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Does tourism support supply-side structural reform in China?

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ABSTRACT

A supply-side structural reform (SSR) has been carried out in China since late 2015, with a view to reducing overproduction in selected products such as coal, iron and steel. This paper examines whether the development of international tourism in China could support SSR, using an multi-methods approach that combines an econometric model and a computable general equilibrium model. It finds that the development of tourism can reduce the outputs of overcapacity industries and reallocate surplus labour to tourism-related industries. The calibration of 30 provincial CGE models demonstrates that the impact of tourism on reform in provinces with severer industry overcapacities is much stronger. This study contributes to the literature on the spillover effects of tourism on non-tourism sectors through its combination of econometric and CGE models. Practical implications are also presented.

1. Introduction

Economic scholars have differing views on government interventions in the market, which can be summarised into three standpoints. First, market mechanisms play a more important role than interventions. According to scholars who hold this view, the market can operate efficiently with little or no government interference. This view can be found in the laissez-faire approach of economists such as Francois Quesnay and Adam Smith in the late 18th century, all the way to neoclassical economics in the mid-1970s and new classical economics in the 1980s (Kennedy, 2009; Lin, 2011; Pally, 2004). Second, government policies are crucial in stabilising economic growth. Keynesian economics in the 20th century is one clear expression of this viewpoint (Pally, 2004). However, the 2008 global financial crisis further exposed the weaknesses of the market mechanism and emphasised the importance of government intervention, resulting in further debate about the roles of the state and market (Dorn, 2012; Menon, 2012). Thus, the classical and Keynesian schools of thought have been integrated into a third viewpoint: new Keynesian economics, which models macroeconomic operations with micro foundations (Romer, 2012).

When economies undergo recession, appropriate government interventions can cope with inefficient resource allocation and inefficiencies in production while allowing the market to allocate scarce resources according to supply and demand (Legrand & Hagemann, 2017; Lin, 2011; Schumpeter, 1961). Although China has not been severely affected by the 2008 financial crisis, its economic growth rate was set back. The balance between government interventions and market mechanisms is also considered 'the centre of any debate regarding China's future' (Dorn, 2012).

Economic reform of China over the last three decades has mainly focussed on the demand side, which has led to dramatic increases in economic growth over the same period (Xinhua, 2015a). Facing new challenges after the 2008 financial crisis, such as severe industry overcapacity due to 'blind expansion' and misallocation of resources, China has turned the direction of the reform from the demand to the supply side since late 2015 (Xinhua, 2016). Supply-side structural reform (hereafter SSR) prioritises 'cutting overcapacity' to reduce excessive production capacity in selected industries such as coal, iron and steel (Xinhuanet, 2016). To eliminate overcapacity, the market should play a dominant role in determining supply and demand through the price mechanism and optimising labour allocation among industries. The government should play a supporting role in balancing the development of different industries through macroeconomic policies (Zhang, 2017).

From the market perspective, the development of tertiary industries such as tourism-related industries can absorb excessive employment from other industries (Liu, 2017) and crowd out their productions. This is known a 'spillover effect', which means that the changes in tourism demand not only directly affect tourism-related industries but also indirectly influence non-tourism industries including those reform-

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focussed industries through market price changes. The positive and negative spillover effects of tourism have been evaluated in the literature; however, they have not been studied at the individual industry level.

This paper investigates the role of tourism in China's SSR. More specifically, it seeks to evaluate the existence and magnitude of the industrial impacts of international tourism, with an emphasis on reform-focussed industries such as coal, iron and steel, and petroleum. These industries, which suffer from severe overcapacity and large deficits, have been chosen as the main targets for reducing excessive production (Xinhuanet, 2016). By exploring the following research questions, this study examines whether the growth of international tourism may favour supply-side structural reform.

1. Could tourism support SSR through reallocating excess factor inputs, that is, labour and capital?
2. Could tourism support SSR through reducing the outputs of reform-focussed industries?
3. What are the similarities and differences between SSR impacts on different industries and across different provinces in China?

Numerous studies have evaluated the economic impacts of tourism at the aggregate (country or regional) level (e.g., Blake, 2005; Kadiyali & Kosová, 2013; Li & Song, 2013; Njoya & Seetaram, 2017; Pratt, 2015a). These studies have found that tourism growth leads to output and input growth in tourism-related industries (Kadiyali & Kosová, 2013), while the agriculture and manufacturing industries experience decreases. However, studies have seldom evaluated the effects of tourism on individual non-tourism industries or compared such impacts across different regions. This study fills in this gap by evaluating the effects of tourism at the industry level in the context of SSR.

This paper makes three contributions. First, it enriches the debate on how to integrate government intervention and the market mechanism effectively, which is a key challenge to economic development in China. This paper investigates the role of tourism in SSR. Second, it is also the first to evaluate the economic impacts of tourism on individual industries for all provinces in China. It is of particular importance to evaluate tourism impacts at the disaggregate (industry) level, as this step will permit the development of specific policies related to China's SSR at the provincial level. Third, a multi-methods approach is used to comprehensively evaluate the impacts of tourism at the industry level. A backward linkages analysis is used to investigate the extent to which tourism-related industries are linked with the other industries. An innovative approach that combines the econometric method and CGE model is then applied to analyse the impacts of international tourism on different industries at the national level. The advantage of this approach is that the forecasts of the econometric model, that is, the predicted international tourism receipts in China, are used as the input of the CGE model. This improves the reliability of the model outputs (Li & Song, 2013). Finally, provincial CGE models are built for 30 provinces in China to evaluate and compare the impacts of tourism on different industries across different provinces.

2. Literature review

2.1. Government interventions and the economic reform

Scholars from different schools of economic thought have extensively debated the pros and cons of government intervention and the market mechanism. From the late 18th century to early 20th century, the laissez-faire approach dominated the literature. This approach assumes that the price mechanism regulates market supply and demand; hence, a free market without government intervention would be most efficient in terms of resource allocation and production. The market is seen as an 'invisible hand' that regulates supply and demand within an economy (Kennedy, 2009; Lin, 2011). The 20th century witnessed a growth of the welfare state supported by Keynesian theory, which argued that government monetary and fiscal policies play an important role in economic growth (Pally, 2004). Beginning in the mid-1970s, neoclassical and new classical economics gained popularity. Its adherents believe that the market is more effective in resource allocation (Pally, 2004). It has been argued that the 2008 global financial crisis further exposed the weaknesses of the market mechanism and emphasised the importance of government intervention (Menon, 2012).

The historical school of economics holds a neutral perspective regarding the roles of government and the market. One prominent leader of the historical school of economics, Schumpeter (1961), believed that because economic crises were unavoidable and essential for long-run development, excessive government intervention was unnecessary. However, the government should take action when the economy suffers from 'pathological recession' (Legrand & Hagemann, 2017). Schumpeter's viewpoint is relevant to China, as in the current economic reform the market is considered to be the basic mechanism for scarce resource allocation according to supply and demand, and the government serves only as a facilitator, one that mainly deals with externalities generated by firms and capital investment for the public good (Lin, 2011).

The economic reform in China has achieved great success, and its economy has witnessed rapid growth over the past three decades, which is attributable to stimulus to the demand side, such as capital investment, exports and consumption (Xinhua, 2015a). Economic growth slowed down after the 2008 global financial crisis, however, and one of the main challenges now to the Chinese economy is weak demand coupled with 'blind expansion' and overcapacity on the supply side (Xinhua, 2016). To solve this problem, the government has formulated new policies to further economic reform. One new initiative has been a plan for structural reform on the supply side from late 2015 to 2020. This structural reform requires a shift from emphasising economies of scale and high rates of growth to quality and efficiency in goods and services (Xinhua, 2016). The mission of the SSR includes 'cutting overcapacity, reducing inventories, deleveraging, lowering cost and strengthening weak links' (Xin, 2017).

The elimination of overcapacity is listed as the top priority in the mission statement (Xinhuanet, 2016). Industries that suffer from severe excess capacities are mainly heavy industries such as coal, iron and steel, petroleum, cement and glass (China National Statistical Administration, 2017). These industries in general face the problems of low industry concentration ratios, low capacity utilisation and large deficits (Ren & Zhang, 2016). China contains 31 provinces and autonomous regions; a number of them, such as Neimenggu Autonomous Region, Hebei, Henan, Tianjin, Shandong, Shanxi, Jiangsu, Anhui and Jiangxi, have large excess capacities (CEEP, 2017).

In the SSR process, the government issued quotas for these provinces to reduce their production capacity. For example, steel production must be reduced by 100–150 million metric tons. At the same time, subsidies have been provided to affected firms and employees who lost their jobs during the reform (Naughton, 2016). SSR, in particular the elimination of production overcapacity, may lead to extensive unemployment in secondary industries such as coal, iron and steel. It has been estimated that 3 million employees will be affected by the reform, and thus it is necessary to relocate them to other industries (Ren & Zhang, 2016).

The tertiary industries, in particular the culture, tourism, sports and entertainment sectors, have a strong potential to absorb extra employment from secondary industries in China (Liu, 2017). Tertiary industries in China have experienced unprecedented growth, and their share of value added accounted for 51.6% of the total figure for all industries in 2016. However, tertiary industries' contribution to overall GDP is still relatively small compared with many countries at a similar stage of development to China (Tan, 2017). The excess of low-efficiency resources possessed by secondary industries has caused a severe shortage of supplies of factor inputs, which further affects the development of tertiary industries (Tan, 2017). The release of extra

capacities in the secondary industries through SSR will not only rebalance the supply of and demand for human and physical resources in the secondary industries, but also reallocate resources to the tertiary industries, which will eventually contribute to sustained national economic growth.

According to the 2015 input and output (IO) table of China, the labour and capital inputs and the total value added of tourism-related industries, such as accommodation, transportation and catering, accounted for almost half of the total for all tertiary industries (China National Statistical Administration, 2013). Thus, tourism-related industries may play a significant role in reallocating laid-off workers from primary and secondary industries due to SSR.

2.2. The impacts of tourism on industries

The literature on the impact of tourism on the performance of national economies is rich. There is considerable evidence that tourism contributes to economic growth (e.g., Durbarry, 2004; Liu, Song, & Blake, 2018; Seetanah, 2011). The effects of tourism development on poverty reduction have also been investigated (e.g., Alam & Paramati, 2016; Blake, Arbache and Sinclair, 2008). The impacts of one-off events, such as the Iraq War and SARS (Dwyer, Forsyth, Spurr, & Van Ho, 2006), the September 11th terrorist attacks (Blake & Sinclair, 2003) and the Olympics and FIFA World Cup (Li & Song, 2013; Madden, 2006) have been extensively studied. Sugiyarto, Blake, and Sinclair (2003) examined the influence of globalisation via reduced tariffs on imported commodities together with tourism growth.

When assessing the economic impact of tourism at the national level in terms of GDP, employment and income, researchers have also analysed the impact of tourism on individual industries related to tourism, such as the catering, transportation and accommodation sectors. However, no research to date has considered the impact of tourism on non-tourism industries (primary and secondary industries). Research has found that tourism growth generates spillover effects or externalities, which suggests that an increase in tourism demand would benefit tourism-related industries, such as accommodation and catering, while reducing the output or input of primary (agriculture) and secondary (manufacturing) industries. As CGE modelling can capture the feedback effects among industries, it is capable of evaluating the spillover effects of the tourism development as a result of SSR. For the purpose of this study, the impacts of tourism on industries can be subdivided into two categories: positive and negative spillover effects.

Positive spillover effects at the industry level have been widely discussed in the literature. Tourism growth increases the demand for tourism-related products and services, such as transportation and accommodation, and other industries that supply goods to tourism-related industries, which further increases outputs and factor inputs such as labour and capital (Kadiyali & Kosová, 2013). Li and Song (2013) found that Chinese tourists travelling within Asia brought US$232.19 million income to Taiwan in 2008 as a result of spillover effects. Pratt (2015a) found that a 10% increase in tourism expenditures increased the percentage change in net value added of most tourism-related industries across seven small developing island states; the largest increase was between 3.01% and 16.5%, in accommodation and restaurants. Kadiyali and Kosová (2013) discovered that two to five new jobs were created in the non-hotel sector for each additional 100 hotel rooms rented per day during a year.

The negative spillover effects of tourism at the industry level can reallocate resources between tourism and non-tourism industries. Several studies have confirmed that an increase in tourism demand reallocates scarce resources such as labour and capital from primary and secondary industries to tourism-related industries (Blake, 2005; Li, Li, Song, Lundberg, & Shen, 2017; Pratt, 2015a). As a result, the expansion of tourism can crowd out the output of non-tourism industries, especially those that do not supply goods to tourism-related industries. This phenomenon is also known as Dutch Disease: when resources are drawn to tourism-related industries, there is a shrinkage in output and demand in other exporting industries, such as manufacturing and agriculture (Pratt, 2015a). For example, Njoya and Seetaram (2017) found that a 5% tourism increase in Kenya resulted in a 0.11% decline in annual agricultural exports. Pratt (2015a) explained that a tourism boom could cause deindustrialisation in small island developing states through decreasing net value added in the manufacturing and agriculture industries. However, the overall impact of tourism development on economic growth depends on the specific economic structure of the destination (Liu et al., 2018).

Although both positive and negative spillover effects of tourism on industries have been explored in the literature, the spillover effects on individual non-tourism industries have seldom been studied.

2.3. Methods used in the tourism impact evaluation

The IO model has been widely applied to evaluate the economic impacts of tourism by calculating various multipliers (e.g., Fletcher, 1989; Frechtling & Horvath, 1999). In recent years, the CGE model has gained popularity in assessing the tourism and economic impact of, for example, poverty reduction (Njoya & Seetaram, 2017), special events (Li & Song, 2013), small island developing states (Pratt, 2015a), regional development (Pratt, 2015b) and tourism policies (Meng, Siriwardana, & Pham, 2013). The CGE model is considered more comprehensive, reliable and rigorous in evaluating the economic impacts of tourism (Dwyer, Forsyth, & Spurr, 2004; Song, Dwyer, Li and Zheng, 2012). Compared with the IO model, a CGE model contains more realistic assumptions; for example, it allows wages and prices to vary across sectors and over time. It also considers labour and capital constraints (Dwyer et al., 2004).

Other approaches, such as econometric models and the Tourism Satellite Account (TSA), have also been used in tourism impact studies. Econometric models have been extensively applied to examine the relationship between tourism development and economic growth (Lin, Yang, & Li, 2018; Seetanah, 2011; Song et al., 2012). However, econometric models, especially single equation models, cannot capture the feedback effects among different industries in the economy (Li & Song, 2013) and so may not perform well in assessing crowding out and reallocation effects among a number of industries. TSA has been applied to analyse, for example, greenhouse gas emissions from the tourism industry (Dwyer, Forsyth, Spurr, & Hoque, 2010) and tourism expenditures generated from the UK meetings industry (Jones & Li, 2015). Although TSA can evaluate the direct impact of tourism, it is not able to capture secondary and tertiary impacts. Liu et al. (2018) introduced the Bayesian dynamic stochastic general equilibrium model into the tourism field and assessed the impact of tourism on economic growth using Mauritius as an example. Their findings support the tourism-led economic growth hypothesis. However, because there are only tourism and non-tourism industries in the model, spillover effects between various industries cannot be evaluated.

Several recent impact assessment studies have applied an innovative approach that combines the econometric model with the CGE model (see, e.g., Li & Song, 2013; Li et al., 2017). The econometric model is a useful complement to the CGE model (Blake et al., 2006), and the combination of the two can generate more reliable results (Li & Song, 2013). The econometric model can evaluate the influences of various factors on tourism demand over time, such as price and income; the CGE model can capture the feedback effects among different economic sectors such as industries, households, the government and the import/export sector, and different factors such as labour and capital. Studies that have applied both econometric and CGE models have only focussed on overall impacts at the destination level instead of the industry level.

This study attempts to combine the econometric and CGE models to evaluate the impact of tourism on various industries at the national level. An econometric model is first developed to predict international tourism receipts, and then a CGE model is used to evaluate the industry

impact of tourism on labour, capital and outputs. The average increase in international tourism receipts over the SSR period predicted by the econometric model is the main model input for the CGE model.

3. Methodology

3.1. Linkage analysis

Linkage analysis is a complement to IO analysis in assessing the impact of tourism-related industries on destination economies (Cai, Leung, & Mak, 2006; Pratt, 2011), so as to measure the interdependency of tourism-related and other industries. Backward linkages reveal the importance of an industry as a source of demand in the whole economy, whereas forward linkages disclose the role the industry plays as a supplier to other industries. Most tourism-related industries are at the final consumption stage in the economy, indicating that they are more likely to purchase goods and services from other industries than sell to them. Thus, backward linkages are used in this study to examine the interdependency of tourism-related industries in China. According to Pratt (2011), backward linkages (BL) can be expressed as

$$BL_j = n\frac{\sum_{i=1}^{n} b_{ij}}{\sum_{i}^{n}\sum_{j}^{n} b_{ij}}, \tag{1}$$

where n is the number of industries in the economy and b_{ij} is the BL multiplier obtained from the Leontief-inverse matrix of the IO table. After normalisation, if the index is larger than unit, then the industry has strong linkages with others, whereas industries with less than unit indices have weak linkages (Cai et al., 2006).

3.2. The econometric model

The econometric model is an autoregressive distributed lag model (ADLM). It is introduced in this study to estimate and forecast the determinants of international tourism receipts in China over the period 2016–2020. The ADLM model is one of the most widely used methods in tourism demand modelling and forecasting studies (Lin, Liu, & Song, 2015; Song & Lin, 2010; Song, Lin, Zhang and Witt, 2011). In contrast to the time series and artificial intelligence models, the ADLM model can generate forecasts by introducing explanatory variables into the models and also examine the impact of influencing factors on the demand for tourism. According to the latest tourism demand review (Wu, Song, & Shen, 2017), income and price are the two most widely used variables in tourism demand modelling. Aside from economic factors, dummy variables such as the seasonal dummies and some one-off events such as the breakout of SARS in 2003 and the global financial crisis in 2008 are also considered in the model. The ADLM mode is expressed as

$$\begin{aligned}\Delta TR_t = {} & \alpha_0 + \sum_{i=1}^{m_1}\varphi_{TRi}\Delta lnTR_{t-i} + \sum_{i=0}^{m_2}\varphi_{Yi}\Delta lnY_{t-i} + \sum_{i=0}^{m_3}\varphi_{RPi}\Delta lnRP_{t-i} \\ & + \sum_{i=0}^{m_4}\varphi_{SPi}\Delta lnSP_{t-i} + \pi_1 lnTR_{t-1} + \pi_2 lnY_{t-1} + \pi_3 lnRP_{t-1} + \pi_4 lnSP_{t-1} \\ & + dummies + \varepsilon_t, \end{aligned} \tag{2}$$

where TR_t is the tourism receipts in China and Y_t is the real income level of visitors to China at time t, respectively. RP_t represents the tourism price in China relative to the global price, and SP_t is the substitute price of the competing destinations. ln and Δ are the logarithm and difference operators, respectively. ε_t stands for the error term, which follows a normal distribution of $N(0,\ \sigma^2)$.

According to the China National Tourism Administration (CNTA), the top 10 source markets (Hong Kong, Macao, Taiwan, Korea (ROK), Japan, USA, Russia Federation, Malaysia, Mongolia and the Philippines) accounted for 90.8% of the inbound market share in 2015. Thus, these markets are used to represent the whole inbound market of China. As a result, Y_t is measured by the average gross domestic production (GDP) index (2010 = 100) of the top 10 source markets. The relative price of China to a source market j is calculated as $RP_{j,t} = \frac{\frac{CPI_{CN,t}}{EX_{CN,t}}}{\frac{CPI_{j,t}}{EX_{j,t}}} (j = 1\ to\ 10)$, where CPI and EX represent the consumer price index (2010 = 100) and the real exchange rate in US dollars, respectively. RP_t is the average of $RP_{j,t}$ and both Y_t and RP_t are weighted by the number of visitor arrivals from the particular market. Another five Northeast Asia destinations including Hong Kong, Macao, Taiwan, Korea (ROK) and Japan are selected as competing destinations of China, and SP_t is calculated as $\sum_{k=1}^{5} w_k RP_{k,t} / \sum_{k=1}^{5} w_k$, where $RP_{k,t}$ is the relative price of the competing destination to China weighted by the visitor arrivals to the destination (w_k). At the time of writing, the 2016 tourism demand data for China on source market level have not yet been released; thus, the quarterly tourism receipts data from 1999 to 2015 are collected from CNTA, while the data for independent variables are obtained from the International Monetary Fund.

To avoid spurious regression, unit root tests are conducted to ensure the stationarity of each variable, and the bounds test developed by Pesaran, Shin, and Smith (2001) is carried out to investigate the long-run relationship between the dependent and independent variables. The general-to-specific method is used to remove statistically and economically insignificant variables sequentially, and the lagged order of the model is determined by Akaike's information criterion. The model is finalised after a series of diagnostic tests including serial correlation, heteroskedasticity and normality tests. The predictions of independent variables are generated by the exponential smoothing state space method, based on which the international tourist receipts of China over 2016 to 2020 are forecast.

3.3. The national and provincial CGE models

For the purpose of this study, we constructed a national CGE model for China and 30 regional CGE models for each province.[1] These CGE models are single country (or province) static models. The IO tables are the main data source for the CGE models because they include 'detailed information on the interaction between economic activities of various economic agents for a given year' (Li and Song, 2013:260). The national and provincial CGE models are calibrated to the 2012 IO tables, which are the most up-to-date data source. The tables with the 2012 prices have been updated to the 2015 prices, the year when SSR started. The China IO table, which contains 139 industries, was produced by the China National Statistical Administration (2013). The provincial IO tables were formulated by each provincial statistical administration.[2] For consistency's sake, the provincial IO tables that contain 42 industries are used in this study, as many provinces have not produced IO tables for 139 industries.

The development of the CGE models in this study follows a model structure created by Lofgren, Harris, and Robinson (2002), which includes four key categories of functions: the Leontief function, Cobb-Douglas function, constant elasticity of substitution function and constant elasticity of transformation function. Li, Blake, and Cooper (2011) have provided detailed descriptions of these functions.

To evaluate the economic impact of tourism demand on different industries, the standard CGE models are further extended to capture the supply and demand activities of tourism. The extended CGE framework models the demand of international tourists for goods supplied by each tourism-related industry, which can be expressed through two main functions. International tourist demand is a Cobb-Douglas function of

[1] Tibet is excluded from this study because its production of coal and petroleum are zero, and the outputs of other reform-focussed industries are limited.

[2] The 2007 IO table is used for Liaoning Province, as the 2012 IO table is not available for this province.

the individual product (Eq. (3)). The quantity demanded by inbound tourists is a Cobb-Douglas function of the aggregate tourism price (Eq. (4)). Studies (e.g., Li et al., 2011; Wattanakuljarus & Coxhead, 2008) have discussed the details of the introduction of tourism into the standard CGE model. A high-level modelling software system for solving the mathematical programming problem known as the general algebraic modelling system – in particular its subsystem, the mathematical programming system for general equilibrium analysis – is used to solve the CGE models.

$$p^T = \lambda \prod_n p_i^{\alpha_i} \tag{3}$$

where p^T is the aggregate price of international tourism; λ is a shift parameter; p_i is individual product price; and $\sum_i \alpha_i = 1$.

$$q^T = \overline{Q^T}\left(\frac{e}{P^T}\right)^{\mu-1} \tag{4}$$

where q^T is the quantity demanded by inbound tourists; $\overline{Q^T}$ is the benchmark quantity demanded by inbound tourists; e is the exchange rate; and μ is the price elasticity of tourism demand, which is the key elasticity in the CGE model. This study uses the estimation of -0.802 calculated by Song, Gartner and Tasci (2012).

At the national level, to evaluate the impact of tourism on industries, the model input of the China CGE model is taken from the econometric forecasting model (see Section 3.2), which is the average of international tourism receipts over the planned SSR period (2016–2020). At the regional level, for the purpose of comparing the impacts among 30 Chinese provinces, it is assumed that US$1 million in international tourism receipts is increased in each provincial CGE model. The CGE models generate a number of results; for the purpose of this study, findings at the industry level are presented for value of labour use, value of capital use and production outputs. To assess the impact of tourism expansion on individual industries focussed on in SSR, it is necessary to classify tourism- and reform-related industries in advance.

According to the classification of the China National Statistical Administration (2013), the China IO table with 139 industries contains 14 tourism-related industries such as accommodation, catering, railway transport, road transport, air transport, water transport, and recreational services. The provincial IO tables with 42 industries are more aggregated, and include eight tourism-related industries: wholesale and retail trade; transport, warehousing and postal services; accommodation and catering; information transfer and software services; rental and commercial services; residential, repairing and other services; health and social services; and culture, arts and sports.

One major focus of SSR is eliminating excessive industrial capacity in coal, iron and steel, cement, glass, petroleum and smelting nonferrous iron industries. These industries are suffering from large deficits, large declines in profits and excess manufacturing capacity (Xinhuanet, 2016). According to the industry classification tables produced by the China Statistical Administration, the industries in the IO tables, which belong to each of the reform-focused industries, can be identified. The more aggregated provincial IO tables separate individual industries only for iron and steel and petroleum, which are the two key reform-focussed industries (see Table 1).

Table 1
Reform-focused industries.

Reform- related Industries	Industries in the China IO table	Industries in the provincial IO table
Coal	Coal Mining and Dressing	Coal Mining and Dressing
Iron and Steel	Ferrous iron mining and dressing	Mining and dressing of iron
	Iron smelting	Pressing and smelting of iron
	Steel smelting	
	Smelting iron alloy	
Petroleum	Petroleum and natural gas extraction	Petroleum and natural gas extraction
	Petroleum refining and nuclear fuel processing	Petroleum refining, nuclear fuel, coking
	Coking products	
Smelting nonferrous iron	Nonferrous iron mining and dressing	–
	Smelting nonferrous iron	–
	Pressing of nonferrous iron	–
Cement	Cement, lime and plaster	–
	Gypsum and cement products	–
Glass	Glass and glass products	–

Table 2
Backward linkage impacts of the top 10 tertiary industries.

No.	Tertiary industries	Backward Linkage
1	**Wholesale and retail trade**	**6.09**
2	Banking and finance	4.83
3	**Road transport**	**3.04**
4	**Commercial services**	**2.81**
5	Other services	1.15
6	**Catering**	**1.06**
7	Professional technology and other technology services	1.03
8	**Information transfer services**	**1.03**
9	Real estate development	0.94
10	**Air transport**	**0.89**

Note: The industries in bold are tourism-related industries.

4. Findings and discussion

4.1. The industry impacts of tourism at the national level

4.1.1. The backward linkages analysis

There are 37 tertiary industries in the national economy of China based on the classification of the China IO table. The top 10 tertiary industries with the strongest backward linkages are presented in Table 2, among which six are tourism-related industries. The linkage indices of five out of the six tourism-related industries are larger than unit, indicating strong linkages with other industries in the economy. Wholesale and retail trade is positioned as the industry with the strongest linkages, followed by road transport, commercial services, catering, information transfer services and air transport. The stronger the backward linkage of an industry, the more goods and service it needs to purchase from other industries to support its own development.

When tourism demand increases, tourism and related industries in its supply chain experience an expansion in outputs and inputs, which can also be explained by the spillover and multiplier effects. At the same time, inputs from the primary and secondary industries, such as labour and capital inputs, are reallocated to tourism-related industries, which further reduces the outputs of these non-tourism industries. Because the development of tourism-related industries with strong backward linkages increases supply and creates job opportunities, the implication is that tourism-related industries are capable of reallocating inputs and further crowding out outputs from non-tourism industries. The following section explains the findings generated using the econometric and CGE models and investigates the extent to which tourism-related industries have helped to eliminate overcapacity and reduce inventories through reallocating labour and capital from reform-focussed industries.

4.1.2. Changes in international tourism demand generated from the econometric model

The forecasts of the international tourism receipts of China over 2016–2020 are presented in Table 3. Before the model is estimated, all

Table 3
Forecasts of international tourism receipts for China, 2016–2020.

Year	Tourism receipts (US$, million)	Annual increase (US$, million)
2015	56,349	4100
2016	**61,058**	**4708**
2017	**66,669**	**5611**
2018	**73,848**	**7179**
2019	**81,824**	**7976**
2020	**90,443**	**8619**
Average	80,407	6366

The numbers in bold are forecasting numbers.

of the variables are examined to determine whether they have been integrated of order one -I(1) and passed the co-integration test. By using the general-to-specific method, all of the variables left in the model are significant; the model thus passes a series of diagnostic tests. Due to space limitations, the estimation results are listed in Appendix 1, and the results of the unit root tests are available upon request. The forecast predicts that the international tourist receipts of China will maintain a sustained growth, reaching US$90,433 million by 2020, with an average annual growth of US$6,366 million.

4.1.3. Impacts of international tourism growth generated from the national CGE model

The rest of this section analyses the results generated using the China CGE model. The input of the China CGE model is the predicted average international tourist receipts of US$6366 million generated from the forecasting model (see Table 3). The results of the industry impact as the main output of the China CGE model are displayed in Table 4. To better present the results, 139 industries in the China IO table are arranged into five categories: primary, SSR-related secondary, other secondary, tourism-related tertiary and other tertiary industries. The number of sectors included in each industry category is shown in brackets (see Column 1 in Table 4). Primary industry comprises agriculture and fishing; secondary industries include the manufacturing industries; and tertiary industries provide services. Reform-focused industries belong to the secondary industry category, and tourism-related industries belong to the tertiary industry category.

Table 4
The industry impact on labour and capital usage and outputs.

Industries (million, US$)	Labour	Capital	Output
Primary (5)			
- Total	−145	−9	−83
- **Average per industry**	**−29**	**−2**	**−17**
Reform-focused secondary (14)			
- Coal (2)	−62	−38	−227
- Iron and steel (4)	−48	−54	−186
- Smelting nonferrous iron (3)	−56	−103	−376
- Petroleum (2)	−9	−31	88
- Cement (2)	5	5	28
- Glass (1)	−12	−12	−117
- Total	−183	−232	−791
- **Average per industry**	**−13**	**−17**	**−57**
Other secondary (83)			
- Total	−805	−811	−195
- **Average per industry**	**−10**	**−10**	**−2**
Tourism-related tertiary (14)			
- Wholesale and retail trade (1)	295	354	1397
- Railway transport (1)	69	19	190
- Road transport (1)	74	77	383
- Water transport (1)	10	17	89
- Air transport (1)	147	166	1388
- Postal and courier services (1)	2	0	5
- Accommodation (1)	15	61	143
- Catering (1)	138	76	584
- Information transfer services (1)	144	43	502
- Commercial services (1)	94	67	557
- Residential services (1)	11	2	23
- Medical and health services (1)	11	0	26
- Culture and arts (1)	2	1	5
- Recreational services (1)	89	92	369
- Total	1101	975	5662
- **Average per industry**	**79**	**70**	**404**
Other tertiary (23)			
- Total	32	77	34
- **Average per industry**	**1**	**3**	**1**

It is projected that an increase in tourism demand by US$6366 million would increase the value of labour use by US$1101 million, the value of capital use by US$975 million and the outputs by US$5662 million in tourism-related industries (Table 4). The largest increase can be seen in the air transport and wholesale and retail sectors, perhaps because the largest proportions of inbound tourists' spending were on air transport and shopping. According to the total value, an increase in tourism demand reduced the values of labour and capital and outputs in the primary and secondary industries. This finding can be explained by allocation effects, which can be captured in the CGE model and have been discussed in the literature (Li and Song, 2013; Pratt, 2015a, b). A growth in tourism demand would lead to an outflow of labour and capital from the primary and secondary industries to the tourism industry.

A large decrease in average outputs per industry can be observed in reform-focused industries (US$57 million), one that is higher than the decrease in the primary (US$17 million) and other secondary (US$2 million) industries. This finding implies that the growth of tourism has had a significant influence in reducing excessive industrial production capacity in reform-focused industries. The largest decrease can be observed in the reform-focused smelting nonferrous iron, coal, and iron and steel industries, with a total decrease of US$166 million in the value of labour, US$195 million in the value of capital and US$789 million in outputs. The implication is that the development of inbound tourism strongly supports SSR, as one major aim of the reform is to reduce excessive production capacity, particularly in the coal and iron and steel industries (China National Statistical Administration, 2017).

An increase in tourist receipts leads to a small increase in the reform-focused petroleum and cement industries, as the development of tourism also indirectly requires supply from the petroleum industry (e.g., transport) and cement industry (e.g., tourism infrastructure). Such a linkage to some extent offsets the decrease caused by allocation effects. Thus, the expansion of the tourism industry may not support SSR's goal of reducing excessive production in the petroleum and cement industries due to the linkages between them.

The smaller decrease in outputs and labour and capital use in primary and other secondary industries may be attributable to inter-industry spillover effects (Table 4), as researchers such as Kadiyali and Kosová (2013) have already observed. The exception is a larger decrease in the average value of labour use per primary industry, which may be due to two factors: primary industries are labour intensive, and the China IO table classifies primary industries in a more aggregated manner, with only five industries in this category. However, this finding indicates that the development of tourism may stimulate urbanisation in China, as more labour transfers from the primary industries to tourism-related industries.

Several individual primary and other secondary industries experienced an increase in outputs because they were closely linked to tourism as suppliers. The four primary and secondary industries that experienced the largest increase in the value of capital and labour use and outputs were beverage and tea, alcohol and alcoholic beverages, building construction and civil engineering construction. These industries benefited from tourism by supplying more products/services to tourism-related industries. Several other tertiary industries, such as real estate development and storage, also benefited from tourism development, which explains the increases in the value of labour and capital and outputs.

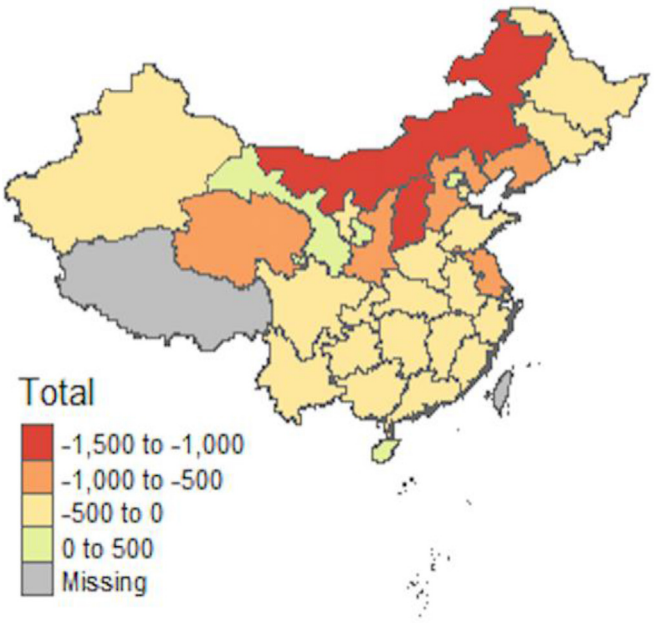

Fig. 1. Provincial distribution of the tourism effects on outputs of reform-focussed industries.

4.2. The industry impacts of tourism at the provincial level generated from the provincial CGE models

As outlined in the previous section on methodology, to compare the effects across different provinces, the same amount of international tourism receipts (US$1 million) was assumed to be injected into the CGE models for 30 provinces. The findings show that an increase of US $1 million in international tourism receipts reduced the total outputs of reform-focused industries (i.e., coal, iron and steel, and petroleum) in 27 provinces; the exceptions were Hainan, Gansu and Beijing. Among the provinces that experienced a decrease, seven went down more than US$500,000, including two that declined over US$1 million; the other 20 decreased less than US$500,000 (Fig. 1). Among the seven provinces with the largest decrease in outputs, five of them (Shaanxi, Neimenggu, Jiangsu, Shanxi and Hebei) suffered from overcapacity. The implication is that international tourism has played a crucial role in supporting SSR, especially in provinces with severe overcapacity. The total value of labour employed in the three reform-focused industries decreased in 28 provinces, and the total value of capital used in the three industries decreased in 25 provinces.

Thus, the development of international tourism could support SSR through reducing outputs of the three key reform-focused industries and reallocating additional labour and capital use from these industries in most provinces. This finding can be mainly explained by allocation and crowding out effects. To meet the expansion of tourism demand, tourism-related industries need to use additional inputs of factors such as labour and capital, which may bid up their prices and further reduce factor demand and outputs in other industries (Dwyer, Forsyth, Madden, & Spurr, 2000).

Other factors also jointly affect the direction and extent of the impact of tourism expansion on reform-focused industries. First, if the production of tourism goods heavily relies on imported goods, an increase in international tourism receipts will have little impact on the production of domestic goods by other industries. Second, if the economy has a large excess capacity of labour and capital in the tourism industries, then an additional tourism demand will not change the industry structure, in terms of reducing production and inputs use in other industries (Dwyer et al., 2000). The third factor is the tourism industry structure in a given province. Most tourism industries, such as catering, are labour-intensive, which results in larger allocation effects in the use of labour across different industries during tourism growth. Tourism industries can also be capital-intensive (e.g., theme parks and hotels at the early expansion stage), which can have a strong effect on the use of capital.

A combination effect of these factors determines the direction and extent of the impact of tourism on reform-focused industries in different provinces. The top 10 provincial-level effects of tourism on reform-focused industries are compared and displayed in Table 5 (output), Table 6 (value of labour employment) and Table 7 (value of capital use). The State Council of China has prioritised the reduction of capacity in two main industries: coal and iron and steel (China National Statistical Administration, 2017). A large decline in outputs can be seen in provinces that have a large overcapacity of coal (such as Neimenggu, Shaanxi and Shanxi) and iron and steel (such as Hebei and Jiangsu) (Table 5). A reduction in the output of reform-focused industries would cause a decrease in the usage of factors used in these industries. An increase in tourism leads to a flow of these inputs (e.g., labour and capital) from the reform-focused industries to tourism-related industries (Tables 6 and 7). In other words, tourism growth can help to reallocate excess labour and capital in reform-focused industries.

Based on economic development, China can be divided into eight economic regions: North-East, Northern Sea, Eastern Sea, Southern Sea, Middle Huang River, Middle Chang Jiang, South-West and North-West (Development Research Centre of the State Council, 2003). The economic development of the North-East region, including Heilongjiang, Jilin and Liaoning, previously relied on natural resources such as coal, petroleum, and iron and steel; the Middle Huang River region, including Shaanxi, Shanxi, Henan and Neimenggu, depended on coal. The two areas currently face the challenge of reducing excessive production outputs in these reform-focused industries. Therefore, cutting excessive output capacity and upgrading the industry structure are of particular importance in these two areas. Fig. 1 clearly shows that international tourism growth would cause a larger decrease in the outputs of reform-focused industries in the two regions, which are mainly located in the northern part of China. A smaller decrease in the production outputs of reform-focused industries can be observed in most provinces in the

Table 5
The industrial impact on outputs (US$, thousands).

Rank	Provinces	Total	Rank	Provinces	Coal	Rank	Provinces	Iron and steel	Rank	Provinces	Petroleum
1	Shaanxi	−1335	1	Neimenggu	−875	1	Qinghai	−519	1	Shaanxi	−453
2	Neimenggu	−1208	2	Shaanxi	−692	2	Hebei	−433	2	Heilongjiang	−308
3	Qinghai	−719	3	Shanxi	−277	3	Liaoning	−426	3	Qinghai	−185
4	Liaoning	−594	4	Guizhou	−247	4	Jiangxi	−397	4	Jilin	−167
5	Jiangsu	−555	5	Anhui	−153	5	Jiangsu	−329	5	Jiangsu	−156
6	Shanxi	−539	6	Ningxia	−139	6	Neimenggu	−267	6	Liaoning	−139
7	Hebei	−520	7	Zhejiang	−97	7	Yunnan	−238	7	Neimenggu	−66
8	Guizhou	−450	8	Hebei	−72	8	Ningxia	−213	8	Tianjin	−66
9	Jiangxi	−407	9	Jiangsu	−70	9	Hunan	−211	9	Shanxi	−65
10	Yunnan	−345	10	Tianjin	−66	10	Shanxi	−197	10	Yunnan	−48

Table 6
The industrial impact on the value of labour use (US$, thousands).

Rank	Provinces	Total	Rank	Provinces	Coal	Rank	Provinces	Iron and steel	Rank	Provinces	Petroleum
1	Shaanxi	−194	1	Shaanxi	−114	1	Hebei	−53	1	Neimenggu	−60
2	Neimenggu	−191	2	Neimenggu	−81	2	Neimenggu	−50	2	Shaanxi	−55
3	Shanxi	−108	3	Shanxi	−56	3	Shanxi	−43	3	Qinghai	−51
4	Hebei	−92	4	Guizhou	−52	4	Liaoning	−41	4	Heilongjiang	−34
5	Liaoning	−74	5	Anhui	−43	5	Yunnan	−32	5	Jilin	−34
6	Guizhou	−72	6	Ningxia	−42	6	Hunan	−26	6	Jiangsu	−31
7	Jiangsu	−69	7	Hebei	−34	7	Shaanxi	−25	7	Tianjin	−26
8	Qinghai	−64	8	Zhejiang	−18	8	Jiangsu	−21	8	Liaoning	−23
9	Ningxia	−57	9	Jiangsu	−17	9	Hubei	−21	9	Xinjiang	−10
10	Anhui	−54	10	Chongqing	−15	10	Sichuan	−20	10	Shanxi	−9

North Sea (Beijing, Tianjin and Shandong), Eastern Sea (Zhejiang and Shanghai), Southern Sea (Fujian, Guangdong and Hainan) and Middle Chang Jiang (Hubei, Hunan, Anhui) regions, which are more developed and have fewer excessive outputs in reform-focused industries. Thus, the development of international tourism to some extent can support SSR in regions that have greater excess production outputs in coal and iron and steel.

5. Conclusions and recommendations

In facing the challenges of a new era, the Chinese government has decided to reform the economy from the supply side to boost the country's sustained economic growth. There has been an intense debate on the virtues of government intervention versus the market mechanism over the last 300 years. Since the 2008 financial crisis, the integration of government intervention and the market mechanism has been emphasised. This study contributes to this debate by providing reliable and rigorous evaluation of the role played by tourism in the SSR through the market mechanism.

Little research has evaluated the spillover effects of tourism on individual industries or compared the impacts across different regions. This paper evaluates the effects of international tourism on reform-focussed industries such as coal and iron and steel for each province in China, based on which specific policy implications can be provided for China's SSR at the provincial level. A multi-methods approach including linkage analysis and econometric and CGE models is applied to comprehensively evaluate the industry impacts of tourism. In particular, an innovative combination of econometric forecasting and CGE models is used to evaluate the effects of tourism development on the economic reform of China.

The findings reveal that an increase in international tourism receipts decreased the outputs of a number of primary and secondary industries, with a larger decrease in reform-focused industries through crowding-out effects (see Tables 4 and 5). This finding indicates that international tourism's impact on reform-focussed industries will support the elimination of excessive production outputs, which is a major aim of the SSR. The development of tourism also enables a shift of production inputs, that is, labour and capital, from reform-focussed to tourism-related industries through allocation effects (see Tables 4, 6 and 7). This finding is also in line with the aim of economic structural change, which is to reduce the share of production inputs and outputs in the secondary industries and increase the share in the tertiary industries.

China's central and local governments intervene to reduce overcapacity in coal and iron and steel, which unavoidably causes excess labour. Through the market mechanism and price adjustment, tourism-related and other industries that supply goods to the tourism industry can absorb excess labour from these reform-focused industries. This goal can be achieved through an increase in tourism demand, which leads to higher labour wages in tourism-related industries. The findings indicate that the development of international tourism can support the SSR, given that the growth of international tourism can crowd out excessive production outputs and reallocate redundant employment from the reform-focussed industries.

At the regional level, an increase in international tourism leads to a greater decrease of production overcapacity in provinces such as Shaanxi and Neimenggu, which are regarded as key provinces in the SSR. The North-East and Middle Huang River regions suffer severely from excessive production outputs of coal and iron and steel, and thus must reduce a relatively large amount of production outputs in these industries. The uneven impacts of tourism can be observed in different regions, with a greater decrease in the two regions with larger overcapacity (see Fig. 1). This implies that tourism plays an effective role in cutting overcapacity.

Based on these findings, labour training programmes might be provided to workers in reform-focussed industries to equip them with new skills and knowledge for reallocation to other industries, such as tourism-related industries. At the regional level, provinces with a large overcapacity of coal (Neimenggu, Shaanxi and Shanxi) or steel (Hebei and Jiangsu) can attract more international tourists through improved tourism facilities and services and promotion in overseas markets. These provinces may also consider providing professional training on working in tourism-related industries to laid-off employees. Due to data unavailability, this study did not capture the shift of labour from different categories such as unskilled, semi-skilled and skilled. Future

Table 7
The industrial impact on the value of capital use (US$, thousands).

Rank	Provinces	Total	Rank	Provinces	Coal	Rank	Provinces	Iron and steel	Rank	Provinces	Petroleum
1	Shaanxi	−539	1	Neimenggu	−206	1	Neimenggu	−121	1	Shaanxi	−338
2	Neimenggu	−376	2	Shaanxi	−177	2	Hebei	−78	2	Heilongjiang	−276
3	Heilongjiang	−277	3	Shanxi	−45	3	Liaoning	−74	3	Jilin	−111
4	Jiangsu	−125	4	Guizhou	−39	4	Jiangxi	−70	4	Qinghai	−85
5	Shanxi	−114	5	Ningxia	−29	5	Shanxi	−64	5	Jiangsu	−83
6	Qinghai	−106	6	Anhui	−24	6	Hunan	−36	6	Xinjiang	−53
7	Jilin	−99	7	Jiangsu	−9	7	Jiangsu	−33	7	Neimenggu	−49
8	Liaoning	−96	8	Yunnan	−9	8	Hubei	−33	8	Tianjin	−38
9	Hebei	−90	9	Hebei	−8	9	Ningxia	−29	9	Liaoning	−19
10	Jiangxi	−71	10	Tianjin	−7	10	Henan	−29	10	Yunnan	−8

studies can evaluate the industrial impacts of tourism on shifts of different levels of labour force when data are available.

Author contribution statement

The initial research idea was raised up by the first author. After discussing the idea with the third author, the framework of the study was generated. The first and second authors reviewed the literature and conducted the modelling and data analyses. All the authors have been involved to discuss the primary results and write up the manuscript. The third author made a major revision on the manuscript.

Appendix

A1. The estimation results of China's international tourism receipts model

Variable	Coefficient
LOG(TR(-1))	−0.759(-12.811)***
LOG(GDP(-1))	2.140 (10.460)***
LOG(SP(-1))	−1.933 (−7.883)***
D(LOG(TR(-1)))	
D(LOG(TR(-2)))	0.106 (2.368)**
D(LOG(TR(-3)))	0.103 (1.963)*
D(LOG(GDP(-2)))	−1.519 (−4.423)***
D(LOG(GDP(-3)))	−1.395 (−4.922)***
D(LOG(RP(-1)))	−2.755 (−4.902)***
D(LOG(RP(-2)))	
D(LOG(RP(-4)))	−2.079 (−3.328)***
D(LOG(SP(-2)))	2.255 (4.065)***
Q1	
Q2	0.322 (11.473)***
Q3	0.170 (3.500)***
03Q2	−0.716 (−15.338)***
06Q4	0.233 (4.920)***
07Q4	−0.314 (−6.399)***
08Q1	0.381 (6.644)***
Constant	−2.859 (−5.176)***
Bounds Test	
F-stat	52,246.06***
t-stat	−12.811***
Diagnostic Tests	
R^2	0.952
adj-R^2	0.935
F-stat	57.092***
Breusch-Godfrey Serial Correlation LM Test	1.653
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.650
Normality	0.481

Note: *** indicates P < 0.01, ** indicates P < 0.05 and * indicates P < 0.10.

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