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Wage and Price Dynamics in a Large Emerging Economy: The Case of Chine

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Wage and price dynamics in a large emerging economy: The case of China[1]

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Abstract

This study finds that the growth in labour costs in China is not passed through fully to final prices in China, neither in the tradable goods sector nor in the economy as a whole. This probably reflects the strong pressure on profit margins from a highly competitive environment, especially in manufactured goods. The potential implications of labour cost increases in China for global inflation pressures are also discussed.

Keywords: Labour costs, inflation, China, global economic slack, globalisation

JEL Classification: E31; F42; J30

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1. Introduction

Many observers think that globalisation contributed to the lowering of inflation in the advanced economies. Others contest such a link: the panel discussion chaired by Frederic Mishkin, reported in BIS (2009), provides an excellent summary of the pros and cons of this controversial topic.

But the effective expansion in the labour force working for a global market place has certainly shaped the environment for monetary policy in the advanced economies. Some of the relevant channels include lower import prices in the advanced economies and the competition from low-wage emerging economies that have reduced price and wage setting power in the advanced economies. The increase in world potential output has increased the available slack in the global economy, and abundant labour supply coupled with rapid productivity growth in emerging economies has helped keep labour cost increases in check. But the disinflationary impact of globalisation may be lower in the future.

During the recovery from the international financial crisis, wage increases in emerging economies have captured increased attention. This has occurred against the backdrop of reduced domestic economic slack in emerging economies. Indeed, estimates presented in Gerlach (2011) suggest that regional output gaps for emerging economies closed already in mid-2010. Due to global supply chains, the increases in labour costs in emerging economies could provide an inflationary push that feeds through to import prices in advanced economies. This impact goes beyond the effect of emerging economies' strong growth on global commodity prices, stemming from the relocation of global manufacturing to emerging economies and their relatively high energy intensity of production.[4]

In the largest emerging economy, China, average nominal wages (staff and workers) increased by 13% in 2010. Administratively set minimum wages have increased even more prominently across China since 2009, with the annual wage hikes in the double digits, and at times surpassing 20%. Depending on the pass-through from labour costs to final goods prices, such dynamics have implications for the prices of Chinese manufactures and possibly, given China's role as the world's factory, ultimately for global inflation dynamics.

In this paper, we examine the pass-through from labour costs to inflation in the Chinese economy, and discuss the potential implications for inflation globally. To this end, we estimate the price equation of an expectations-augmented Phillips curve for China, where prices are set as a mark-up over productivity-adjusted wages, using panel data at provincial level for 1994-2010. The dataset is novel, and allows for the examination of labour cost and price developments both in the industrial sector and in the economy as a whole. The use of provincial data also provides some descriptive insights into the significant intra-country variation in labour costs in a large emerging economy such as China.

We find that growth in unit labour costs has not been passed fully through to inflation, which implies that profit margins of firms operating in China may have fallen over time. This holds for the aggregate economy (all sectors), and at a more disaggregated level in the industrial sector. This is in line with the intensive global competition faced by manufacturing firms in China. Given the less than full pass-through, the inflationary impact of rising unit labour costs is to some extent mitigated. Yet, China's gradual move to more differentiated products with higher pricing power and the sizeable growth in

[4] Using a multi-country general equilibrium model, Lipińska and Millard (2012) argue that persistent productivity increases in the BRICs (Brazil, Russia, India, China) predominantly lead to lower G-7 inflation. However, if oil demand elasticity is low or labour markets are flexible, inflation in the G-7 could actually rise. Flexible labour markets lead to higher real wages accompanying the productivity increases, limiting output increase in the BRICs.

nominal wages recently imply that rising inflation pressures in the future cannot be ruled out. This has potential implications for global inflation pressures.

The previous literature on a link between labour costs and inflation in China is limited. Wage dynamics have been explored eg by de Sousa and Poncet (2011). Otherwise wages typically appear in the estimation of Mincer type income-education regressions which are of limited use in understanding current wage dynamics. There are more studies on inflation in China. These include the analyses by Brandt and Zhu (2000, 2001) on the interaction between soft budget constraints, growth and inflation during the Chinese transition. There are also studies modelling the inflation process by hybrid New Keynesian Phillips curves (eg Funke, 2006; Zhang and Murasawa, 2011). However, these studies are silent on the link between domestic labour costs and inflation. In addition to contributing to filling this gap, our paper adds to recent macroeconomic studies that apply China's province-level data (eg Brandt et al. 2013).

There is a growing literature on the impact of globalisation on inflation, ranging from studies examining the impact of global slack on domestic inflation (eg Borio and Filardo, 2007) to research analysing the impact of low wage import competition on inflation in the advanced economies (eg Auer and Fischer, 2010). Previous research has also examined the impact of inflation shocks in China on inflation in other economies (eg Feyzioğlu and Willard, 2006). While our empirical analysis does not directly contribute to this literature, we apply an approach from the literature on global economic slack to assess the importance of external demand pressures on inflation at a provincial level. Moreover, the evaluation of the domestic labour cost-price pass-through is arguably important for understanding the potential international implications of emerging economy wage increases.

This paper is structured as follows. The next section discusses inflation and labour cost dynamics in China. Section 3 presents the methodology and discusses pertinent data issues. Estimation results from the labour cost-inflation link in China are in Section 4, while Section 5 discusses the potential implications for global inflation. Section 6 concludes.

2. Wage and price developments in China

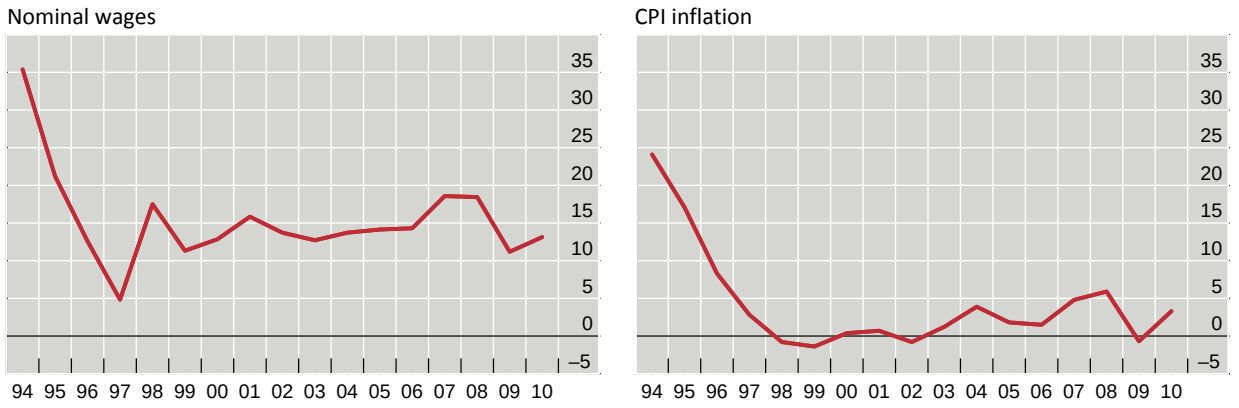
Historically, Chinese inflation has been relatively low, especially considering the economy's high growth rate since 1978 and its transitional nature. Indeed, it has not been uncommon for transition economies to have experienced inflation rates exceeding 100% at an early stage of reforms. As inflation is a monetary phenomenon in the long run, successful calibration of monetary policy could be argued to be an important reason for China for having avoided runaway inflation. However, in the short and medium run, given the importance of wages as a component of final goods prices, moderate labour cost developments are likely to have been an important factor preventing excessive price pressures. Indeed, nominal wage increases have mostly been moderate in relation to the economy's GDP and productivity growth rates, and China has experienced a falling labour share of income during much of the past two decades (see eg Aziz and Cui, 2007).

Graph 1 shows that the growth in nominal wages (staff and workers) dropped substantially from over 30% in the mid-1990s closer to the 10-15% range in the 2000s. CPI inflation followed a similar trend, as the overheating of the mid-1990s gave way to deflation in the late 1990s and early 2000s. Inflation rates have been positive since 2003, except for the brief deflationary episode during the international financial crisis in 2009.

Growth in nominal wages of staff and workers and CPI

Annual growth rates, in percent

Graph 1



Sources: Datastream; national data.

Regarding interprovincial differences in the level of nominal wages, in 2010 the average wages of staff and workers were highest in Shanghai and Beijing (at 71,874 yuan and 65,683 yuan, respectively), and lowest in Jiangxi province (29,092 yuan).[5] The biggest increase in nominal wages between 1994 and 2010 was experienced in Beijing (where wages increased over ten-fold) and the smallest in Guangdong province (with less than a six-fold increase). During the most recent years in our sample (2006–10), the highest nominal wage growth took place in two inland provinces, Hubei and Shaanxi. This contrasts with an earlier part of the sample when nominal wage growth was typically highest in the coastal provinces. Focusing on the industrial sector[6], nominal wages in 2010 were again highest in Shanghai and lowest in the Jiangxi province, and slightly lower than when all sectors were considered (56,551 yuan and 27,038 yuan, respectively).

Regarding productivity dynamics, Graph 2 shows that real labour productivity across all three main economic sectors has been increasing over time, but mostly in the secondary (industrial) and tertiary (service) sectors. Any shift of labourers out of agriculture into the secondary and tertiary sectors immediately implies an increase in average economy-wide real labour productivity. The share of employment in agriculture, the sector with the lowest labour productivity, has been falling continuously, with the structural change then contributing – beyond the increase in real labour productivity within each sector – to the steady increase in economy-wide real labour productivity over time.[7]

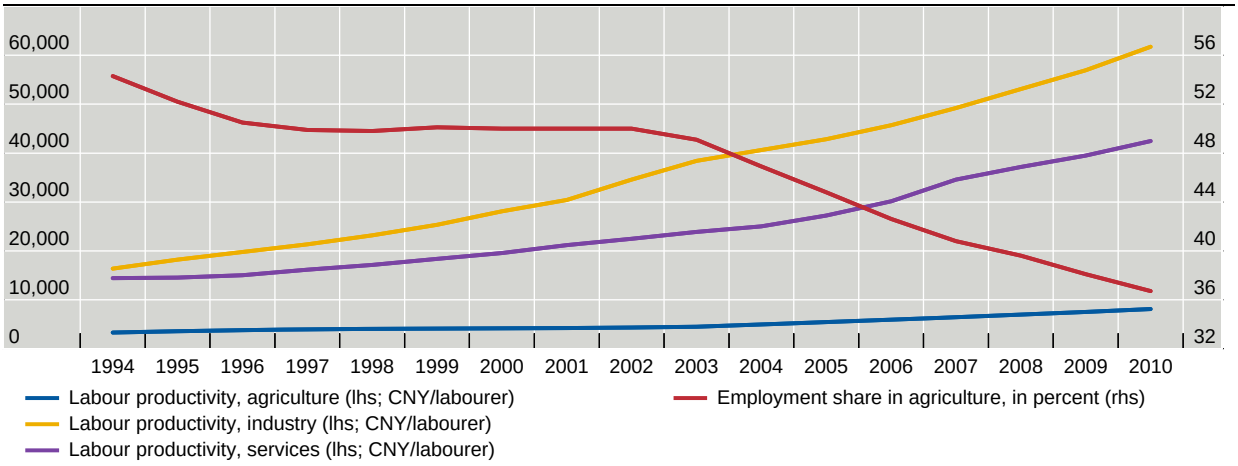
[5] Using average exchange rates for 2010, these amount to 10,617 USD (Shanghai), 9,702 USD (Beijing) and 4,297 USD (Jiangxi), respectively.

[6] The industrial sector considered in our paper is called “secondary industry” in China’s statistics. It includes mining, manufacturing, utilities and construction.

[7] In this paper, we do not examine the causes of real labour productivity changes in China. We also make no attempt to predict future real labour productivity changes — it is likely that aggregate labour productivity will increase further, for three main reasons. Capital stock per labourer in China is low; the gap between labour productivity in the advanced economies and China is still large; and the share of agriculture in Chinese employment remains relatively high, compared to historical patterns of other Asian economies.

Sectoral labour productivity and employment share in agriculture

Graph 2



Note: Labour productivity is expressed in constant price terms.

Sources: National data and authors' calculations.

Unit labour costs can be defined as nominal wages relative to real labour productivity. We compute unit labour costs as the average nominal wage of "staff and workers" divided by labour productivity, which in turn is computed as real GDP over total employment, for both the economy-wide and industrial sector measures (see Section 3 for further details). The group of "staff and workers" consistently covers over 94% of "urban formal sector" workers during our sample, but eg Chinese private sector enterprises are excluded.[8] Therefore, this group does not cover the entire universe of Chinese workers, and is different from the broader group of total employment used to compute productivity. Yet, the data allow us to estimate the economy-wide (ie all sectors) total, as well as to construct a sectoral breakdown, including at a provincial level. Other measures of unit labour costs are of course plausible, often yielding very similar dynamics (see eg Ma et al., 2012, for unit labour costs in manufacturing).

Graph A1 in the Appendix shows estimates of province-level unit labour cost growth both as an aggregate comprising all sectors and in the secondary industry only. Both measures fell from relatively high levels in the mid-1990s and became negative in the latter part of the decade in many provinces. The drop in unit labour cost growth during the Asian crisis is more visible in the industrial sector than in the measure covering all sectors. For most of the 2000s, the growth rates have been in positive territory in most provinces. The biggest increase in unit labour costs between 1994 and 2010 was experienced in Beijing (where nominal wage growth was also high) and the lowest in Inner Mongolia. In the most recent years in our sample (2006–10), Beijing still experienced the highest unit labour cost growth, but some of the highest growth rates took place in inland provinces, including Shanxi and Hubei.

Various studies compare China's labour costs internationally. Ceglowski and Golub (2011) argue that China's unit labour costs have been rising since 2003 but remain low relative to those in most other countries. Depending on the data source, in purchasing power parity terms, China's manufacturing unit

[8] Staff and workers comprise urban formal sector workers in the following ownership categories: state units, urban collective units, joint units, shareholding units, foreign units, Hong Kong–Macau–Taiwan (HKMT) units, and "other" units (where the "other" appears a small residual). Explicitly excluded are the employees of township and village enterprises, private enterprises, and urban individual-owned enterprises, as well as foreigners and labourers from HKMT, re-employed retirees, and educators in informal education. The group of staff and workers, thus, comprises a rather narrow set of labourers.

labour costs were 33% or 68% of the US levels in 2008–09. Yang et al (2010) conclude that China's manufacturing wage has already converged to that of some Asian emerging markets, eg Philippines and Thailand, but that Mainland China still enjoys large labour cost advantages over some others (eg Chinese Taipei, Korea, Hong Kong SAR).

The determination of nominal wages depends greatly on institutional factors.[9] In the case of state-owned enterprises (SOEs), by the early 1990s wage payments were explicitly linked to efficiency changes, often measured as tax and profit remittances. Labour productivity increases appear time and again in the regulations on the determination of SOE wage increases, albeit not prominently, with profitability being clearly of more importance. If we assume that profitability is market-determined, SOE wages have arguably been influenced by market conditions. By the late 1990s, collective bargaining was promoted throughout the economy, including in the SOEs, while wages in non-SOEs have been market-determined all along. However, given the predominance of surplus labour until at least into the late 2000s, minimum wage regulations are likely to set a binding constraint during the period under consideration. Wages even in the market-oriented sector of the economy thus likely follow government decisions (on minimum wages).

If minimum wage regulations are enforced, an increase in minimum wages may translate into higher average wages.[10] Minimum wages have seen prominent increases in recent years. In 2011, local authorities in 14 of China's 31 provincial-level regions increased minimum wages by at least 20%. This includes minimum wage hikes exceeding 30 per cent in the inland provinces of Anhui and Henan. According to the Ministry of Human Resources and Social Security, as part of the 12th Five-Year Plan (2011–15), minimum wages will grow by an average rate of at least 13% over this period. Minimum wages in most parts of China would reach more than 40 per cent of the average income of local urban residents by 2015. Furthermore, the aim is to increase urban and rural per capita net income by more than 7% annually in real terms over the five years to 2015.[11]

Some institutional changes unrelated to the labour market also impact on wages. To mention just one example, reforms to the household registration system that facilitate the acquisition for rural citizens of an urban household registration will likely lead to higher wages. While urban workers with urban household registration may not hold the same occupations as migrant workers in urban areas, Lu and Song (2006) find that the returns to education are much higher for urban workers with urban household registration than for migrant workers.

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[9] A comprehensive institutional analysis of wage determination in China is as yet missing in the literature. A background paper to this article by Holz (2013) fills this gap and provides many details on the institutional framework. What previously existed in the literature are overviews of labour market institutions (eg Cai et al., 2008) as well as a number of investigations of wage data (eg Ge and Yang, 2010).

[10] In the reform period, minimum wages were first established in 1994. The province-specific minimum wage is to take into account local minimum living standards of employees and their dependents, the average wages of staff and workers, labour productivity, the urban economic situation and the general level of economic development.

[11] See "China's minimum wage to grow over 13% annually," 29 June 2011, Xinhua News Agency, accessed at http://www.chinadaily.com.cn/business/2011-06/29/content_12803800.htm on 8 December 2011.

3. Methodology and data

In order to measure the impact of increases in unit labour costs on final prices, we rely on an expectations-augmented Phillips curve framework.[12] While the previous literature typically estimates both wage and price equations, we focus on price-setting behaviour and take changes in unit labour costs as given.[13] It is the price setting behaviour that ultimately matters for assessing the impact of unit labour cost increases on Chinese and foreign inflation developments. From a more econometric viewpoint, the approach is arguably appropriate if wages are significantly impacted by administrative decisions such as minimum wage regulations, ie exogenous factors.

In the traditional model, monopolistically competitive firms set prices as a mark-up over productivity-adjusted wages (unit labour costs, *ulc*). Additionally, prices are affected by aggregate demand pressures and cost-push shocks. These are captured by the inclusion of the output gap (y) and import prices (p^m), respectively. The price equation in such a model is of the form:

$$\pi_t = \beta_0 + \beta_1 \Delta ulc_t + \beta_2 y_t + \beta_3 \Delta p_t^m + u_t \,, \qquad (1)$$

where Δ is a first difference operator. Yet, this approach is not fully satisfactory for an analysis at a provincial level, as it disregards the fact that demand pressures from other provinces are likely to impact inflation developments in a given province. In fact, the provinces could be regarded as very open economies within the same currency union. This implies the need to construct a measure of "external" output gap (y^{ext}) for the provinces that could capture demand pressures in other parts of China, and potentially in its international trading partners as well. The concept and the construction of an external output gap in our paper follows that of the "global" output gap in the literature (see eg Borio and Filardo, 2007). It is similarly motivated by the fact that a narrow measure of economic slack does not adequately capture the relevant excess demand or supply conditions prevailing in the economy of interest.[14] The calculation of the external output gap for each province involves China's economy-wide output gap (y^{China}) and that of the G3 economies (y^{G3}; including the United States, European Union and Japan). As weights, it applies the share of domestic (w_1; ie trade with other Chinese provinces) and international trade (w_2) in total trade of each province i, with $w_{1i} + w_{2i} = 1$. Then, for each province i:

$$y_{it}^{ext} = w_{1i} y_t^{China} + w_{2i} y_t^{G3} \,. \qquad (2)$$

As argued by Martínez-García and Wynne (2013), the use of *intra*national data to study the concept of global slack can be motivated by the fact that the economic relationships between the regions in a single country could approximate those in a fully globalised world. Moreover, Martínez-García and Wynne (2010) show that in theory, the effects of foreign activity on domestic inflation can be taken into account by the information contained in terms of trade. As a corollary, as we are using an external output gap to capture economic activity outside these provinces, import prices are not included separately in the framework. Then, the model can be simply written as:

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[12] This approach is common in the literature. See eg Gordon (1985); Ghali (1999) and Mehra (1991).

[13] Forward-lookingness in this model is captured in the wage equation, where productivity-adjusted wages are a function of expected inflation and demand and supply shocks.

[14] Borio and Filardo (2007) explore the importance of global output gap for domestic inflation developments. They find evidence that proxies for global economic slack substantially add to the explanatory power of conventional inflation rate equations. Martínez-García and Wynne (2010) analytically show how, in the context of a variant of a new open economy macro model of Clarida, Galí and Gertler (2002), foreign output gaps matter for domestic inflation. See also earlier work eg by Tootell (1998) about the importance of foreign output gap for inflation developments in the United States.

$$\pi_t = \beta_0 + \beta_1 \Delta ulc_t + \beta_2 y_t + \beta_3 y_t^{ext} + u_t \,. \qquad (3)$$

It is common in the empirical literature to write the price equation of the expectations-augmented Phillips curve in an error correction form, with price and labour cost series entering the long-run relationship in levels (eg Ghali, 1999; Mills and Wood, 2002). This is motivated by the time series properties of the series, in particular the possibility that the series included in the long-run relationship are cointegrated. We also follow this approach.

We estimate the price equation with panel data covering 30 provinces, as it provides greater power than single equation methods. This is particularly relevant, as the periodicity of the data is annual and the sample is relatively short. Moreover, given the importance of China for the global supply of manufacturing goods, it is of interest to evaluate price setting for all the sectors as an aggregate and for the tradable goods sector separately.

We use the pooled mean group (PMG) estimator proposed by Pesaran et al. (1999), which assumes that the long-run coefficients are equal across the cross-sections, but the short-run coefficients and error variances may differ (see Pesaran et al, 1999, for formal treatment). The PMG estimator is based on an autoregressive distributed lag model. Our specified long-run relationship includes the levels of prices and unit labour costs, together with the two output gaps.[15] The dynamic panel specification of our model, with one lag, can be written as:

$$p_{it} = \delta_{10i} ulc_{it} + \delta_{11i} ulc_{i,t-1} + \delta_{20i} y_{it} + \delta_{21i} y_{i,t-1} + \delta_{30i} y_{it}^{ext} + \delta_{31i} y_{i,t-1}^{ext} + \lambda_i p_{i,t-1} + \mu_i + \varepsilon_{it}. \qquad (4)$$

The estimated price equation can be written in error correction form as:

$$\Delta p_{it} = \phi_i (p_{i,t-1} - \theta_{0i} - \theta_{1i} ulc_{it} - \theta_{2i} y_{it} - \theta_{3i} y_{it}^{ext}) - \delta_{11i} \Delta ulc_{it} - \delta_{21i} \Delta y_{it} - \delta_{31i} \Delta y_{it}^{ext} + \mu_i + \varepsilon_{it}, \qquad (5)$$

with $\phi_i = -(1-\lambda_i)$, $\theta_{0i} = \frac{\mu_i}{1-\lambda_i}$, $\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1-\lambda_i}$, $\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1-\lambda_i}$ and $\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1-\lambda_i}$.

Our data are based on Chinese official statistical series.[16] Wage data are not available at sectoral level prior to 1993, and major price reforms did not occur until the early 1990s. Indeed, only by 1993 did the vast majority of transactions occur at market prices.[17] Our estimation period starts in 1998, as the years of economic overheating in mid-1990s are clearly outliers in terms of both wage and price inflation (Graph 1).

Three different price indices are used in the study: the consumer price index (CPI), the retail price index (RPI), and the producer price index (PPI). The CPI is considered the relevant price index when all sectors are analysed. The RPI, which in the case of China does not include services prices, is viewed as

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[15] The estimation procedure accommodates variables that are integrated of order zero or one. For our sample, the panel unit root test by Harris and Tzavalis (1999) suggests that the null hypothesis of a unit root can be rejected for all the price and unit labour cost series in first differences.

[16] The default data sources are the database available on the Chinese language website of the National Bureau of Statistics (NBS) at http://www.stats.gov.cn and the China Statistical Yearbook. The data used to compute the G3 output gap are obtained from the CEIC database and the IMF's WEO database. An appendix explaining the construction of data in more detail is available upon request.

[17] According to China Price Yearbooks (Zhongguo wujia nianjian), the share of agricultural procurement prices that are market-determined increased from 51.6% in 1990 to 87.5% in 1993. For retail sales, the corresponding figures are 53.0% and 93.8%; for producer goods approximately 36.4% and 81.1%.

reflecting price changes for tradables. Many service prices in China have traditionally been regulated by administrative measures. Finally, the PPI (also labelled ex-factory price index) is used as an alternative measure of tradable goods prices.

Output gaps are obtained as actual output less potential output, with estimates for potential output traced out from data for gross regional product (y; province level measure) and gross domestic product (y^{China} and y^{G3}; national measures) by standard filtering techniques. We employ the Hodrick-Prescott filter, with a smoothing parameter of 100 for annual data.

Regarding the construction of the external output gap and the weights w_1 and w_2 in Equation (2), we use provincial trade data to construct estimates of the shares of domestic (ie vis-à-vis other Chinese provinces) and international trade, for each province. We take the difference of the published figures for the total trade (domestic & international) and the international trade of each province to obtain an estimate of its domestic trade. The G3 output gap is specified as a weighted average of the output gaps computed for the European Union, United States and Japan; the (annually) time-varying weight is specified as the ratio of China's imports and exports with each G3 economy to China's total trade with the G3 economies.[18]

Unit labour costs are defined as average nominal labour costs relative to real labour productivity. The series used for nominal labour costs are the average wages of staff and workers. We have province-level data for staff and workers for the all sectors total, and separately for the industrial sector (labelled "secondary industry" in China's official statistics; our proxy for the tradable goods sector). Average labour costs of staff and workers are taken to be the official, published average (monetary and in-kind) wages, available for the economy-wide total and for four secondary sector sub-sectors.[19] Real labour productivity is defined as real GDP (in 2000 prices) per labourer.[20] Productivity measures cannot be calculated for staff and workers only because of a lack of matching output data, which implies that total sectoral output and employment (not limited to staff and workers) must be used in the computation.

Tibet is excluded from province-level data throughout due to the lack of sufficient data. For Chongqing, data on most variables are available only starting 1997; missing values are computed based on data for Sichuan.[21]

4. Estimation results

In this section, we present estimation results from a model that explicitly investigates the long-run relationship between unit labour costs and prices. The model takes into account cyclical demand pressures that originate both in the province itself and externally. Our approach allows for non-stationarity in price and unit labour cost series, and potential cointegration between the two variables.

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[18] The data on provinces' total trade (domestic & international) are not available after 2002. Therefore, the computed weights w_1 and w_2 are based on prevailing data for 2002. In contrast, the trade weights used to construct the G3 output gap change annually as the share of China's trade with each of the G3 economies changes.

[19] To obtain aggregate average wages at the secondary sector level, sub-sector average wages are weighted by sub-sector employment shares. The published end-year labourer data are used rather than interpolated mid-year values because the break in sectoral classification makes interpolation impossible for 2003.

[20] Real GDP is constructed from the published nominal GDP (year 2000) and the published real growth rate series. Employment data are end-year values. Missing employment data for 2006 are interpolated using 2005 and 2007 values.

[21] Prior to 1997, Chongqing was part of Sichuan.

Estimation results from the long-run relationship of the price equation are displayed in Table 1, and discussed in detail below.

Estimation results for price equation — Table 1

	(1)	(2)	(3)	(4)	(5)	(6)
	All sectors (CPI)	Tradables (RPI)	Tradables (PPI)	Tradables (PPI), WTO period	All sectors (CPI), without external output gap	Tradables (RPI), without external output gap
Speed of adjustment (Φ)	–0.288	–0.346	–0.468	–0.589	–0.338	–0.382
	(8.33)	(7.62)	(5.20)	(4.87)	(5.94)	(8.67)
Long-run coefficients						
Labour cost (θ_1)	0.565	0.370	0.557	0.628	0.491	0.311
	(24.54)	(17.53)	(46.01)	(43.99)	(33.10)	(18.91)
Output gap (θ_2)	0.809	0.966	0.654	0.457	1.468	1.508
	(4.21)	(6.35)	(4.05)	(4.46)	(16.85)	(16.09)
External output gap (θ_3)	1.423	1.093	0.824	0.553		
	(5.36)	(8.97)	(4.59)	(4.28)		
N x T	390	390	386	270	390	390

Notes: Dependent variable is the inflation rate. Absolute z-values are in parentheses. Constant term and the short-run coefficients on labour costs, output gap and external output gap are not shown. Column (1): Pooled Mean Group estimates for all sectors, CPI inflation. (2): tradable sector, RPI inflation. (3): tradable sector, producer price inflation. (4): tradable sector, producer price inflation, 2002-2010. (5): all sectors, CPI inflation, excluding the external output gap. (6): tradable sector, RPI inflation, excluding the external output gap.

All the estimated models share some common features. We always find a statistically significant and negative adjustment coefficient, suggesting that the models converge to equilibrium over time. Moreover, we always obtain a statistically significant and positive long-run coefficient on unit labour costs, with the coefficient estimate falling below one. Importantly, this suggests that an increase in unit labour costs is not passed through fully to final prices. Finally, the coefficients on the province-level output gap and the external output gap in the long-run relationship take the expected positive signs and are always statistically significant. The coefficient on the external output gap is higher in magnitude than the one estimated for the province-level output gap, which implies that inflation is more responsive to economic slack measured at the economy-wide and international level than at a more narrow provincial level.

When using aggregate unit labour cost data comprising all sectors, and headline CPI inflation as a measure of prices, the long-run coefficient on unit labour costs is 0.565 (Column 1). What explains the long-run coefficient on labour costs that is lower than one? It is likely that firms in China (in particular those operating in the manufacturing sector) have faced an increasingly competitive operating environment and have not passed productivity-adjusted wages fully on to final prices, reducing profit margins instead. From a transition economics perspective, industrial firms likely enjoyed larger profit margins at the early stages of transition, when the labour cost gap vis-à-vis advanced economies was highest and the intensity of competition low. Then, as the economy has gradually been liberalised, more firms have entered the Chinese market and wage increases have at times exceeded productivity growth, the high profit margins have taken a hit.

How does our estimate of the pass-through coefficient compare with those found for other economies? Interestingly, the two studies we are aware of for emerging markets also find pass-through

coefficients below one. For Hong Kong SAR, Liu and Tsang (2008) find the coefficient of unit labour cost pass-through to inflation to be in the range of 0.56 – 0.58. In the case of South Africa, Todani (2006) estimates the pass-through coefficient from unit labour costs to prices at 0.68, attributing this finding to increasing competition in the product markets. In contrast, the long-run coefficient between unit labour costs and prices in advanced economies is often found not to be far from unity (eg Mehra, 1993; OECD, 2008; in the United States and various OECD economies, respectively).

The pass-through is lower for the tradables sector than for the economy as a whole (Column 2), when we use retail prices as a measure of tradable goods prices. Given the previous arguments about international competition and reduced price setting power, such a finding seems plausible.[22] When producer (ex-factory) prices are used as a proxy of tradables prices, therefore removing the impact of retailers' margins, we find the pass-through to be higher than in the case of retail prices (Column 3). However, it is still significantly lower than one. And, when the estimation sample is shortened to include only the period of WTO membership, the pass-through increases somewhat, but still remains far from that conventionally found for advanced economies (Column 4).

How would the results look if we omitted the external output gap variable? Columns 5 and 6 present the results for all sectors and for the tradables sector, respectively, when only the province's own output gap is included in the estimation. In this case, the coefficient on the provincial output gap increases in magnitude, as it may be partly capturing the degree of economic slack that is actually external to that province. This holds both for all sectors and for the tradables sector only. Yet, the coefficient still falls short of the sum of the estimated coefficients on the internal and external output gaps (θ_2 and θ_3), suggesting that the inclusion of an external output gap is indeed important. The long-run coefficient on unit labour costs falls somewhat when only the province's own output gap is used.[23]

The PMG estimator assumes that the long-run elasticities are equal across panels, that is, slope homogeneity holds. When this restriction is true, the estimates are efficient and consistent. However, if the true model is actually heterogeneous, estimates obtained by the mean group (MG) estimator, allowing also the long-run coefficients to differ, would still be consistent. The Hausman test suggests that differences in the coefficients obtained by the MG and the PMG estimators are not systematic and the PMG estimator is indeed preferred for our specifications that include the external output gap, Columns (1) – (4) (*p*-values of 0.61, 0.91, 0.44 and 0.97, respectively).

5. Discussion

The results from the previous section suggest a less than full pass-through from unit labour costs to final prices. Yet, especially in an environment with rapidly increasing labour costs, final prices can still be significantly affected. Moreover, as China's manufacturing sector is gradually moving to more differentiated products with potentially higher pricing power, labour cost increases may be increasingly passed through to domestic final prices. And, given the role of China in global manufacturing, an

[22] We have also constructed data to capture unit labour cost developments in China's tertiary (service) sector, taken as a proxy for the non-tradables sector. While a comparison of the labour cost-price pass through in the tradables and non-tradables sectors is interesting, there is no published price index available for the service sector since 2002. Similarly, while there are data on staff and worker wages by ownership of the firm, no comparable data exist for labour productivity.

[23] If the price of oil imports is included as an additional variable in the models excluding the external output gap, it obtains a statistically significant positive coefficient in the long-run relationship. Yet, the size of the coefficient on unit labour costs remains very close to that reported in Columns (5) and (6).

increase in Chinese export prices could have an impact on price developments globally. This latter international dimension is briefly discussed in this section.

If unit labour cost increases are passed into China's export prices, as assumed by producer currency pricing, then import prices in China's trading partners will be affected. Would this matter for foreign inflation developments more broadly? As changes in import prices represent relative price shifts, there need not be any impact on foreign headline inflation. If nominal prices are fully flexible, price declines for certain goods can be met by price increases for others, leaving the aggregate price level unchanged.

But especially large relative price changes could well impact aggregate inflation. Ball and Mankiw (1995) argue that price rigidity plays an important role in determining the impact of relative price changes on final inflation. In their model, in the presence of menu costs, firms adjust prices in response to large shocks but not to small ones. Large shocks then matter disproportionately for the price level, and the impact on inflation depends on the distribution of relative price changes.

This argument is supported by empirical evidence. Sekine (2009) estimates that global shocks to two relative prices – wage costs and import prices – account for an important share of disinflation in the OECD countries in the past decades. Pain et al (2008) similarly find a growing importance of import prices for consumer price developments since the mid-1990s – well beyond the weight of imported goods and services in domestic demand. Auer and Fischer (2010) suggest that low wage imports have had a strong impact on sectoral producer prices in the United States and could have affected US equilibrium inflation in the previous decade. Auer et al. (2013) find similarly strong price effects from import competition in Europe during 1995–2008; when Chinese and other low wage Asian exporters captured 1% of a European market, producer prices fell by 3%.

The impact of emerging economies on advanced economy price levels could increasingly be of an inflationary nature. The BIS (2012) points out the potential of higher unit labour costs in emerging economies to have an impact on inflation in the advanced economies, given the growing role of emerging economies in global supply chains. Global demand conditions also matter. In particular, if emerging markets experience rapid increases in unit labour costs at the same time as economic slack is declining globally, advanced economy inflation risks could increase. While it is possible that rising labour costs in China would lead to a fall in the share of imports from China, this is likely to be a gradual process, given the established supply chains and the sheer scale of firms' manufacturing operations in China.

The potential of increased inflation in China to affect foreign inflation is reflected in reduced form evidence about the international transmission of inflation shocks. Using vector autoregressions, IMF (2003) estimates that shocks to mainland Chinese inflation would have the largest impact on inflation in economies nearby, in particular Hong Kong SAR and Chinese Taipei. Given that the share of imports from China as a share of their total imports is large, import prices may be strongly affected by China-specific shocks. Additionally, cost developments in the Chinese manufacturing sector could affect the prices of foreign exports by influencing foreign pricing power and wage inflation. Using a global VAR framework, Osorio and Unsal (2011) suggest that China causes important inflation spillovers in the Asian region mainly through direct demand shocks but also indirectly via higher commodity prices.

Finally, the impact of emerging economy shocks on foreign inflation should in theory be transitory. The monetary authorities in the advanced economies could be expected to ultimately stabilise inflation: for instance, the model of Lipińska and Millard (2012) has advanced economy inflation falling only temporarily as a result of a productivity shock in the emerging economies. But such a transition period could last a long time. During the Great Moderation, for instance, developments in the emerging economies probably contributed to lower inflation in the advanced economies for some years.

6. Conclusion

We have investigated wage-price dynamics in China, using a novel dataset with province-level data. The dataset allows for an examination of intra-country dynamics and developments both in the tradable goods sector and the economy as a whole. We find that increases in unit labour costs have not been passed through fully to final prices, neither in the economy as a whole, nor in the tradable goods sector. The results bring further insights as to why inflation remained low in China in the reform period despite its high growth rate. Given the close supply chain links in the Asia-Pacific region, this may also have lowered price pressures in other countries, especially in China's main trading partners.

As the results are not based on structural models, drawing implications for the future should be done with caution. In particular, China's move to more differentiated products with greater pricing power and the recent sizeable growth in nominal wages imply that price pressures in China may rise. If so, and assuming it is not offset by a nominal depreciation of China's currency, this could raise price levels in advanced economies. Central banks in the advanced economies, therefore, may need to counteract imported inflation pressures by tightening domestic monetary policy.

One interesting research question that is not answered in the paper is whether a less than full pass-through is a more general emerging economy phenomenon, driven by increased competition in the product markets, overall liberalisation of the domestic economy and the opening-up to international competition. Another future research avenue would be to examine the international transmission of labour cost shocks that could be especially important for the international transmission of cost pressures along cross-border manufacturing supply chains.

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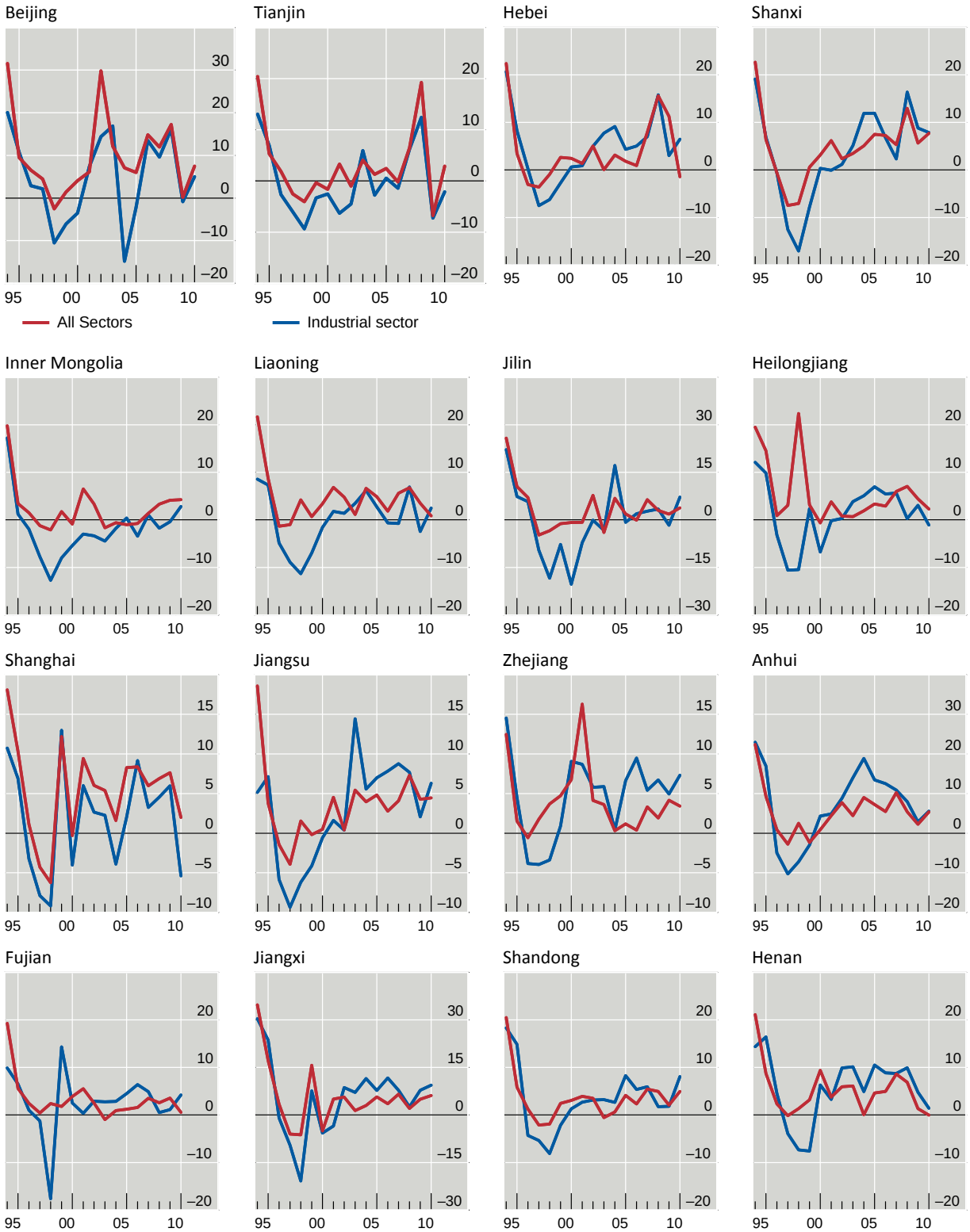
Appendix A

Estimates of unit labour cost at provincial level

Percentage change over previous year

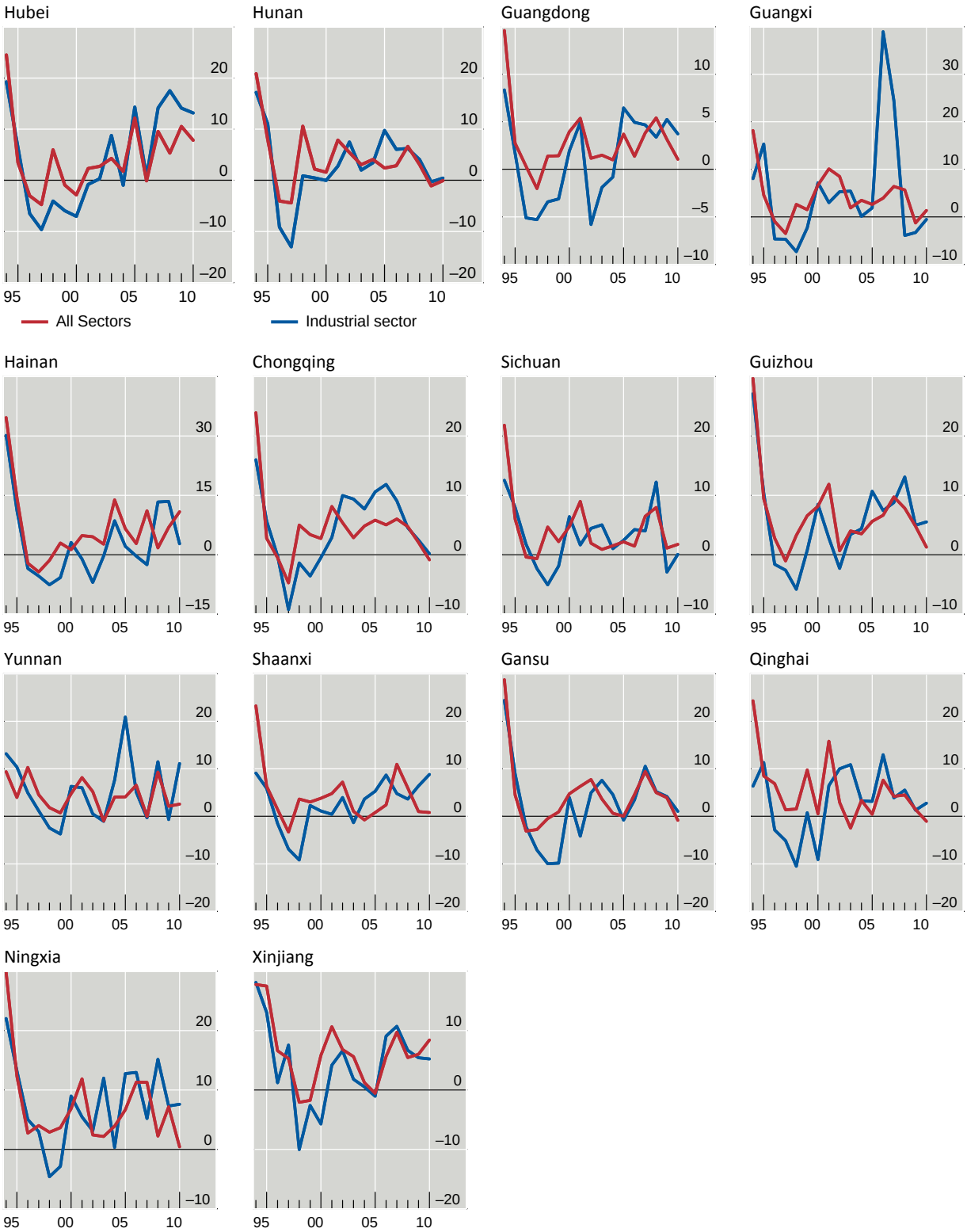
Graph A1



Sources: National data and authors' calculations.

Estimates of unit labour cost at provincial level

Percentage change over previous year — Graph A1



Sources: National data and authors' calculations.