

Special Feature A

Wages and Export Prices in China: Implications for Global Inflation

Introduction

Following double-digit global inflation during the 1990s, the world economy experienced a sustained stretch of relatively mild price increases in the decade that followed. One of the factors thought to have driven this moderation in inflation was China's integration into the global trading system as the dominant supplier of manufactured goods to the rest of the world. During the 2000s, China's share of global trade rose dramatically while its export prices were kept in check by an abundant supply of low-cost labour, prompting some analysts to argue that the country was exporting deflation to the advanced economies (OECD, 2006; Kamin *et al.*, 2006).

More recently, however, concerns have risen over whether China's booming imports may have boosted international commodity prices (IMF, 2011). Concurrently, demographic trends, together with other structural factors, are causing marked shifts in labour supply in China. Nominal wages, which have generally risen in tandem with improving productivity in the industrial

sector over the last decade, have accelerated by 10–20% p.a. in recent years. This has led some observers to conclude that China's "Lewisian turning point"—the point where surplus rural labour runs out—has arrived, thereby precipitating wage and price pressures.

This Special Feature investigates the empirical nexus between labour costs and export prices in China using time series econometrics. More specifically, it examines how the evolution of China's wage and productivity dynamics has affected global inflation outcomes over the last decade by analysing the behaviour of import prices in the two major trading centres of Hong Kong and Singapore, as a proxy for Chinese export prices. Examining this pass-through, after taking into account changes in other production costs, price mark-ups, and exchange rate fluctuations, will help to ascertain whether China will reverse its erstwhile role of making goods cheaper for global consumers.

China's Impact on Global Inflation Trends

In the years following its accession to the WTO in 2001, China was seen as a source of downward pressure on global prices. While most observers attribute this to the country's intrinsic competitiveness in producing labour-intensive commodities, others claim that excess capacity in

the manufacturing sector has caused goods prices to decline and spill over to the rest of the world through cheap exports. Academic studies have, however, found the evidence for China exporting deflation to be mixed at best.

Using regression analysis to model both the direct and indirect channels of price transmission, Kamin *et al.* (2006) found no conclusive evidence that growth in Chinese exports had a deflationary impact on US import and producer prices. For manufactured goods, such as textiles and steel products, they noted that a 1.0% point increase in the share of imports from China was associated with a 0.8% point decrease in annual import price inflation. Nevertheless, the relatively low share of imports in US GDP of about 12% meant that the impact of Chinese imports on US consumer prices would have been quite small. Indeed, the authors showed that China's exports have lowered annual import price inflation in a large group of OECD countries by only a quarter of a percentage point or less on average since 1983.

Relying on a vector autoregression (VAR) methodology, Feyzioglu and Willard (2006) similarly concluded that Chinese inflation had no significant effect on US and Japanese inflation at the aggregate level, although there was some evidence of sector-specific linkages between prices in China and the US, especially for final manufactured goods. Overall, their results do not support the claim that inflation declined in several countries because of China's increasing role in the world economy.

Methodology and Data

In this Special Feature, to determine whether wage increases in China have been a significant factor behind its recent export price increases, a structural supply-side framework in the vein of Kravis and Lipsey (1977) is adopted. This approach isolates the impact of unit labour costs (*ULC*) on export prices (*P*) after controlling for the effects of changes in raw material costs (*MAT*), the producer price mark-up (*PROFIT*), and nominal exchange rate movements (*EXCH*):

$$\ln(P_t) = \beta_0 + \beta_1 \ln(ULC_t) + \beta_2 \ln(MAT_t) + \beta_3 \ln(PROFIT_t) + \beta_4 \ln(EXCH_t) + \varepsilon_t \quad (1)$$

More recently, however, attention has turned to China's rising wage levels and widespread increases in minimum wages across the country. Observers noted that labour cost increases in the coastal areas that are in excess of productivity gains added to supply-side inflationary pressures. Furthermore, the potential onset of the Lewisian turning point (see Box B for a survey of views on this issue) has raised the question of whether China would pass on continually rising wage costs to global consumers via higher prices for its manufactured products.

In related research, at least one study has shown that prices in the Asian countries are sensitive to inflation developments in China. Notably, the IMF (2011) found that a 1.0% point increase in China's inflation induced by a food supply shock could cause prices to increase by about 0.25% point across the region. In contrast, demand shocks emanating from China spilled over to Asian countries mainly through their impact on global commodity prices and the subsequent effects on domestic food and energy costs.

Since all variables are in natural logarithms, the parameters are elasticities. Equation (1) is also consistent with the specifications adopted in the literature on exchange rate pass-through.¹

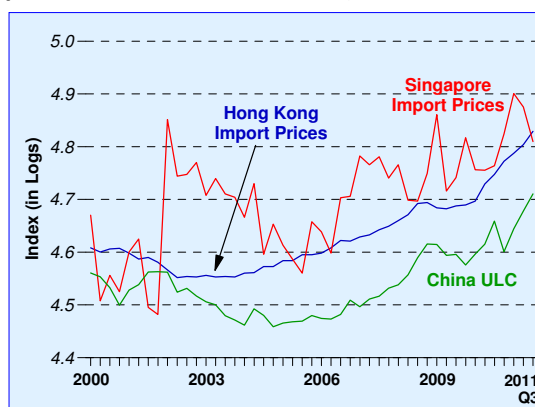
As the time series on China's export prices is too short for estimation purposes, the empirical strategy adopted here is to use the import price indices of major importing countries as a proxy. The obvious choice is Hong Kong's import price index for merchandise goods sourced from China, which has been compiled since the early 1990s. This series closely mirrors China's export prices, since the territory has long served as a hub for

¹ See Goldberg and Knetter (1997) for a survey of the pass-through literature.

re-exporting mainland goods to the world. The other import price index examined is that of Singapore, which plays a similar entrepôt role.² Since China exports mostly manufactured products, the first regressor in equation (1) is the unit labour cost in its industrial sector, computed using time series data from Q1 2000 on value-added, employment and nominal wages.³ Chart 1 depicts the co-movements between this series and the two import price variables. Compared to average wages, the ULC measure is a better gauge of cost pressures as it takes into account the assertion that China can maintain its export competitiveness despite substantial wage increases by virtue of significant improvements in workers' productivity.

The raw materials sub-index of China's producer price index is utilised as a proxy for the second regressor, raw material costs. Following Mallick and Marques (2008), an estimate of corporate profit margins in China is taken as the measure of the producer mark-up over marginal costs.⁴ As the import price variables are denominated in local currencies, the bilateral exchange rate with respect to the Chinese renminbi is also incorporated as an additional explanatory variable in equation (1) to capture the exchange rate pass-through effect.

Chart 1
Import Prices and China's ULC (Q1 2000–Q3 2011)



² As there is no readily available import price index in Singapore for products from China, a unit value index was created by aggregating SITC 7-digit trade data provided by IE Singapore.

³ Mining, utilities and construction are included in this classification, although their weights are relatively small.

⁴ The series used was compiled by the IMF.

Box B**Has China Reached its Lewisian Turning Point?*****The Lewis Model of Dualistic Development***

In his paper “Economic Development with Unlimited Supplies of Labour” published in 1954, Sir W.A. Lewis rejected the neoclassical assumption of limited labour supply, and postulated that in developing countries, an unlimited supply of unskilled rural labour from the “subsistence” or agricultural sector is available for employment in the growing “capitalist” or industrial sector in the early stages of economic development. The labour surplus in the agricultural sector allows the expanding industrial sector to obtain the required labour at constant low wage rates and grow through capital accumulation. However, when the surplus runs out, wages will start to rise in both sectors, such that the inter-sectoral wage differences will begin to fall. The point of reversal was later termed the “Lewisian turning point”.

Applying the Lewis Model to China

China’s spectacular economic growth over the last three decades, driven in part by large-scale labour migration from the low productivity rural sector to the high productivity urban sector, appears to fit Lewis’ model of dualistic development. More recently, the concept of the Lewisian turning point has gained widespread traction in discussions of China’s future growth prospects, prompted by reports of worker shortages in the major industrial areas.

Proponents of the Lewisian turning point have pointed out that the current labour shortage arises from a decline in the working-age population. They argue that China is reaching the turning point as a result of its demographic transition from a largely rural society to a predominantly urban population. In the early stages of the transition, when mortality rates start to fall before fertility rates do so, the economy will benefit from the demographic dividend as the GDP growth rate rises due to the growing proportion of working-age people in the population. Eventually, however, fertility rates decline, the population begins to age, and the Lewisian turning point kicks in when surplus labour is exhausted.

Apart from the demographic transition, Cai (2008) observed that China has experienced a further fall in the natural population growth rate since the Cultural Revolution in the 1960s, which caused a dip in the growth rate of the working-age population twenty years later. This was aggravated by the one-child policy introduced in 1978. The United Nations estimates that the proportion of the working-age group in China’s total population started to fall after 2010, and that the size of the cohort will begin to contract by around 2015. In contrast, Cai (2008) reckoned that China had reached its Lewisian turning point as early as 2004, and that labour shortages would be widespread by 2009.

The findings of nation-wide surveys also support the view that China has run out of surplus rural labour. For example, a 2005 survey conducted by the China Development Research Centre of the State Council indicated that, although the rural surplus was about 100 million, many of these workers were middle-aged and unsuited for relocation to the industrial sector. About three-quarters of the villages spread across 17 provinces responded that “all the young workers in the village that are capable of working away from home have already left”.

Other studies have noted that the shortage of migrant workers is pervasive across China, and not merely confined to the eastern coastal regions. According to the 2009 Peasant Workers Monitoring Survey by the National Bureau of Statistics, the number of migrant workers in the Pearl River Delta fell by 22.5% y-o-y, while it grew by 33.2% in the Central region and 35.8% in the Western region. Since then, economic growth has soared in the latter areas, thus pushing China nearer to full employment and the Lewisian turning point. According to data from the China Household Income Project (CHIP), nominal migrant wages rose by more than 9% p.a. from 2006 to 2009.

Evidence Against the Lewisian Turning Point

Sceptics have disputed the claim that China has exhausted its pool of surplus rural labour because soaring wages could be attributed to an apparent shortage of migrant labour in the cities which was caused by policy barriers rather than demographic factors. They cite empirical studies that show that there is still an abundant supply of labour in the rural regions. For instance, the World Bank asserted that a tightening of the Chinese labour market was not imminent, based on estimates of annual labour entrants of 8 million and 24 million in rural and urban areas respectively. Knight *et al.* (2011) also found that there are 80 million rural people who are potential migrant workers, while Mai and Peng (2009) deduced that the pool of rural surplus labour will expand as agricultural labour productivity continues to grow.

Leveraging on a survey undertaken by the Rural-Urban Migration in China and Indonesia project (RUMiCI), Golley and Meng (2011) concluded that there still is an abundance of rural workers who are under-employed with low income, and that rural-urban migration would remain a major source of economic growth for China. As compared to studies which downplay the distortions caused by the hukou (registration) policy, Golley and Meng (2011) conclude that the policy is a formidable deterrent to the migration of workers from the countryside to the cities.

If the Lewisian turning point has indeed arrived, the gap between the wages of rural unskilled and urban skilled workers would have narrowed. Yet, Golley and Meng (2011) find that the wages of urban skilled workers have soared by over 90% from 2000 to 2009, while those of migrant workers only increased by 30%. They therefore surmised that urban-rural wage differentials were not converging precisely because of regulatory barriers that prevent the free mobility of labour in China.

Conclusion

Although the empirical evidence on the Lewisian turning point is mixed and does not lend overwhelming support to either camp, the truth is likely to be somewhere in between. Rising wages in China could be attributed to a confluence of factors—depletion of surplus rural labour in some regions, labour immobility due to policy barriers, and increased productivity of labour. Nonetheless, Lewis' hypothesis remains useful in predicting the future interactions between wage differentials, labour supply, and rural-urban migration in China.

As China's urban population surpassed that of the rural areas for the first time at the end of 2011, the Lewisian hypothesis suggests that wage hikes are likely to accelerate further, and that the need to review policies which can sustain China's economic growth assumes greater importance. The policy options to increase labour supply in China include raising the retirement age, reforming the hukou system to grant citizens equal access to social amenities such as schooling, healthcare, and housing, and increasing investment in education and training to boost productivity.

References

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The Pass-through from Wages to Export Prices: Empirical Evidence

Results for Hong Kong

According to augmented Dickey-Fuller tests, the null hypothesis of a unit root cannot be rejected at the 5% level of significance for the logarithmic values of all the variables used in the empirical analysis for Hong Kong.⁵ The Johansen test further shows that the non-stationary variables in equation (1) are cointegrated and that there is a single cointegrating vector binding the time series together in the long run.⁶

This vector, estimated via maximum likelihood (ML) and normalised on Hong Kong's import prices, is shown in column (1) of Table 1 for a model with four lags.⁷ Only the coefficient on *ULC*

is statistically significant and its estimated magnitude suggests that a 1.0% increase in China's *ULC* will raise Hong Kong's import prices by 0.5% in the long run. For comparison, the long-run parameters in the cointegrating equation are also estimated using single equation OLS and these are shown in column (2).⁸ For every 1.0% increase in China's unit labour costs, Hong Kong's import prices rise by only 0.3% in this regression. Raw material costs have a similar, albeit stronger, impact on prices. In contrast, the exchange rate effect is much larger and also significant, although pass-through is far from being complete in the long run.

Table 1
Regression Estimates for Hong Kong Import Prices, Q1 2000 to Q3 2011

Dependent Variable: $\ln(P_t)$			
Explanatory Variable	(1)	(2)	(3)
	ML	OLS	DOLS
$\ln(ULC_t)$	0.51** (0.13)	0.32** (0.10)	0.47* (0.17)
$\ln(MAT_t)$	0.05 (0.24)	0.37* (0.14)	0.68** (0.22)
$\ln(EXCH_t)$	0.14 (0.09)	0.57** (0.07)	0.43** (0.08)
Constant	2.08	1.44 (0.88)	-0.63 (1.70)
Diagnostics			
R-squared	0.76	0.93	0.97
No. of observations	43	47	44
Standard error of regression	0.01	0.02	0.02
Durbin-Watson statistic	-	0.48	0.63

Note: Heteroskedasticity and autocorrelation-consistent standard errors are in parentheses.

** Statistically significant at the 1% level.

* Statistically significant at the 5% level.

⁵ For lag lengths of up to four, and regardless of whether a trend term is included in the test.

⁶ Although the number of cointegrating vectors found is sensitive to the lag length, when the producer mark-up was excluded from the analysis, the rank test consistently indicated that there is only a single cointegrating vector.

⁷ Variations in profit margins have statistically insignificant effects and the variable has been omitted in the specifications in Table 1.

⁸ Note that the reported t-statistics are only indicative of true statistical significance, since the asymptotic distribution of the estimated parameters is, in general, not normal.

In practice, the OLS estimates of the cointegration parameters, though super-consistent, may be subject to small sample biases. Consequently, the method of dynamic OLS (DOLS) proposed by Stock and Watson (1993) was applied to check on their robustness. Augmenting the OLS regression with the contemporaneous, forward and lagged changes in each regressor resulted in somewhat larger elasticities for *ULC* and *MAT* and a smaller coefficient for *EXCH*. Hence, the results are relatively robust to the estimation method used and they suggest unequivocally that rising unit labour costs in China have had at least a modest impact on Hong Kong's import prices in the last decade.

Even so, Chart 1 suggests that China's unit labour costs and Hong Kong's import prices have only risen in tandem from the beginning of 2005, thus raising the possibility of time-varying behaviour in the parameter estimates. Chart 2 plots the recursive DOLS estimates of the unit labour cost elasticity, with the initial sub-sample being Q1 2000–Q4 2004. The recursive elasticity is seen to be relatively low and statistically indistinguishable from zero in the years preceding the Global Financial Crisis, turned negative during the crisis period, and then rose rapidly in 2010 before stabilising at 0.47 in 2011.

To complete the analysis, a short-run error correction model is estimated, based on the DOLS estimates of the long-run parameters given in Table 1. Following a general-to-specific approach to lag length reduction, the final result is as follows⁹ (figures in parentheses are standard errors):

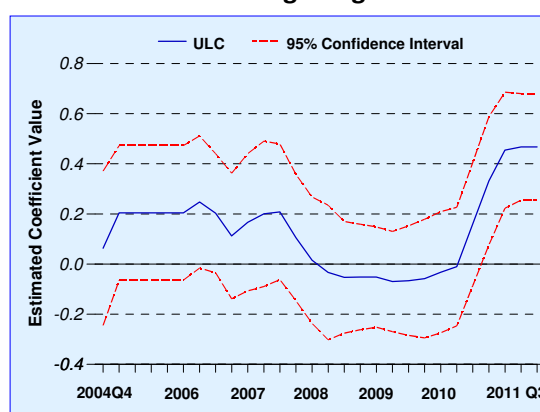
$$\Delta \ln(P_t) = 0.46 \Delta \ln(P_{t-1}) + 0.39 \Delta \ln(EXCH_t) - 0.09 ECM_{t-1} \quad (2)$$

(0.13) (0.16)
(0.05)

$$R^2 = 0.40 \quad S.E. = 0.01 \quad DW = 2.01$$

The explanatory power of this equation is reasonable while the standard error of the regression is less than 1%. The "loading" coefficient on the error-correction term (ECM_{t-1}) is marginally significant but its estimated size suggests that import prices adjust tepidly to changes in their long-run determinants. Instead, import price movements tend to be fairly persistent, as indicated by the relatively large coefficient on the lagged dependent variable. In the short run, the only variable that affects prices is exchange rate fluctuations, with almost all the pass-through taking place immediately.

Chart 2
Recursive DOLS Estimates of the ULC Coefficient
for Hong Kong



⁹ The estimated constant is too small to be reported.

Results for Singapore

Unit root and cointegration tests suggest that Singapore's import prices are integrated, and cointegrated with the set of explanatory variables. Nevertheless, preliminary findings show that the producer mark-up plays a more important role in explaining Singapore's import price movements than raw material prices.

Omitting the material costs variable, the unique cointegration vector estimated by a multivariate model with four lags is shown in column (1) of Table 2. The coefficient on China's unit labour costs is highly significant, but it implies a long-run impact on Singapore's import prices that is implausibly large compared to Hong Kong. In contrast, the effect of profit margins appears to be reasonable while the exchange rate pass-through is statistically insignificant and of an incorrect sign.

However, the results reported in the remaining columns put the ML estimate into perspective: the elasticity of Singapore's import prices with respect to China's unit labour costs falls to 0.8 using OLS, though the variable remains highly significant.

The other coefficients are statistically insignificant—dropping them from the regression raises the estimated elasticity of labour costs somewhat, but otherwise leaves the results unchanged.

Again, the DOLS results appear to be the most intuitive and amenable to economic interpretation. In column (3) of Table 2, the dynamic regression estimates suggest that the elasticity of China's unit labour costs is close to unity, higher than the static OLS results. The impact of corporate profits, with a coefficient of 0.4, is also significant and relatively strong. Furthermore, the DOLS method implies that there is some exchange rate pass-through into Singapore's import prices, even though the estimated coefficient is not significant at the conventional levels.

Table 2
Regression Estimates for Singapore Import Prices, Q1 2000 to Q3 2011

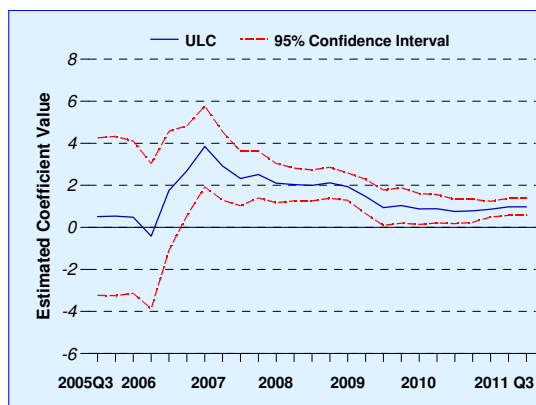
Dependent Variable: $\ln(P_t)$			
Explanatory Variable	(1)	(2)	(3)
	ML	OLS	DOLS
$\ln(ULC_t)$	1.68** (0.28)	0.76** (0.17)	0.98** (0.21)
$\ln(PROFIT_t)$	0.48* (0.21)	0.12 (0.08)	0.40* (0.17)
$\ln(EXCH_t)$	-1.10 (0.88)	-0.17 (0.43)	0.28 (0.70)
Constant	5.50	0.76 (0.83)	0.02 (1.44)
Diagnostics			
R-squared	0.50	0.32	0.61
No. of observations	43	47	44
Standard error of regression	0.07	0.09	0.07
Durbin-Watson statistic	-	1.26	1.36

Note: Heteroskedasticity and autocorrelation-consistent standard errors are in parentheses.

** Statistically significant at the 1% level.

* Statistically significant at the 5% level.

Chart 3
Recursive DOLS Estimates of the ULC Coefficient
for Singapore



Recursive estimates of the ULC elasticity from the DOLS regression, plotted in Chart 3, show that the impact of rising unit labour costs in China on Singapore's import price inflation has been consistently positive and significant since 2007. The coefficient hovered around 2.0 in the immediate pre-financial crisis period but then fell to 0.98 in mid-2011, where it has stabilised. Recursive estimates for the other coefficients also reveal parameter stability towards the end of the sample period, thus allowing the results to be used for valid inference about the likely future effect of wage inflation in China on Singapore's import prices. Given this, the final estimated elasticities are used to form the following error-correction model for Singapore:

$$\Delta \ln(P_t) = -0.19 \Delta \ln(\text{PROFIT}_t) - 0.43 \text{ECM}_{t-1} \quad (3)$$

(0.11) (0.12)

$$R^2 = 0.45 \quad \text{S.E.} = 0.07 \quad \text{DW} = 2.14$$

Sum-up

This Special Feature has undertaken an econometric analysis of the extent to which unit labour cost changes in China are reflected in the import prices of two of its major trading partners, Hong Kong and Singapore, after taking into account raw material cost movements, variations in profit margins, and exchange rate effects.

As with the case of Hong Kong, this is a very simple and parsimonious model for capturing short-run fluctuations in the prices of Singapore's imports from China. Price adjustments essentially obey an error correction mechanism, with profit margins having only a small and relatively insignificant effect. Compared with Hong Kong, however, the speed of adjustment to the long-run equilibrium is much faster—slightly over two-fifths of the current disequilibrium is eliminated every quarter—thus confirming that the level of Singapore's import prices co-moves with Chinese unit labour costs and profit mark-ups over the longer term.

In general, the results suggest that the recent wage cost inflation in China has had a statistically discernable impact on both Hong Kong and Singapore's import prices. The estimated elasticities range from 0.3–1.0 and are generally higher for Singapore.

While material costs also matter for the determination of Hong Kong's prices, the producer mark-up has a more important role to play in Singapore's case.

The implication for global inflation is that if China's unit labour costs continue to rise with the arrival of the Lewisian turning point, countries importing from China will face higher prices, in the absence of appropriate policy measures or exchange rate appreciation.

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