Has Globalization Changed the Phillips Curve? Firm-Level Evidence on the Effect of Activity on Prices*

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The flattening of the Phillips curve observed in the industrial countries has been attributed to globalization, in contrast with the traditional explanation centered on monetary policy credibility. The empirical literature is not conclusive. This paper argues that recourse to micro data is needed to identify whether changes in the slope of the Phillips curve are structural. Taking advantage of a unique data set including about 2,000 Italian firms, the paper tests whether a change in the link between capacity utilization and prices is confirmed at the company level and whether it is concentrated among those firms that are more exposed to foreign competition. The answer is either inconclusive or negative in all cases. The results do not lend support to the view that the flattening of the Phillips curve is due to globalization.

JEL Codes: E31, E52, E58.

1. Introduction

A widespread flattening of the Phillips curve has taken place in recent years. In virtually all the advanced economies, the response of inflation to a variety of measures of cyclical slack (such as the unemployment gap, the output gap, or the degree of capacity

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utilization) has steadily decreased since the 1980s.[1] There has been much discussion on how monetary policymakers should react to this finding: does it indicate that a structural change in the trade-off between output and inflation variability took place, or is it simply an endogenous sign of monetary policy success?

An influential argument, advanced by Borio and Filardo (2007), as well as by others, draws a link between the flattening of the Phillips curve and the spread of globalization or, more precisely, the stronger competitive pressures from emerging countries, notably from Asia, unleashed by the increasing openness of the international economy.[2] There are various versions of this story, the common element being that globalization has changed the price-setting behavior of individual firms. According to this view, foreign competition has reduced the pricing power of domestic corporations, limiting their ability to raise prices during booms in response to transitory domestic cost or demand pressures; the prices of items produced at home are increasingly determined by foreign demand and supply factors, rather than domestic ones; and on the labor market, the threat of outsourcing to cheaper labor countries disciplines wages, keeping them low and less responsive to increases in demand.[3]

According to this "globe-centric" view, global, rather than domestic, slack is a major driving force of domestic inflation rates, and a flatter Phillips curve is a structural feature of advanced economies. If true, this would have far-reaching implications for the conduct of monetary policy. The most obvious is that monetary policy would have more leeway to fine-tune domestic activity, with less need to worry about inflation variability. According to Bean (2006a, 2006b), it implies that policy errors would not show up in large movements of inflation away from the target, and at the same time that variations in aggregate demand are a less effective means of controlling inflation. Woodford (2007) argues that central banks may lose incentive to control inflation if they perceive a flatter trade-off between output expansion and inflation.

[1] See International Monetary Fund (2006), Kohn (2006), and Pain, Koske, and Sollie (2006).

[2] See also Bank for International Settlements (2006).

[3] Bean (2006a, 2006b).

However, there is controversy. According to Rogoff (2006), an increase in international competition could in principle steepen, rather than flatten, the Phillips curve: firms revise prices more frequently, as the cost of keeping prices fixed at the wrong level increases.[4] Ball (2006) argues that, even with greater international competition, marginal costs still depend on the firm's own output levels. Woodford (2007), based on a two-country New Keynesian model, shows that even in an open economy and with a single world market for labor, the aggregate supply relation still connects domestic inflation with domestic economic activity.

A long-standing tradition in economic analysis, since the seminal contributions by Friedman, Phelps, and Lucas, emphasizes the pitfalls of treating estimated Phillips curves as structural relationships. The traditional line of argument links the flattening of Phillips curves to the very success of monetary policy in stabilizing actual and expected inflation. Negative correlation between "sacrifice ratios" and the average inflation rate may reflect an endogenous adjustment of the degree of price stickiness to lower inflation,[5] or a change in the way inflation expectations are formed under a more credible policy regime; treating these endogenous and reversible changes of the output-inflation trade-off as if they were structural may lead to recurrent policy mistakes, generated by the very success obtained in the past. Sargent, Williams, and Zha (2006) have shown that this may be the case when short-sighted policymakers recursively estimate a non-expectational, backward-looking Phillips curve and update their beliefs and policies accordingly.

Assessing whether the change in the slope of the Phillips curve is a structural consequence of globalization or just an endogenous by-product of the success of monetary policy is therefore extremely relevant. However, the empirical literature is inconclusive: although they use a similar approach, the International Monetary Fund (2006) finds that globalization has reduced the sensitivity of inflation to domestic capacity, while Ball (2006) and Ihrig et al. (2007) find

[4] A similar conclusion was reached by Romer (1993) based on a different argument: sacrifice ratios should be smaller in open economies, since an expansionary monetary policy has larger effects on inflation via the exchange rate, and smaller effects on output, via the higher price of imported inputs.

[5] Ball, Mankiw, and Romer (1988).

little or no effect.[6] The evidence presented is almost entirely based on the estimation of reduced-form relationships and on macroeconomic data. The problems raised by this approach hinge on the lack of cross-sectional variability in the data and on the difficulty of properly accounting for inflation expectations. There is an emerging consensus that more disaggregated information is needed.[7]

The empirical strategy followed in this paper is to exploit microeconomic evidence, making extensive recourse to individual data and exploiting the variability in firm characteristics, to better identify the underlying structural relationship and to examine observable implications overlooked by the macroeconomic literature. This paper exploits a unique data set, including almost twenty years of annual information on individual firms' pricing and capacity utilization, as well as on various aspects of their exposure to globalization. The availability of firm-level information makes it possible to better control for aggregate effects, such as changes in inflation expectations, avoiding the problems typical of aggregate estimates of the Phillips curve. It also makes it possible to test for some observable implications of the hypotheses discussed above, e.g., the fact that the change in the sensitivity of prices to capacity utilization is more pronounced for those firms which are more directly exposed to the competition of emerging countries.

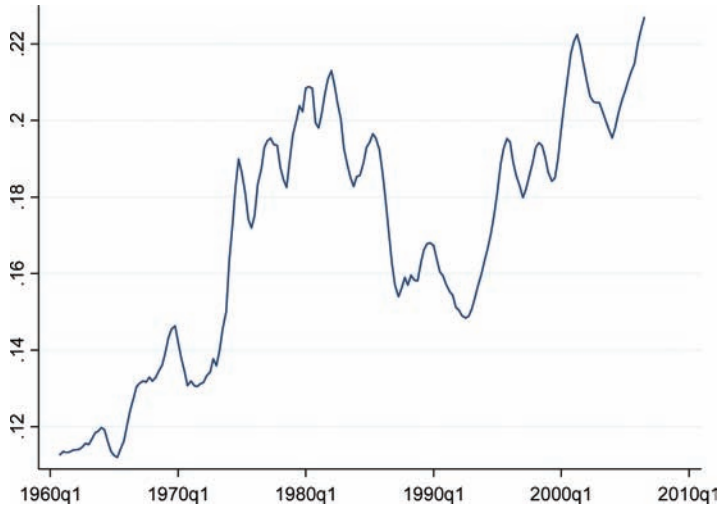
Italy is also an appropriate case to study. Given its traditional specialization in low- and medium-technology production, like textiles and clothing, the Italian economy has been particularly affected by increased competition from emerging countries, notably Asian ones.[8] While the degree of trade openness of the Italian economy has been slightly rising (figure 1), the change in the composition of trade since the beginning of this century is startling; the share of

[6]Previous literature on the link between openness and sacrifice ratios also produced mixed results. See Temple (2002), Daniels, Nourzad, and Vanhoose (2005), and Razin and Loungani (2005).

[7]This is also pointed out by Borio and Filardo (2007).

[8]Italian industry is specialized in medium-to-low technology sectors (textiles and clothing, leather and footwear) that are particularly vulnerable to competition from newly industrialized countries. In 2000–01 only 13 percent of Italian exports was in high-tech sectors, while 44 percent was in low-tech sectors, mostly textile and clothing; the same figures for the euro area were 30 percent and 21 percent (European Central Bank 2005).

Figure 1. Italian Trade/GDP



Notes: Ratio of the sum of Italian imports and exports to GDP. Four-quarter moving average. **Source:** Istat.

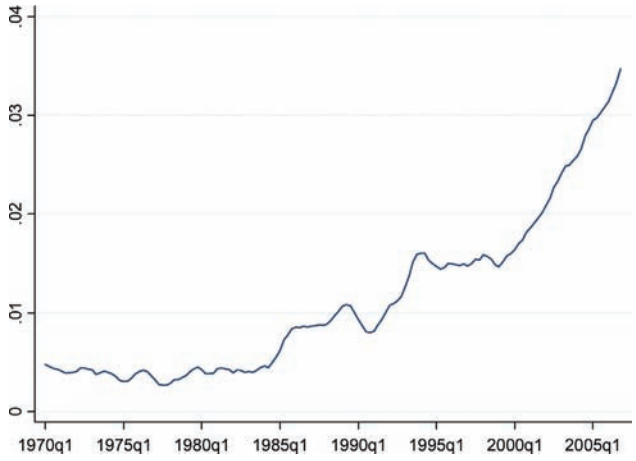
China and India in Italian trade has increased four-fold since 2000 and is still on the rise (figure 2).[9]

At the same time, Italy shares the trend toward lower and more stable inflation, as well as toward a lower sensitivity of inflation to cyclical swings. In recent decades, monetary reforms of unprecedented relevance fostered the anti-inflationary credibility of the monetary authorities, most likely accounting for a considerable portion of the flattening of the Phillips curve.[10]

[9]Following China's membership in the World Trade Organization (WTO), imports of textile and clothing from China to Italy grew substantially, Italian exports of textile and clothing toward third countries decreased (Banca d'Italia 2005), and Italian firms operating in traditional sectors increasingly delocalized various stages of production toward countries with lower labor costs (Banca d'Italia 2006, p. 156).

[10]In 1992 full independence in moving the discount rate was granted to the Governor of the Bank of Italy; since 1994 the Governor has explicitly announced annual inflation objectives (see Altissimo, Gaiotti, and Locarno 2001, p. 147), while the wage bargaining setup introduced in 1993 has linked wage increases to a forward-looking official inflation target (Brandolini et al. 2007). In 1998 Italy joined the Economic and Monetary Union.

Figure 2. Italian Trade with China



Notes: Sum of Italian imports and exports vis-à-vis China over sum of Italian imports and exports. Four-quarter moving average. **Source:** Istat.

The remainder of the paper is organized as follows. Section 2 discusses in more detail the advantages of making recourse to micro data and presents the empirical model to be estimated. Section 3 introduces the data, based on the Bank of Italy's Survey of Investment in Manufacturing (SIM). Section 4 presents the empirical results and section 5 draws the main conclusions.

It should be noted at the outset that there are other aspects of the debate on the effect of globalization on inflation that are not addressed in this paper. Notably, there is an intense discussion on whether, in recent years, trade links and international competition have acted as a negative shock to inflation, through falling import prices and increasing imports of inexpensive goods. This amounts to a relative price shock and, possibly, a temporary decline in inflation, rather than a permanent change in the output-inflation trade-off, and it would have fewer implications for the optimal design of monetary policy, although benefits for the consumer may be substantial. The general finding is that these effects, although small, exist.[11]

[11] A quantitative assessment of the direct effects of trade on inflation is provided by Pain, Koske, and Sollie (2006) for OECD economies; by Kamin, Marazzi, and Schindler (2004) for the United States; by Chen, Imbs, and Scott (2004) for the European Union; and by Bugamelli, Fabiani, and Sette (2009) for Italy.

2. The Empirical Approach

The existing empirical literature is based on the aggregate specification:[12]

$$\pi_t = \pi^e_{t+1} + \alpha_0\left(y_t - y^*_t\right) + \alpha_1 T_t\left(y_t - y^*_t\right) + \eta_t, \tag{1}$$

where π_t stands for inflation at time t, π^e_{t+1} stands for expected inflation, y_t stands for output at time t, and y^*_t stands for potential output at time t. To measure the impact of globalization on the slope α_0, the output gap is interacted with the trade/GDP ratio T_t.

Substantial econometric issues arise in the empirical implementation of (1). First, π^e_{t+1} is difficult to measure. Ball (2006) shows that the results are not robust to the choice of a proxy; in addition, the almost universal practice of adopting a backward-looking variable, like lagged inflation, is subject to the Sargent, Williams, and Zha (2006) critique. The low variance in π_t, π^e_{t+1} during the "Great Moderation" makes (1) hard to estimate efficiently. Finally, T_t lacks cross-sectional variability and it could be spuriously correlated with π^e_{t+1}.

This paper replicates equation (1) at the firm level. Focusing on individual data makes it possible to control for inflation expectations in a straightforward way, to exploit cross-sectional variability, and to use information on each firm's exposure to international competition. The effects of globalization are likely to be quite different depending on firms' characteristics, as they operate through firm-specific channels: marginal costs may have become less sensitive to the business cycle, as the threat of locating activities offshore in China, India, or Eastern Europe diminishes the power of workers to claim higher wages (via overtime compensation or production premia) at a time of increasing pressure on labor utilization by the firm; increased competition from emerging countries may have decreased the scope of a firm to move its prices in response to a cyclical rise in marginal costs, affecting the cyclical behavior of its profit margins.

We start from the definition of the change in prices by firm i:

$$\Delta p_{i,t} = \Delta mc_{i,t} + \Delta \mu_{i,t}, \tag{2}$$

[12] Equation (1) is from Ball (2006). The International Monetary Fund (2006) and Ihrig et al. (2007) follow a similar approach.

where $p_{i,t}$ is the price set by firm i in year t, $mc_{i,t}$ stands for marginal labor costs, and $\mu_{i,t}$ stands for the markup (all variables are in logs).[13] We adopt the assumption that all prices are adjusted within a single year. While simplifying the notation, such an assumption is not unreasonable in light of the existing evidence on price revisions.[14]

To derive a firm-level supply function, two features are then taken into account: marginal labor costs are affected by the degree of capacity utilization; adjustments in markups may compensate for part of the cyclical movements in marginal costs. It is convenient to express the change in marginal labor cost as the sum of the change in the national contractual wage, w_t^C, and of a firm-specific wage component, $w_{i,t}^F$, less the change in labor productivity $\delta_{i,t}$:

$$\Delta mc_{i,t} = \Delta w_t^C + \Delta w_{i,t}^F - \Delta \delta_{i,t}. \tag{3}$$

In the Italian labor market setup,[15] national contractual wages w_t^C incorporate both a forward-looking and a backward-looking expectations term: $\Delta w_t^C = a\pi_{t|t-1} + (1-a)\pi_{t+1|t} + \varepsilon_t'$. The firm also faces a firm-specific upward-sloping supply curve for labor, as workers demand a higher wage to supply extra hours or enjoy overtime premia written into labor contracts:[16] the growth in the firm-level wage component is a positive function of the deviation of activity $y_{i,t}$ from its steady-state level $y_{i,t}^*$: $\Delta w_{i,t}^F = \gamma(y_{i,t} - y_i^*) + \varepsilon_{i,t}''$.[17]

$$\Delta mc_{i,t} = [a'\pi_{t|t-1} + (1-a')\pi_{t+1|t}] + \gamma\big(y_{i,t} - y_{i,t}^*\big) + \varepsilon_{i,t} \tag{4}$$

[13]Here we abstract from the cost of intermediate inputs, for the sake of notational simplicity. It is included later.

[14]In Italy firms are found to revise prices on average every ten to eleven months based on both micro quantitative data (Fabiani et al. 2006) and surveys (Fabiani, Gattulli, and Sabbatini 2007).

[15]National wage agreements are meant to safeguard purchasing power, based on the official forecast for inflation over the contract period (two years) at the time the contract was signed; productivity gains and real wage increases are mostly left to firm-level agreements (Brandolini et al. 2007).

[16]See Rotemberg and Woodford (1999).

[17]Under the assumption of firm-specific capital, fixed in the short run (Altig et al. 2005), labor productivity may also decrease with the deviation of activity from its steady-state level: $\Delta\delta_{i,t} = -\beta(y_{i,t} - y_{i,i}^*) + \nu_{i,t}''$. This effect is not included here for the sake of simplicity; it would not change the results in any substantial way.

A link between markups and cyclical conditions may derive from the existence of customer markets. An asymmetric reaction of demand to price increases and decreases may follow from the idea that the consumer is subject to search costs due to imperfect information on other firms' prices.[18] Ball and Romer (1990) show that in this case the desired markup is a function of the firm's relative price, $\mu_{i,t} = \mu_i - k(p_{i,t} - p_{t|t-1}) + \tau_{i,t}$, and therefore partly absorbs some of the cyclical movements in nominal marginal costs:

$$\Delta\mu_{i,t} = -\left(\frac{k}{1+k}\right)\Delta\left(w^F_{i,t} - \delta_{i,t}\right) + \varphi_{i.t}. \tag{5}$$

The individual firm's pricing equation is then

$$\Delta p_{i,t} = [a\pi_{t|t-1} + (1-a)\pi_{t+1|t}] + \left(\frac{\gamma}{1+k}\right)\left(y_{i,t} - y^*_{i,t}\right) + \eta_{i,t}. \tag{6}$$

We interpret the arguments advanced in support of the "globalization and the Phillips curve" hypothesis as implying that, as an effect of delocalization, the slope of firm-specific labor supply curves, γ, decreases, since firms are able to outsource production in times of increasing demand. In addition, we interpret it as also implying that, since firms face new foreign competitors and risk losing their customers if they increase prices, k increases and desired markups absorb a larger part of the cyclical movements in marginal costs.[19] As a result, a decrease in $\gamma/(1+k)$ is the conjecture we want to test.

Averaging (6) over firms, an aggregate Phillips curve of the same form as (1) above could be obtained. However, the estimate of (6) is not affected by the usual problems since it is possible to control for inflation expectations, $\pi_{t+1|t}$, and to take advantage of cross-firm variability.

[18] Rotemberg and Woodford (1999) survey a wide range of models of variable desired markups, based on variable elasticity of demand, on customer markets (where firms set prices not only to maximize current profits but also to expand their customer base in the future), on implicit collusion, and on variable firm entry.

[19] Ball and Romer (1990) show that such an implication requires the assumption that, if prices are kept at their current level, most buyers remain with their original sellers.

We write an augmented version of (6):

$$\Delta p_{i,t} = s_i + d_t + a_1 CU_{i,t} + b_1\left(\lambda_i \Delta W_t^{NAT}\right) + b_2(1-\lambda_i)\Delta P_t^{INP} + \eta_{i.t}, \tag{7}$$

where time fixed effects d_t control for inflation expectations $(\pi_{t|t-1}, \pi_{t+1|t})$, which are assumed equal across agents. $CU_{i,t}$ is the observed degree of capacity utilization at firm level, which proxies for $(y_t - y_t^*)$. Individual fixed effects s_i control, among other things, for a firm-specific steady-state level of capacity utilization, CU_i^*. Two additional regressors are included to fully account for price determinants: the change in the price of intermediate inputs (ΔP_t^{INP}) times their share over the firm's variable costs $(1-\lambda_i)$, and the change in national contractual wages (ΔW_t^{NAT}) times labor's share over the firm's variable costs (λ_i) ($b_1 = b_2 = 1$ is expected).

We first assess whether the observed flattening of the macroeconomic Phillips curve can be replicated at the micro level by a corresponding decrease in a_1 in (7). This should not be the case if the change in the slope observed at the macroeconomic level is only a statistical artefact due to the dynamics of inflation expectations, à la Sargent, Williams, and Zha (2006).

We then interact $CU_{i,t}$ with firm-specific measures of exposure to globalization $(T_{i,t})$:

$$\begin{aligned}\Delta p_{i,t} = {} & s_i + d_t + a_1 CU_{i,t} + a_2 T_{i,t} CU_{i,t} + b_1\left(\lambda_i \Delta W_t^{NAT}\right) \\ & + b_2(1-\lambda_i)\Delta P_t^{INP} + \eta_{i.t}.\end{aligned} \tag{7a}$$

We choose $T_{i,t}$ in several alternative ways: the firm-level share of export over sales (the closer micro counterpart of (1) above), to single out those firms whose pricing power is reduced by exposure to competitive pressures on their export markets; the Asian share in Italian imports of the firm's (three-digit) type of product, an indicator of competitive pressures exerted from low-cost producers on Italian firms' domestic markets; and a dummy taking value 1 if in a specific year the firm was carrying productive activity abroad, to single out those firms who are able to shift production offshore and are therefore less affected by pressures on resource utilization. The assumption that globalization affected the slope of supply curves implies $a_2 < 0$.

A variant of the previous experiment is based on the idea that the economically relevant increase in international integration was largely fostered by a single institutional event, China's joining the WTO (November 2001); competitive pressures exerted by China are mostly price based and are particularly relevant for Italy's labor-intensive, low-technology productions. As an interaction variable, we use an aggregate measure of the share of trade with China into Italian trade (TC_t), which starts accelerating in 2001 (figure 2); in addition, we exploit the information on the firms who declare that their competitors are Chinese (identified by a dummy D_i) to split the sample. We expect $a_4 < 0$.

$$\begin{aligned}\Delta p_{i,t} = {} & s_i + d_t + a_1 CU_{i,t} + a_2 TC_t CU_{i,t} + b_1\left(\lambda_i \Delta W_t^{NAT}\right) \\ & + b_2(1-\lambda_i)\Delta P_t^{INP} + \eta_{i.t} + D_i\left[d_t + a_3 CU_{i,t} + a_4 TC_t CU_{i,t}\right. \\ & \left. + b_3\left(\lambda_i \Delta W_t^{NAT}\right) + b_4(1-\lambda_i)\Delta P_t^{INP}\right] \qquad (7b)\end{aligned}$$

For these purposes, we need firm-level information on price changes and on the degree of capacity utilization. In addition, we need to find measures of the firms' exposure to international competition, focusing on export orientation, on foreign penetration in the domestic market, on the possibility to delocalize production, and on the presence of foreign competitors.

3. The Data

We obtain data from the Bank of Italy's annual Survey of Investment in Manufacturing (SIM). The SIM is an open panel of about 1,200 firms, which contains specific information on individual Italian manufacturing firms since 1978.[20] During the last two decades, the survey has been extensively used to investigate a large number of topics.[21]

[20] Services firms were only recently included in the survey, which is currently known as the Survey of Industrial and Services Firms. See http://www.bancaditalia.it/statistiche/indcamp/indimpser. Each year about 15–20 percent of firms are dropped from the sample due to attrition and are replaced by firms with comparable characteristics.

[21] Full references can be found in Gaiotti and Secchi (2006). For recent research, see Bugamelli (2007) and Bugamelli, Fabiani, and Sette (2009).

Data are collected at the beginning of each year, relative to the previous year, by interviewing a stratified sample of firms with more than fifty employees (smaller firms have only been included since 2003).[22] The survey includes information on employment, investment, production, and technical capacity, as well as on specific topics that change year by year. Data revision is carried out by officials of the Bank of Italy. A special effort is made to keep information as closely comparable as possible in subsequent years.

A major advantage of SIM is that it contains information on a number of variables that are not usually available. For our purposes, since 1988, firms have been asked to report the percentage change in the average price of goods sold. The firm-level rate of capacity utilization is also available, as the answer to the question, What is the ratio between actual production and the level of production which would be possible by fully using the available capital goods and without changing labor inputs?

Our complete sample, obtained by dropping all the data points for which information on either price changes or capacity utilization is missing, covers the period 1988–2005; it includes 18,943 observations and between 800 and 1,600 firms per year (table 1). The average stay of a firm in the sample is five years. The sample is broadly representative of the industry composition of the Italian economy; it tends to be slightly biased toward larger firms.

Descriptive statistics on the two main variables are reported in table 2. The average annual price change is around 2 percent; there is a high degree of variability across firms. As for capacity utilization, firms on average report that they are using 80 percent of their capacity; the dispersion of this variable is relatively high, ranging from 100 to 40 percent, with a few observations below this value. Capacity utilization is also closely connected to movements of the firm-specific component of marginal costs.[23]

[22]The sample is stratified according to sector (two-digit classification of the Italian National Institute of Statistics, Istat), size (number of employees), and geographical location (region).

[23]Simple regressions show that a ten-point increase in capacity utilization (the median absolute change in our sample) is correlated to an increase in labor compensation per capita of about 1 percent, an increase in total costs per unit of output of about 2 percent, and a greater recourse to overtime hours of about 0.1 percent of total hours. For details, see the working paper version of this research (Gaiotti 2008).

Table 1. Sample Composition

By Year		By Employees		By Industry	
1988	768	0–49	210	Extractive industries (energy)	25
1989	799	50–99	4,987	Mining (non-energy)	64
1990	760	100–199	4,988	Food	2,050
1991	795	200–499	4,870	Textiles and clothing	2,657
1992	795	500–999	2,132	Leather and leather products	854
1993	766	1,000+	1,756	Wood, furniture	323
1994	777			Paper and paper products, publishing and printing	897
1995	828			Coke, refined petroleum products, nuclear fuel	53
1996	950			Chemicals, synthetic fibers	1,324
1997	891			Rubber and plastic products	883
1998	937			Non-metallic mineral products	1,517
1999	1,010			Metals, metal products	2,361
2000	1,291			Mechanical equipment and machinery	2,691
2001	1,580			Electrical equipment	1,372
2002	1,607			Automotive industry	995
2003	1,587			Other manufacturing	740
2004	1,250			Electricity, water, gas supply	137
2005	1,552				
	18,943		18,943		18,943

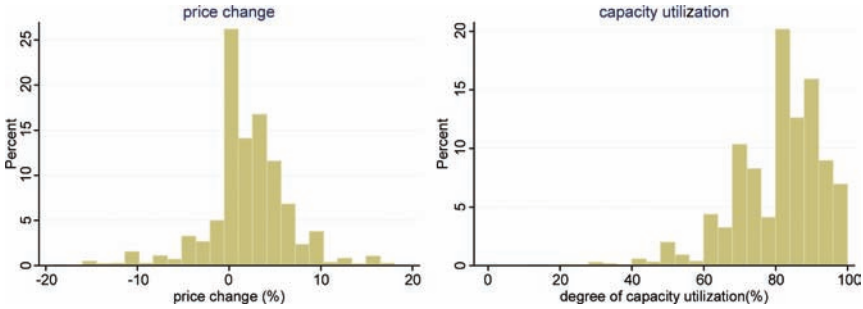
Note: Number of observations.
Source: Survey of Investment in Manufacturing (SIM).

Table 2. Descriptive Statistics: Prices and Capacity Utilization

	Mean	Standard Dev.	Quantiles				
			1%	10%	50%	90%	99%
Price Change	2.3	6.1	−15.0	−3.0	2.0	8.0	20.0
Capacity Utilization	80.2	12.8	40.0	65.0	80.0	95.0	100.0

Source: Survey of Investment in Manufacturing (SIM).

Figure 3. Distribution, All Years



Source: Survey of Investment in Manufacturing (SIM).

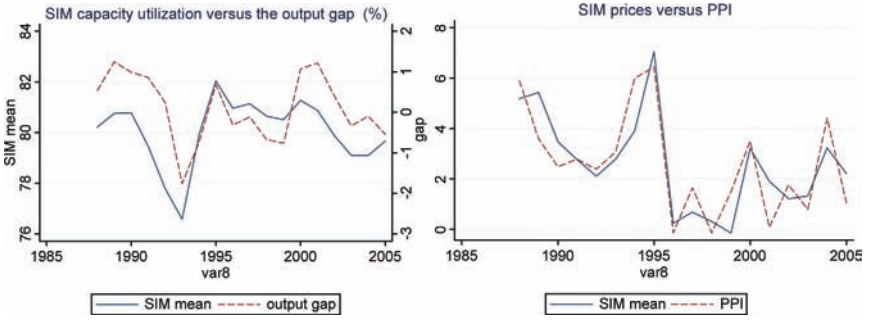
The advantage of working with firm-level data can be further appreciated in figure 3, which reports the overall (all years) distribution of price changes and capacity utilization. There is a lot of heterogeneity to be exploited across firms. The share of firms that change their prices each year is on average around 80 percent; this value is in line with research on price stickiness in Italy, which found that firms change prices on average every ten to eleven months.

The reliability of our firm-level measures can be assessed by comparing them with their macroeconomic counterparts: the PPI constructed and produced by the Italian National Institute of Statistics (Istat) and the output gap (figure 4). It is quite clear that the measures are closely correlated. The correlation of the annual sample mean of price changes with PPI inflation is around 0.85. The movements in the degree of capacity utilization in SIM also track the corresponding behavior of the output gap in the whole economy quite well (the correlation coefficient is 0.53).

The survey also includes information on firms' characteristics which makes it possible to assess their different exposure to globalization (table 3).

The first piece of information is *the share of firms' sales that are exported*. Firms exposed to increasing competition on their external markets may be more prone to compensate for cyclical movements in marginal costs through markups to defend market shares. On average in 2005, firms in the sample exported 35 percent of their sales. The cross-sectional dispersion was large: the upper decile of the export/sales ratio was almost 80 percent, while the lower decile

Figure 4. Prices and Capacity Utilization versus PPI and the Output GAP



Source: Survey of Investment in Manufacturing (SIM). PPI, GDP: Istat. The output gap is the annual mean of the deviation of quarterly GDP from its trend, obtained with a Hodrick-Prescott filter ($\lambda = 1,600$).

was zero. According to this particular measure, international integration is increasing: as also shown in figure 5, the average propensity to export increased by 7 percentage points since 1990.

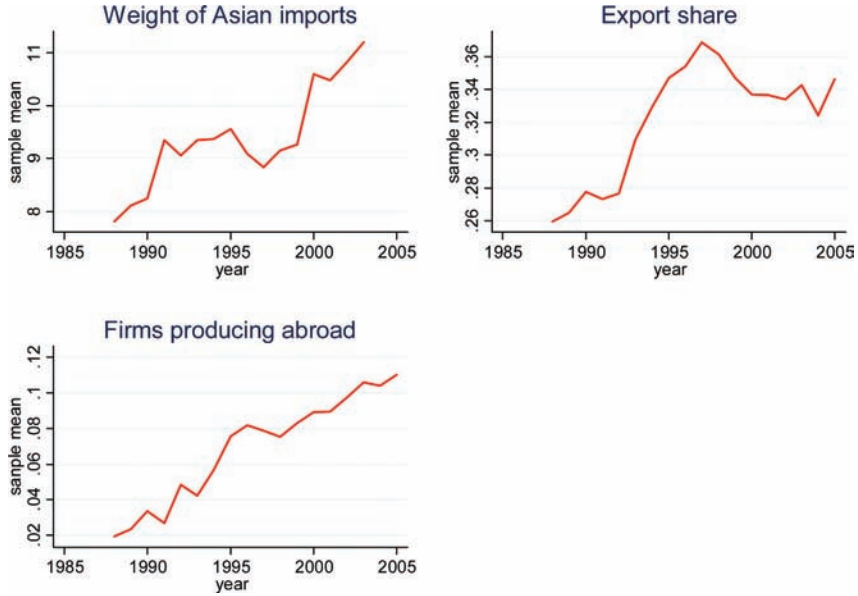
A second piece of information is *the (three-digit) type of product* of the firm, which can be matched with information on the *importance of imports from Asia* for that product. This classification, in contrast with the previous one, is designed to assess the degree of foreign competition faced by Italian firms in their domestic market.

Table 3. Descriptive Statistics: International Integration

	In 1990:	**In 2005: (1)**						
				Quantiles				
	Mean	**Mean**	**Standard Dev.**	**1%**	**10%**	**50%**	**90%**	**99%**
Export Share	27.7	34.6	30.3	0	0	29.3	79.0	97.2
Weight of Asian Imports	8.2	11.2	9.7	0.02	1.4	6.8	26.9	35.2
Firms Producing Abroad	3.4	11.0	31.3	0	0	0	1	1

Source: Survey of Investment in Manufacturing (SIM). (1) For "weight of Asian imports," 2003.

Figure 5. International Integration in the Sample



Source: Survey of Investment in Manufacturing (SIM).

For each three-digit product type, we consider the share of imports from Asia in relation to total Italian imports using data from the World Trade Analyzer of Statistics Canada over 1988–2003.[24] In the sample, in 2003 the average ratio of Asian to total imports was 11 percent (table 3). Across firms, it ranged from 27 percent (upper decile) to almost nil (lower decile). Asian presence was highest in sectors such as toys, textiles, and sporting goods and lowest in sectors such as drinks, milk, and food (table 4). It has been steadily increasing through the sample period (figure 5).

Questions on *the delocalization of productive activity* were also included in the SIM in 2003 and in 2004. Workers in companies that are delocalizing production may make less aggressive demands for increased overtime compensation or production premia when

[24]For a few industries, information at the three-digit level was not available, reducing available observations for this variable from about 19,000 to around 16,000.

Table 4. Weight of Italian Imports from Asia, by Type of Product

Industry		
231	Manufacture of coke oven products	57.2%
365	Manufacture of games and toys	54.9%
192	Manufacture of luggage, handbags and the like, saddlery and harness	47.7%
183	Dressing and dyeing of fur; manufacture of articles of fur	38.3%
364	Manufacture of sports goods	35.6%
354	Manufacture of motorcycles and bicycles	35.2%
267	Cutting, shaping, and finishing of ornamental and building stone	30.0%
174	Manufacture of made-up textile articles, except apparel	28.7%
366	Miscellaneous manufacturing n.e.c.	28.4%
181	Manufacture of leather clothes	27.7%
182	Manufacture of other wearing apparel and accessories	27.7%
193	Manufacture of footwear	27.0%
363	Manufacture of musical instruments	26.3%
247	Manufacture of man-made fibers	26.0%
262	Manufacture of non-refractory ceramic goods other than for construction purposes	21.6%
171	Preparation and spinning of textile fibers	21.5%
172	Textile weaving	21.5%
261	Manufacture of glass and glass products	21.1%
335	Manufacture of watches and clocks	20.7%
297	Manufacture of domestic appliances n.e.c.	20.7%
175	Manufacture of other textiles	18.7%
292	Manufacture of other general purpose machinery	18.7%
315	Manufacture of lighting equipment and electric lamps	17.8%
322	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	17.4%
323	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus	17.0%
101	Mining and agglomeration of hard coal	17.0%
334	Manufacture of optical instruments and photographic equipment	16.9%
314	Manufacture of accumulators, primary cells and primary batteries	16.9%
362	Manufacture of jewelry and related articles	15.4%
287	Manufacture of other fabricated metal products	15.4%
252	Manufacture of plastic products	14.7%
205	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	14.6%

(continued)

Table 4. (Continued)

Industry		
141	Quarrying of stone	13.7%
142	Quarrying of sand and clay	13.7%
143	Mining of chemical and fertilizer minerals	13.2%
286	Manufacture of cutlery, tools and general hardware	13.0%
204	Manufacture of wooden containers	12.9%
153	Processing and preserving of fruit and vegetables	10.8%
251	Manufacture of rubber products	10.5%
930	Other service activities	10.0%
316	Manufacture of electrical equipment n.e.c.	9.1%
152	Processing and preserving of fish and fish products	8.9%
263	Manufacture of ceramic tiles and flags	8.0%
264	Manufacture of bricks, tiles and construction products, in baked clay	8.0%
294	Manufacture of machine tools	7.5%
313	Manufacture of insulated wire and cable	7.3%
145	Other mining and quarrying n.e.c.	7.1%
291	Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	6.4%
295	Manufacture of other special purpose machinery	6.2%
241	Manufacture of basic chemicals	6.2%
154	Manufacture of vegetable and animal oils and fats	5.5%
212	Manufacture of articles of paper and paperboard	5.4%
271	Manufacture of basic iron and steel and of ferro-alloys	5.2%
272	Manufacture of tubes	5.2%
273	Other first processing of iron and steel	5.2%
156	Manufacture of grain mill products, starches and starch products	4.9%
332	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes	4.9%
203	Manufacture of builders' carpentry and joinery	4.0%
923	Other entertainment activities	3.9%
341	Manufacture of motor vehicles	3.2%
232	Manufacture of refined petroleum products	3.0%
268	Manufacture of other non-metallic mineral products	2.9%
202	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fiber board and other	2.8%
293	Manufacture of agricultural and forestry machinery	2.8%
158	Manufacture of other food products	2.7%
343	Manufacture of parts and accessories for motor vehicles and their engines	2.6%
331	Manufacture of medical and surgical equipment and orthopedic appliances	2.3%

(continued)

Table 4. (Continued)

Industry		
132	Mining of non-ferrous metal ores, except uranium and thorium ores	2.2%
201	Sawmilling and planing of wood; impregnation of wood	2.2%
243	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	2.2%
246	Manufacture of other chemical products	2.0%
266	Manufacture of articles of concrete, plaster and cement	1.9%
221	Publishing	1.9%
157	Manufacture of prepared animal feeds	1.8%
222	Printing and service activities related to printing	1.8%
742	Architectural and engineering activities and related technical consultancy	1.8%
274	Manufacture of basic precious and non-ferrous metals	1.7%
265	Manufacture of cement, lime and plaster	1.5%
244	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	1.4%
211	Manufacture of pulp, paper and paperboard	1.3%
159	Manufacture of beverages	0.9%
131	Mining of iron ores	0.8%
245	Manufacture of basic pharmaceutical products	0.8%
282	Manufacture of tanks, reservoirs and containers of metal	0.7%
921	Motion picture and video activities	0.3%
144	Production of salt	0.2%
155	Manufacture of dairy products	0.1%
151	Production, processing and preserving of meat and meat products	0.0%
111	Extraction of crude petroleum and natural gas	0.0%
103	Extraction and agglomeration of peat	0.0%
401	Production and distribution of electricity	0.0%

Note: Share of imports from Asia over total Italian imports.
Source: World Trade Analyzer, Statistics Canada.

activity rises. In 2004, about 11 percent of firms declared that "they produced goods or services abroad using branches, subsidiaries, or controlled companies."[25] The survey also asked about the timing of delocalization. Among the respondents who outsourced part of their

[25]In addition, 13 percent declared that they had commercial deals with foreign firms and 8 percent said that they had production agreements with foreign firms.

Table 5. Competitors, by Geographical Area

	In Industrial Countries	In Other Countries	In China
Cheap Products	9.7%	28.8%	27.2%
Average Price/Quality Ratio	24.6%	13.9%	3.5%
Medium/High Quality	21.2%	6.7%	1.1%
Very High Quality	9.3%	2.5%	0.6%
Not Applicable	8.8%	17.1%	28.5%
Don't Know	7.1%	9.5%	12.0%
Don't Answer	19.3%	21.6%	27.2%
Total	100%	100%	100%
# of Observations	1,587	1,587	1,587

Source: Survey of Investment in Manufacturing (SIM), 2003 questionnaire. Distribution of answers to the question "what is the average quality of your competitors' products?"

production, 50 percent did so after 1999; almost 40 percent between 1990 and 1998; only 7 percent in the 1980s; and 4 percent in the 1960s or in the 1970s. Based on this information, we construct a 0–1 dummy for each firm, taking value 1 in the year the firm starts to have some productive activity abroad. According to this measure, the share of firms producing abroad increased from 3 percent in 1990 to 11 percent in 2005 (table 3).[26]

Other non-time-varying firm characteristics can be recovered from the answers to occasional questions introduced in the survey in particular years. Based on the 2003 survey, it is possible to directly assess whether firms *face Chinese (or generally foreign) competitors for their products,* exploiting a question on the average quality of the firm's own products and of its competitors' products; among the latter, firms were asked to distinguish between industrialized countries, other countries, and China (table 5). We define as "firms exposed to Chinese competition" those that in 2003 answered the question on the quality of their Chinese competitors' products with replies other than "do not know" or "not applicable." According to this definition, about 65 percent of respondents had competitors from

[26]Information for 2005 was extrapolated.

industrialized countries, while around 30 percent had competitors from China in that year.

Among the remaining variables entering equation (7), national contractual wages and the input deflator in manufacturing are from Istat.[27] The firm-specific ratio of labor costs over variable costs (λ_i) is taken from Gaiotti and Secchi (2006); it is constructed by merging the SIM with the Central Accounts Data Service (firms' balance sheets), taking the average share over the sample period for each firm.

4. Main Findings

4.1 Benchmark Specification

Table 6 shows that the flattening of the Phillips curve observed in the main industrial countries is confirmed for Italy. The table reports the results of a regression of quarterly inflation on the output gap (measured as the deviation of GDP at constant prices from its HP-filtered trend) and its own lags. The effect of a change in the output gap on inflation has constantly decreased since the 1970s. As shown in the last row of the table, in 1998–2006 a 1 percent increase in the output gap caused inflation to increase by slightly more than 0.2 percentage points after three quarters; the same effect was almost double this large in the previous decade, and almost six times larger in the 1970s. The table also reports the results of a break-point test, which clearly rejects the hypothesis of coefficient stability.[28]

The estimates of equation (7) are reported in the first column of table 7. Two conclusions stand out. The estimate of a_1 is positive, around 0.03, and statistically significant. The size of the effect is also plausible; the magnitude of the coefficient is comparable with the macro estimates, once the different metrics of capacity utilization

[27] The intermediate input deflator is the ratio of the difference between production and value added at 1995 prices and the difference between production and value added at current prices.

[28] The table reports a sup-Chow statistic (the highest statistics from a sequence of Chow tests with varying break dates) and the asymptotic critical value reported by Andrews (1993). The estimation covers the last two decades for a comparison with the sample period of our micro data sample.

Table 6. The Phillips Curve in Italy

	Inflation 1970–1979	**Inflation 1980–1989**	**Inflation 1990–1997**	**Inflation 1998–2006**
Output Gap	0.46 (**)	0.18	0.09	0.08 (*)
	0.18	*0.15*	*0.06*	*0.04*
Lagged Inflation (1)	0.94 (**)	0.96 (**)	0.90 (**)	0.72 (**)
	0.05	*0.02*	*0.06*	*0.09*
R2	0.93	0.98	0.94	0.90
Effect of Gap on Inflation After 3Q (2)	1.69	0.61	0.40	0.29
	0.52	*0.52*	*0.30*	*0.12*
Stability Test (3)	$\chi 2(6) = 80.54$		(Critical Value at 5%: 20.26)	

Notes: OLS estimate of $\pi_t = b_0 + b_1 ygap_{t-1} + \sum_{i=1}^{4} c_i \pi_{t-i}$, where π_t is four-quarter CPI inflation; $ygap_t$ is the deviation of GDP at constant prices from its trend (obtained with an HP filter); t is quarters. Standard errors are shown below the estimates. (**): significance at 1 percent; (*): significance at 10 percent. (1) Sum of coefficients on lagged inflation, Σc_i. (2) Implied effect of a 1-percentage-point persistent increase in the output gap on inflation after three quarters. (3) Sequential Sup-Chow χ^2 statistics. Estimation period: 1986–2006. Robust standard errors. The asymptotic critical value is from Andrews (1993), Table 1 (with parameter $\pi_0 = .15$ and degrees of freedom p = 6).

Table 7. Benchmark Specification

	Δ Price	**Δ Price**	**Δ Price**	**Δ Price IV (1)**
$CU_{i,t}$	0.031 (**)	0.031 (**)	0.034 (**)	0.050 (**)
	0.006	*0.005*	*0.007*	*0.019*
$\Delta W_t^{NAT}\lambda_i$	0.476 (*)		0.547 (*)	0.432 (*)
	0.219		*0.265*	*0.304*
$\Delta P_t^{INP}(1-\lambda_i)$	0.996 (**)		1.098 (**)	1.190 (**)
	0.12		*0.133*	*0.113*
Lagged Dep.			0.014	
			0.02	
Time Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R2	0.12	0.10	0.09	0.12
Period	1988–2005	1988–2005	1988–2005	1990–2005
Obs.	14,783	18,943	11,059	8,492
Hausman Test (2):				$\chi 2(19) = 0.47$ (P = 100%)

Notes: Estimate of equation (7) in main text. Dependent variable: change in firm's prices; robust standard errors in italics. IV = fixed-effect instrumental variable estimator. (**): significance at 1 percent. (*): significance at 10 percent. *CU:* firm-level degree of capacity utilization. ΔW^{NAT}: change in nationwide contractual wages. Δ^{INP}: percentage change in the intermediate input deflator in manufacturing. λ_i: firm-specific average ratio of labor costs to variable costs. (1) Instruments: lagged capacity utilization and dummy taking value -1 when the firm is facing low demand, $+1$ when it is facing high demand, and zero otherwise. (2) Hausman test for H_0: that an FE estimator of the equation in the third column is consistent and efficient, against the alternative that only IV-FE is consistent.

and the output gap has been taken into account.[29] The estimates of coefficients b_1 and b_2, on the change in national contractual wages and on the change in intermediate input costs (each multiplied by the respective average share), are statistically significant, have the expected sign, and are of the expected magnitude.[30]

The remaining columns present robustness checks. In the second column, the controls for input costs are dropped; the estimates of a_1 are unaffected. The third column presents the results of estimates which also include the lagged dependent on the right-hand side: the estimated coefficient on $\Delta p_{i,t-1}$ is negligible (0.01) and not statistically different from zero.[31] Finally, in the fourth column, instrumental variables (IV) are used to address the potential endogeneity of $CU_{i,t}$. The instruments used are the variables' lagged values and a qualitative proxy for firm-specific shocks to demand, constructed from a question included in the SIM.[32] A Hausman test overwhelmingly fails to reject the null hypothesis that the FE estimator is consistent and efficient.

To investigate the existence of a break, in figure 6, we report rolling estimates of a_1, performed by running a series of regressions on panels covering a four-year span, starting with the period 1989–92 and then moving the window forward. The results are shown together with 95 percent confidence bands. While the estimated coefficients somehow decrease over time, they mostly remain within the previous periods' confidence bands. Moreover, the decrease is fully

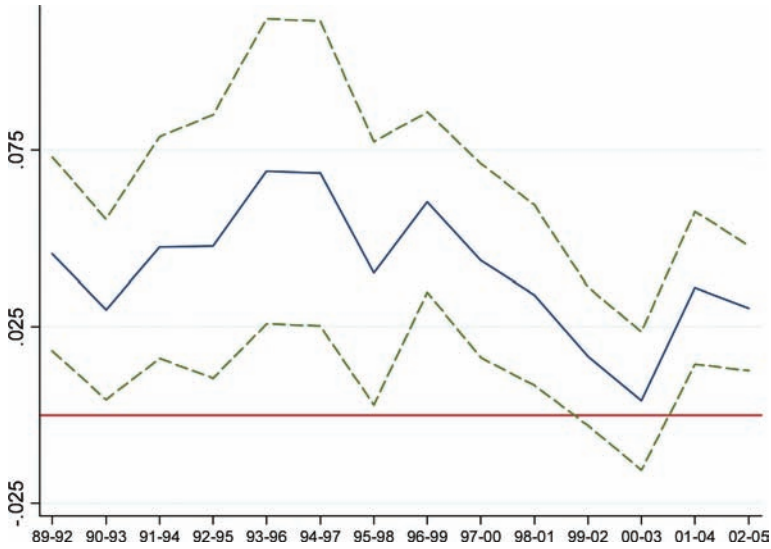
[29] A change in the output gap of 1 percentage point corresponds to a change in the sample mean capacity utilization in SIM of about 2.5–3.0 percentage points. Hence, our estimate of a_1 corresponds to an effect of the output gap on prices of about 0.08–0.09 within a year.

[30] The coefficient on contractual wages is lower than 1 (about 0.6), but this is a common finding (Gaiotti and Secchi 2006).

[31] The fixed-effects (FE) estimator may result in downward-biased estimates of the autoregressive coefficient; however, its use is appropriate when the number of time periods is reasonably large, as in our sample. Alternative experiments run with a GMM first-difference estimator, not reported, still yielded results not significantly different from those in the table (while implying the loss of a considerable number of observations).

[32] A dummy, taking value 1 in the case of an increase in demand, −1 in the case of a decrease in demand, and zero otherwise, is based on two pieces of information: whether the firm judges that the deviation between actual and previously planned investment was due to unexpected demand behavior, and the quantitative difference between actual and planned investment.

Figure 6. Rolling Estimates



Notes: Rolling window estimate (four-year panel) of coefficient a_1 in equation (7) in text. Horizontal axis: estimation period.

reverted at the end of the period. To complement this result, table 8 also reports a stability test for an unknown break-point (first row). The null hypothesis of no structural break cannot be rejected, as the statistics is substantially below the critical value for a 5 percent confidence level.

How can these results be reconciled with the macro evidence? The obvious conjecture is that the observed break in the macro

Table 8. Stability Test for Equation (7)

	Statistics	**Critical Value (5%)**
Time Dummies Included	2.37	9.31
Time Dummies Not Included	265.6	9.31

Notes: Sequential Chow χ^2 statistics derived running a sequence of tests for all possible breaks in coefficient a_1 in equation (7). Estimation period: 1988–2005. The asymptotic critical value is from Andrews (1993), Table 1 (based on $\pi_0 = .10$ and degrees of freedom p = 1).

equation is due to an econometric misrepresentation of inflation expectations, along the lines of Sargent, Williams, and Zha (2006), rather than being otherwise rooted in micro behavior. Indeed, if we rerun the sequence of Chow tests reported above by omitting the time dummies d_t from equation (7), we now find significant evidence of instability, as shown in the second row of table 8, resembling the results obtained for the aggregate time series. Since omitting d_t amounts to omitting controls for inflation expectations, this is a first suggestion that a change in the monetary regime is likely to be the crucial element in driving the flattening of the Phillips curve, and that only by disregarding the importance of inflation expectations can macro results be replicated.

4.2 Interactions

The first three columns of table 9 present the results from model (7a). The interaction term, $T_{i,t}$, is defined alternatively as the export share (first column), the Asian presence on domestic markets (second column), and the dummy indicating that productive activity is partly conducted abroad (third column). All in all, the assumption that globalization has no connection with the flattening of the supply curve is never rejected. While the point estimate of coefficient a_2 is negative in all cases, which would be consistent with the "globalization and the Phillips curve" hypothesis, the coefficients are always very poorly estimated, and they are never significantly different from zero in a statistical sense. The result is confirmed when all three interactions are included simultaneously (fourth column).

A significantly negative value for a_2 can only be obtained by rerunning the regressions after dropping the time dummies d_t. As shown in the last three columns of the table, the coefficient a_2 now becomes marginally significant for all regressions. A tentative interpretation is that only by disregarding controls for inflation expectations can a statistically significant correlation between the slope of the curve and international integration be observed at the micro level.

At any rate, the point estimates of a_2 indicate that the effect of the increase in international integration on the average slope of the curve are, at most, minor. This is shown in table 10. For each

Table 9. Interactions

	Δ Price	Δ Price	Δ Price	Δ Price	Δ Price	Δ Price	Δ Price
(a_1) $CU_{i,t}$	0.033 (**)	0.029 (**)	0.032 (**)	0.031 (**)	0.042 (**)	0.035 (**)	0.038 (**)
	0.007	*0.008*	*0.007*	*0.009*	*0.007*	*0.008*	*0.007*
(a_2) $CU_{i,t}T_{i,t}$ (1)	−0.006			−0.009	−0.015 (*)		
	0.007			*0.008*	*0.007*		
(a_2) $CU_{i,t}T_{i,t}$ (2)		−0.026		−0.024		−0.040 (*)	
		0.020		*0.018*		*0.017*	
(a_2) $CU_{i,t}T_{i,t}$ (3)			−0.006	−0.005			−0.013 (**)
			0.004	*0.005*			*0.004*
(b_1) $\Delta W_t^{NAT}\lambda_i$	0.475 (*)	0.440	0.471 (*)	0.443 (*)	1.038 (**)	1.123	1.056 (**)
	0.219	*0.251*	*0.219*	*0.251*	*0.088*	*0.101*	*0.088*
(b_2) $\Delta P_t^{INP}(1-\lambda_i)$	0.997 (**)	1.080 (**)	0.973 (**)	1.081 (**)	0.606 (**)	0.684	0.602 (**)
	0.12	*0.134*	*0.118*	*0.134*	*0.037*	*0.044*	*0.038*
Time Fixed Effects	Yes	Yes	Yes	Yes	No	No	No
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.12	0.13	0.12	0.13	0.06	0.07	0.06
Period	1988–2005	1988–2003	1988–2005	1988–2003	1988–2005	1988–2003	1988–2005
Observations	14,782	11,065	14,563	11,065	14,782	11,065	14,563

Notes: Estimate of equation (7a) in main text. Robust standard errors in italics. (**): significance at 1 percent; (*): significance at 10 percent. Definition of variables: see text. (1) T is the export/output ratio. (2) T is the weight of Asian imports in a firm's domestic market. (3) T is a dummy = 1 when the firm is producing abroad.

Table 10. International Integration and the Slope of the Supply Curve

	Interaction Variable:		
	Export Share	**Asian Imports**	**Production Abroad**
Slope in 1990 (a)	0.038	0.031	0.038
Coeff. on Interaction Term (b)	−0.015	−0.04	−0.013
Interaction Variable, 1990 (c)	0.28	0.08	0.03
Interaction Variable, 2005 (1) (d)	0.35	0.11	0.11
% Change in Slope, 1990–2005: b*(d–c)/a	−2.8%	−3.9%	−2.7%

Notes: (a) Coefficient a_1 (last three columns of table 9), less the product of (b)*(c). (b) Coefficient a_2 (last three columns of table 9). (c) and (d) See table 3. (1) For Asian imports, 2003.

of the three versions of the equation, the first row reports its estimated slope in 1990; the second and third row report the sample mean of the interaction variable, respectively, in 1990 and in 2005; and the last row reports the resulting percent change in the slope of the curve. The overall decrease is of the order of just 2–3 percent.

Finally, results for equation (9) are reported in table 11. As mentioned, TC_t measures China's penetration into the Italian market, while $D_i = 1$ identifies the firms who declare that their competitors are Chinese. Alternatively, we also consider two additional splits: the large exporters (an export/sales ratio larger than 0.5) and those firms that in 2004 declared that they produced goods and services abroad. For each regression, the second column reports the coefficient on each variable interacted with D_i assuming value 1 for that particular subgroup of firms.

The estimates for a_4 are reported in the second row and second column of each regression. The hypothesis that $a_4 = 0$ (no differential effects of opening to China on the sensitivity of prices to activity for the subgroup of firms) can never be rejected. Not only is the estimated coefficient never significantly different from zero, but for the first subgroup, the point estimate does not have the expected sign. If anything, the prices of the firms that directly face Chinese competitors became more, not less, reactive to their capacity constraints after 2001.

Table 11. Sample Splits

	Δ Price		**Δ Price**		**Δ Price**	
	Firms Non-Competing with Chinese Products	**Dummy for Firms Competing with Chinese Products**	**Non-Exporters**	**Dummy for Exporters**	**Firms Non-Producing Abroad**	**Dummy for Firms Producing Abroad**
$CU_{i,t}$	0.047 (**)	−0.030	0.037 (*)	0.025	0.040 (*)	0.035
	0.018	*0.038*	*0.02*	*0.04*	*0.02*	*0.06*
$CU_{i,t}TC_t$	−0.008	0.010	−0.003	−0.014	−0.004	−0.021
	0.008	*0.019*	*0.01*	*0.02*	*0.01*	*0.03*
$\Delta W_t^{NAT}\lambda_i$	0.316	0.851	0.571 (**)	−0.527	0.434 (*)	1.520
	0.249	*0.504*	*0.221*	*0.436*	*0.225*	*0.929*
$\Delta P_t^{INP}(1-\lambda_i)$	1.042 (**)	−0.209	1.198 (**)	−0.834 (**)	0.968 (**)	0.427
	0.139	*0.265*	*0.146*	*0.194*	*0.121*	*0.577*
Time Fixed Effects	Yes		Yes		Yes	
Firm Fixed Effects	Yes		Yes		Yes	
R2	0.12		0.12		0.12	
Period	1988–2005		1988–2005		1988–2005	
Observations	14,783		14,784		14,784	

Notes: Estimate of equation (7b) in main text. Robust standard errors in italics. (**): significance at 1 percent. (*): significance at 10 percent. *CU*: firm-level degree of capacity utilization. *TC*: share of trade with China over total Italian trade. See main text for details.

5. Conclusions

It has been conjectured that the flattening of the Phillips curve observed at the macroeconomic level is a structural feature of advanced economies, and that it is a consequence of globalization. The most compelling arguments rely either on a change in the behavior of individual firms' markups, which may have become more countercyclical in order to defend market shares, or on a less upward-sloping curve for firm-specific inputs: companies that are delocalizing production may exploit a pool of labor more elastically supplied, and their workers may make less aggressive demands for increased overtime compensation when the level of activity rises.

We argued that a testable implication of this conjecture is that a change in the sensitivity of prices to capacity utilization is apparent not only in macroeconomic time series but also at the firm level, that this result is robust to controls for economy-wide inflation expectations, and that such a change has also been concentrated among the firms that are most exposed to international competition.

Using the micro data from the Bank of Italy's Survey of Investment in Manufacturing, we are able to test whether these implications are observable. The answer is either inconclusive or negative. A statistically significant flattening of the supply curve can only be replicated at the micro level by running a (possibly misspecified) regression which omits controlling time fixed effects. The interaction coefficient with various measures of firms' international integration has the expected sign, but it is not significantly different from zero and (more importantly) its point estimates indicate an economically irrelevant effect at the macro level. The effect of China's entry on firms that are most exposed to that country's competition was, if any, of the opposite sign to the one that could have been expected.

The results give no support to the conjecture that the flattening of the Phillips curve is rooted in the different behavior of individual firms exposed to competition. There seems to be little empirical ground in our data to discard the traditional view that a more moderate dynamic of inflation expectations is by far the main force driving the observed changes in the slope of the curve. In our view, the result suggests that institutional and policy changes

which occurred in the first half of the 1990s remain the most likely explanation of the macro findings. As far as the empirical evidence currently stands, monetary policymakers would be ill advised to reconsider their "beliefs" and their strategies.

While we find no support for the conjecture that globalization affected the Phillips curve, our results do not imply that it had no effect on firms' pricing. Our results are not inconsistent with the argument that trade is likely to have acted as a favorable direct shock on the prices of the firms that were most exposed to international competition, possibly with substantial benefits for the consumers. A thorough assessment of this issue is beyond the scope of this paper, although various pieces of empirical analysis for OECD countries, mentioned in the paper, seem to be consistent with this conjecture.

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