INFLATION AND THE SHARING OF MACROECONOMIC POWER: A PANEL DATA ANALYSIS APPLIED TO THE CHINESE PROVINCES

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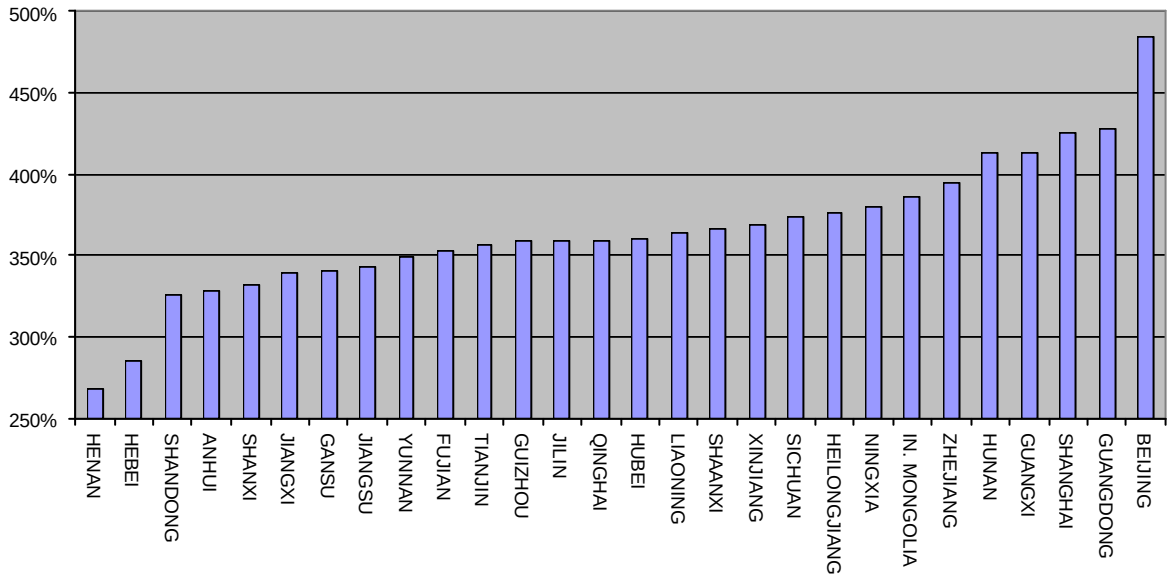
Abstract: Important inflation differences have been existing since 1978 across the Chinese provinces. This paper intends to connect this observation with the literature that emphasises the role of local governments in the process of excess credit supply in China. A model is proposed, which presents the credit growth as an outcome of the macroeconomic power enjoyed by local authorities. The higher the degree of macroeconomic autonomy of the province, the higher its inflation rate through a higher credit expansion. The proposition is supported by a panel-data analysis applied to the Chinese provinces

Key words: China, inflation, credit expansion, local policy

INTRODUCTION

Studying inflation differences within China may appear groundless as the convergence in inflation rates is supposed to emerge as an outcome of taking part to a monetary union. Nevertheless, the Chinese provinces exhibit important inflation differences, as shown by Figure 1.

Figure 1: Provincial Inflation (1978-97)



Source: China Statistical Yearbooks (various years)

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The existence of important inflation differentials across the Chinese provinces is much less surprising once their degree of economic integration is taken into account. Indeed, markets for both goods and capital show signs of regional fragmentation in China. According to the World Bank (1994), inter-provincial investment as a share of total investment is quite low and has declined between 1985 and 1992, while the share of external investment has increased. By instance, in 1992 inter-provincial and foreign investment accounted for respectively 3.3% and 31.7% of total investment in Guangdong. Similarly, the share of trade flows across the provinces, relative to total retail trade, has declined in many provinces, while the share of external trade has increased. Between 1985 and 1992, domestic interprovincial trade grew at a rate of 4.8% per year, much lower than foreign trade and total retail sales (9%)[1]. This suggests to the authors that "individual provinces are tending to behave like independent countries".

Hence, inflation differentials between the Chinese provinces can at least partly be explained by the factors usually used in the literature on cross-country inflation differences. According to this literature, inflation differences are initiated by different macroeconomic policies[2].

In this paper, we intend to show how the implementation of different policies at the local level has generated differences in provincial inflation rates in China. Particularly, it will be argued that the inflationary impact of local policy depends on the degree of local macroeconomic autonomy, which has been varying over time and across the provinces. The paper is organised as follows: in section 1, a stylised description presents the way local policy generates excessive credit growth. We develop in turn a model of the transmission channel between local macroeconomic autonomy, credit growth and inflation (section 2). In the third and last section, we test for the theoretical implications.

1. STYLISED DESCRIPTION

Since 1978, the Chinese transition has been characterised by the economic overheating e.g. the simultaneity of decentralisation, inflation, and strong real growth. Basically, reforms have been aimed to grant local agents more management autonomy. Decentralisation provides to local agents the necessary incentives to grow richer. It is therefore a prerequisite for a strong

[1] Overseas exports and imports grew at 17 and 7% per year respectively over the same period.

economic growth. Particularly, the reforms in fiscal and investment management have deeply modified the relation between local and central authorities. First, it has allowed the local authorities to reveal their own policy preferences. Second, increasing investment management responsibilities have provided local authorities the means to achieve their own policy targets.

1.1. Local policy objectives

Before the reforms, economic resources were forwarded to the state-owned industrial enterprises and in turn to the central government while local government expenditures were closely monitored. Bank credit could only be used for circulating investment, while capital investments were financed straight through budgetary subventions.

Starting in 1985, state enterprises were granted greater autonomy. They were allowed to keep part of their profit, and to rely on bank credit for their capital investment. Conversely, central revenue has shrunk. As a consequence, state investment management has been more and more transferred to the localities. The local investment share in total state fixed investment jumped from 27% in 1975 to 65% in 1995, which corresponds for the same year to 21% of the total fixed investment[3].

This transfer of investment responsibility has been made possible because at the same time local governments had been granted more financial autonomy through the fiscal reforms implemented from the beginning of the eighties. Local governments came to collect, own and spend about 70% of budgetary revenue, that is to say 9% of GDP at the beginning of the nineties (Zhang, 1999). Moreover, the extrabudgetary funds available to the local governments have been increasing rapidly: in 1995, they accounted for one third of total local revenue.

The basic scheme of the fiscal reforms was to divide the central and local revenues by enterprise according to their administrative subordinate relationship, e.g. respectively between large state-owned enterprises, and "local" enterprises. Local governments have thus been allowed to benefit by the development of the enterprises they were responsible for. In order to maximise their own resources, local governments had strong incentives to allocate the available financial resources in the most dynamic sectors associated with the highest profits.

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[2] See Campillo and Miron (1996), Cottarelli et al. (1998) for a survey of the literature.

[3] If the project is supervised by a central government agency, then it is classified as a central project. Otherwise, it is classified as local. "Supervision" means that the appropriate authority formulates the project proposal, seeks or issues its approval, and is responsible for the project financing.

This allocation could take the form of investment in pre-existing local enterprises or the creation of new enterprises under local authority. In other words, local authorities had full incentive to maximise the real growth in their province.

1.2. Local policy instruments

Local state investment represents the main instrument for local authorities to achieve their policy objectives. Local investment is thus directed towards the most dynamic sectors in order to maximise the province development (light and textile industries, construction industries, and commerce). Sectors typically associated with strong externalities (infrastructure, energy, raw materials) remain under the central government responsibility[4].

To finance their investment and growth policy, local governments have been heavily relying on bank credit, leading to excessive credit growth[5]. Officially, banking activities are defined by the credit plan, and reviewed by the branch of the central bank present at the local level. The banking sector is state-dominated, with the four state banks accounting for 70% of the banking sector in 1997. However, because both local officials of the central bank and the state banks depend on local governments for material and financial benefits as well as social facilities, they have strong incentives to follow local government priorities[6].

The process of excessive credit growth has been well described in the literature[7]: taken as a whole, the credit overspending is an outcome of the central government dual-objective, e.g. the compliance with the credit ceilings and the financing of strategic projects or enterprises. With the support of local banks, provincial governments purposely divert the available resources from central to local projects or enterprises, because they anticipate that the central authorities will ultimately provide the financing gap. In other words, the locally initiated credit overspending emerges as a result of the lack of credibility of the central credit policy.

Hence, local authorities are able to influence the local credit policy to finance their investment policy[8]. This influence can take the form of a direct financing of the local budget to cover the local government expenditures or can be more indirect by asking the bank to finance a specific project or to extend a loan to an enterprise under the local responsibility.

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[4] Local officials influence the allocation of central investment only at the margin. It basically depends on central priorities.

[5] Bank credit accounts for 25% of total investment financing during the transition period

[6] See Ma (1995), Qian and Xu (1993).

[7] See among other Brandt and Zhu (1998), Jin (1994), Ma (1995), Wang (1991).

[8] For instance, Liew (1994) assumes that the monetary power is decentralised at the provincial level.

Local government influence on the provincial credit growth may however vary according to the existing balance between local and central policies in each of the provinces. Since state investment represents the main instrument for local authorities to achieve their policy objective, the share of state investment locally controlled provides a good idea of the degree of local government autonomy. Large differences can be found between the provinces: by instance in 1995, 81% of the state investment in the Fujian province were managed by the local government, compared to only 35% in the Xinjiang autonomous region. Hence, provincial governments do not benefit from the same latitude to implement their policies. This suggests in turn that their influence on the total credit growth in the province varies according to their degree of policy autonomy.

In brief, because of the existing collusion between provincial governments and banks, local authorities are able to divert resources to maximise the growth inside the border of their provinces, which in turn maximise their revenues. This results in excessive credit growth, because of the central commitment to finance the central priority projects. This process does not however provide any mechanism that explains inflation stabilisation. The next section explains inflation reduction as a result of "austerity" policies implemented by the central authorities.

1.3. The Political Centralisation as an Instrument of Inflation Control

The corollary of the local government preference for growth is their little aversion to inflation. The increase in production capacity, in the number of staff workers and/or wages are seen as signals for local dynamism. By contrast, inflation is perceived as a national process which central authorities are responsible for. Since it embodies the political power, the central government has to cope with the social discontent generated by inflation. As Huang (1996) writes: "If they do not balance the macroeconomic situation, no one else in the system will. They are "balancers of last resort". Moreover, since inflation is associated with the diversion of the resources initially devoted to central priority projects, the central authorities have full incentive to reassert their control on the economy when inflation surges.

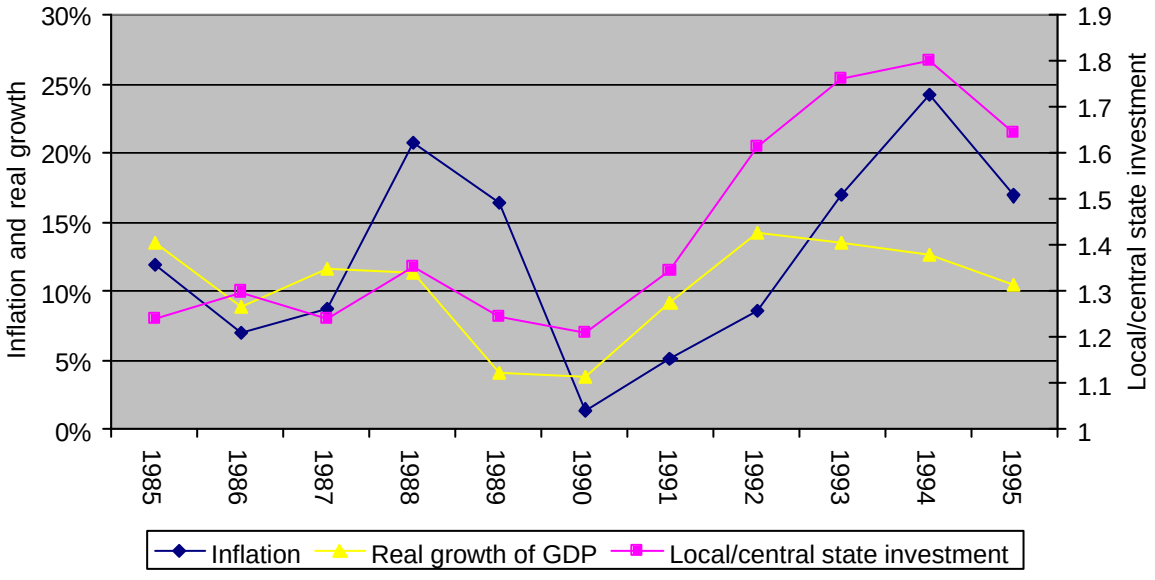
The central authority has little power to enforce the implementation of the policy defined by the credit and investment plans. Moreover, the centre suffers from an information asymmetry

problem. Along with the decentralisation and the market reforms, signals of local shirking behaviour have become blurred. As underlined by Jin (1994), the centre is unable to distinguish the performance of their local subordinates in the implementation of policies.

However, a rise in national inflation is a signal for economic overheating. The central government then relies on political leverage to enforce the implementation of an austerity program. Indeed, if most of the economic power has been decentralised in China, the political power has remained centralised. As writes Huang (1996): "No matter how strong local officials in economic terms, they remain, as during the Maoist period, bureaucratic and political subordinates". Conformity to the Chinese Communist Party ideology is a necessary condition for advancement. Therefore, when deciding stabilisation, the centre also emphasises administrative and ideological discipline to enforce local officials to follow the central recommendations.

In practice, austerity policies are conducted through administrative and economic means. On one hand, investment growth is slowed down by reducing the available credit and by centralising the approval procedure. On the other hand, the investment structure is modified. Typically resources that were diverted from central to local project are shifted back to central priority investment projects, as shown in Figure 2 by the changes in the ratio of local to central state investment.

Figure 2: Inflation Cycles



Source: China Statistical Yearbooks (various years)

More precisely, the inflationary process shown by Figure 2 can be described as follows: an increase in the share of local investment is followed by an increase in real growth and

inflation, as a consequence of local investment policy. Subsequently, local officials are asked by the centre to slow down investment growth and to substitute central for local investment, which corresponds to a decrease in the ratio of local to central investment after each inflation pick. The associated cost of austerity is the slowing down of real growth. Thus, once inflation is under control, central authorities soften the credit constraints to renew with economic expansion. A new growth/inflation cycle begins.

In the following section, a model of the transmission mechanism between local policy and inflation illustrates the above description.

2. MODELLING THE SHARING OF MACROECONOMIC POWER

The model developed here is transposed from Cukierman (1995)'s analysis on the inflationary outcome of central bank independence, which relies on traditional model of monetary policy time-inconsistency: the policymaker objective is to reach a desired level of employment while minimising inflation. Due to the existence of long-term contracts or because of a Lucas type confusion between aggregate nominal and real relative shocks, the deviation of employment from its natural level is positively related to unanticipated inflation. The policymakers choose the monetary growth rate such as to maximise their objective function, and given the expected inflation rate. The first order condition provides the result of interest: the rate of monetary growth and inflation depend positively on the concern of policymakers for employment relative to inflation.

Central bank independence can thus be seen as an institutional device to solve the inflationary bias of monetary policy: under the central assumption that central banks care relatively more than political authorities about price stability, the delegation of the monetary power to the central bank implies a lower preference for employment relative to inflation control. The main result is that a lower level of central bank independence is associated with more inflation variability and a higher level of inflation.

China experience requires several modifications of the base model. The concept of central bank independence is not relevant in China. On one hand, since the People's Bank of China is officially subjected to the central government policies. The central bank and the central government are thus taken as one single agent: the central authority. One the other hand, since local banks have strong incentives to follow local government priorities rather than the head

office instructions, the local government and the central bank local branch are also considered as one single agent: the local authority.

We assume that local and central authorities have a similar trade-off between inflation control and a real growth objective y_i^*, which is summarised by their respective objective functions (1.a) and (1.b):

$$-\left[\frac{A_{loc,i}}{2}\left(y_i^* - y_i\right)^2 + \frac{p_i^2}{2}\right] \text{ (1.a) and } -\left[\frac{A_{c,i}}{2}\left(y_i^* - y_i\right)^2 + \frac{p_i^2}{2}\right] \qquad \text{(1.b)}$$

The local and central objective functions are identical, except that their respective concern for growth relative to inflation $A_{c,i}$ and $A_{loc,i}$ are allowed to differ. As explained in the first section, the local authorities put more emphasise on growth maximisation while the central authority cares about price stability. We model this divergence of policy preferences by the following inequality: $A_{c,i} < A_{loc,i}$.

Using the credit growth as instrument, both the central and the local authorities design the macroeconomic policy in the province i, depending on the sharing of macroeconomic power. Let δ_i be a parameter between zero and one, measuring the degree of macroeconomic autonomy enjoyed by the local authority. Particularly we suppose that given δ_i, the actual choice of policy can be represented as arising from the maximisation of a weighted average of the objective functions (1.a) and (1.b) with weights δ_i and $1-\delta_i$ respectively. This intermediate objective function, featuring the relative influence of local and central authorities on the policy choice in the province, is given by equation (2):

$$-\left[\frac{A_i}{2}\left(y_i^* - y_i\right)^2 + \frac{p_i^2}{2}\right] \text{(2)}$$

$$\text{where } A_i = (1-\delta_i)A_{c,i} + \delta A_{loc,i},\ 0 < \delta_i < 1.$$

Finally, instead of using a Phillips relationship that can be questioned in the Chinese case we formulate the idea that the credit growth, the real growth and inflation are pro-cyclical in China, as described in section 2. We use the same production function as Ma (1995): the output in the province i Y_i is assumed to be positively related to the credit volume L_i

(equation 3). The provincial inflation rate π_i equals the growth of credit ℓ_i minus real growth y_i (equation 4)[9].

$$Y_i = L_i^{\alpha}\ ,\ 0<\alpha<1 \quad (3)$$

$$\pi_i = \ell_i - y_i = (1-\alpha).\ell_i \quad (4)$$

The authorities maximise their objective function (2) with respect to the credit growth ℓ_i under the constraint (4) and given the sharing of macroeconomic power δ_i. The first order condition leads to the following expression of the credit growth and the inflation rate in the province:

$$\ell_i = \frac{aA_i}{a^2 A_i + (1-a)^2}\, y_i^* \quad (5)$$

$$p_i = \frac{aA_i(1-a)}{a^2 A_i + (1-a)^2}\, y_i^* \quad (6)$$

The credit growth and the inflation rate are both increasing with the growth/inflation trade-off A_i[10]. Since $A_{c,i} < A_{loc,i}$, credit and inflation also depend positively on δ_i, the local autonomy, leading to the following proposition[11]:

> ***Proposition: The higher the macroeconomic autonomy of the local authority d_i, the higher the growth of credit ℓ_i, hence the higher the inflation rate p_i in the province i, ceteris paribus.***

We turn to the econometric evidence of this proposition.

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[9] For simplicity, we abstract here from other determinants of inflation such as changes in the money demand, deficit financing, or other variables specific to transitional economies. The econometric analysis will control for these factors.

[10] Laffont (1997)'s dynamic model with two regions leads to a similar result. The central bank trade-off between growth and inflation determines the regional growth. The decentralisation allows regions to benefit by their own development, but forces them in return to transfer part of their output to the central bank. Because these transfers increase the central bank preference for growth relative to inflation, decentralising leads to a higher inflation rate.

[11] The signs of the derivative of the credit growth and inflation with respect to α are indeterminate. The signs are positive (negative) if the marginal productivity of credit is low (high) and the relative preference for real growth is high (low).

3. ECONOMETRIC EVIDENCE

The panel data set is composed of 24 Chinese provinces over the period 1988-95[12]. Since the inflationary impact of local autonomy is assumed to go through the growth of credit, we proceed in two steps: first, the provincial credit growth is explained by local autonomy, that is the positive relationship between the local autonomy and the growth of credit given by equation (5) is assessed. Second, provincial inflation is expressed as a function of credit growth, as shown by equation (4). Then the positive relationship between provincial inflation and local autonomy is finally tested (equation 6).

3.1. Equation of Provincial Credit Growth

The dependent variable is the provincial credit growth ℓ_{it}. To measure local autonomy, the ratio of local to central state investment is used (δ_{it}). As detailed in section 1, local state investment is an important instrument of local policy. However, during austerity periods, local authorities are asked by the centre to substitute central for local investment. It will thus measures the trade-off relationship between central and local. This variable varies over time and also across the provinces, as shown in section 1. In addition, since the extent to which local governments rely on bank credit to finance their expenditures is also an indicator of their autonomy, the local deficit (def_{it}) is introduced[13].

Panel-data econometrics requires taking into account the two-dimensional structure of the data. Fixed individual effects are introduced to capture provincial structural features. Since the provinces belong to the same country, the time dimension should not be omitted. The national trend of credit growth will account for the fact that each province can be affected by the same nation-wide macroeconomic fluctuation. We compute it as the growth of national credit excluding the endogenous variable contribution. In other words, if ℓ_{it} is the credit growth of the i^{th} province at time t and ℓ_{-it} the national trend, the following regression is run:

$$\ell_{it} = a_1\, d_{kt} + a_2\, def_{kt} + a_0\, \ell_{-it} + u_i. + e_{it} \text{ with } \ell_{-it} = \frac{\sum_{k\neq i} L_{kt}}{\sum_{k\neq i} L_{kt-1}} - 1$$

Where a_1,a_2, a_0, are the parameters to estimate, $u_{i.}$ the fixed individual effect, e_{it} the error, i (t) the provincial (time) subscript, L_{kt} the amount of credit in the k^{th} province at the end of year t.

[12] See appendix 1 for a description of the sample and for the variable definitions.
[13] Including budgetary and extra-budgetary items.

The results are reported in Table 1, regression 1.1. The national trend is highly significant, which means that a large part of the provincial credit growth rates is explained by the same macroeconomic developments encountered by all the provinces.

The autonomy variable is associated with a positive and significant coefficient. Hence, the higher the relative weight of local investment, the higher the credit growth. Moreover, a positive correlation is found between inflation and the magnitude of the government deficit, suggesting the use of credit to finance local government expenditures. These two results support the hypothesis of a local influence on credit policy.

Since local investment is partly financed by bank credit, the causality could be bi-directional. Hausman (1978)'s methodology is used for testing exogeneity of the autonomy variable. It is basically a test of no misspecification in the model under H0. The coefficient estimate under OLS is consistent and efficient under H0, but not consistent under H1. The coefficient estimate under 2SLS is consistent under both H0 and H1, but not efficient under H0[14]. The test statistics (m= 0.0580) is significant at the 10% level. Since we cannot treat the autonomy variable as exogenous, we retain the model using the Instrumental Variable estimation (1.2. regression), that exhibits similar estimates.

The model stability over time is investigated using Chow tests: the whole period regression fit is compared to the model estimate over the first half period. The F-test statistic reported at the end of Table 1 is not significant at the 5% level. Cross-provincial stability is also evaluated, cutting the sample into three groups of provinces (coastal, central, and western provinces)[15]. The regression fit over the whole sample is successively compared to a restricted sample excluding one group. Since the three F-statistics are not significant, the model specification fit also the cross-dimension of the sample. We thus not reject that the coefficients are stable over time and across provinces.

The main empirical findings are threefold: first, provincial credit growth strongly depends on the national macroeconomic environment, but not solely: when local investment, hence local policy, is dominant the growth of credit is higher. Second, the need for deficit financing

[14] The instruments are the log of GDP per capita, as a proxy of the development level of the province, the openness ratio as a proxy of the potential for local investment, and the stock of infrastructure in the province, as a proxy of the need for central investment. They are all one year lagged.

[15] Provinces were classified into three regions by the 7th five-year plan (1986-90). Coastal provinces are the most developed, with the highest revenue per capita, and the highest real growth, as opposed to Western provinces. Central provinces stand between.

increases the credit growth in the provinces, other things being equal. Both results support the evidence that local governements do exercise a monetary power through their influence on the credit growth in the province.

3.2 Equation of Provincial inflation

The transmission mechanism between autonomy and inflation is assumed to go through credit expansion. Provincial inflation is thus expressed as a function of credit growth with a one-year lag ($\ell_{i,t-1}$). In addition, we control for two important factors of inflation, that were previously omitted for simplicity reasons: first, the variations in money velocity are captured by the real growth of the household saving deposits ($d_{i,t-1}$). For a given rate of credit growth, an increase in the household real saving lowers inflation, and inversely[16]. Second, the transitional features of the Chinese provinces are also considered. The empirical literature on inflation difference across transition countries use indexes of reform progress under the following assumption: the more advanced a country in its structural reforms, the more competitive the economy, the better the quality of economic policy, hence the lower the inflation[17]. Following these studies, the ratio of non-state to state production ($T_{i,t-1}$) will account for the differences in the quality of transition among the Chinese provinces.

Finally, the national trend of inflation ($\pi_{-i,t}$) is introduced to capture time-specific effects. Again, it is computed as a weighted average of the inflation rates of all provinces except the endogenous variable. Fixed provincial effects enter all regressions.

To summarise, if p_{it} is the credit growth of the i[th] province at time t, the following model is specified:

$$p_{it} = a'_1 \ \ell'_{i,t-1} + a'_2 d_{i,t-1} + a'_3 T_{i,t-1} + a'_0 p_{-i,t} + u'_{i.} + e'_{i,t} \text{ with } p_{-it} = \sum_{k \neq i} \left[\frac{Y_{kt}}{\sum_{j \neq i} Y_{jt}} p_{kt} \right]$$

Where a'_1, a'_2, a'_3, a'_0 are the parameters to estimate, u'_i the fixed individual effect, e'_{it} the error, i (t) the provincial (time) subscript, Y_k the real GDP of the province k.

[16] Saving deposits are almost the only financial asset that the Chinese households are allowed to use.

[17] Cotarelli et al (1998) use several indexes, as the private sector share of GDP, progress in privatisation and enterprise restructuring, price liberalisation, foreign trade liberalisation, financial market liberalisation, and legal reforms. However, only the degree of price liberalisation and the progress made in bank restructuring appear to lower significantly inflation. Fisher et al (1998), and Lougani et Sheets (1997) both use the index constructed by De Melo at al (1996) that assesses each country's overall reform program, taking into account the extent of liberalisation of prices and state trading monopolies, liberalisation of foreign trade, privatisation of enterprises and banking reform. Both of them find a strongly significant negative correlation between the index and the

Table 2 reports the results. Again, the national trend has a strong positive impact on inflation (regression 2.1). Hence, the inflationary processes across the Chinese provinces follow close cycles[18]. The trend of national inflation captures the impact of nation-wide reforms, like price liberalisation, external trade liberalisation, exchange rate policy, or financial reforms. Provincial inflation is not only a national process, as shown by the significance of the provincial specific variables[19]. First, the one period lagged growth of credit increases significantly inflation, while the real growth of household saving deposits decreases it. Moreover, since the absolute values of their coefficients are not significantly different, the growth of credit is inflationary only if not matched by an equivalent growth of the household saving deposits[20]. For instance, when inflation surged in 1988, saving deposits were massively converted into cash, and cash into consumer goods, which further increased inflation. Finally, the ratio of non-state to state production is associated with a negative coefficient: it shows that the more advanced the province in the transition process, the less its inflation rate. The conclusion replicates the empirical results found by the studies of inflation differential applied to transition economies.

Again, we test for the time and cross-sectional stability of the model. We can not reject the null hypothesis of coefficient stability, as shown by the Chow statistics reported at the end of Table 2.

The positive effect on inflation of the credit growth does not lead however to any conclusion relative to role of local autonomy. The positive effect can be due to the residual credit growth from regression (1.2.). To assess the role of local autonomy on inflation, the credit growth is replaced by its fitted value and the residuals from regression (1.2.). The results are reported in regression (2.2.). While the residuals are not significant, the fitted value increases inflation only at the 13% level. This low confidence level could be due to the presence in the fitted value of the national trend of credit growth. Indeed, the inflationary impact of the national credit growth is already reflected by the national trend of inflation. We thus introduce separately on one hand the credit growth value explained by the local autonomy and the fiscal

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inflation rate.

[18] Zhao and Tong (1996) come to the same conclusion in their statistical analysis of inflation dispersion. Unfortunately, data on goods and capital flows across the provinces are not available to go deeper into the question.

[19] The F-test of the joint significance of the province specific variables (d, T, and ℓ) leads to the rejection of the restriction (F(3,166)=5.59, with a P-value of 0.1%). We thus retain the model with all the right-hand side variables.

[20] The Wald test leads to a F-stat of 0.37 associated with a probability of 55%.

deficit and on the other hand the national trend of credit. The positive impact of the fitted value becomes significant, while the national trend of credit growth is not, which supports our intuition (regression 2.3.). The credit growth is also replaced by its determinants to evaluate their total effect on inflation (regression 2.4.). Only the autonomy variable is found to have a significant impact on provincial inflation. On average, around 20% of the provincial inflation rates are explained by this variable[21].

3.3 Alternative variable

Finally, we pay particular attention to the Brandt and Zhu (1999) empirical study of the inflation cycles in China. These authors explain the cycles by the central support to the state sector. Because of the soft budget constraint of the state firms, the productivity level in the state sector is lower than in the non-state sector. This leads to an increase in the allocation of credit to the non-state sector, and in turn to a widening income gap between the state and the non-state sector. The central government is committed to equalise the income in the state and the non-state sector but can not perfectly control the allocation of credit. Hence, it has to resort on seigniorage to finance the transfer to the state sector. Therefore, an increase in the allocation of credit to the non-state sector results in more rapid growth, but also in an increase in the transfers required to the state sector, that are financed through seigniorage, which generates inflation.

According to this interpretation, the variable of interest is rather the share of state investment in total investment than the share of local state investment in total state investment. The less the resources allocated to the state sector, the more needed the seigniorage, hence the higher the inflation rate. The authors find a strong negative correlation between the state share of investment and seigniorage and in turn between seigniorage and inflation. We also introduce the ratio of non-state to state investment in our panel estimations. Regression (2.5) shows that while the ratio of local to central investment still increases significantly inflation, the ratio of non-state to state enterprise investment is insignificant[22]. There is thus no evidence that the

[21] The contribution is roughly computed as the average of the ratio of the autonomy variable times its coefficient to the fitted value of inflation.
[22] We also run the regression without the ratio of non-state to state industrial production which can be suspected to be highly correlated with the ratio of non-state to state investment. The alternative variable was still not significant.

result found by Brandt and Zhu (1999) at the national level holds to explain inflation differences at the local level.

Under the state/non-state interpretation, the state banks extend as much credit as possible to the more productive non-state sector in order to maximise their own profit[23]. Under the local/central government interpretation, the state banks accommodate the local government policy and allocate the credit in the most dynamics sectors. Under both hypotheses, the central government reasserts administrative control over credit and investment in the economy to control inflation. Remembering that the state-owned investment used by Brandt and Zhu includes the state investment controlled by the local governments allows reconciling both interpretations of the inflation process in China. Under financial decentralisation, credit funds are diverted both from the central government investment projects to the state enterprises controlled by the local governments *and* from the state to the non-state sector. If the intention is to study the credit diversion, a better indicator will then be the share of the central investment share in the total amount of fixed investment. According to our intention of analysing the sharing of the macroeconomic power between local and central governments and its inflationary consequences, the ratio of local to central state investment remains however a good indicator of the relative autonomy enjoyed by the local governments.

CONCLUSION

Inflation differences across the Chinese provinces can partly be explained by the policy implemented by the local governments in their provinces. A simple model shows how a higher credit growth emerges from a higher degree of local macroeconomic autonomy. The econometric analysis supports the proposition. The contribution of provincial macroeconomic autonomy to credit growth creates additional inflation. In other words, local governments do exercise a monetary power that varies through time and across provinces. Because they emphasise more real growth than inflation control, this monetary power leads to inflation.

We control for other additional determinants of inflation: particularly, the time and cross dimensions of the sample are taken into account by the inclusion of fixed provincial effects

[23] The assumption of profit maximisation by the state banks is questionable, since they face soft budget constraints as the state enterprises (see Qian (1994).

and the national trends of the endogenous variables. Moreover, we also account for the differences in the saving behaviour of households, showing that credit growth is inflationary only if not matched by an equivalent growth of saving deposits. The negative impact of the ratio of non-state to state production reproduces earlier results on transitional countries: the more advanced the province in the reform process, the less its inflation rate.

This paper contributes to the theoretical literature on the relation between local and central authorities by providing evidence of the inflationary consequence of local policies. This does not mean however that decentralisation in China has gone too far. We rather interpret the results as the need for institutional reforms that restrain the local influence on credit policy. From a policy perspective, the Chinese authorities face a dilemma: on one hand, only re-centralising the macroeconomic power allows to control inflation. On the other hand, only decentralisation provides enough incentives at the local level to promote economic growth. The recent reform of the People's Bank of China is an attempt to solve this dilemma by reducing the number of branches of the central bank present at the local level.

APPENDIX 1: SOURCES AND DEFINITIONS

Sample:
The sample is composed of 24 Chinese provinces, municipalities directly under the central government and autonomous regions:

	Coastal provinces: Tianjing, Shanghai, Hebei, Liaoning, Jiangsu, Zhejiang, Fujian, Guangdong, Hainan.
Central provinces:	Shanxi, Heilongjiang, Anhui, Jiangxi, Henan, Hunan, Inner Mongolia.
	Western provinces: Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang.

Due to data availability, Beijing, Guangxi, Hubei, Shandong are excluded from the sample. Hainan and Guangdong provinces are aggregated.

Database sources:
China Regional Economy, a profile of 17 years of reform and opening-up, China State Statistical Bureau, 1996, *China Statistical Yearbook*, China Statistical Bureau, various years, *Almanac of China foreign economic relations and trade*, China Statistical Bureau, various years, *Almanac of China's Finance and Banking*, China Statistical Bureau, various years,

Variable specification:

- *Inflation*: rate of growth of overall consumer price index of residents.
- *Credit growth*: rate of growth of credit in the state owned banks, including loans to state-owned enterprises, urban collective enterprises, industrial and commercial loans to households, agricultural loans, and fixed asset loans.
- *Real growth of household saving deposits*: growth of real saving deposits hold by households (1978 retail price index) in the state owned banks.
- *Non-state/state industrial production*: Non-state real industrial production / state real industrial production.
- *Autonomy*: ratio of local to central state investment.
- *Government deficit*: (budgetary and extra-budgetary expenditures - budgetary and extra-budgetary revenue) deflated by the retail price index (1978 prices) / real GDP (1978 prices)
- *Infrastructure*: (railway length + road length)/surface area of the province
- *Real GDP per capita*: self-explanatory.
- *Openness*: (exports + imports)/ GDP. Exports and imports with respect to the rest of the world are converted at official exchange rate into local currency (RMB yuans).

APPENDIX 2: ECONOMETRIC RESULTS

Table 1: Credit Growth Regressions

Dependent variable: growth of credit ($\ell_{i,t}$)	1.1.	1.2[1]
Growth of credit (national) ($\ell_{-i,t}$)	0.886	0.886
	*(6.06)***	*(5.93)***
Government deficit ($tdef_{i,t}$)	0.456	0.419
	*(3.10)***	*(2.52)***
Autonomy ($\delta_{i,t}$)	0.021	0.026
	*(2.93)***	*(2.07)***
R2	0.25	0.35

** (**): significant at the 10% (5%) level. Number of observations: 178*
[1] Instrumental variable estimation.
All regressions include individual fixed effects.
Chow tests: Time dimension: F(86,64) =1.11 (breakpoint: 1991);
Cross-dimension: F(55,95)=0.71 (Coast), F(49,101)=0.56 (Centre), F(53,97)=0.86 (West).

Table 2: Provincial Inflation Regressions

Dependent variable: inflation rate ($\pi_{i,t}$)	2.1.	2.2.	2.3.	2.4.	2.5.
Inflation rate (national) ($\pi_{i,t}$)	0.877	0.867	0.865	0.862	0.863
	*(31.54)***	*(28.30)***	*(28.44)***	*(27.93)***	*(27.91)***
Non-state/state industrial production ($T_{i,t-1}$)	-0.004	-0.005	-0.006	-0.006	-0.006
	*(-1.71)**	*(-1.88)**	*(-2.20)***	*(-2.21)***	*(-2.37)***
Real growth of deposits ($d_{i,t-1}$)	-0.076	-0.083	-0.075	-0.073	-0.071
	*(-4.03)***	*(-3.96)***	*(-3.56)***	*(-3.30)***	*(-3.22)***
Growth of credit ($\ell_{i,t-1}$)	0.083				
	*(1.75)**				
Fitted value of regression (1.2)		0.151	0.293[1]		
		(1.52)	*(2.37)***		
Residual of regression (1.2)		0.071	0.076	0.074	0.079
		(1.42)	*(1.54)*	*(1.50)*	*(1.59)*
Growth of credit (national) ($\ell_{-i,t-1}$)			0.002	-0.011	0.001
			(0.021)	*(-0.10)*	*(0.01)*
Government deficit ($tdef_{i,t-1}$)				0.083	0.071
				(1.02)	*(0.87)*
Autonomy ($\delta_{i,t-1}$)				0.010	0.011
				*(1.97)***	*(2.08)***
Non-state/state investment (t-1)					0.013
					(0.87)
R2	0.87	0.87	0.86	0.87	0.87

** (**): significant at the 10% (5%) level. Number of observations: 194.*
All regressions include individual fixed effects.
[1] excluding the national credit growth impact (=0.02 autonomy(t-1) + 0.41 * government deficit (t-1))*
Chow Tests: Time dimension: F(111, 79) = 0.59 (breakpoint: 1991);
Cross dimension: F(87,128)=0.78 (Coast),F(63,152)= 0.97(Centre), F(69,146)=0.26 (West).

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