

## **Mark-ups and offshoring: an empirical assessment**

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*Abstract:* This paper analyzes the relationship between markups and imports taking into account one main feature of current trade flows: offshoring. Markups are estimated following the procedure suggested by Roeger (1995). Additionally, we parameterize the observed heterogeneity among firms to consider additional explanatory variables, namely product standardization and market concentration. The analysis uses a long panel dataset of Spanish manufacturing firms over the period 1990-2005. The results support the IMD hypothesis but only for final goods: the negative effect of import propensity is larger the more final-goods oriented imports are and the more homogeneous is the type of goods elaborated by firms. These results are confirmed with firm-specific regression analysis.

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## **1. Introduction.**

Many papers have analyzed the relationship between international trade and efficiency heterogeneity among firms in last years. Those papers address four well known channels throughout openness could have effects on efficiency. Firstly, trade openness enlarges markets, so firms can (potentially) take advantage of scale economies. In fact, this static effect has been traditionally a main force to support economic integration processes, such as custom unions. Secondly, trade openness is associated to increased product competition, which leads to dynamic efficiency gains: less productive firms close and, as consequence, average aggregated efficiency tends to increase. This reallocation effect has been extensively analyzed after the influential paper by Melitz (2003). Thirdly, market openness does not only makes accessible other destiny markets, but also lets firms to purchase intermediate goods and services in foreign countries. The mere principle of comparative advantage suggests that this change in the purchases origin induces efficiency advantages for domestic firms. Fourthly, market openness implies that firms have more access to foreign technology. Such technology could be directly incorporated in purchased goods, services and equipment goods. Additionally, the contact with foreign firms in domestic or foreign markets could also improve firm efficiency throughout spillovers effects.

Though the analysis of productivity has received in last years a huge attention, market openness should also have effects on other key performance variables. In particular, it is likely that markups, or the alternative measure of price-cost margins, are also affected. On the one hand, markups could vary insofar as changes in efficiency after market openness were not fully passed through final prices. On the other hand, changes in competitive pressures coming from easier access of foreign firms to domestic markets can also affect firm markpus. This is the classical argument supported by the IMD (Import as Market Discipline) hypothesis. Many papers have analyzed this issue for a long time, which obtains a considerable empirical support (see, for example, Levinhson (1993) and Harrison (1994)). Though not unanimously, most of the papers conclude that domestic markups are negatively associated with competitive pressure approached by imports<sup>1</sup>. The basic prediction is that trade openness increases the number of product varieties available and the elasticity of demand that domestic producers face.

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<sup>1</sup> See Tybout (2003) for a survey of the theoretical and empirical evidence.

The IMD hypothesis is formulated assuming that imports are considered final goods and, presumably, almost perfect substitutes. In such a way, it does not take into account two main features of current trade flows: offshoring and intra-firm trade. Offshoring is defined here as intermediate imports, irrespective whether the supplier has or has not ownership links with the importing firm. Intra-firm trade refers imports coming from other firms with which the importer has ownership relationships. Both of them have been widely documented in the theoretical literature and have a strong empirical support (Helpman, 2006). However, in our knowledge only Egger and Egger (2004) have considered explicitly the distinction between intermediate and finished goods in the analysis of markups. They use an industrial panel dataset (NACE three-digit level) and price-cost margins are approached by an accounting measurement. Such approach of markups is very usual in the literature, due to it is easily computed. Though it is a suitable alternative with industrial aggregated data, it is only a approach to real firm markups and it hides heterogeneity within industries. As microdata have frequently shown, such heterogeneity should be large.

Following Egger & Egger (2004), in this paper the IMD hypothesis will be tested distinguishing between intermediated and final imports. Specifically, instead to approach mark-ups by accounting measures, we measure firm-level markups following the methodology suggested by Roeger (1995). A main advantage of this approach is that it allows us a direct and easy estimation of the markup component, avoiding the problems of simultaneity between inputs and productivity shocks in the Hall (1988) methodology. Though Olley and Pakes (1996) and Levinhson and Petrin (2003) have proposed approaches to solve that issue, the Roeger (1995) method circumvents the problem. It is based on subtracting the price-based from the primal Solow residual. This *net* Solow residual drops out the productivity shock that is present in both specifications (primal and dual).

This paper contributes to the literature in several ways. Firstly, in our knowledge, it is the first paper that analyzes the effects of *offshoring* on domestic markups using firm data. It enriches the empirical analysis taking into account the heterogeneity of performances across firms within specific industries. Besides, it allows us to approach more precisely the theoretical definition of markups (i.e., the ratio of price over marginal cost), instead of using an accounting proxy, at the same time that we discuss whether the predicted effect of import penetration is not only valid at the industrial level but also at the firm level.

A second contribution of this paper is that it combines a pooled regressions approach (firms and years) with results based on individual regressions for each firm, which is the best way to control unobserved heterogeneity. This is possible because we use a relatively long firm panel dataset (fifteen years) and we take advantage of the procedure suggested by Roeger (1995), which allows us a straightforward identification of markups with very few explanatory variables.

Thirdly, the paper also addresses explicitly the role of product differentiation in the relationship between trade openness and markups. We assume that the IMD hypothesis should be properly tested in a context of non-differentiated products. That is, import pressures would be more intensive when domestic products are almost perfect substitutes of imported goods. However, in a context of product differentiation, domestic firms could maintain market power even with foreign competitive pressure.

The main results of the paper are the following. Firstly, we obtain a predicted negative effect of imports on firm markups. This effect occurs whether firm penetration is defined at the sectoral or at the firm level. Secondly, the negative effect of import propensity is larger the more final-goods oriented imports are and the more homogeneous is the type of goods elaborated by firms. By the opposite, intermediate imports seem to act in the opposite direction, increasing slightly the corresponding markups. These results point out that, as was expected, pro-competitive effects of imports are relevant only in the context of final goods, while for intermediate imports pro-efficiency effects prevail. These results are robust both when we use a pooled-panel approach and firm-specific regression analysis.

The structure of the paper is as follows. Section 2 describes briefly the empirical model applied to estimate firm markups and the expected effects related to international trade variables. Section 3 describes the database and the variables, with special attention in the procedure followed to classify the type of imports. Section 4 discusses the results. Finally, Section 5 concludes.

## **2. Methodological framework.**

### **2.1. Markups and international trade.**

The Import as Market Discipline hypothesis (IMD) has received a relatively strong support in the context of the IO literature. From eighties, different theoretical models with imperfectly competitive product market have produced several predictions about the effects of an increased exposure to international trade on price-cost margins, firm size, exports, productivity and profitability of domestic firms. Tybout (2003) summarizes some of them and reviews the empirical results. The predictions of most of the theoretical models are that trade liberalization increases the number of product varieties available and the elasticity of demand that domestic producers face. That implies a decrease of mark-ups. The empirical evidence with industries data confirms this prediction. Using economic profits over sales as an approach of price cost margin, the ratio of imports to domestic consumption tends to be negative correlated with the profitability of domestic sales, especially when domestic concentration is high. The empirical evidence with plant-level panel data, and controlling for market shares, produces the same results: industries with wide exposure to foreign competition are associated with lower price-cost margin (see for example, Roberts and Tybout (1996)). Using an alternative methodology, the Hall approach, and allowing that the mark-up varies with trade liberalization, Levinsohn (1993) found that the mark-ups of Turkish manufacturing firms strongly fell with exposure to foreign competition since 1984. Following a similar approach, Harrison (1994) also test the effect of trade reform in Cote d'Ivoire in two performs variables: profit and productivity. He found that market power is higher in sectors with lower import penetration and larger tariffs. He also obtained a positive relation between more open trade policies and productivity growth. Note that this analysis focuses on inter-industry differences, while firm heterogeneity within industries does not play a relevant role.

Additionally, many theoretical models with imperfectly competitive product market predict that increased exposure to international trade can have effects on efficiency and profitability of domestic firms. With respect to efficiency, the influential paper by Melitz (2003) has stimulated an emerging literature that related the decision to export with observed intraindustry heterogeneity in productivity and size. In this model the exposure to trade implies two selection processes: only the most productive firms enter the export market and the less productive firms exit the domestic market. Both processes lead to a reallocation

towards more productive firms and the average productivity of the country increases. A main characteristic of such an approach is that it models the demand side using CES preferences which, as usual, generates constant markups. Though it is not the zero markup (i.e., the perfect competition framework) that it is present in the more traditional models of international trade, constant markup is at odds with observed heterogeneity across firms. Many other recent papers that build on this tradition, such as Yeaple (2005) and Bernard, Redding and Schott (2007), also assume constant markups<sup>2</sup>. An alternative approach was taken by Bernard et al (2003). In that case, markups are not fixed across firms, but the distribution is fixed in other characteristics of the model. In particular, it is invariant to geographic characteristics and trade barriers. Two firms exporting to the same country would have the same mark-up then. Their simulation results indicate that markups are not affected by changes in trade barriers.

More recently, Melitz and Ottaviano (2008) propose an alternative framework that establishes predictions on the distribution (average and variance) of four performance measures: productivity, size, price and markup. This model is based on a monopolistically competitive framework with heterogeneous firms and endogenous differences in the ‘toughness’ of competition across countries, reflected by the number and average productivity of competing firms in that market. This model follows many features of Melitz (2003) and, in particular, it predicts a distribution of domestic firms according to efficiency levels that is related to export activity, so that only more efficient firms (with higher markups) export. However, it has two specific characteristics that determine different (and more realistic) predictions about markup distribution. Firstly, demand side is specified using a linear demand system with horizontal product differentiation<sup>3</sup>. It allows authors to incorporate endogenous markups. Secondly, trade operates through an increase of product market competition, instead of through the increased labour market competition channel. Firms respond to this tougher product market competition by setting a lower markup that outweighs the selection effect according to which the most productive firms survive and set higher markups. This paper predicts that in a context of market openness surviving firms are more productive and set higher markups, but

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<sup>2</sup> In the Helpman and Krugman (1985) tradition, markups can vary if there is an effect of openness on the price-elasticity of demand. Obviously, this is the same effect that emphasized by the IMD hypothesis.

<sup>3</sup> Specifically, they incorporate endogenous markups using the linear demand system with horizontal product differentiation developed by Ottaviano, Tabuchi, and Thisse (2002). In that approach, price elasticity not only depends on the level of product differentiation, but also on average prices and the number of competing varieties.

the average markup is reduced. In other words, the pro-competitive effect outweighs the selection effect.

This model enriches the classical IMD hypothesis, integrating in a unified framework many effects related to market openness, simultaneously incorporating the selection and reallocation effects among heterogeneous firms. However, market openness is only qualified by market (country) size and trade costs among countries. There is not an explicit assessment for the type of import flows that qualify such openness. Notwithstanding, the impact of openness depends on the degree of substitutability among varieties: the larger it is, the larger the negative effect of imports on domestic markups. It seems logical to control for this effect in the empirical analysis.

Additionally, it is relevant to take into account that a main characteristic of current trade flows is that a large percentage of them is made up of intermediate goods (Hummels et al, 2001). A complementary strand of the literature has analyzed this issue more carefully. Antràs and Helpman (2004) develop a model where production entails relationship-specific investments by both the final-goods producers and suppliers. Such relationships evolve in an incomplete contracting setting. Their model analyzes the choices between integration and outsourcing and between domestic sourcing and foreign sourcing. As in Melitz's, the model predicts an association between firm productivity and the degree of involvement in international activities, so that more productive firms outsource in foreign markets, while less productive firms outsource domestically. Actually, the model also incorporates the decision about outsourcing or not (i.e., vertically integrating), following the Grossman and Helpman (2002) approach<sup>4</sup>. Antras and Helpman (2008) have generalized that model allowing that the degree of contractibility varies across inputs and countries.

Both Melitz and Ottaviano (2008) and Antràs and Helpman (2004) models predict that firms more involved in international activities (exports and international outsourcing) outperform those that do not follow such strategy. These predictions have received strong empirical support. Wagner (2006) reviews the results with respect to the relationship between export activity and productivity. Tomiura (2007), Altomonte *et al* (2008) and Fariñas and Martín

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<sup>4</sup> Grossman and Helpman (2002) had analyzed the industry equilibrium in the integration versus outsourcing decisions. That model did not consider geography and the treatment of contractual incompleteness was more rudimentary.

(2008), among others, find empirical support for imports and that such effect is bigger when they consider intermediate imports.

With respect to markups, Egger and Egger (2004) is the only analysis that distinguishes between intermediate and final imports. They point out that considering all imports as final goods underestimates the relevance of the IMD hypothesis. However, there is not reason why intermediate imports should depress domestic markups. Intermediate imports allow firms to optimize available resources, contracting out those processes that are less efficient to be provided in-house. Of course, it does not imply necessarily that firms engage in international trade flows. However, dramatic advances in technology, in particular related to transportation costs, has reduced substantially trade costs (e.g., search costs of an adequate external provider) and stimulated trade across larger distances.

It is worth mentioning here that we follow the convention of naming intermediate imports as offshoring, which identifies the relocation of processes to any foreign country<sup>5</sup>. Though there is not consensus about this term, we consider (as in the vast majority of papers) that it includes both intra-firm international outsourcing and arm's-length international outsourcing. In the first case, the foreign provider of the input is still owned by the firm, while in the second the foreign provider of the input is independent from the firm using the input. To disentangle these links among offshoring and intra-firm trade is very difficult with microdata<sup>6</sup>. In fact, the vast majority of papers use data for the US multinationals, due to very few countries have the type of highly disaggregated information required.

It should be mentioned that the distinction between intermediate and finished products has been used in other contexts. For example, Andersson and Fredriksson (2000) use it to assess intra-firm trade for Swedish-owned multinational firms, where they include a bundle of explanatory variables based on firm, affiliate and host country specific variables. Bardhan and Jaffee (2005) also analyze that issue for the US imports, with a special focus on the high-tech computer industry. However, in our knowledge, no previous paper has used this distinction to analyze differentiated effects of imports on markups with firm microdata.

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<sup>5</sup> It can include both goods and service trade. However, we do not afford the analysis of service offshoring in this paper, due to the lack of adequate data.

<sup>6</sup> See, for example, Konrad and Lommerud (2001) for an analysis of the theoretical links between FDI and intra-firm trade.

## 2.2 The empirical approach to markups.

The main empirical problem with markups is that, by contrast to productivity, it is not easy to be identified empirically. In an ideal world, researchers would observe prices and marginal costs, so markup  $\mu$  is merely defined as its ratio (or, in terms of price-cost margin, as  $1-1/\mu$ ). However, marginal costs are hardly approached and it is very unlikely that researchers have information on price levels. Actually, the most common situation is one in which the researcher has only information about an industrial price index (i.e., a price index of the industrial activity in which the firm has been classified), the value of sales or production and average costs (i.e., the ratio of labour and/or inputs costs over sales and/or production).

Though researchers cannot observe directly either of its components, some methods have been suggested to estimate markups<sup>7</sup>. A first alternative is to use a structural approach in which a complete set of equations are used. It includes a cost function and a price equation, which lets to estimate not only marginal costs but mark-ups too. Additional equations of cost shares can also be included for the sake of efficiency. Its main drawback is that a lot of information is required to apply this methodology. Specifically, information on prices is necessary to separate variations in volumes and current prices. This approach was used by Bernstein and Mohnen (1991) with industrial data. Moreno and Rodriguez (2004, 2008) have also used it to take advantage of the availability of price variations at the firm level in an analysis of markups for exporting firms.

An alternative was proposed by Roeger (1995). In that paper he was interested in knowing whether the differences between primal and dual productivity measures can be explained by imperfect competition, defined as a positive (no null) markup of price over marginal cost. As he points-out, a by-product of the analysis is that it provides an alternative method to estimate markups ratios. We describe briefly that approach forward. We depart considering a standard production function which is linearly homogeneous in the inputs. Under imperfect competition (see Hall (1988)), the output growth rate can be expressed as:

$$y_{it} = \mu_{it} \left( s_{it}^L \cdot l_{it} + s_{it}^M \cdot m_{it} + s_{it}^K \cdot k_{it} \right) + \theta_{it} \quad (1)$$

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<sup>7</sup> We do not consider those papers that have used accounting measures to approach margins, usually defined as sales net of labor and materials costs over sales.

where  $y_{it}$ ,  $l_{it}$ ,  $m_{it}$  and  $k_{it}$  are the growth rate of output, labour, materials and capital, respectively.  $s_{it}^j$  is the cost share of input  $j$  in sales,  $s_{it}^j = \frac{P_{it}^j \cdot J_{it}}{P_{it} \cdot Y_{it}}$ ,  $j = L, M, K$  where  $P_{it}^j$  and  $P_{it}$  are the price of inputs and output, respectively. Additionally,  $\theta_{it}$  is the growth of productivity and  $\mu_{it}$  is the price marginal cost mark-up:  $\mu_{it} = P_{it} / C_{it}'$  where  $C_{it}'$  is the marginal cost.

Equation (1) can be rewritten to decompose the Solow residual ( $SR_{it}$ ) into two terms: the mark-up component and the productivity (technological) term:

$$SR_{it} = y_{it} - s_{it}^L \cdot l_{it} - s_{it}^M \cdot m_{it} - (1 - s_{it}^L - s_{it}^M) \cdot k_{it} = \beta_{it} (y_{it} - k_{it}) + (1 - \beta_{it}) \theta_{it} \quad (2)$$

where market power is measured by the Lerner index  $\beta_{it}$ , such as  $\beta_{it} = \frac{P_{it} - C_{it}'}{P_{it}} = 1 - \frac{1}{\mu_{it}}$ .

Some papers have used equations (1) or (2) to estimate mark-ups. However, the main problem is the well-known expectation of a correlation between unobservable productivity shocks and input levels. In that context, is very difficult to find exogenous instruments. Though Olley and Pakes (1996) and Levinhson and Petrin (2003) introduce alternative ways to deal with this issue, Roeger (1995) suggests a more simple approach to circumvent that problem. Specifically, he proposes to use the price-based or dual Solow ( $DSR_{it}$ ) residual which, using the cost minimization problem and imposing constant returns to scale, is defined as:

$$DSR_{it} = s_{it}^L \cdot p_{it}^l + s_{it}^M \cdot p_{it}^m + (1 - s_{it}^L - s_{it}^M) \cdot p_{it}^k - p_{it} = -\beta_{it} (p_{it} - p_{it}^k) + (1 - \beta_{it}) \theta_{it} \quad (3)$$

where  $p_{it}^l$ ,  $p_{it}^m$ ,  $p_{it}^k$  and  $p_{it}$  are the growth rates of wages, price of intermediates inputs, the rental price of capital and the output price, respectively.

Subtracting equation (3) from equation (2), we obtain:

$$(y_{it} + p_{it}) - s_{it}^L \cdot (l_{it} + p_{it}^l) - s_{it}^M \cdot (m_{it} + p_{it}^m) - (1 - s_{it}^L - s_{it}^M) \cdot (k_{it} + p_{it}^k) = \beta_{it} [(y_{it} + p_{it}) - (k_{it} + p_{it}^k)] \quad (4)$$

In equation (4) the term which refers to the growth of productivity is eliminated and, as consequence, the problem of correlation between unobservable productivity shocks and input

levels disappears. In this sense, the Lerner index  $\beta_{it}$  can be estimated consistently<sup>8</sup>. From a practical point of view, that informational requirements are limited to sales ( $y_{it} \cdot p_{it}$ ), labour cost ( $l_{it} \cdot p_{it}^l$ ), the nominal value of intermediate consumption  $m_{it} \cdot p_{it}^m$  and the nominal value of capital services ( $k_{it} \cdot p_{it}^k$ ).

To simplify notation, we denote the left-hand side in equation (4) as  $dY_{it}$ , which can be interpreted as the difference between the growth rate of sales (nominal production) sales and a weighted average of the growth rate of the factors cost weighted by their respective share in sales. We denote the term in brackets on the right-hand side of the equation as  $dX_{it}$ , which can be interpreted as the growth rate of sales per value of capital. Then, the equation to be estimated is:

$$dY_{it} = \beta_{it} dX_{it} + u_{it} \quad (5)$$

What are the implicit assumptions in this context? A first problem is that the constant returns to scale assumption could bias upwardly (downwardly) the estimated levels (changes) in the mark-up<sup>9</sup>. With firm data, however, this is not a serious problem because usually the constant returns to scale assumption is not rejected or, any case, only very slightly decreasing returns to scale are obtained (Moreno and Rodriguez, 2004).

A second assumption is that factors of production can be adjusted instantaneously. Roeger (1995) points out that under the assumptions that all factors of production can be adjusted instantaneously and that all variables can be measured without errors, the error term would be identically equal to zero. With respect to the first issue, Roeger showed that the difference between the primal and the dual residuals is cyclical in presence of excess capacity and also if labour hoarding is present in recession. A variable that approach the excess capacity can be introduced in the estimation to control that problem. In the case of labour hoarding, firms use temporal workers to maximize the utilization of the labour force over the business cycle. This buffer role played by temporal workers can also be analyzed empirically.

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<sup>8</sup> A relevant question to be remarked is that it does not mean that markup is unaffected by potential variables influencing efficiency. In particular, insofar as differences in marginal costs across firms are affected by import activity, as recent evidence suggests, the parameter  $\beta_{it}$  will get that effect.

<sup>9</sup> For a more extensive discussion, see Konings *et al* (2005).

Another reason for a nonzero  $u_{it}$  is related to measurement errors, particularly with respect to inputs. As Roeger (1995) points out, the measurement error related to labour is not relevant insofar as this variable appears only on the left side of equation (4). In any case, we approach this variable using the number of effective worked hours instead of the number of workers, which is the usual approach and that is in the basis of the measurement error. With respect to capital stock, we use a more accurate measurement based on the permanent inventory methodology, instead of the book value of fixed assets, as is usual in many papers.

In sum, this methodology lets to estimate margins in a very simple way avoiding endogeneity problems related to the measurement of productivity. Additionally, it allows us a flexible parameterization to explain the observed heterogeneity of mark-ups among firms incorporating some explanatory variables. Specifically, our objective is to analyze how import activity is related to heterogeneity in mark-ups across firms. With that purpose, we interact the independent variable of equation (5) ( $dX_{it}$ ) with differences measures to approach of the degree of openness. Specifically, we use a binary variable that classifies importers and non importers firms or the import ratio ( $IMP$ ). The last one is measured using firm-level data and industrial average. To test the hypothesis that final and intermediate imports affect margins in different ways, an additional interaction is included classifying firms according to the type of imports ( $Type$ ). Finally, other interactions related to the degree of product homogeneity, market competition and the capacity utilization are also included. As was previously referred, the last one tries controls the potential bias that emerges from the cyclical behaviour of margins in the presence of excess capacity. Then, equation (5) can be written as:

$$dY_{it} = \beta_1 dX_{it} + \beta_2 dX_{it} \times IMP_{it} + \beta_3 dX_{it} \times IMP_{it} \times Type_{it} + \beta_4 dX_{it} \times Other\ Variables + \beta_5 CU_{it} + u_{it} \quad (6)$$

Some papers have used this approach to analyze the effect of trade liberalization on the margins. Konings et al (2005) analyze how privatization and competitive pressure can affect to price-cost margin in a panel data of Bulgarian and Romanian manufacturing firms. They found that import penetration affects negatively to mark-ups but only in sectors where product market concentration is high. However in more competitive sector, the effect is reversed. This result is explained by the authors in terms of the two opposite effects that international competitive pressure have on prices and marginal cost. On the one hand, it is expected that international competitive pressure depressed prices. On the other hand, the positive effect of

import penetration in highly competitive sectors suggests that the main effect is cutting marginal cost. In the case of competitive sectors, the second effect prevails: competitive pressure from the international market push firms to engage in more restructuring and innovating activities, which makes them more cost-efficient<sup>10</sup>.

The results of Altamente and Barattieri (2007) are less conclusive about the IMD hypothesis because they only found evidence of pro-competitive gains from trade in some industries. The positive relationship that they obtained in others can be explained by firms adjusting their product mix in response to trade pressures. Firms move to products characterized by lower elasticity of demand. The results of these authors are in accordance with one of the Bernard, Redding and Schot (2006) theoretical predictions. Specifically, the hypothesis that the exposure to low-wage country imports increases the probability that a plant switches to an industry with lower exposure. These authors follow Melitz and Ottaviano (2008) to develop a model with testable implications of domestic and foreign openness on relative price, mark-ups and productivity. Using disaggregated manufacturing data for some EU countries, they found evidence of pro-competitive effects of relative openness in the short run: the domestic import penetration reduces margin, price and increase productivity. However, in the long run the effects reverse. None of the previous papers distinguish the different effects of final and intermediate imports on markups.

### **3. Data.**

Estimations are carried out with an unbalanced panel of Spanish manufacturing firms for the period 1990-2005. The variables were obtained from the *Encuesta Sobre Estrategias Empresariales* (ESEE), a survey sponsored by the Ministry of Industry and carried out by the Fundación SEPI. The sampling scheme of this survey is conducted for each manufacturing NACE class (two-digit) level. Companies employing between 10 and 200 employees are chosen by a random sampling scheme and the rate of participation is around 4%. For firms employing more than 200 employees, the rate of participation is about 60%. The sample considered is about 2000 manufacturing firms that have ten or more employees each year.

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<sup>10</sup> Using the same methodology, Konings and Vandenbussche (2005) present evidence about the positive impact of antidumping protection on the market power of import-competing domestic firms in most manufactured sectors of the EU.

The set of variables included in  $dY_{it}$  and  $dX_{it}$  are production ( $y_{it}$ ), number of hours effectively worked during the year ( $l_{it}$ ), intermediate consumption ( $m_{it}$ ) and capital input ( $k_{it}$ ). Hours effectively worked are measured as the sum of the normal work time and overtime minus the non-worked hours, while intermediate consumption is defined as the sum of purchases and external services, minus the variation in the stock of purchases. We measure  $k_{it}$  using the net stock of capital for equipment in real terms, calculated by using the perpetual inventory formula. The rental price of capital is calculated as the long-run debt interest rate paid by the firm  $i_{it}$  minus the change rate of prices of capital goods  $\pi_{it}^E$  plus equipment good depreciation,  $\delta_{it}$ , multiplied by the investment good price index  $p_{it}^E$ . The other prices included in  $dY_{it}$  and  $dX_{it}$  refer to the labour costs per employee ( $p_{it}^l$ ) and the price index for intermediate consumption ( $p_{it}^m$ ), calculated as a Paasche index, weighting the price variations of raw materials, energy and services purchased of surveyed firms.

The database includes information about the volume of imports for each firm and year, but it does not contain an explicit question about the type of imported goods, whether final or intermediate. However, each firm declares the percentage of sales of commercialized products not elaborated by the firm and that come from abroad. Additionally, importers declare the percentage of imports coming from foreign companies with which they have commercialization and distribution agreements or which participate in the firm's capital. We call them as linked imports. When such linked imports exist, firms also declare whether they refer to products that are similar to those items produced by them. As can be seen, none of these sets of information indicates explicitly if imports refer to intermediate or final goods. However, we use them jointly with information about the share of imported goods that are commercialized to proxy those situations in which import flows can be classified as intermediate or final goods with confidence. Specifically, we consider that imports refer to final goods when the firm commercializes products but does not have linked imports. In the case that the firm has linked import, we also classify imports as final when it declares that they are similar to those goods produced by the firm. We assume that the rest of imports refer to intermediate goods; that is our proxy for offshoring. Alternatively, we can classify more properly intermediate imports for a subsample of firms that import from foreign companies with commercialization and distribution agreements conditional to these imported goods are not similar to those elaborated by them. We define this subset as *linked intermediate goods*. Appendix 1 provides additional details of the construction of variables.

Table 1 shows (columns A and D) the percentage of importers and the import ratio (excluding non-importers) in 1990-2005. As can be seen, the proportion of importing firms has increased in about 10 points over the period. The import ratio has also increased slightly, in about 4 points. In both cases such an increase has occurred in the nineties, while they remained very stable since 2000.

As can be seen in column B, almost 20% of firms over the period are final importers. They represent the 30% of importing firms. Their average import ratio (18.3) is 3.6 points larger than the average ratio of all importers. Additionally, these firms depict an increase in the intensity of import flows over the period. The proportion of firms importing intermediate goods (*offshoring*) has increased from 40.5% to 45.8% between 1991 and 2005. The intermediate imports have increased at a bigger rate than sales. As result, the import ratio has increased more than 3 points. Finally, the average percentage of firms with *linked intermediate imports* is about 7% of all firms (10.7% of importers). These firms are intensive importers: import intensity is almost ten points bigger than the average import ratio for all firms during this period.

An additional question to deal with refers to whether competitive pressures of imports differ according to the degree of product differentiation. To address this issue, we use a binary variable to measure the degree of product homogeneity. It takes value one if the product sold by the firm is highly standardized and zero otherwise<sup>11</sup>. Insofar as this variable is negatively correlated with demand price elasticity, its effect over markups should be negative. Finally, we test if the Import as Market Discipline hypothesis differs according to market competition. Two variables are considered with this aim. The first one indicates the market share that the firm declares. The second one measures the concentration ratio (CR4), elaborated with market shares of four larger firms, according to the information provided by firm itself. The number of observations for this variable is very low because firms should point out the market share of the main competitors (see Appendix for definition of variables).

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<sup>11</sup> This variable is elaborated using individual information provided by firms. In that sense it could be a better approach to the specific characteristics of products elaborated by firm than product-aggregated classifications such as Rauch (1999).

#### 4. Results.

In this section we present the results of estimating the equation (6) with different sets of explanatory variables. Two complementary approaches are used to estimate firm markups. The first approach consists of the traditional approach combining firm and time dimensions. A second one is based on the estimation of markups ( $\beta_1$ ) with individual regressions for each firm. This has the advantage of being a true firm-specific approach to mark-up and it is possible due to the Roeger's model only requires one explanatory variable, assuming that variables in equation (5) are properly elaborated. In our case, we use a subsample of firms with enough time spans (at least nine years) to carry on this analysis.

Tables 2 to 5 show the estimation results for equation (6) with different sets of explanatory variables using the first approach. Specifically, all estimates are carried out by pooled OLS. To control unobserved heterogeneity, we also made complementary estimations with panel data. However, the Hausman test does not reject the null hypothesis of correlation between individual effects and the error term. Given that the results of random effects and pooling estimations are very similar, we only present those corresponding to pooling estimations<sup>12</sup>. As we explained in Section 2.2, the Roeger (1995) approach allows us to estimate consistently markups without instrumental variables procedure. In all the estimations we have included the variation of capacity utilization to control the cyclical difference between the primal and the dual residuals in presence of excess of capacity. As expected, the coefficient of this variable is positive and very robust across all the estimations. Additionally, time dummies are also included in all the estimations and are jointly significant. We also include industry dummies in complementary estimations but they are not significant.

Following the traditional approach of the IMD hypothesis, we start considering the industry import ratio as a proxy for foreign competitive pressure (Table 2). As can be seen in column 1, the industrial average of import ratio affects negatively the price-marginal cost, confirming such hypothesis. The average import ratio for all manufacturing industries is 0.094. This implies that the average markup for all firms is about 0.163. Next columns in Table 2 allow us to assess whether this result can be generalized for all types of imported goods. Column 2 introduces the

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<sup>12</sup> The random effects estimations are available upon request.

interaction of the dummy variable that proxies final goods with industrial average imports. As can be seen, these imports increase the negative effect associated to external competitive pressure. The average markup for a final good importer is about 0.158. When we consider intermediate imports (Column 3) the opposite effect is found, as we expected. The average markup for a firm with this type of imports is about 0.170. The coefficient is non-significant for linked imports of intermediate goods (Column 4), although we find the expected positive sign. These results confirm our main hypothesis about the relevance of distinguishing between final and intermediate goods for testing the IMD hypothesis. Though competitive pressures of imports still remain for final goods, imports of intermediate goods act in the opposite direction.

Although most empirical literature uses industry imports, we can test the effect of imports on markups using individual data. The results presented in Table 3 repeat the set of estimations showed in Table 2, using firm imports ratio instead of average industrial ratio. The estimations jointly support the previous results. Foreign competitive pressure only plays for final goods. As can be seen in Column 1, markups are reduced for final goods importers from 0.172 to 0.151 (an impact of -0.021), confirming the competitive pressure of these products in the markups of firms. However, we expect that the interaction between the import ratio and the firm which import intermediate goods presents a positive sign. For these firms the international pressure can have two potential effects on mark-ups. They may be an effect on prices (reducing them as in the case of final goods) and an effect on marginal costs (decreasing them or increasing productivity). The last effect can be explained in the context of the empirical evidence about the relationship between productivity and imports of intermediate goods. Some recent papers have found that the firms that do offshoring are more productive. Insofar as this premia is translated to markups, it can compensate competitive pressures (the first effect) related to imports. As can be seen in Column 3, the impact of import ratio on markup for firms which import intermediate goods is almost zero. The coefficient of the interaction for linked imports of intermediate goods (see Column 4) is also positive but it is non-significant. As way explained in section 3, there are a reduced number of these firms and additionally they present the biggest import ratio.

The Table 4 explores additional information about how the degree of differentiation in goods produced by firms can affect the heterogeneity in markups. The variable that approaches the differentiation takes value 1 whether the firm declares that its products are highly standardized.

As can be seen in column 1, it has a negative direct effect on margins, though it is not significantly different from zero. The rest of columns analyze the interaction between the import ratio and the degree of product differentiation. We expect a negative sign for the interaction term in the sense that competitive pressure of imports will be high when products are homogeneous. The results presented in columns 3 and 4 confirm such expectation: the IMD hypothesis is stronger supported when imports are carried out by firms that produce highly homogenous goods and especially for final good imports.

Table 5 complements previous results introducing other variables related to the degree of domestic competition. Specifically, we use the market share reported by firms and the concentration rate (CR4) in markets in which the firm is involved. As expected, Columns 1 and 2 point out that both variables affect positively to average markups. However, the coefficient for concentration ratio is non-significant. It must be noted that the last variable has a low number of observations because firms should point out the market share of the main competitors and other alternatives measures are required. The interaction between these variables and the import ratio presents a positive sign though they are non-significant. Konings et al. (2005) obtained a negative effect of this interaction for Bulgaria and Romania during their private restructuring process in the nineties. They argue that international pressure has two potential effects on markups, through prices and marginal costs. They justify the negative sign because firms with a dominant position in domestic markets reduce price in response to international trade. The second effect of international pressure is the reduction of marginal cost to increase efficiency, especially in more competitive sectors.

Finally, as was explained in Section 2, one of the advantages of the procedure of Roeger (1995) to estimate markups is the small number of explanatory variables. This fact, jointly with the availability of a long time period, allows us to estimate individual markups. Specifically, we estimate equation 5 for each firm with more than nine observations. Using these estimated markups we can compare the distributions for different groups of firms classified according to the type of imports. In this sense, this is an alternative way to test the IMD hypothesis. Note that with this procedure we are not controlling for time and industry effects, although the last are non-significant on the pooled estimations.

Figure 1 shows the distribution of individual markups for the 885 firms with more than 9 years in the sample. The average markup is 0.184, which is very similar to the results presented in previous estimations. However, the dispersion is very high, as the standard deviation of 0.165 shows. As can be seen, the distribution is slightly skewed, with a large proportion of firms on the right tail.

Departing from these firm-specific estimations, we next compare the distribution of markups among different groups of firms and we test the equality both of the average and the distributions. Though the econometric approach is very different to more standard pooled regressions, the results confirm those obtained in previous estimations. Graph i in Figure 2 compares the distribution of importers and non-importers, while the test of the null hypothesis of equality between the average margins and distributions is showed in the first line of Table 6. As can be seen, the null hypothesis can not be rejected. The same result is obtained with respect to the equality of the distributions. Although the number of non importers is small, this result suggests that there is not a negative association between imports and markups. Next, we test whether import intensity affects this relation. We define intensive importers as those firms with an import ratio bigger than the 75<sup>th</sup> percentile (17.7%). As can be seen in Graphs iii of Figure 2, the distribution of markups for these firms is slightly on the left with respect to the other importers. Accordingly, the tests presented on Table 6 reject not only the equality of average markups between both groups but also the equality of distributions. With respect to non-importers (Graph ii), although intensive importers present a smaller average mark-up, we can not reject the equality of both distributions.

Additionally, we split the sample according to the type of imported goods: final and linked intermediate goods. On the one hand, as can be seen in Graphs iv and v of Figure 2, the distribution of markups for firms that import final goods is on the left with respect to others importers, though it seems that there are not differences with respect to non-importers. This is supported by the test presented on Table 6: we can not reject the equality of the distributions between final good importers and non-importers, but we reject the equality with respect to others importers. On the other hand, the graph vi confirms the results of previous estimates when product differentiation is considered. The distribution of markups for final importers that produce homogeneous goods is clearly on the left with respect to the rest of firms. The markup

of these firms is significantly smaller than the others. Finally, as can be seen in the last two rows of Table 6, a small number of firms are classified as linked intermediate good importers. Although they present the same markup as the other importers, we reject the equality of the distributions of both groups of firms.

## **5. Conclusions.**

The aim of this paper is to analyze the relationship between markups and imports taking into account two main features of current trade flows: offshoring and intra-firm trade. Markups are estimated following the procedure suggested by Roeger (1995). We try to test if the IMD hypothesis is still supported if we distinguish between final and intermediate imports. Additionally, we have parameterized the observed heterogeneity among firms to consider additional explanatory variables, namely the degree of differentiation of products, market share and market concentration. In this sense, we also control for the possible interaction between the degree of competition in the market and import ratio. The analysis uses a long panel dataset of Spanish manufacturing firms over the period 1990-2005.

The results support the IMD hypothesis, but only for final goods. There is a negative effect of import propensity for final-goods oriented imports that is larger the more homogeneous is the type of goods elaborated by firms. These results are confirmed with firm-specific regression analysis.

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## **Appendix 1: Variables definition.**

*Capital stock of equipment goods:* It is net stock of capital for equipment goods in real terms. It is calculated by using the perpetual inventory formula:  $K_t = (1 - \delta)K_{t-1}(P_t / P_{t-1}) + I_t$ , where  $P$  is the price index for equipment,  $\delta$  is the depreciation rate, and  $I$  is the investment in equipment.

*Concentration:* Surveyed firms give annual information about markets served (up to five), identifying their market share and the market share of main competitors. From this information a CR4 index is calculated summing up the four larger market shares.

*Degree of product homogeneity:* Dummy variable that takes value 1 if the product supplied by the firm is highly standardized. This information is reported by the firm.

*Market share:* The surveyed firms give annual information about markets served (up to five), identifying their market share. A zero market share is assigned when firms define their market shares as insignificant. The weighted market share is calculated using the proportions with respect to total sales in each market as weighting.

*Utilization of capacity:* Variation in the percentage of utilization of installed capacity reported by the firm.

### *Classification of imports*

The database includes information about the volume of imports for each firm and year, but it does not give specific information about the type of imported goods (final or intermediate). Nevertheless, it includes complementary information that can help to classify the import. Specifically, each firm declares the percentage of foreign ownership and the percentage of sales of commercialized products not elaborated by the firm and that come from abroad. Additionally, importers declares the percentage of imports coming from foreign companies with which the firm has commercialization and distribution agreements or that participate in the firm's capital (linked imports). When such imports exists (i.e., they are positive), the firm declares whether those imports are similar to those produced by them in the domestic market. As can be seen in Table A1, only the 10% (15%) of observations (positive imports) is associated to linked imports. This percentage is almost the 25% (40%) in the case of product commercialized by the firm coming from abroad.

We consider that when a firm does not have linked imports but commercializes product not elaborated for them and that came from abroad, they should be final goods. Even when they have linked imports, we also consider that the imported goods are final if firms declare that these imported goods are not similar that those produced by the firms. Almost 20% of the firms are included in this category.

We consider that most of the rest of firms only import intermediate goods (intermediate goods). However, using the available information, it is also possible to classify the linked imports that are intermediate goods. Specifically, when a firm has imported from foreign companies with which the firm has commercialization and distribution agreements or which participate in the firm's capital and declare that these imports are not similar those elaborated by them. Some of them commercialize products not elaborated by them and that come from abroad.

Accordingly, we define the types of imports as:

*Final Goods Imports:* Dummy variable that takes value 1 if the firm has commercialized products not elaborated by themselves and that come from abroad and if the firm does not have linked imports. It is also takes value 1 if the firm import from foreign companies with which the firm has commercialization and distribution agreements but it defines this linked imports as imported goods that are similar those elaborated by the firm in the domestic market.

*Linked Intermediate Goods Imports*: Dummy variable that takes value 1 if the firm has imported from foreign companies with which the firm has commercialization and distribution agreements or which participate in the firm's capital and declare that these imports are not similar those elaborated by them. Some of them are commercialize products not elaborated by themselves and that come from abroad.

**Table A1: Classification of imports**

		<b>Sales of commercialized products not elaborated by the firm and that come from abroad</b>			
		<b>=0</b>		<b>&gt;0</b>	
<b>Imports from foreign companies with which the firm has commercialization and distribution agreements or which participate in the firm's capital</b>	<b>= 0</b>	Import=0 6603	Import>0 7195	<i>Final: 2679</i>	
	<b>&gt; 0</b>	Non-similar <i>Linked Inter.</i> : 385	Similar 129	Non-Similar <i>Linked Inter.</i> : 927	Similar <i>Final: 946</i>

**Table 1**

	Percentage of importer firms				Import ratio for importer firms			
	All (A)	Final goods (B)	Intermediate goods (A) – (B)	Linked intermediate goods (C)	All (D)	Final goods (E)	Intermediate goods (D) - (E)	Linked intermediate goods (F)
1991	57.5	17.8	40.5	7.8	12.2	15.2	11.0	20.6
1992	56.6	19.5	38.3	7.8	13.3	16.1	12.0	23.3
1993	57.9	18.8	39.6	6.8	12.6	16.0	11.0	19.0
1994	61.5	18.0	44.4	8.5	13.7	17.8	12.1	23.6
1995	63.7	18.9	44.9	8.7	15.1	19.0	13.4	23.6
1996	65.0	19.0	46.6	9.2	15.2	19.3	13.5	23.8
1997	65.7	18.4	47.6	8.9	14.5	18.8	12.9	22.5
1998	65.3	18.1	47.5	7.5	15.3	20.2	13.5	23.5
1999	67.7	19.5	48.7	7.6	15.5	19.0	14.2	26.4
2000	66.7	18.1	48.9	7.5	15.9	20.0	14.4	25.8
2001	66.4	18.4	48.5	7.0	15.3	18.3	14.2	24.7
2002	67.8	20.1	48.0	3.6	14.7	17.6	13.5	28.8
2003	67.8	20.5	47.6	4.4	14.6	17.6	13.4	26.9
2004	66.7	20.9	46.2	3.5	15.1	19.2	13.3	29.8
2005	67.0	21.7	45.8	4.0	16.2	20.2	14.4	29.8
Average	64.3	19.1	45.7	6.9	14.7	18.3	13.2	24.2

**Table 2**  
**Markups and industrial imports**  
**OLS pooled estimation**

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 [dX_{it} \times Z_{it}] + \beta_3 [dX_{it} \times Z_{it} \times O_{it}] + \delta_1 \cdot dUC_{it} + \sum_{t=1991}^{2005} \gamma_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)
<b>Markup: <math>\beta_1</math></b>	0.177 (30.8)	0.176 (30.4)	0.179 (30.8)	0.178 (30.8)
<b>Effect of import ratio (AMR): <math>\beta_2 [dX_{it} \times AMR_{it}]</math></b>	<b>-0.143</b> <b>(2.7)</b>	<b>-0.109</b> <b>(1.9)</b>	<b>-0.200</b> <b>(3.2)</b>	<b>-0.159</b> <b>(2.9)</b>
<b>Effect of final goods import ratio:</b> $\beta_3 [dX_{it} \times AMR_{it} \times DFG_{it}]$		<b>-0.110</b> <b>(1.8)</b>		
<b>Effect of intermediate goods import ratio</b> $\beta_3 [dX_{it} \times AMR_{it} \times DIG_{it}]$			<b>0.092</b> <b>(1.8)</b>	
<b>Effect of linked intermediate goods import ratio</b> $\beta_3 [dX_{it} \times AMR_{it} \times DLIG_{it}]$				<b>0.111</b> <b>(1.2)</b>
<b>Utilization of capacity : <math>\delta_1</math></b>	0.019 (4.3)	0.019 (4.3)	0.019 (4.3)	0.019 (4.3)
<b>Time Dummies</b>	Yes 0.0	Yes 0.0	Yes 0.0	Yes 0.0
<b>Number of observations (Number of firms)</b>	17749 (2519)	17749 (2519)	17749 (2519)	17749 (2519)

Notes:

- $Z_{it}$  refers to the industry average of the import ratio.  $O_{it}$  refers to dummies that classified firms according their type of import: final, intermediate or linked intermediate goods.
- t-statistics in parenthesis.
- In the row of time dummies, the p-value of the joint significance test is presented.

**Table 3**  
**Markups and firm-level imports**  
**OLS pooled estimation**

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 [dX_{it} \times Z_{it}] + \beta_3 [dX_{it} \times Z_{it} \times O_{it}] + \delta_1 \cdot dUC_{it} + \sum_{t=1991}^{2005} \gamma_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)
<b>Markup: <math>\beta_1</math></b>	0.172 (52.8)	0.172 (52.7)	0.172 (52.7)	0.172 (52.8)
<b>Effect of import ratio (MR): <math>\beta_2 [dX_{it} \times MR_{it}]</math></b>	<b>-0.090</b> (4.8)	<b>-0.058</b> (2.6)	<b>-0.143</b> (5.2)	<b>-0.100</b> (4.9)
<b>Effect of final goods import ratio</b> $\beta_3 [dX_{it} \times MR_{it} \times DFG_{it}]$		<b>-0.085</b> (2.6)		
<b>Effect of intermediate goods import ratio</b> $\beta_3 [dX_{it} \times MR_{it} \times DIG_{it}]$			<b>0.085</b> (2.6)	
<b>Effect of linked intermediate goods import ratio</b> $\beta_3 [dX_{it} \times MR_{it} \times DLIG_{it}]$				<b>0.053</b> (1.3)
<b>Utilization of capacity : <math>\delta_1</math></b>	0.019 (4.3)	0.019 (4.4)	0.019 (4.4)	0.019 (4.3)
<b>Time Dummies</b>	Yes 0.0	Yes 0.0	Yes 0.0	Yes 0.0
<b>Impact of Import ratio: MR Average * <math>\beta_2</math></b>	<b>-0.009</b>	<b>-0.005</b>	<b>-0.014</b>	<b>-0.009</b>
<b>Impact of Import ratio for firms which import final goods</b> <b>MR Average * <math>\beta_2</math> + MR Average (DFG) * <math>\beta_3</math></b>		<b>-0.021</b>		
<b>Impact of Import ratio for firms which import intermediate goods</b> <b>MR Average * <math>\beta_2</math> + MR Average (DIG-DLIG) * <math>\beta_3</math></b>			<b>-0.002</b>	<b>0.003</b>
<b>Number of observations (Number of firms)</b>	17767 (2519)	17767 (2519)	17767 (2519)	17767 (2519)

Notes:

- $Z_{it}$  refers to the import ratio of the firm.  $O_{it}$  refers to dummies that classified firms according their type of import: final, intermediate or linked intermediate goods.
- t-statistics in parenthesis.
- In the row of time dummies, the p-value of the joint significance test is presented.

**Table 4**  
**Markups and firm-level imports: the effects of product differentiation**  
**OLS pooled estimation**

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 [dX_{it} \times Z_{it}] + \beta_3 [dX_{it} \times Z_{it} \times O_{it}] + \beta_4 [dX_{it} \times Z_{it} \times O_{it} \times O2_{it}] + \delta_1 \cdot dUC_{it} + \sum_{t=1991}^{2005} \gamma_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)
<b>Markup: <math>\beta_1</math></b>	0.170 (38.7)	0.172 (52.7)	0.171 (55.8)	0.172 (52.7)
<b>Effect of import ratio (MR): <math>\beta_2 [dX_{it} \times MR_{it}]</math></b>		<b>-0.027</b> <b>(0.9)</b>		<b>-0.063</b> <b>(3.0)</b>
<b>Effect of non-differentiated products: <math>\beta_2 [dX_{it} \times HP_{it}]</math></b>	<b>-0.009</b> <b>(1.7)</b>			
<b>Effect of import ratio for firms with non-differentiated products: <math>\beta_3 [dX_{it} \times MR_{it} \times HP_{it}]</math></b>		<b>-0.096</b> <b>(2.8)</b>	<b>-0.120</b> <b>(5.5)</b>	
<b>Effect of final goods import ratio for firms with non-differentiated products <math>\beta_4 [dX_{it} \times MR_{it} \times HP_{it} \times DFG_{it}]</math></b>				<b>-0.094</b> <b>(2.7)</b>
<b>Utilization of capacity : <math>\delta_1</math></b>	0.019 (4.3)	0.019 (4.4)	0.019 (4.4)	0.019 (4.4)
<b>Time Dummies</b>	Yes 0.0	Yes 0.0	Yes 0.0	Yes 0.0
<b>Number of observations (Number of firms)</b>	17758 (2519)	17758 (2519)	17758 (2519)	17758 (2519)

Notes:

- $Z_{it}$  refers to the import ratio of the firm.  $O_{it}$  refers to dummies that classified the firms according to the degree of the standardization of their product and  $O2_{it}$  refers to a dummy that define final goods importers
- t-statistics in parenthesis.
- In the row of time dummies, the p-value of the joint significance test is presented.

**Table 5**  
**Markups and firm-level imports: the effects of market share and concentration**  
**OLS pooled estimation**

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 [dX_{it} \times Z_{it}] + \beta_3 [dX_{it} \times Z_{it} \times O_{it}] + \delta_1 \cdot dUC_{it} + \sum_{t=1991}^{2005} \gamma_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)
<b>Markup: <math>\beta_1</math></b>	0.159 (46.7)	0.161 (24.5)	0.172 (50.9)	0.177 (32.3)
<b>Effect of import ratio (MR): <math>\beta_2 [dX_{it} \times MR_{it}]</math></b>			<b>-0.107</b> <b>(4.4)</b>	<b>-0.148</b> <b>(3.1)</b>
<b>Effect of market share of the firm: <math>\beta_2 [dX_{it} \times MS_{it}]</math></b>	<b>0.052</b> <b>(3.5)</b>			
<b>Effect of concentration: <math>\beta_2 [dX_{it} \times CR4_{it}]</math></b>		<b>0.020</b> <b>(1.7)</b>		
<b>Effect of import ratio controlling for market share</b> $\beta_3 [dX_{it} \times MR_{it} \times MS_{it}]$			<b>0.108</b> <b>(1.4)</b>	
<b>Effect of import ratio controlling for concentration</b> $\beta_3 [dX_{it} \times MR_{it} \times CR4_{it}]$				<b>0.089</b> <b>(1.2)</b>
<b>Utilization of capacity : <math>\delta_1</math></b>	0.017 (3.7)	0.017 (2.2)	0.018 (3.9)	0.018 (2.4)
<b>Time Dummies</b>	Yes 0.0	Yes 0.0	Yes 0.0	Yes 0.0
<b>Number of observations (Number of firms)</b>	16267 (2468)	6463 (1600)	16267 (2468)	6463 (1600)

Notes:

- $Z_{it}$  refers to the import ratio of the firm.  $O_{it}$  refers to market share or CR4 concentration index.
- t-statistics in parenthesis.
- In the row of time dummies, the p-value of the joint significance test is presented.

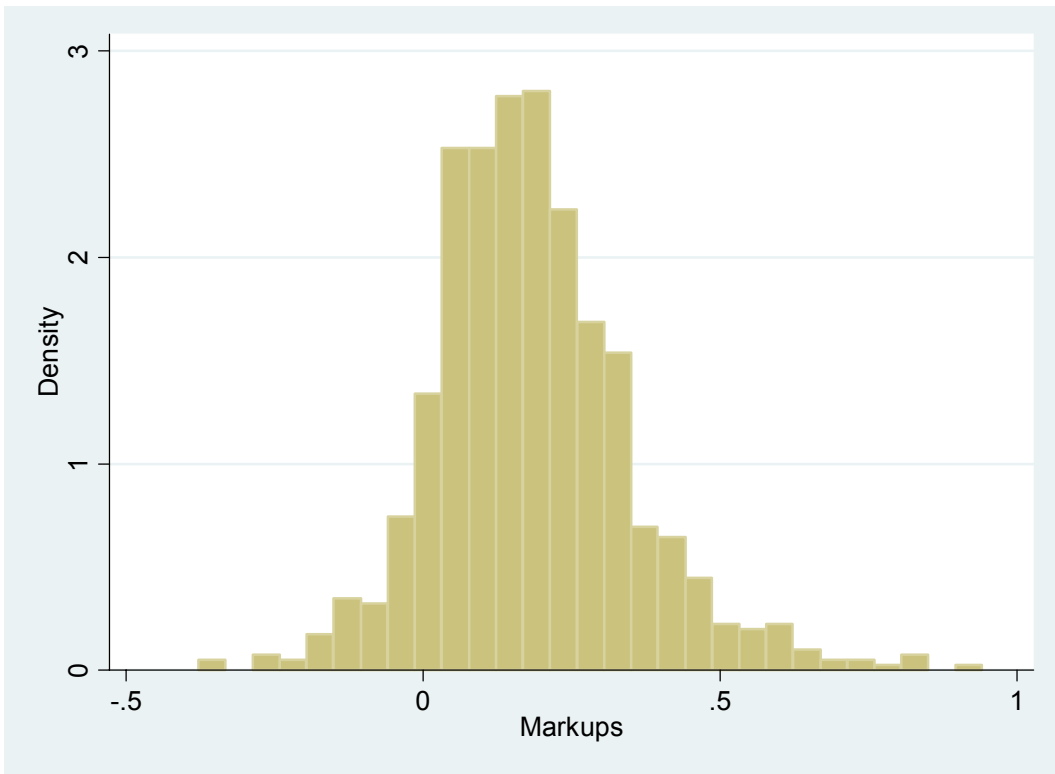
**Table 6**  
**Mark-ups differences according the type of imports**

	<b>Number of firms</b>	<b>Average mark-ups</b>	<b>Test of equality of average</b>	<b>Test of difference of average is negative</b>	<b>Test of equality of distributions</b>
<b>Importers</b>	729	0.182 (0.165)			
<b>Non importers</b>	156	0.191 (0.162)	0.543	0.271	0.668
<b>Intensive importers</b>	185	0.161 (0.160)			
<b>Non importers</b>	156	0.191 (0.162)	0.084	0.042	0.112
<b>Intensive importers</b>	185	0.161 (0.160)			
<b>Other importers</b>	544	0.189 (0.167)	0.041	0.021	0.022
<b>Final importers</b>	331	0.173 (0.160)			
<b>Non importers</b>	147	0.194 (0.165)	0.194	0.097	0.262
<b>Final importers</b>	331	0.173 (0.160)			
<b>Other importers</b>	398	0.190 (0.170)	0.176	0.088	0.023
<b>Final importers with homogeneous products</b>	288	0.169 (0.159)			
<b>Rest of firms</b>	597	0.191 (0.168)	0.056	0.028	0.025
<b>Linked intermediate importers</b>	76	0.184 (0.173)			
<b>Non importers</b>	156	0.191 (0.162)	0.775	0.388	0.133
<b>Linked intermediate importers</b>	76	0.184 (0.173)			
<b>Other importers</b>	653	0.182 (0.165)	0.901	0.549	0.088

Notes:

- In the test of equality (or difference) the p-value is presented.
- The test of equality of distributions is the Kolmogorov-Smirnov test.

**Figure 1**  
**Markups distribution**



**Figure 2**  
 Markups distribution: Kernel density estimates

