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"Normal" growth of the Chinese economy: new metrics based on consumer confidence data

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Abstract

The past three decades of remarkable Chinese economic development have triggered a noteworthy poverty reduction and the empowerment of Chinese consumers. However, the existing literature has been quite silent on Chinese consumer sentiment and the way consumers perceive their economy as a whole. We build on that by focusing on consumer confidence data to propose an indicator of normal long-term growth for the Chinese economy. We note a significant decoupling of the stated indicator and the official GDP figures after the global financial crisis, implying that the Chinese economy is on a sub-optimal trajectory. Our findings support the middle-income trap hypothesis for the Chinese economy.

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1. Introduction

The 1978 Chinese shift from central planning to market economy and the subsequent opening to international trade and globalization have been a direct stimulus for doubling China's GDP per capita until 1987 (Chen et al., 2013). Moreover, in the subsequent two decades China has more often recorded double-digit annual growth rates than not. Even the global financial crisis has left the Chinese economy on the growth trajectory, although with a slowdown (Sun, 2009; Lai, 2015). However, the stated Chinese economic miracle has left dramatic social and demographic consequences (De Haan, 2011). It is widely acknowledged that the migration of more than 200 million workers from rural to urban areas has been a driving force of the Chinese economic boom (Ye and Robertson, 2019). Such socio-demographic transformation has been accompanied by magnificent poverty reductions (Harris, 2009) and consumer empowerment.

In the recent period, the question of secular sustainability of such miraculous growth[1] seems to be in the focus of researchers' interest. Projections of future Chinese growth potential have literally started to proliferate. Zhu, Zhang and Peng (2019) perform a meta-analysis of the existing projections of potential growth and find them to be quite diverse. As the authors argue, these diverse estimates strongly reflect the high methodological variety of the reviewed studies. Three literature strands have emerged in that sense: convergence studies relying on cross-country data, the demand-side approach (most often represented by Dynamic Stochastic General Equilibrium Models), and the supply-side approach (most often operationalized through the Hodrick and Prescott (1977) filter).

Our paper methodologically adds to these approaches by introducing an innovative estimator of potential Chinese economic growth. Building on consumer confidence data, we define a novel measure of *normal* (potential) GDP growth and analyze its relationship with the official Chinese national accounts. We find the motivation for utilizing consumer confidence as a data pillar for quantifying Chinese potential growth in the general finding that potential output is highly dependent on behavioral elements and agents' psychological attitudes (Ciccarone and Marchetti, 2013). More related to the Chinese case, how the above explicated socio-economic tendencies influenced the domestic consumer sentiment is still an underexplored topic. Li (2011) provides one of the rare empirical studies on this topic, finding that consumer confidence is a significant driver of overall Chinese economic activity, independently of the prevailing macroeconomic fundamentals. In that sense, it is important to discern how Chinese consumers perceive their aggregate economic development due to the stated socio-economic tectonics.

We introduce several versions of consumer confidence-based potential growth indicators, taking the long run average of consumer confidence as a neutral reference point. Our estimates show a significant decoupling of actual and potential economic growth in the recent years after the global financial crisis, revealing that the Chinese economy is on a sub-optimal trajectory.

2. Data and estimation framework

In assessing the *normal* growth rate of the Chinese economy, we start from a simple growth equation (Biau and D'Elia 2011; Rioust De Largentaye and Roucher 2015; European Commission, 2017; Gayer and Marc, 2018):

[1] It should also be noted that some doubts have been raised about the quality of the Chinese national accounts system. For example, Maddison and Wu (2008) state that the Chinese official statistics underestimate inflation and consequentially overestimates GDP growth. In a similar vein, Chen et al. (2019) find an upward bias in local statistics due to Government's incentives for meeting the targeted economic outcomes. Rawski (2001) presents very similar arguments, with an even stringer claim, i.e. that actual Chinese growth in some periods accounts for only a third of the officially published figures.

$$y_t = \beta_0 + \beta_1 \cdot (CCI_t - \overline{CCI}) + \beta_2 \cdot \Delta CCI_t + \varepsilon_t, \quad (1)$$

where y_t is the real year-on-year GDP growth rate, and CCI_t is the Consumer Confidence Index. Equation (1) mimics an error correction model by embodying both the long run and short run dynamics of GDP growth (in relation to CCI). The term $(CCI_t - \overline{CCI})$ refers to the current deviation of CCI from its long run average (100), ΔCCI_t is the first difference of CCI, and ε_t is the error term satisfying the Gauss-Markov conditions. β_1 is the marginal impact of a long run unit increase in CCI, while β_2 is the equivalent short run parameter. The long run average of CCI is taken as a neutral reference point, so our primary interest lies in β_0, interpreted as consumers' perception of the *normal* growth rate (the rate corresponding to the long run average of CCI and thus reflecting consumers' assessment of a normal or neutral level of output growth).[2] We focus on CCI as a regressor because this survey-based indicator is widely acknowledged as a leading indicator of aggregate economic activity (Eickmeier and Ng, 2011; Osterholm, 2014; Utaka, 2014; Sorić, 2018; etc.).

The dataset is obtained from OECD, spanning from 1993Q1 to 2019Q3, according to data availability.

We tackle equation (1) using three alternative estimation methods. Due to the generally cyclical nature of the national economy, as well as resource constraints in the particular Chinese case, the "normal" growth rate of the Chinese economy might be severely time-varying. Our preferred methodological approaches account for that by taking a long-run perspective, so we scrutinize the potential secular characteristics of the *normal* growth rate of the economy. First, we consider a time-varying (TV) parameter model in state space form:

$$\boldsymbol{y}_t = \boldsymbol{x}_t'\boldsymbol{\beta}_t + \boldsymbol{\varepsilon}_t, \varepsilon_t \sim N\left(0, \sigma_{t,\varepsilon}^2\right) \quad (2)$$

$$\boldsymbol{\beta}_{t+1} = \boldsymbol{\beta}_t + \boldsymbol{\eta}_t, \ \boldsymbol{\eta}_t \sim N(\boldsymbol{0}, \boldsymbol{Q}), t = 1, \dots, T, \quad (3)$$

where $\boldsymbol{\beta}_t{}' = \left(\beta_{t,0}\ \beta_{t,1}\ \beta_{t,2}\right)$ is an unobserved state vector, $\boldsymbol{Q} = diag(\sigma_{\eta 1}^2, \sigma_{\eta 2}^2, \sigma_{\eta 3}^2)$ is a diagonal covariance matrix, $\boldsymbol{x}_t{}' = (1\ (CCI_t - \overline{CCI})\ \ \Delta CCI_t\ )$ is a regressor vector, and $\boldsymbol{\eta}_t{}' = \left(\omega_{t,1}\ \omega_{t,2}\ \omega_{t,3}\right)$ is the error term vector. The parameters in $\boldsymbol{\beta}_t$ are estimated via diffuse Kalman filter.

Our second empirical approach entails estimating equation (1) by rolling window regression. We use subsamples of 30 observations, adding one more current data point and eliminating one from the start of the subsample in each iteration.

Third, instead of assuming a smooth transition process, we allow for abrupt breaks in equation (1) using the Bai and Perron (2003) structural break test. The procedure is data-driven and it endogenously identifies break date(s) in the observed relationship. The algorithm assesses all observed date points as potential breaks, and adds an additional break to the model if it significantly contributes to the overall fit of the model. Should a significant break be found, we split the sample accordingly and re-apply the procedure to each subsample. This procedure continues in iterations until there are no more significant breaks or the subsample becomes smaller than 15% of the full assessed sample. We allow for a maximum of five breaks and perform the test at the 5% significance level.

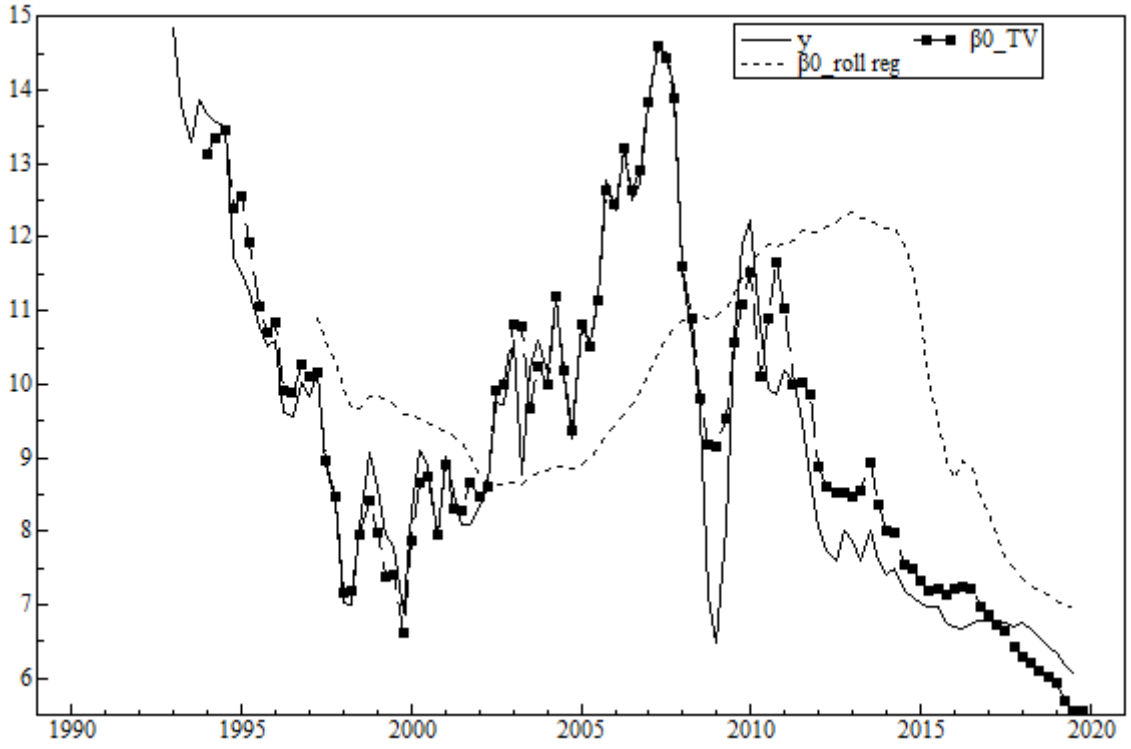
[2] Equation (1) can also be specified as $y_t = \beta_0 + \beta_1 \cdot CCI_t + \beta_2 \cdot \Delta CCI_t + \varepsilon_t$. In this setup, the normal growth rate would be obtained by plugging $CCI_t = 100$ in the regression equation. The two approaches yield completely identical solutions.

These three estimation approaches combined allow us to assess the time dynamics of the *normal* Chinese growth rate.

3. Results

In estimating the TV regression model, we allow each of the variances in **Q** (equations 2-3) to be either deterministic or stochastic, resulting in 2^3=8 model specifications. According to the Akaike information criterion, the best fit is obtained for the specification with all three variances being stochastic. Figure 1 depicts the time-varying *normal* growth rates obtained from TV regression and rolling window estimations, compared to the official GDP growth rates.

Figure 1. Graphical presentations of actual and normal GDP growth rates



The TV regression estimate seems to cyclically follow the official GDP growth rate, while the rolling window indicator exhibits much more discrepancies from the official figures. A noteworthy tendency is observed after the global financial crisis, when both measures of normal growth exhibit a strong downward trend. This finding is in full accordance with the model of Cai and Lu (2013), revealing a secular lowering of Chinese growth potential mainly due to demographic changes. A similar conclusion is drawn by Zhu, Zhang and Peng (2019), who extrapolate a GDP growth rate of only 5% by 2025.

In a similar vein, both measures of *normal* growth start to record considerably higher values than actual GDP growth in the post-crisis period. An additional insight is provided using the Bai-Perron test results in Table I.

Table I: Bai-Perron test results

Estimation sub-period	Parameter		
	β_0	β_1	β_2
1993Q1-1996Q4	11.3366***	0.3036	-0.6137
1997Q1-2001Q2	8.5150***	0.2930	9.56E-05
2001Q3-2005Q2	9.7581***	-0.5496*	0.5737
2005Q3-2011Q4	12.3339***	1.1767***	1.2489***
2012Q1-2019Q3	6.9754***	-0.1635***	0.0977

Table II reports four identified break dates, leading to five estimation sub-periods. The obtained β_0 estimates again behave very similarly to the official data.

Both TV and rolling window estimates of β_0 (as depicted in Figure 1) are in fact consumers' assessments of normal GDP growth rates. Having them at hand enables us to relate these series to the rational expectations literature (Muth, 1961). Namely, a predictor such as the two assessed normal growth rates is deemed rational if agents' predictions are on average equivalent to actual macroeconomic realizations. To be precise, we refer to weak-form rationality in the sense of unbiasedness.[3] To test whether the two examined series of *normal* GDP growth rates are unbiased predictors of actual GDP growth (i.e. equal to actual GDP growth on average), we utilize the Wilcoxon signed rank test. This is a nonparametric version of the t-test for dependent samples, and it effectively deals with two empirical challenges in the examined dataset. It accounts for the potentially problematic dependence between the observed series, and it successfully deals with potential non-normality in the dataset, generated due to small sample problems. The application of Wilcoxon signed rank test to time series data is theoretically well explored (Hallin and Puri, 1991; 1992) and already seen in the literature (Sorić, 2018). We performed the test separately on each of the five sub-periods identified by the Bai-Perron test (see Table I). Wilcoxon test results are given in Table II.

Table II: Wilcoxon test results

Estimation sub-period	Comparison	
	y_t vs. β_0(TV)	y_t vs. β_0 (rolling regression)
1993Q1-1996Q4	-2.040 (0.0414)	-
1997Q1-2001Q2	2.112 (0.0347)	-3.621 (0.0003)
2001Q3-2005Q2	-1.293 (0.1961)	2.585 (0.0097)
2005Q3-2011Q4	-2.045 (0.0409)	0.571 (0.5677)
2012Q1-2019Q3	-2.489 (0.0128)	-4.860 (0.0000)

Note: Table entries are the differences between y_t and β_0 estimates. p-values are given in parentheses.

Table II reveals that both TV and rolling regression estimates are heavily biased in the vast majority of the observed sub-periods. TV assessments of β_0 mostly overestimate actual GDP growth rate (yielding a negative difference between the two series), while the rolling window regression paints a much complex picture, depending on the assessed sub-period.

The only sub-period in which both estimates of normal growth are significantly higher than actual GDP growth is the last one (2012Q1-2019Q3), signaling an obvious and robust consumers' overestimation of *normal* GDP growth. According to consumers' perceptions, actual GDP in that last sub-period is considerably below its potential level, reflecting a sub-

[3] Strong-form rationality would imply that agents' prediction errors are unaffected by the available macroeconomic information set (Colling et al., 1992).

optimal trajectory of the Chinese economy. Apart from the obvious Chinese slowdown after the global financial crisis (Lai, 2015), this recent overly pessimistic consumers' view of the Chinese economy can at least partly be attributed to microeconomic factors such as the recorded boom in Chinese household debt (Liu et al., 2020).

Our results are also in line with the *middle-income trap* hypothesis. This concept refers to a specific equilibrium in which middle-income economies grow slower than either rich or poor ones. This empirical notion has received considerable attention in the literature, and Cai (2012) and Woo (2012) acknowledge the empirical validity of such a concept for China. Woo (2012) even goes a step further and accentuates the key obstacles to escaping the middle-income trap: a banking crisis and the related credit crunch, state governance that discourages private investment, creates high inequality and corruption, and an ecological collapse. The latter factor is particularly important since environmental pollution is well documented to have a detrimental effect on the quality of life of Chinese consumers (Lu et al., 2017). It remains to be seen whether the environmental degradation has caused any offset in the overall level of consumer confidence, or in the overall level of *normal economic* growth, as perceived by the consumers.

4. Conclusion

We add to the scarce literature on Chinese economic sentiment by deriving two novel measures of *normal* Chinese GDP growth from CCI data. Both stated indicators record significantly higher values than the official GDP growth rate after the global financial crisis, revealing a sub-optimal trajectory of Chinese economy. The obtained results support the middle-income trap hypothesis for the Chinese economy.

The proposed indicators can be utilized as proxies for Chinese potential output growth in future research. Recent studies have shown that the choice of the potential output quantification method heavily affects the econometric estimates of e.g. Okun's law (Arčabić and Olson, 2019). In that sense, the robustness of other macroeconomic relationships such as the Taylor rule or New Keynesian Phillips curve still remain to be tested.

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