018	
Panel C: by revenue-to-expenditure ratio	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Diver1	0.319**	0.207*	0.303	0.098	-0.213	0.237*
	(2.43)	(1.93)	(0.72)	(0.52)	(-0.93)	(1.83)
Diver1 squared	-0.015	-0.017**	-0.004	-0.002	0.043	-0.026**
	(-1.13)	(-2.25)	(-0.03)	(-0.17)	(1.22)	(-2.74)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	7404	7829	2649	2686	2647	2924
Adj R^2	0.364	0.391	0.330	0.366	0.074	0.160

Table 8: Diversified investment affects GDP growth through the government debt ratio

This table reports the following regression results:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 Diver_{it-1}{}^2 + \beta_3 Diver_{it-1} * debt_{it} + \beta_4 Diver_{it-1}{}^2 * debt_{it} + \beta_5 debt_{it}{}^2 * Diver_{it-1} + \beta_6 debt_{it} + \beta_7 debt_{it}{}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{it}$$

where Y_{it} is **GDP growth,** $Diver_{it-1}$ is **Diver1** in the previous year and $debt_{it}$ is Log(Debt ratio + 1). We take logarithm transformation of the debt ratio as there exist many extreme values. $Diver_{it-1} * debt_{it}$ is the interaction term of **Diver1** and **Log(Debt ratio + 1);** $Diver_{it-1}{}^2 * debt_{it}$ is the interaction term of **Diver1 squared** and **Log(Debt ratio + 1).** *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	GDP growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diver1	0.059	-0.053	-0.266	-0.428**	-0.099	-0.196	-0.324	-0.483**
	(0.49)	(-0.43)	(-1.23)	(-1.99)	(-0.76)	(-1.48)	(-1.42)	(-2.15)
Diver1 squared			0.050*	0.056**			0.049	0.062*
			(1.83)	(2.08)			(1.48)	(1.94)
Diver1*Log(Debt ratio + 1)	-0.010	0.013	0.124**	0.172***	0.140**	0.174**	0.123	0.150*
	(-0.39)	(0.49)	(2.52)	(3.52)	(1.98)	(2.41)	(1.64)	(1.96)
[Diver1 squared]			-0.016**	-0.018***			-0.016**	-0.020**
*Log(Debt ratio + 1)			(-2.87)	(-3.33)			(-2.29)	(-2.96)
Diver1*[Log (Debt ratio + 1)]^2					-0.021*	-0.024**	0.005	0.008
					(-1.89)	(-2.10)	(0.31)	(0.55)
Log(Debt ratio + 1)	-0.264**	-0.222*	-0.419**	-0.405**	-0.049	-0.220	0.173	0.052
	(-2.27)	(-1.82)	(-3.27)	(-3.04)	(-0.16)	(-0.71)	(0.51)	(0.16)
[Log(Debt ratio + 1)]^2					-0.063	-0.018	-0.132*	-0.101
					(-1.03)	(-0.30)	(-1.90)	(-1.48)
Control variables	No	Yes	No	Yes	No	Yes	No	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4489	4368	4489	4368	4489	4368	4489	4368
Adj. R^2	0.452	0.466	0.454	0.467	0.454	0.466	0.455	0.468

Table 9: Diversified investment affects GDP growth through LGFV debt per population

This table reports the following regression results:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 {Diver_{it-1}}^2 + \beta_3 Diver_{it-1} * debt_{it} + \beta_4 {Diver_{it-1}}^2 * debt_{it} + \beta_5 {debt_{it}}^2 * Diver_{it-1} + \beta_6 debt_{it} + \beta_7 {debt_{it}}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{it}$$

where Y_{it} is **GDP growth,** $Diver_{it-1}$ is **Diver1** in the previous year, $debt_{it}$ is **Log(per debt + 1)** and **per debt** is LGFV debt per 10,000 population. We take logarithm transformation of **per debt** as there exist many extreme values. $Diver_{it-1} * debt_{it}$ is the interaction term of **Diver1** and **Log(per debt + 1)**; ${Diver_{it-1}}^2 * debt_{it}$ is the interaction term of **Diver1 squared** and **Log(per debt + 1).** *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	GDP growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diver1	-0.026	-0.039	-0.149	-0.179	-0.122	-0.145	-0.093	-0.135
	(-0.33)	(-0.47)	(-1.05)	(-1.26)	(-1.31)	(-1.53)	(-0.63)	(-0.93)
Diver1 squared			0.006	0.008			-0.005	-0.002
			(0.46)	(0.62)			(-0.35)	(-0.11)
Diver1	0.072	0.067	0.779***	0.795***	0.662**	0.656**	0.918***	0.917***
*Log(per debt + 1)	(0.85)	(0.76)	(3.68)	(3.69)	(2.94)	(2.86)	(3.51)	(3.46)
[Diver1 squared]			-0.043***	-0.045***			-0.030**	-0.034**
*Log(per debt + 1)			(-3.39)	(-3.44)			(-2.03)	(-2.33)
Diver1					-0.313**	-0.303**	-0.174	-0.140
*[Log(per debt + 1)]^2					(-3.24)	(-3.05)	(-1.45)	(-1.15)
Log(per debt + 1)	-1.934**	-1.368*	-3.789***	-3.275***	-5.962***	-4.987**	-5.936***	-4.922**
	(-2.70)	(-1.84)	(-4.28)	(-3.63)	(-3.75)	(-3.00)	(-3.69)	(-2.93)
[Log(per debt + 1)]^2					(3.14)	(2.68)	(1.94)	1.083
					(3.14)	(2.68)	(1.94)	(1.44)
Control variables	No	Yes	No	Yes	No	Yes	No	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4975	4823	4975	4823	4975	4823	4975	4823
Adj. R^2	0.387	0.395	0.390	0.399	0.389	0.397	0.390	0.399

Table 10: Diversified investment affects GDP growth through local industrial enterprises

This table reports the following regression results of a crowding-out effect:

$$Y_{it} = \beta_0 + \beta_1 Diver_{it-1} + \beta_2 Diver_{it-1}{}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{1it}$$

$$\text{Log}(Industry\ No)_{it} = \alpha_1 + \alpha_2 Diver_{it-1} + \alpha_3 Diver_{it-1}{}^2 + \sum \alpha_j \, control_{jit} + \alpha_{J+1} year_t + \alpha_{J+2} county_i + \varepsilon_{2it}$$

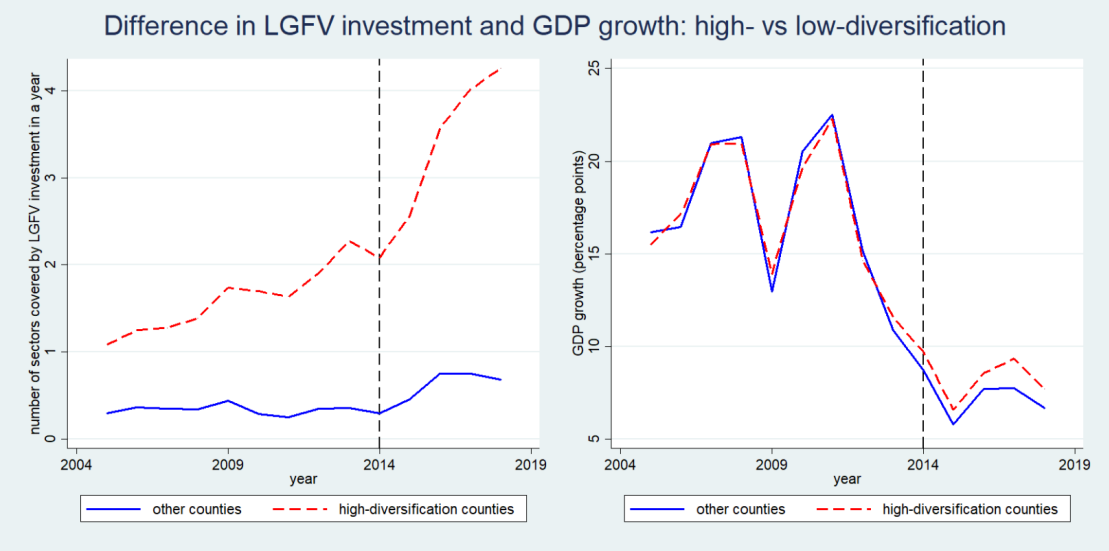
$$Y_{it} = \theta_0 + \theta_1 Diver_{it-1} + \theta_2 Diver_{it-1}{}^2 + \theta_3 \log(Industry\ No)_{it} + \sum \theta_j \, control_{jit} + \theta_{J+1} year_t + \theta_{J+2} county_i + \varepsilon_{3it}$$

where Y_{it} is the **GDP growth rate** and $Industrial\ No_{it}$ is the number of industrial firms in a county. $Diver_{it-1}$ is **Diver1** in the previous year. Columns (1)-(3) contain the regression results for the full sample; columns (4)-(6) for the subsample between 2009 and 2013; and columns (7)-(9) for the subsample between 2014 and 2018. *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively.

	Full sample			Between 2009 and 2013			Between 2014 and 2018		
	GDP growth	**Log(Industry No.)**	**GDP growth**	**GDP growth**	**Log(Industry No.)**	**GDP growth**	**GDP growth**	**Log(Industry No.)**	**GDP growth**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Diver1	0.229**	0.018***	0.212**	0.213	0.003	0.211	0.173	0.008**	0.193*
	(2.78)	(4.44)	(2.60)	(1.39)	(0.73)	(1.38)	(1.64)	(2.47)	(1.83)
Diver1 squared	-0.018**	-0.001***	-0.016**	-0.013	-0.000	-0.013	-0.016*	-0.001**	-0.017**
	(-2.72)	(-3.36)	(-2.55)	(-1.00)	(-0.69)	(-0.99)	(-1.88)	(-2.49)	(-2.05)
Log(Industry No.)			0.976**			0.571			-2.864***
			(2.81)			(0.94)			(-3.91)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	15170	15609	15170	5311	5467	5311	5544	5652	5544
Adj R^2	0.373	0.406	0.374	0.345	0.247	0.346	0.090	0.160	0.096

Figure 1: Policy shock to diversification and the local economy

In September 2014, the Minister of Finance of China issued one circular (Cai Jin [2014] No.76) to promote and apply in standardised manner the Public-Private Partnerships (PPPs). This can be viewed as a watershed where LGFVs evolved from mainly financing conduits with public-good dominant investment activities to proactive investment platforms. From the left-hand panel of the graph below, we can see that the "highly diversified" area, defined as the top on-third counties by the average LGFV diversification level, diverges substantially with the rest of the areas in terms of the number of sectors it newly invests in a year. The right-hand panel shows some differentiation of the economic growth rate too.



Appendix

Table A1: Dushan County LGFVs and investee companies

LGFVs	Investee companies	Level II industry classifications
Dushan County State-owned Capital Operation Group Co., Ltd.	Dushan Tongyuan Real Estate Co., Ltd.	Real estate Industry
	Guizhou Dushan Rongtong Trading Co., Ltd.	Retail Industry
	Guizhou Southwest Smart City Development Co., Ltd.	Software and Information Technology Service Industry
	Guizhou Dushan Shengbao Investment Co., Ltd.	Business Service Industry
	Dushan County Chengxin Market Operation Co., Ltd.	Business Service Industry
	Guizhou Dushan Yisheng Health Care Development Co., Ltd.	Health industry
	Guizhou Communications Investment Traffic Safety Facilities Co., Ltd.	Wholesale industry
	Guizhou Difute Tea Industry Co., Ltd.	Liquor, beverage and refined tea manufacturing
	Guizhou Bainian Tiancheng Tourism Development Co., Ltd.	Business Service Industry
	Guizhou Dongfeng Antimony Industry Co., Ltd.	Non-ferrous metal mining and dressing industry
	Guizhou Gaoke Power Sales Co., Ltd.	Electricity and heat production and supply industry
	Dushan County Huinong Poverty Alleviation Industry Investment Development Co., Ltd.	Business Service Industry
	Dushan Wulian Ancient City Cultural Tourism Development Co., Ltd.	Business Service Industry
	Dushan County Ruifeng Land Resources Investment Development Co., Ltd.	Business Service Industry
	Dushan County Hengyun Municipal Project Investment Co., Ltd.	Social Security Industry
	Guizhou Dushandongfeng Food Industry Co., Ltd.	Food manufacturing Industry
	Dushan Precious Bank Precision Poverty Alleviation Fund Management Center (Limited Partnership)	Capital market services Industry
	Dushan County Material Supply Company	Retail Industry
Dushan County Chengxin Market Operation Co., Ltd.	Dushan Fumin Village Bank Co., Ltd.	Currency financial services Industry
	Guizhou Dushan Rural Commercial Bank Co., Ltd.	Capital market services Industry
	Dushan County Fuel Company	Wholesale industry
Dushan County Chengrong Financial Asset Management Co., Ltd.	Dushan County Yongcheng Park Construction Management Co., Ltd.	Civil Engineering Construction Industry
Guizhou Dushan Economic Development Zone Investment Development Co., Ltd.	Guizhou Zijin Center Building Construction Development Co., Ltd.	Business Service Industry
	Dushan Jingke Optoelectronic Information Material Co., Ltd.	Computer, communications and other electronic equipment manufacturing
	Dushan County State-owned Grain and Oil Trading Co., Ltd.	Wholesale industry
	Guizhou Jiaye Supply Chain Management Co., Ltd.	Retail Industry

Sources: WIND, Qcc.com, Qixin.com, TianYanCha.com.

Table A2: Sample selection bias

To test sample selection bias, we assume that county-level characteristics affect both the economic growth and the LGFV investment behaviour. *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels, respectively. The selectivity effect is summarised in λ, where a significant value of λ indicates potential existence of selection bias in a specification.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diver1	0.298***	0.291***						
	(3.34)	(3.30)						
Diver1 squared	-0.021**	-0.019**						
	(-2.34)	(-2.14)						
Diver2			2.058**	2.006**				
			(2.80)	(2.76)				
Diver2 squared			-1.398**	-1.399**				
			(-2.11)	(-2.13)				
Diver3					0.150**	0.153**		
					(3.19)	(3.29)		
Diver3 squared					-0.005**	-0.005**		
					(-3.04)	(-2.98)		
Log(Diver4 + 1)							1.029**	0.981**
							(2.99)	(2.88)
$[\text{Log(Diver4 + 1)}]^2$							-0.514**	-0.467**
							(-3.22)	(-2.96)
λ	-1.369*	-0.455	-1.393*	-0.500	-1.382*	-0.478	-1.490*	-0.371
	(-1.72)	(-0.45)	(-1.75)	(-0.49)	(-1.73)	(-0.47)	(-1.88)	(-0.36)
Control variables	No	Yes	No	Yes	No	Yes	No	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	20721	20721	20721	20721	20721	20721	20591	20591
Regression method				Heckman two-step				

Table A3: Instrumental variable regression

This table reports results of the following regressions using instrumental variables:

First stage:

$$Diver_{it-1} = \Upsilon_0 + \Upsilon_1 Diver_{iv_{it-1}} + \Upsilon_2 {Diver_{iv_{it-1}}}^2 + \Upsilon_3 CP_{it-10} + \Upsilon_4 {CP_{it-10}}^2 + \sum \Upsilon_j \, control_{jit} + \Upsilon_{J+1} year_t + \Upsilon_{J+2} county_i + \varepsilon_{1it}$$

$${Diver_{it-1}}^2 = \alpha_0 + \alpha_1 Diver_{iv_{it-1}} + \alpha_2 {Diver_{iv_{it-1}}}^2 + \alpha_3 CP_{it-10} + \alpha_4 {CP_{it-10}}^2 + \sum \alpha_j \, control_{jit} + \alpha_{J+1} year_t + \alpha_{J+2} county_i + \varepsilon_{2it}$$

Second stage:

$$Y_{it} = \beta_0 + \beta_1 \widehat{Diver_{it-1}} + \beta_2 {\widehat{Diver_{it-1}}}^2 + \sum \beta_j \, control_{jit} + \beta_{J+1} year_t + \beta_{J+2} county_i + \varepsilon_{3it}$$

where Y_{it} is **GDP growth**. $Diver\_iv_{it-1}$ is lagged Diver1_iv and ${Diver\_iv_{it-1}}^2$ is the squared value of lagged **Diver1_iv**. CP_{it-10} is the **CP ratio** and ${CP_{it-10}}^2$ is the squared value of the **CP ratio**. $\widehat{Diver_{it-1}}$ and ${\widehat{Diver_{it-1}}}^2$ are estimated values from the first stage. Columns (1)-(4) include regression results using the full sample data; and Column(5) and (6) contain the results for the subsample where a county observes non-zero LGFV investment in a given year. Columns (1) and (2) only use Diver1_iv as the instrumental variable. Cragg-Donald Wald F statistics in columns (1) and (2) are bigger than 10 and pass the weak instrumental variable test. Columns (3) and (4) use Diver1_iv and the CP ratio as instrumental variables. Cragg-Donald Wald F statistics in columns (3) and (4) are bigger than 10, satisfying the weak instrumental variable test. Sargan *p* value is *p*-value of the Sargan test. A large *p*-value corresponds to the conclusion that the exogeneity of instrumental variables is satisfied. In columns (3) and (4), Sargan *p* value is bigger than 0.1, both satisfying the exogeneity test of instrumental variables. Columns (5) and (6) show that when we consider the non-zero subsample, the same variables also satisfy weak instrumental variable test and exogeneity test of instrumental variables. *t*-statistics using robust standard errors are reported below the coefficients in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% levels. respectively.

	All sample				Non-zero subsample	
	(1)	(2)	(3)	(4)	(5)	(6)
First stage: dependent variable			**Diver1**			
Diver1_iv	0.848***	0.733***	0.840***	0.722***	0.918***	0.914***
	(38.68)	(25.29)	(37.84)	(24.70)	(28.76)	(18.06)
Diver1_iv squared		0.019***		0.197***		0.001
		(3.49)		(3.44)		(0.08)
CP ratio			0.001	-0.068***	0.008	-0.060**
			(0.15)	(-3.84)	(0.69)	(-2.02)
CP ratio squared				0.001***		0.001**
				(3.99)		(2.76)
Cragg-Donald Wald F statistic	5005.233	1286.228	2398.316	607.940	1050.380	202.933
Sargan *p* value			0.914	0.823	0.988	0.857
Second stage: dependent variable			**GDP growth**			
Diver1	0.461***	0.867***	0.466***	0.913***	0.395**	1.248***
	(4.30)	(3.78)	(4.24)	(3.87)	(3.17)	(3.59)
Diver1 squared		-0.046**		-0.052**		-0.079**
		(-2.31)		(-2.47)		(-2.73)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
County and year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	15129	15129	14481	14481	6618	6618
Adj R^2	0.374	0.374	0.376	0.376	0.377	0.373

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