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MARKUPS, BARGAINING POWER AND OFFSHORING: AN EMPIRICAL ASSESSMENT

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Abstract

This paper tests the pro-competitive effect of imports on product and labour markets for Spanish manufacturing firms in the period 1990-2005. In doing so, it takes into account the type of imported products: final *vs* intermediate. Markups are estimated following the procedure suggested by Roeger (1995) and including an efficient bargaining model. The observed heterogeneity among firms is parameterized to consider additional product standardization and market concentration. The results support the Imports as Market Discipline hypothesis for importers of final goods, while firms that offshore intermediate inputs show similar markups to non-importers. Additionally, the union bargaining power is smaller the more final-goods oriented imports are and the more homogeneous is the type of goods elaborated by firms.

Keywords: Markups, offshoring, bargaining power.
JEL Classification: F12, L60, L13.

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1. Introduction.

Many papers have analyzed in recent years the relationship between market openness and some performance variables. Most of them have focused on assessing the productivity heterogeneity among firms. There are at least three channels throughout which openness could have effects on firms' efficiency: scale economies, dynamic efficiency gains due to reallocation effects and access to foreign technology embodied in imported goods and services. Additionally, the contact with foreign firms in domestic and foreign markets could also improve firm efficiency by means of *spillover* effects.

It is likely that markups are also affected by market integration. On the one hand, markups could vary insofar as changes in efficiency were not fully transmitted to prices. On the other hand, changes in competitive pressures due to easier access to domestic markets by foreign providers can also affect domestic firm markups. This is the classical argument supported by the Import as Market Discipline hypothesis (IMD henceforth), whose basic prediction is that trade openness increases the number of product varieties available and the elasticity of demand that domestic producers face. Many papers have analyzed such hypothesis for a long time (see, for example, Levinhson (1993) and Harrison (1994)) and, though not unanimously, most of them conclude that markups of domestic firms are negatively associated with foreign competitive pressures.

The IMD hypothesis assumes that imports are final goods and, presumably, almost perfect substitutes to domestic production. In such a way, it does not take into account a main feature of current trade flows, namely that a large proportion of international trade is comprised by imports of intermediate goods and services, a phenomenon known as offshoring.[1] Though offshoring has been widely documented in theoretical and empirical literature (Helpman, 2006), its effect on the IMD hypothesis has been very scarcely considered. It seems natural to expect that, insofar as those intermediate purchases indicate the slicing of the value chain aiming to obtain efficiency advantages, their negative effect on markups were smaller or, even, non-significant. To our knowledge, only Egger and Egger (2004) have modelled the Import as Market Discipline hypothesis distinguishing between intermediate

[1] The definition of *offshoring* is not homogeneous in literature. Here it is defined as the purchase of intermediate goods from foreign providers, irrespective of the ownership links between the domestic importer and the foreign supplier.

and final goods. Boullhol *et al.* (2006) and Abraham *et al.* (2009) are recent empirical applications following this argument.

In this paper we revisit the IMD hypothesis including such a distinction between the types of imported goods. With that aim, we estimate firm-level markups using the methodology suggested by Roeger (1995). Its main advantage is that it allows us to estimate markups avoiding the simultaneity problem between inputs and productivity shocks that emerges in the Hall (1988) framework, which has been extensively used to approach markups.

A common feature of both the Hall (1988) and Roeger (1995) methodologies is the assumption of perfect competition in input markets. However, as Crépon *et al.* (1999) point out, it may cause an underestimation of markups, due to the omission of the share of rents captured by workers. To include it, they extend the Hall approach by introducing an efficient bargaining model between workers and firms. In this paper we use a similar approach, though in the Roeger (1995) empirical framework, to consider labour market imperfections in a joint estimation of markups and union bargaining power.

This paper contributes to literature in several ways. Firstly, we estimate simultaneously markups and workers' bargaining power. In doing so, we avoid potential downward biases that were previously mentioned while combining two strands of empirical literature: those papers that have jointly analyzed product and labour imperfections within the Hall approach and those that have used the Roeger empirical approach in a context of labour markets with perfect competition. This general setting allows us to estimate the effects of import competition on both markups and union bargaining power. With respect to the latter, many authors have pointed out that increased market integration erodes the power of domestic trade unions (e.g., Rodrik, 1997). In that respect, there is an obvious effect of import competition on labour rents: insofar as globalization reduces economic rents (the effect that the IMD hypothesis predicts), both profits and labour rents are directly affected. The key question is therefore whether it also affects workers' bargaining power and, consequently, to the distribution of rents between employers and employees.

Secondly, we test the Import as Market Discipline hypothesis distinguishing between final and intermediates imports. As was previously mentioned, average estimated effects could be downward biased if intermediate imports are a relevant share of total imports. In that context, we also discuss the effect of offshoring on the relationship between import competition and union bargaining power. Additionally, the paper addresses the role of product differentiation in the relationship between trade openness and markups, under the hypothesis that import pressures should be more intensive when product differentiation is small and imported goods are closer substitutes of domestically produced goods.

Finally, the paper uses both a traditional approach with panel data regressions and, also, firm-specific regressions. The latter allows us to analyze the distribution of estimated parameters and it is a non-standard approach to control unobserved heterogeneity across firms. That is possible because we use a relatively long firm panel dataset and we take advantage of the estimation procedure, which allows us a straightforward identification of markups with very few explanatory variables.

The data refer to Spanish manufacturers during the period 1990-2005, which offer an interesting case to jointly address product and labour market imperfections in the context of the globalization process. On the one hand, Spain is a medium-size economy which has experienced an accelerated trade integration since the late eighties in the context of the enlargement and deepening processes of the European Union. Immediately after joining the EU in 1986, Spanish firms affronted the Single Market process and the adjustments to comply with the third phase of the European Monetary Union. The consequence of those changes, in a general setting of increased globalization, was a steady rise in openness (trade over GDP) from 37% in 1990 to 59% in 2006. On the other hand, the Spanish labour market is one of the most highly regulated in all developed countries, with high statutory protection and union power (see Botero *et al*., 2004).

The main results of the paper are the following. First, we obtain a predicted negative effect of imports on firm markups. Second, the negative effect of import propensity is larger the more final-goods oriented imports and the more homogeneous the type of goods elaborated by firms. On the contrary, intermediate imports decrease slightly or do not affect the corresponding markups. These results point

out that, as was expected, pro-competitive effects of imports are more relevant in the context of final goods, while for intermediate imports pro-efficiency effects partially outweigh the pro-competitive effect. Third, we obtain positive evidence of union bargaining power in the Spanish manufacturing industry. Consequently, estimated markups are downward biased when perfect competition in labour market is assumed. As in the case of markups, union bargaining power is smaller for those importers of final goods that produce homogeneous goods.

The structure of the paper is as follows. Section 2 summarizes the theoretical background and the empirical approach used to estimate markups. Section 3 describes the database and definition of variables. Section 4 discusses the results. Finally, Section 5 summarizes our final conclusions.

2. Theoretical and empirical framework.

2.1 Background literature.

The Import as Market Discipline hypothesis has received strong support in the context of Industrial Organization literature (Tybout, 2003). Most of the theoretical models predict that trade liberalization increases the number of product varieties available and the elasticity of demand that domestic producers face, which implies a decrease of markups. The empirical evidence with industry-aggregated data confirms this prediction. Using economic profits over sales as an approach for price cost margin, the ratio of imports to domestic consumption is usually negatively correlated with the profitability of domestic sales, especially when domestic concentration is high. The results with firm-level panel data show the same results: industries with higher exposure to foreign competition are associated with lower price-cost margins. For example, using the Hall approach, Levinsohn (1993) found that the markups of Turkish manufacturing firms were reduced due to increased exposure to foreign competition[2].

Additionally, many theoretical models with imperfectly competitive product market predict that increased exposure to international trade can have effects on the efficiency and profitability of domestic firms. With respect to efficiency, the seminal paper by Melitz (2003) has stimulated extensive literature that connects the decision to export with intra-industry heterogeneity in productivity and size. A main characteristic of such an approach is that the demand side is modelled by using CES preferences

[2] Following a similar approach, Harrison (1994) also tested the effect of trade policy reforms for profits and productivity in The Ivory Coast. She found that market power is higher in sectors with lower import penetration and larger tariffs.

which, as usual, generate constant markups. Though it is not the perfect competition framework that was present in traditional models of international trade, constant markups are at odds with observed heterogeneity across firms. Many other recent papers that build on this tradition, such as Yeaple (2005) and Bernard et al. (2007), also assume constant markups. [3]

More recently, Melitz and Ottaviano (2008) have proposed an alternative framework that establishes predictions on the distribution (average and variance) of some performance variables. Their 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. This model follows many features of the Melitz (2003) approach. but it has two characteristics that lead to more realistic predictions about markup distribution. Firstly, the demand side is specified using a linear demand system with horizontal product differentiation.[4] 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 the average markup is reduced. In other words, the pro-competitive effect outweighs the selection effect.

The Melitz and Ottaviano (2008) model enriches the classical IMD hypothesis, integrating in a unified framework the selection and reallocation effects among heterogeneous firms. In that approach market openness is defined by country size and trade costs among countries. 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. However, there is not an assessment of the type of import flows that qualify such openness. In that sense, 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 literature has analyzed this issue more carefully. Specifically,

[3] Bernard et al (2003) propose an alternative approach in which markups are not fixed across firms, though its distribution is fixed in other characteristics of the model.
[4] Specifically, they incorporate endogenous markups using the linear demand system developed by Ottaviano et al (2002). In this approach, price elasticity not only depends on the level of product differentiation, but also on average prices and the number of competing varieties.

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 and foreign sourcing. As in Melitz (2003), 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.[5] That prediction has received strong empirical support. Tomiura (2007), Altomonte *et al* (2008) and Fariñas and Martín (2010), among others, find empirical support for the positive effects of imports on efficiency, and that such an effect is bigger for intermediate imports. [6] In a complementary way, Amiti and Konings (2007) show that reducing tariffs on final and intermediate goods generates productivity gains for Indonesian industries and that these gains are bigger for imported inputs.

The relevance of intermediate imports in current international trade flows suggests that to consider all imports as final goods would underestimate the relevance of the IMD hypothesis. In fact, there is no reason why intermediate imports should depress domestic markups. Intermediate imports allow firms to optimize available resources, contracting out those processes that are less efficient when there is in-house provision. Of course, it does not imply necessarily that firms engage in international trade flows. However, dramatic advances in technology have substantially reduced transaction costs (e.g., search costs of an adequate external provider) and stimulated trade across larger distances. Egger and Egger (2004) have dealt with this issue by proposing a model that predicts a positive effect of offshoring on markups. Such a hypothesis is supported by using an industrial panel dataset (NACE three-digit level) in which price-cost margins are approached with an accounting measurement.

Most of the theoretical and empirical literature dealing with markups assumes perfect competition in the labour market. Some papers have relaxed that assumption. Bughin (1991, 1993 and 1996) analyzed the relationship between labour markets institutions, particularly trade unions, and product market power. Later, Crépon *et al.* (1999) extended the Hall approach to estimate markups

[5] The model also incorporates the decision about outsourcing or vertical integration following the Grossman and Helpman (2002) approach. Antras and Helpman (2008) have generalized that model by allowing the degree of contractibility to vary across inputs and countries.

[6] The relationship between domestic outsourcing and productivity is not clearly established in the empirical papers. However, the evidence seems to be more convincing for offshoring. See Bjerring (2006) for a survey, and Görg et al (2008) for an empirical analysis with plant level data.

considering an efficient bargaining model between firms and unions based on MacDonald and Solow (1981). This allows them to propose an equation where markups and bargaining power are jointly estimated, with the advantage that it does not require measuring the opportunity cost of labour. Using a balanced panel of French firms, they find that ignoring imperfect competition in the labour market produces an underestimation in the price cost margin. Dobbelaere (2004) and Dobbelaere and Mairesse (2008) confirm these results for two unbalanced panels of Belgium and French firms, respectively. Additionally, some papers have used this methodology to test the pro-competitive effects of imports both on the product and labour markets. Specifically, Boulhol et al (2006) estimate markups and workers' bargaining power in the UK manufacturing sectors. In a second stage they relate trade variables with the parameters previously estimated. They find that imports from developed countries, which are mostly intra-industry trade, have contributed to the decline in both markups and workers' bargaining power. However, that pro-competitive effect does not appear for imports from developing countries.

The connection between trade and labour market bargaining has been explored since the eighties (Grossman (1984) and Mezzeetti and Dinapoulos (1991), among others). Insofar as globalization reduces economic rents (i.e., the IMD hypothesis), both profits and labour rents are directly affected. However, the key question is whether it also affects workers' bargaining power and, therefore, the distribution of rents between them and employees. The reason would be similar to that of product markets: increasing access to foreign goods implies more competition of foreign workers. It tightens domestic labour markets and reduces union bargaining power, especially in a context where the inter-industry labour market is reduced. It is likely that the precise effect of decreasing union bargaining power on wages and employment depends on specific characteristics of labour market institutions, such as the scope and structure of the bargaining process (e.g., the predominant degree of centralization/decentralization) or union preferences. In that context, Dumont *et al* (2006) extend the Bughin approach to estimate in a two step procedure not only labour bargaining power, but also union preferences between wages and employment. They analyze differences among five European countries and find that internationalization seems to have a negative impact on the bargaining power of unions.

Additionally, the effect of import competition on union bargaining power may be larger the more relevant imports of intermediate goods are. In such a case employees deal with the fact that the firm outsources some parts of the productive process to foreign countries. This is clear in some highly internationalized sectors such as the automotive industry, where competition among subsidiaries in different countries is a main factor to explain union bargaining power. However, the negative effect of final imports on union bargaining power should not be dismissed either. Imports of final goods act as a substitute for domestic production in goods such as apparels and footwear, and also erode the power of domestic trade unions.

To our knowledge, Abraham et al (2008) is the only paper that analyzes the effect of outsourcing on product and labour market discipline with firm data. They use the Olley and Pakes (2006) correction to deal with the problem of the endogeneity that emerges with the Hall approach and present different approaches to measure globalization, namely import penetration, outsourcing and foreign direct investment. They also find that globalization reduces both markups and union bargaining power, but only when imports come from low-wage countries. Additionally, the results show that the growth in outsourcing is positively correlated with both product and labour market imperfections, while the level of outsourcing does not have a statistically significant effect.

2.2 Empirical approach.

In contrast to productivity, markups are not easy to identify. In an ideal world, researchers would observe prices and marginal costs. However, marginal costs are difficult to approach and it is very unlikely to obtain information on price levels. Though researchers cannot observe either of its two components, some methods have been suggested to estimate markups. A first alternative is to use a structural approach with a specific cost function, cost shares and price equations, which allows us to estimate marginal costs and markups. Its main drawback is that very detailed information is required in order to apply this methodology. This approach was used by Bernstein and Mohnen (1991) with industrial data, and by Moreno and Rodriguez (2004, 2010) by taking advantage of the availability of price variations at the firm level in an analysis of markups for exporting firms.

Roeger (1995) was interested in knowing whether the differences between primal and dual productivity measures can be explained by imperfect competition. As he pointed-out, a by-product of

the analysis is that it provides an alternative method to estimate markups. We briefly describe that approach later on, departing from a standard production function that is linearly homogeneous in the inputs. In that context, and under imperfect competition, the output growth rate can be expressed as (Hall, 1988):

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

where y_{it}, l_{it}, m_{it} and k_{it} are the growth rate of output, labour, materials and capital, respectively; $s_{it}^{j} = \frac{P_{it}^{j} \cdot J_{it}}{P_{it} \cdot Y_{it}}$ is the cost share of input j (j=L,M,K) in sales, and P_{it}^{j} (P_{it}) stands for the prices of inputs (output). Additionally, θ_{it} is the productivity growth and μ_{it} is the price marginal cost margin: $\mu_{it} = \frac{P_{it}}{C_{it}^{'}}$.

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

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

where market power is measured by the Lerner index $\beta_{it} = 1 - \frac{1}{\mu_{it}}$. Some papers have used equations (1) or (2) to estimate markups. The main problem that emerges in that context is the expected correlation between unobservable productivity shocks and input levels, a serious problem given that it is very difficult to find exogenous instruments in this context. The approaches suggested by Olley and Pakes (1996) and Levinhson and Petrin (2003) introduce alternative ways to deal with the endogeneity of productivity shocks[7] By contrast, Roeger (1995) proposes a more simple approach to circumvent this problem, based on taking advantage of common components in the primal and dual (price-based) Solow Residual. Departing from the cost minimization problem and imposing constant returns to scale, the latter is defined as:

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

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

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

[7] Abraham *et al.* (2009) and Dobbeleare and Mairesse (2008) are two recent empirical examples.

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

In equation (4) the term which refers to the growth of productivity is eliminated and, as a consequence, the problem of correlation between unobservable productivity shocks and input levels disappears. In this sense, the Lerner index β_{it} can be estimated consistently.[8] In this context, information 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 and a weighted average of the growth rate of factor costs, weighted by their respective share in sales. We denote the term in brackets in 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:

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

The specification of equation (5a) incorporates some assumptions to be considered. The first issue is that the constant returns to scale assumption could bias upwardly (downwardly) the estimated levels (changes) in the markup.[9] With firm data, however, this is not a serious problem because usually the constant returns to scale assumption is not rejected, or 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) showed that the difference between the primal and the dual residuals is cyclical in the presence of excess capacity and also if labour hoarding is present in recession. A variable that approaches 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 throughout the business cycle. Another reason for a non-zero u_{it} is related to measurement errors, particularly with respect to inputs. As he points out, the measurement error related to labour is not relevant insofar as this variable appears only on the left side of equation (4). As we will explain in the next Section, we believe that our approaches to labour (that uses hours effectively worked instead of the number of employees) and capital stock (that uses the inventory

[8] It does not mean that the markup is unaffected by potential variables that influence efficiency. In particular, insofar as differences in marginal costs across firms are affected by import activity, as recent evidence suggests, the parameter β_{it} will capture that effect.

[9] For a more extensive discussion, see Konings *et al.* (2005).

permanent method to elaborate capital stocks and rents at the firm level instead of fixed assets) reduces to a large extent the potential measurement errors.

Finally, both the Roeger (1995) and Hall (1988) approaches assume perfect competition in the labour market. However, if wages are not the result of a huge number of interactions between individual workers and firms, but coalitions emerge in both sides, observed wages are no longer equal to marginal productivities. That gap will be larger the larger is bargaining power of trade unions. As was suggested above, some recent papers have addressed this issue introducing imperfections in this market.

Crépon *et al.* (1999) included the efficient bargaining model into the Hall (1988) approach assuming that firms and workers bargain simultaneously over both wages and employment. The objective of the union is to maximize the amount of rent sharing, $l_{it}(p_{it}^L - \overline{p}_{it}^L)$, where p_{it}^L is the negotiated wage and $\overline{p}_{it}^L$ is the alternative or reservation wage. The firm objective is to maximize its short run profit: $p_{it} \cdot y_{it} - p_{it}^L \cdot l_{it} - p_{it}^M \cdot m_{it}$.[10] The Nash solution to the bargaining problem is given by the maximization of a weighted average of both objective functions, where the weight associated to the union objective function is the union bargaining power. Departing from the first order conditions of the optimization problem, the elasticity of output with respect to labour is $\varepsilon_{it}^{Y,L} = \mu_{it} \cdot s_{it}^L + \mu_{it} \cdot \frac{\phi_{it}}{1-\phi_{it}}\left(s_{it}^L + s_{it}^M - 1\right)$, where ϕ_{it} represents the union bargaining power. As can be seen, labour cost share no longer equals output elasticities of labour divided by the markup when worker bargaining power is different from zero. If it is not properly considered, estimated markups would be biased. Crépon *et al* (2002) show that, in this context, the markup also includes the rent that goes to the workforce and must be interpreted as the ratio of price over marginal cost where this is evaluated at the reservation wage instead of the bargained wage.

We simultaneously consider imperfect competition in product and labour markets under the Roeger (1995) methodology, using the Crepón *et al* (1999) approach to the efficient bargaining model. To our knowledge, Estrada (2009) is the only paper that uses this approach to estimate markups and union

[10] Crépon *et al.* (1999) assume that only labour is the variable input factor. Crépon *et al.* (2002), Dobbelaere and Mairesse (2008) and Abraham *et al.* (2009) also introduce materials as variable inputs.

bargaining power for some industries in seven developed countries. Therefore, using the labour-output elasticity defined above, both the Solow residual (SR_{it}) and its price-based (DSR_{it}) now have the following expressions, where a new term that measures union bargaining power has been added:

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

$$DSR_{it} = s_{it}^{L} \cdot p_{it}^{I} + s_{it}^{M} \cdot p_{it}^{M} + (1 - s_{it}^{L} - s_{it}^{M}) \cdot p_{it}^{K} - p_{it} + \frac{\phi_{it}}{1-\phi_{it}}\left(s_{L}^{I} + s_{M}^{I} - 1\right) \cdot \left(p_{I} - p_{k}\right) = -\beta_{it}(p_{it} - p_{it}^{K}) + (1 - \beta_{it})\theta_{it} \quad (3b)$$

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

$$\begin{aligned} &\left(y_{it} + p_{it}\right) - s_{it}^{L} \cdot \left(l_{it} + p_{it}^{l}\right) - s_{it}^{M} \cdot \left(m_{it} + p_{it}^{m}\right) - \left(1 - s_{it}^{L} - s_{it}^{M}\right) \cdot \left(k_{it} + p_{it}^{k}\right) = \\ &\beta_{it}\left[\left(y_{it} + p_{it}\right) - \left(k_{it} + p_{it}^{k}\right)\right] + \frac{\phi_{it}}{1-\phi_{it}}\left(1 - s_{it}^{L} - s_{it}^{M}\right) \cdot \left[\left(k_{it} + p_{it}^{k}\right) - \left(l_{it} + p_{it}^{l}\right)\right] \end{aligned} \quad (4b)$$

In equation (4b), in addition to the Lerner index (β_{it}), a new term allows us to estimate the bargaining market power (ϕ_{it}). As was previously pointed out, the markup (in this case the Lerner index) should be interpreted as an average markup evaluated at the competitive wage level. Denoting the second term of the right-hand side in equation (4b) by dN_{it}, which can be interpreted as the growth rate of nominal capital per worked hour, the equation to be estimated is therefore:

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

where $\gamma_{it} = \frac{\phi_{it}}{1-\phi_{it}}$. The empirical strategy consists of testing firstly the IMD hypothesis under perfect competition in the labour market (equation (5a)) and, later, considering the extended model (equation (5b)). It allows us to evaluate the magnitude of changes in the markup when the standard assumption of perfect competition in the labour market is no longer considered.

This methodology allows us to estimate both margins and bargaining power in a very simple way while avoiding endogeneity problems related to the measurement of productivity. Additionally, it allows us to use a flexible parameterization in order to explain the observed heterogeneity of mark-ups among firms by incorporating some explanatory variables. Specifically, our main objective is to analyze how import activity is related to heterogeneity in mark-ups and bargaining power across firms. With that purpose, we interact the right-side variables of equation (5a) with the import intensity (*IMP*), defined as imports over total sales. This variable is measured using both firm-level data and industry averages. An interaction term that classifies firms according to the type of imports (*Type)* is also included to test the hypothesis that final and intermediate imports affect margins in different ways. Finally, other

interactions related to the degree of product homogeneity, market competition and capacity utilization are also introduced. As was previously mentioned, the latter controls for the potential bias that emerges from the cyclical behaviour of margins in the presence of excess capacity. Therefore, equation (5a) can be written as:

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

When the assumption of perfect competition in labour markets is relaxed, equation (6a) is enlarged to include interactions between dN_{it}, the import ratio (*IMP*) and intermediate inputs.

$$\begin{aligned} dY_{it} = {} & \beta_1 dX_{it} + \beta_2 dX_{it} \times IMP_{it} + \beta_3 dX_{it} \times IMP_{it} \times Type_{it} + \beta_4 dX_{it} \times Other\ Variables_{it} + \beta_5 CU_{it} \\ & + \gamma_1 dN_{it} + \gamma_2 dN_{it} \times IMP_{it} + \gamma_3 dN_{it} \times IMP_{it} \times Type_{it} + \gamma_4 dN_{it} \times Other\ Variables_{it} + u_{it} \end{aligned} \quad (6b)$$

Some papers have used this approach to analyze the effect of trade liberalization on markups. For example, Konings et al (2005) analyze how privatization and competitive pressure can affect price-cost margins in a panel data of Bulgarian and Romanian manufacturing firms. They find that import penetration negatively affects markup, but only in sectors where product market concentration is high. However in a more competitive sector, the effect is reversed. They explain that result pointing out that international competitive pressure depresses prices but also reduces marginal cost. In the case of competitive sectors, the second effect prevails: foreign competition leads firms to engage in more restructuring and innovating activities, which makes them more cost-efficient. 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 a majority of manufactured sectors of the EU. Finally, Altomonte and Barattieri (2007) also test the IMD hypothesis with this methodology, but their results are less conclusive. They only find evidence of pro-competitive gains from trade in some industries and explain the positive relationship obtained in other sectors by firms adjusting their product mix in response to trade pressures.

3. Data.

Firm data are taken from the *Encuesta Sobre Estrategias Empresariales* (ESEE), a survey sponsored by the Spanish 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 an unbalanced panel of about 2000 manufacturing firms for the period 1990-2005.

The set of variables included in the production function includes 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 working 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 capital stock for equipment, 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 (π_{it}^{E}) plus equipment goods depreciation (δ_{it}), multiplied by the investment goods price index (p_t^E). The other prices refer to labour costs per employee (p_{it}^{l}) and the price index for intermediate consumption (p_{it}^{m}). The latter is calculated as a Paasche index, weighting the price variations of raw materials, energy and services purchased by surveyed firms. It is expected that the empirical approaches for labour using the number of effective worked hours (instead of the number of workers) and for capital stock using a precise measurement based on the permanent inventory methodology (instead of book value of fixed assets), jointly with the availability of firm-level information of price variations, reduces the traditional sources of measurement errors in this type of estimations.

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 provides information about the percentage of sales of commercialized products not elaborated by the firm and that come from abroad. Additionally, importing firms inform about 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 define these imports as *linked.* When they exist, firms also declare if such imports refer to products that are similar to those items produced by them. Though this set of information does not indicate explicitly whether imports refer to intermediate or final goods, it can be combined to classify those situations in which import flows can

be described as intermediate or final goods. Specifically, we define final imports as those situations in which either there are no linked imports or linked-imported goods are similar to those produced by the firm. We assume that in the rest of situations firms import intermediate goods that are transformed in the productive process. Finally, we consider intermediate imports for a subsample of firms that import from foreign companies with commercialization and distribution agreements, al long as these imported goods are not similar to those elaborated by them. We define this subset as linked intermediate goods. The Appendix provides additional details about the construction of variables.

Following the standard convention, we name intermediate imports as offshoring.[11] Though there is no consensus about this term, we consider that it includes both intra-firm international outsourcing and arm's-length trade. Unfortunately, to disentangle these links between offshoring and intra-firm trade is very difficult and very few countries have the type of highly disaggregated information required.

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 by about 10 percentual points over the period. The import ratio has also increased slightly, by about 4 points. In both cases such an increase occurred in the nineties, while they have remained very stable since 2000. As can be seen in column B, almost 20% of firms over the period are final importers. They represent 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 show an increase in the intensity of import flows over the period. The proportion of firms importing intermediate goods (o*ffshoring)* 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 that takes

[11] Of course, *offshoring* can refer to goods and service trade. Unfortunately, the lack of adequate data prevents us the analysis of service *offshoring*.

value one if the product sold by the firm is highly standardized and zero otherwise. This variable is elaborated using individual information provided by firms. Therefore it may be a better approach to the specific characteristics of products elaborated by the firm than product-aggregated classifications. Insofar as this variable can be negatively correlated with demand price elasticity, its effect over markups should be negative. Finally, we test if the IMD 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 competitors, according to the information provided by the firm itself. The disadvantage of the latter variable is that the number of available observations is lower, because firms have to identify the market share of their main competitors (see Appendix for definition of variables).

4. Results.

In this section we present the results of estimating the equation (6a) and (6b) with different sets of explanatory variables. Two complementary approaches are used to estimate the markup which, as we mentioned above, is measured as a Lerner index. Firstly, a standard panel approach combining firm and time dimensions. Secondly, individual regressions for each firm that allows us to obtain firm-specific markups (β_i). That is possible because the Roeger approach only requires one explanatory variable, assuming that variables in equation (5a) are properly elaborated. In this latter case we focus our attention on the distribution of the firm-level estimated markups according to different firm characteristics.

4.1 The IMD hypothesis without controlling for union bargaining power.

We start by estimating equation (6a), that is, without controlling for the bargaining power of the employees. Tables 2 to 5 show the estimation results with different sets of explanatory variables using the first approach.[12] All estimates are carried out by pooled OLS. To control for unobserved heterogeneity, we have also run regressions with fixed-effects. However, the test for the null hypothesis that all fixed effects are equal to zero was not rejected. Consequently, we only present the results

[12] A percentage of firms present negative profits in some years. It implies that the sum of the variable cost shares in sales exceed the unity. We have dropped the extreme values corresponding to the first percentile.

corresponding to pooled estimations.[13] As we explained in Section 2.2, this approach allows us to estimate consistently markups without an instrumental variables procedure. However, in all the estimations we have included the variation of capacity utilization to control the cyclical difference between the primal and the dual residual when there is 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 to capture time-specific effects and they are jointly significant. By contrast, industry dummies are not significant and they are not included.

Following the standard approach of the IMD hypothesis, we start by 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 negatively affects the markup, confirming such a hypothesis. The average import ratio for all manufacturing industries is 0.094. This implies that the average markup for all firms is about 0.164. These results are consistent with previous international evidence such as Konings *et al.* (2005) and Konings and Vandenbussche (2005). The 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 interaction of industrial average imports with the two dummy variables that proxy final and intermediate goods, respectively. As can be seen, the negative effect associated to external competitive pressure is bigger for final goods: the value of the coefficient is -0.160. This implies that the average markup for a final good importer is about 0.150. As we expected, when we consider intermediate imports the pro-efficiency effect of this type of imports outweighs the pro-competitive effect of the external pressure. As can be seen, the coefficient for this interaction is non-significant. The average markup for an intermediate good importer is about 0.168. The coefficient turns positive although non-significant for linked imports of intermediate goods (Column 3). These results support 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 do not seem to affect mark-up.

Although most of the empirical literature measures imports at the industry level, we can test the effect of imports on markups using individual data. The estimated parameters, presented in Table 3, jointly support the previous results. Foreign competitive pressure plays a significant role in the case of final

[13] The estimations are available from the authors upon request.

goods. As can be seen in Column 2, markups are reduced from 0.172 of non-importers to 0.146 for final goods importers. However, the impact of the import ratio on margins is smaller for firms that import intermediate goods (the coefficient of the interactions goes from -0.142 to -0.058). This implies that the markup for intermediate goods importers is about 0.164. For these firms, international competition seems to have a depressing effect on marginal costs which partially outweighs the negative effect on prices.[14] These results suggest that the importer *premia* is partially passed through to markups. As can be seen in Column 3, the coefficient of the interaction for linked imports of intermediate goods is non-significant. This result can be influenced, as we explained in section 3, by the fact that there is a reduced number of these firms which, in addition, have the biggest import ratio.

Table 4 explores additional information about the effect of product differentiation on markups. The variable that approaches the degree of product differentiation takes value 1 if the firm declares that its products are highly standardized, and zero otherwise. As can be seen in Column 1, it has a direct negative effect on margins and the coefficient is significant at 10%. 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 insofar as competitive pressures of imports are higher when products are more homogeneous. The results presented in Columns 2 and 3 confirm that hypothesis: the IMD effect is stronger when imports are carried out by firms that produce highly homogenous goods, especially for final good imports. Specifically, the markup for final good importers that produce non-differentiated goods is 0.141.

Table 5 complements previous results introducing other variables related to the degree of domestic competition. Specifically, we use the weighted market share reported by firms and the weighted concentration rate (CR4) in markets in which firms compete. As expected, Columns 1 and 2 show that both variables positively affect average markups. Unlike Konings *et al.* (2005) who obtain a negative effect of the interaction between concentration and international pressure for Bulgaria and Romania during their privatization restructuring process in the nineties, the interactions between market share and CR4 and the import ratio are non-significant.

[14] There is empirical evidence that supports a positive relationship between productivity and imports of intermediate goods.

4.2 Firm-level estimations of markups.

A clear advantage of the procedure proposed by Roeger (1995) to estimate markups is that it requires a small number of explanatory variables. This feature, along with the availability of a long time period, allows us to estimate individual markups. Specifically, we estimate equation (5a) for 885 firms with more than nine observations. This approach may be seen as a complementary way to test the IMD hypothesis. The average markup for these firms is 0.184, which is very similar to the results presented in previous estimations. However, as can be seen in Figure 1, the dispersion is large and the distribution is slightly skewed, with a large proportion of firms on the right tail.

Departing from these firm-specific estimations, we compare the distribution of markups between different groups of firms according to the type of imports and we perform tests of equality of means and tests of equality of distributions (see Figure 2 and Table 6). Firstly, Graph i compares the distribution of importers and non-importers. As can be seen in the first line of Table 6, the null hypothesis of equality between the average margins and distributions can not be rejected. Although the number of non importers is small, this result suggests that there is not a negative correlation between imports and markups. To further explore this relationship, we test whether it is affected by import intensity. We define intensive importers as those firms with an import ratio bigger than the 75^{th} percentile (17.7%). As can be seen in Graph iii, the distribution of markups for these firms is slightly on the left with respect to the other importers. The tests presented in Table 6 not only reject 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 markup, we can not reject the equality of both distributions.

Additionally, we split the sample according to the type of imported goods. Specifically, we compare final good importers with other importers and non-importers. As can be seen in Graphs iv and v, the distribution of markups for firms that import final goods is located on the left with respect to other importers, though it seems that there are no 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 other importers. Graph vi presents the results 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. Therefore, though the econometric approach is different to standard pooled regressions, the results confirm those previously obtained.

4.3 Joint estimation of the markup and union bargaining power.

In this section we relax the assumption of perfect competition in the labor market that was previously held. Table 7 shows the estimation results for equation (6b) with different sets of explanatory variables. The first two columns present the estimates of the markups with and without controlling for the bargaining power of workers. Column 1 shows that the average markup in the Spanish manufacturing industry is around 0.164. This value increases to 0.176 when imperfect competition in the labor market is taken into account (Column 2). As in previous empirical evidence, we find that ignoring bargaining between unions and employers underestimates the estimated markup. The latter value is slightly larger than those obtained by Estrada (2009) using the same methodology but with industry data instead of firm data.[15] He finds a Lerner index of 0.136 for Spanish industries in the period 1970-2004. Our result is also in line with Boulhol *et al.* (2006), who obtain an average estimated Lerner index of around 0.20 for the UK manufacturing industry.

The average price over marginal cost associated to the estimated Lerner index (0.176) is 1.214. This result is in keeping with earlier works in other countries. For example, Abrahams *et al.* (2009) and Dobbeleare (2004) report an average markup of 1.35 and 1.49 for Belgian manufacturing, respectively. For French firms, Dobbeleare and Mairesse (2008) and Crépon *et al.* (2002) estimate an average markup of 1.20 and 1.42, respectively.

As can be seen in Column 2, the variable which accounts for workers bargaining power is strongly significant. The estimated union bargaining power for the manufacturing industry is about 0.13-0.15.[16] This result indicates that workers influence employment and wage and, in this sense, bargained wages can be outside of the labor demand curve. It is also consistent with previous papers, although it reflects that the bargaining power of unions in Spain seems to be slightly smaller than in some other European

[15] The estimation is also consistent with the results found by Moreno and Rodríguez (2010) using a structural approach.

[16] The estimated standard errors for ϕ of the estimated parameters are computed using the Delta Method: $\hat{\sigma}_{\hat{\phi}} = \frac{\hat{\sigma}_{\hat{\gamma}}}{(1+\hat{\gamma})^2}$.

countries.[17] For example, for Belgian firms, Dobbelaere (2004) obtains a parameter of 0.244 while the estimated bargaining power presented in Abrahams *et al.* (2009) ranges from 0.117 to 0.369, without (with) materials as variable input, respectively. Both Crépon *et al.* (2002) and Boulhol *et al.* (2006) obtain larger estimated union bargaining power (0.66 for French firms and 0.4 for English firms, respectively).

To analyze the heterogeneity among sectors, we have estimated equation (6b) for 20 manufacturing sectors without considering the interactions with other variables.[18] The estimated Lerner index ranges from 0.089 to 0.296, which implies that the price- marginal cost ratio ranges from 1.098 to 1.420. Comparing the estimated index Lerner and the average of import ratio for the 20 industries (see Figure 3) we obtain a negative correlation of -0.46, which is consistent with our previous estimations of the industry as a whole. Additionally, the heterogeneity of the union bargaining power among industries is bigger than previously obtained for markups. The estimated values for the other sectors range from 0.144 to 0.423, but we do not find significant parameters in the "Meat industry", "Other food and tobacco", "Ferrous and non-ferrous metals", "Printing products" and "Office and data processing machinery".

Figure 4 shows the scatter for both estimated parameters across industries. As can be seen, those sectors with a larger Lerner index are often those sectors with stronger union bargaining power. The correlation between the two groups of parameters is 0.49. Industries such as "Non-metallic mineral products", "Metal products", "Beverages", "Paper" and "Agricultural and industrial machinery" present markups and union bargaining power that are above the overall average of the industry. This result suggests a bigger capacity of the unions to negotiate bigger wages in industries where the markup is high.

Column 3 of Table 7 shows the interaction of the import ratio with the markup and the bargaining power terms. That is, we test if international competition is also associated with lower union bargaining power. The comparison of this estimation with the results in Column 1 of Table 3 supports the relevance of considering imperfect competition in the labour market. The markups for non-importing firms increases

[17] This result differs from those obtained by Estrada (2009) using industry-aggregated data. He only found union bargaining power in service sectors as a whole, whereas he did not find evidence of worker power for manufacturing.
[18] For this estimation, we have eliminated all the observations with negative profits.

by more than 8%, attaining a value of 0.186. Therefore, even controlling for the union bargaining power, the IMD hypothesis works for Spanish manufacturing firms. With respect to the interaction with the bargaining power term, although the coefficient presents an expected negative sign, it is non-significant.[19] This result differs with Abraham *et al.* (2009), who find a negative effect of import penetration in both markups and union bargaining power, although only for imports from low-wage countries. However, Boulhol *et al.* (2006) obtain the opposite result: they only obtain a negative relationship between the estimated markups and union bargaining power for imports from developed countries. They argue that this type of imports is surely intra-industry, so it is a better candidate for the pro-competitive effects on markups. The last column of Table 7 includes an additional interaction to distinguish according to the type of imports. As can be seen, we confirm the previous results with perfect labor competition. The negative impact of the import ratio on markup is larger for final good importers. Specifically, the markup for intermediated and final good importers is 0.174 and 0.155, respectively.

To explore more carefully the relationship between union bargaining power and globalization, we have analyzed whether the relationship is affected by the degree of differentiation produced by the firm. Table 8 repeats the estimations of Table 4 taking into account the bargaining power term. As can be seen in Column 1, the coefficient increases their significance: firms that produce homogeneous goods not only present smaller markups but also lower union bargaining power. Specifically, the union bargaining power for firms with differentiated product is 0.179, a number that is 31% bigger than the average of the industry as a whole. The estimations with the interactions of the degree of differentiation with the import ratio and import ratio of final goods are showed, respectively, in the last two columns of Table 8. As in the previous results, we confirm that the negative effect of international competition is even larger when imports are carried out by firms that produce homogenous goods, especially, for final good imports. Additionally, in this case, we find that the interaction with the bargaining term is also negative and significant. The effect of the import ratio for firms that produce homogeneous goods is negative: the union bargaining power of these firms is 0.116 instead of 0.149 for the rest of firm. The impact is even more negative when we consider final importers: the value in this case is 0.065. This suggests that unions have more restrictions to negotiate larger rent sharing in industries where the degree of

[19] As in the previous estimations, the null hypothesis that the individual effects are equal to zero can not be rejected. For this reason, we only present the OLS pooled estimation. However in the fixed effects estimations, the estimated parameter is negative and significant at the 10%.

differentiation is lower and that these difficulties increase when these industries are more exposed to international competition.

5. Conclusions.

The negative effect of import competition on domestic markups has been a well-founded result in empirical literature for many years. Similar arguments have been suggested to predict a negative effect of market integration on domestic workers' bargaining power. This paper analyzes jointly both perspectives, while paying special attention to the specific effect of intermediate imports on product and labour market imperfections. The estimation of markups departs from the procedure suggested by Roeger (1995) and it introduces union power by means of an efficient bargaining model.

The results are highly robust irrespective of the empirical strategy followed, which includes pooled and firm-specific regressions. Additionally, market imperfections are introduced consecutively, which allows us to asses the biases that emerge in the estimation of markups when union bargaining power is not considered. The results strongly support the negative effect of imports, with independence of whether they are measured at the firm or industry level. However, the distinction between the types of imported goods points out that the IMD hypothesis is more relevant for final goods. By contrast, when offshoring activities are considered, productivity gains seem to outweigh partially the pro-competitive effect of international competition. The negative effect for final-goods oriented imports, both on markups and union bargaining power, is larger the more homogeneous are goods elaborated by firms. Finally, we show that both measures of market imperfections are highly correlated. Those industries with higher markups also show larger imperfections in labour markets, proxied by union bargaining power. Overall, these results support the positive effects of market integration policies, measured here through import activity, in reducing market imperfections. However, these effects crucially depend on the nature of imported goods. The increasing role of intermediate imports in world trade flows suggests that not all economic integration across countries necessarily reduces domestic market imperfections.

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Appendix: *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, δ 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 market shares of four main competitors in each market. Later, a weighted concentration index is calculated for each firm using as weighting the proportions of sales in each market with respect to total sales.

Degree of product homogeneity: Dummy variable that takes value 1 if the product supplied by the firm is highly standardized. As in the rest of variables, 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.

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 explicit information about the type of imported goods (final or intermediate). Nevertheless, it includes complementary information that helps us 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 provide information about 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 exist, firms declare whether they are similar goods to those produced by them. As can be seen in Table A1, only 10% (15%) of all observations (observations with positive imports) are associated to linked imports. This percentage is almost 25% (40%) in the case of product commercialized by the firm coming from abroad.

We assume that firms that do not have linked imports but which commercialize imported product not elaborated by themselves should be final importers. 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 to 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 to 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 also takes value 1 if the firm imports from foreign companies with which it has commercialization and distribution agreements but it defines this linked imports as imported goods that are similar to 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 to those elaborated by

them. Some of them are commercialized products not elaborated by themselves and that come from abroad.

Table A1: Classification of imports

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

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

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 \left[dX_{it} \times AMR_{it} \right] + \beta_3 \left[dX_{it} \times AMR_{it} \times Type_{it} \right] + \delta \cdot dUC_{it} + \sum_{t=1991}^{2005} \alpha_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)
Markup (β_1)	0.177***	0.168***	0.168***
	(0.006)	(0.004)	(0.004)
Effect of import ratio (β_2)	-0.143***		
	(0.054)		
Effect of final goods import ratio (β_3)		-0.160***	-0.160***
		(0.060)	(0.060)
Effect of intermediate goods import ratio (β_3)		-0.028	-0.037
		(0.046)	(0.050)
Effect of linked intermediate goods import: ratio(β_3)			0.020
			(0.089)
Utilization of capacity(δ)	0.019***	0.019***	0.019***
	(0.004)	(0.004)	(0.004)
Wald test - Time Dummies	0.0	0.0	0.0
Wald test - Fixed effects	0.82	0.82	0.82
Mark-ups for all importer firms	*0,164*		
Mark-ups for firms which import final goods		*0,150*	*0,150*
Mark-ups for firms which import intermediate goods		*0.168*	*0.168*
Number of observations	17749	17749	17749
(Number of firms)	(2519)	(2519)	(2519)

Notes:

- AMR_{it} refers to the industry average of the import ratio. $Type_{it}$ refers to dummies that classified firms according their type of import: final, intermediate or linked intermediate goods.
- Estimated standard error in parenthesis. Coefficients significant at: 1%***, 5%**, 10%*

Table 3
Markups and firm-level imports
OLS pooled estimation

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 \left[dX_{it} \times MR_{it} \right] + \beta_3 \left[dX_{it} \times MR_{it} \times Type_{it} \right] + \delta \cdot dUC_{it} + \sum_{t=1991}^{2005} \alpha_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)
Markup (β_1)	0.172***	0.172***	0.172***
	(0.003)	(0.003)	(0.003)
Effect of import ratio (β_2)	-0.090***		
	(0.019)		
Effect of final goods import ratio (β_3)		-0.142***	-0.143***
		(0.028)	(0.028)
Effect of intermediate goods import ratio (β_3)		-0.058**	-0.062**
		(0.023)	(0.026)
Effect of linked intermediate goods import ratio (β_3)			-0.046
			(0.040)
Utilization of capacity (δ)	0.019***	0.019***	0.019***
	(0.004)	(0.004)	(0.004)
Wald test - Time Dummies	0.0	0.0	0.0
Wald test - Fixed effects	0.82	0.82	0.82
Mark-ups for all importers firms	*0.163*		
Mark-ups for firms which import final goods		*0.146*	*0.146*
Markups for firms which import intermediate goods		*0.164*	*0.165*
Number of observations (Number of firms)	17767	17767	17767
	(2519)	(2519)	(2519)

Notes:

- MR_{it} refers to the import ratio of the firm. $Type_{it}$ refers to dummies that classified firms according their type of import: final, intermediate or linked intermediate goods.
- Estimated standard error in parenthesis. Coefficients significant at: 1%***, 5%**, 10%*

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

$$dY_{it} = \beta_1 \cdot dX_{it} + \lambda_2 \left[dX_{it} \times HP_{it} \right] + \lambda_3 \left[dX_{it} \times MR_{it} \times HP_{it} \right] + \lambda_4 \left[dX_{it} \times MR_{it} \times HP_{it} \times Type_{it} \right] + \delta \cdot dUC_{it} + \sum_{t=1991}^{2005} \alpha_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)
Markup (β_1)	0.170***	0.171***	0.167***
	(0.004)	(0.003)	(0.003)
Effect of non-differentiated products (λ_2)	-0.009*		
	(0.006)		
Effect of import ratio for firms with non-differentiated products (λ_3)		-0.120***	
		(0.022)	
Effect of final goods import ratio for firms with non-differentiated products (λ_4)			-0.145***
			(0.031)
Utilization of capacity (δ)	0.019***	0.019***	0.019***
	(0.004)	(0.004)	(0.004)
Wald test - Time Dummies	0.0	0.0	0.0
Wald test - Fixed effects	0.82	0.82	0.82
Markups for firms with non-differentiated products	*0.164*		
Markups for importer firms with non-differentiated products		*0.159*	
Markups for firms with non-differentiated products and which import final goods			*0.141*
Number of observations (Number of firms)	17758	17758	17758
	(2519)	(2519)	(2519)

Notes:
- MR_{it} refers to the import ratio of the firm. HP_{it} refers to dummies that classified the firms according to the degree of the standardization of their product and $Type_{it}$ refers to a dummy that define final goods importers.
- Estimated standard error in parenthesis. Coefficients significant at: 1%***, 5%**, 10%*

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

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 \left[dX_{it} \times MR_{it} \right] + \lambda_2 \left[dX_{it} \times MS_{it}(CR4_{it}) \right] + \lambda_3 \left[dX_{it} \times MR_{it} \times MS_{it}(CR4_{it}) \right] + \delta \cdot dUC_{it} + \sum_{t=1991}^{2005} \alpha_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)
Markup (β_1)	0.159***	0.161***	0.173***	0.177***
	(0.003)	(0.007)	(0.003)	(0.005)
Effect of import ratio (β_2)			-0.107***	-0.148***
			(0.025)	(0.047)
Effect of market share of the firm (λ_2)	0.052***			
	(0.015)			
Effect of concentration(λ_2)		0.020*		
		(0.012)		
Effect of import ratio controlling for market share (λ_3)			0.108	
			(0.080)	
Effect of import ratio controlling for concentration (λ_3)				0.089
				(0.072)
Utilization of capacity (δ)	0.017***	0.017**	0.018***	0.018**
	(0.005)	(0.008)	(0.005)	(0.008)
Wald test - Time Dummies	0.0	0.0	0.0	0.0
Number of observations (Number of firms)	16267	6463	16267	6463
	(2468)	(1600)	(2468)	(1600)

Notes:
- MR_{it} refers to the import ratio of the firm. MS_{it} refers to market share and $CR4_{it}$ to concentration index.
- Estimated standard error in parenthesis. Coefficients significant at: 1%***, 5%**, 10%*

Table 6
Mark-ups differences according the type of imports

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

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

Table 7
Markups, union bargaining power and firm-level imports
OLS pooled estimation

$$dY_{it} = \beta_1 \cdot dX_{it} + \beta_2 \left[dX_{it} \times MR_{it} \right] + \beta_3 \left[dX_{it} \times MR_{it} \times Type_{it} \right] + \gamma_1 \cdot dN_{it} + \gamma_2 \left[dN_{it} \times MR_{it} \right] + \delta \cdot dUC_{it} + \sum_{t=1991}^{2005} \alpha_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)
Markup (β_1)	0.164***	0.176***	0.186***	0.186**
	(0.003)	(0.003)	(0.004)	(0.004)
Effect of import ratio (β_2)			-0.115***	
			(0.022)	
Effect of final goods import ratio (β_3)				-0.166***
				(0.030)
Effect of intermediate goods import ratio (β_3)				-0.083***
				(0.025)
Bargaining term (γ_1)		0.151***	0.178***	0.177***
		(0.023)	(0.026)	(0.026)
Effect of import ratio on bargaining (γ_2)			-0.295	-0.292
			(0.188)	(0.188)
Utilization of capacity (δ)	0.019***	0.017***	0.017***	0.018***
	(0.004)	(0.005)	(0.004)	(0.004)
Wald test - Time Dummies	0.0	0.0	0.0	0.0
Wald test - Fixed effects	0.82	0.83	0.83	0.83
Bargaining power for non-importers (ϕ_{it})		0.131	0.151	0.151
		(0.017)	(0.018)	(0.017)
Mark-ups for importers firms			*0.175*	
Mark-ups for firms which import final goods				*0.155*
Markups for firms which import intermediate goods				*0.174*
Number of observations	17767	17767	17767	17767
(Number of firms)	(2519)	(2519)	(2519)	(2519)

Notes:

- MR_{it} refers to the import ratio of the firm. $Type_{it}$ refers to dummies that classified firms according their type of import: final, intermediate or linked intermediate goods.
- Estimated standard error in parenthesis. Coefficients significant at: 1%***, 5%**, 10%*

Table 8
Markups, bargaining power and firm-level imports: the effects of product differentiation
OLS pooled estimation

$$dY_{it} = \beta_1 \cdot dX_{it} + \lambda_2 \left[dX_{it} \times HP_{it} \right] + \lambda_3 \left[dX_{it} \times MR_{it} \times HP_{it} \right] + \lambda_4 \left[dX_{it} \times MR_{it} \times HP_{it} \times Type_{it} \right] + \gamma_1 \cdot dN_{it}$$
$$+\eta_2 \left[dN_{it} \times HP_{it} \right] + \eta_3 \left[dN_{it} \times MR_{it} \times HP_{it} \right] + \eta_4 \left[dN_{it} \times MR_{it} \times HP_{it} \times Type_{it} \right] + \delta \cdot dUC_{it} + \sum_{t=1991}^{2005} \alpha_t \cdot TD_t + \varepsilon_{it}$$

	(1)	(2)	(3)
Markup (β_1)	0.186***	0.185***	0.180***
	(0.005)	(0.004)	(0.003)
Effect of non-differentiated products (λ_2)	-0.018***		
	(0.006)		
Effect of import ratio for firms with non-differentiated products (λ_3)		-0.151***	
		(0.025)	
Effect of final goods import ratio for firms with non-differentiated products (λ_4)			-0.180***
			(0.035)
Bargaining term (γ_1)	0.218***	0.175***	0.163***
	(0.036)	(0.025)	(0.024)
Effect of non-differentiated products (η_2)	-0.114**		
	(0.047)		
Effect of import ratio for firms with non-differentiated products: (η_3)		-0.439**	
		(0.217)	
Effect of final goods import ratio for firms with non-differentiated products (η_4)			-0.527**
			(0.277)
Utilization of capacity (δ)	0.017***	0.018***	0.018***
	(0.004)	(0.004)	(0.004)
Wald test - Time Dummies	0.0	0.0	
Wald test - Fixed effects	0.83	0.83	0.83
Bargaining power for referred group: ϕ_{it}	0.179	0.149	0.140
	(0.024)	(0.018)	(0.015)
Number of observations (Number of firms)	17758	17758	17758
	(2519)	(2519)	(2519)

Notes:
- MR_{it} refers to the import ratio of the firm. HP_{it} refers to dummies that classified the firms according to the degree of the standardization of their product and $Type_{it}$ refers to a dummy that define final goods importers
- Estimated standard error in parenthesis. Coefficients significant at: 1%***, 5%**, 10%*

Figure 1
Markups distribution

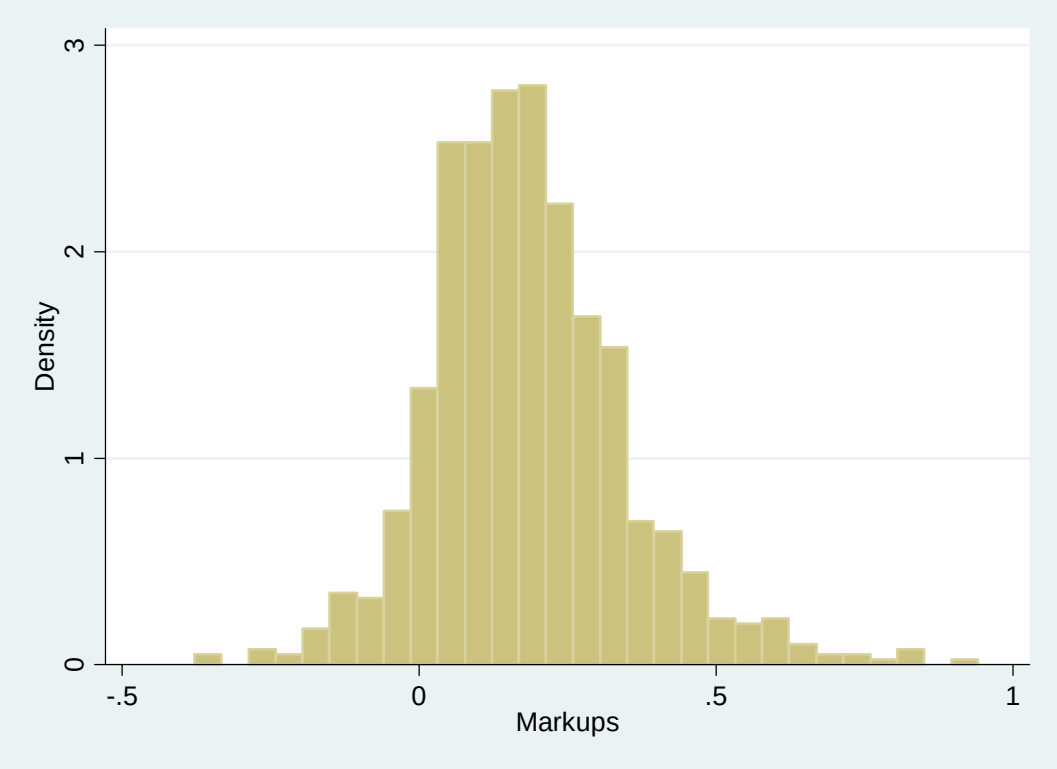


Figure 2
Markups distribution: Kernel density estimates

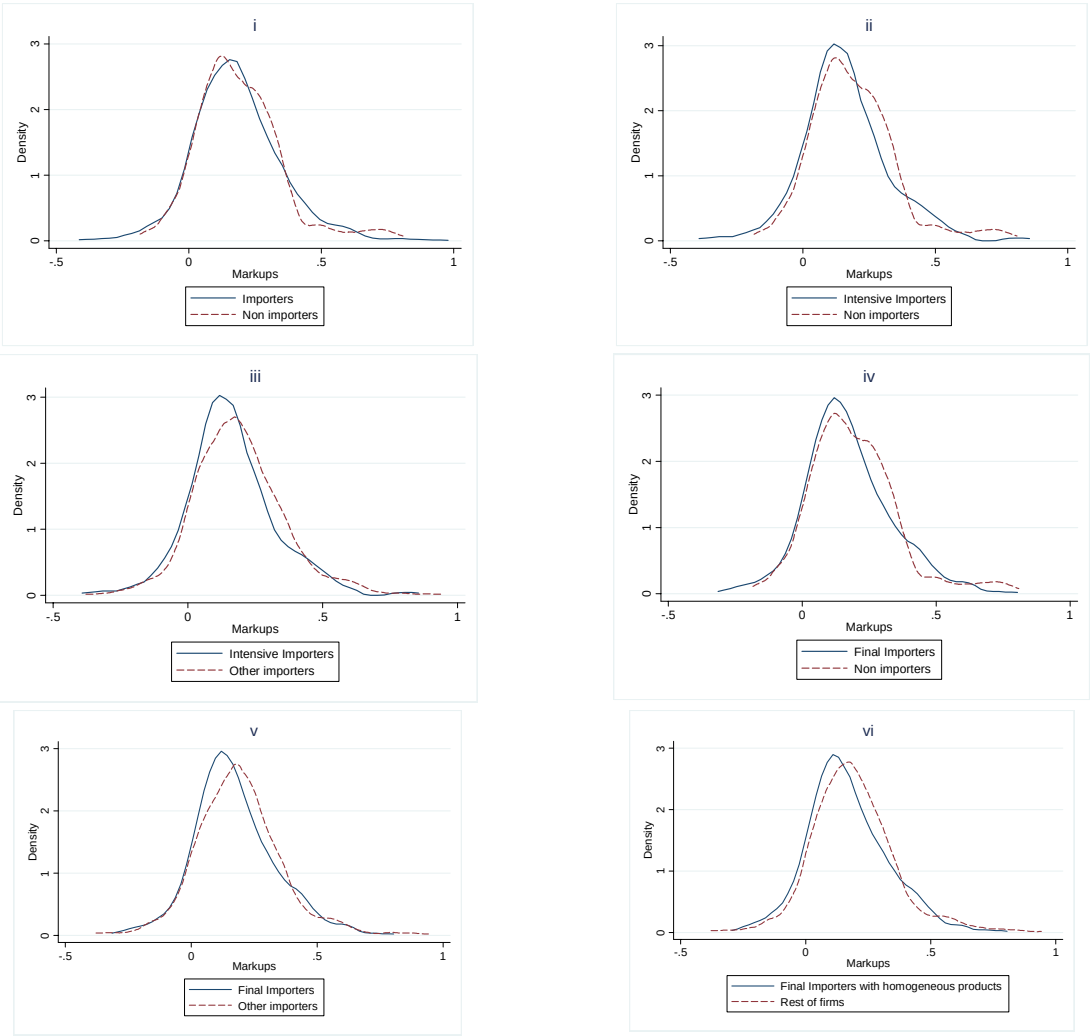


Figure 3
Markups (Lerner index) and Import ratio across industries

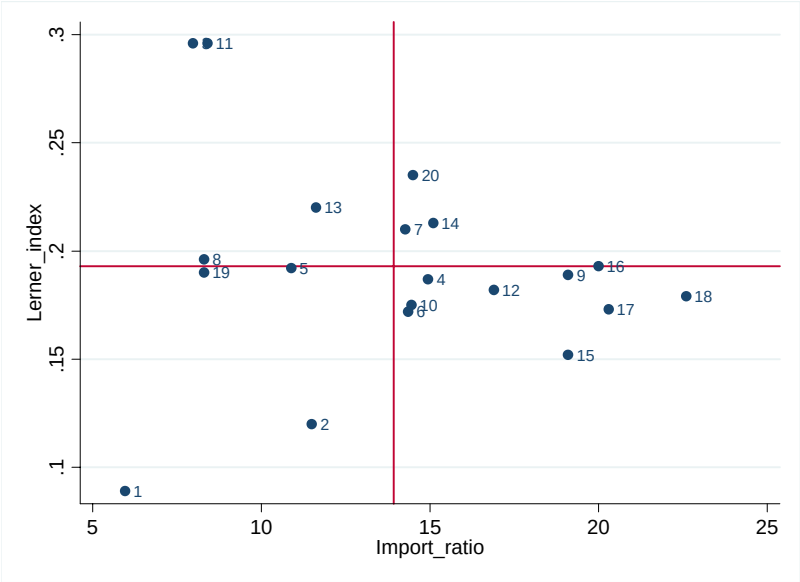
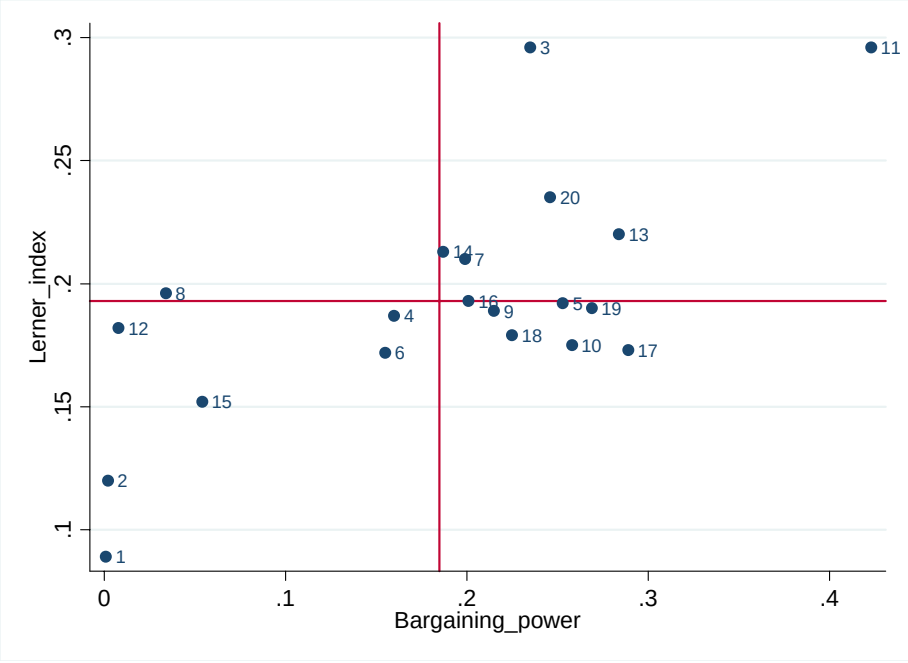


Figure 4
Markups (Lerner index) and Union Bargaining Power across industries



1	Meat related products	11	Non-metal mineral products
2	Food and tobacco	12	Basic metal products
3	Beverages	13	Fabricated metal products
4	Textiles and clothing	14	Industrial and agricultural equipment
5	Leather, fur and footwear	15	Office mach., data proc., precision instr. and similar
6	Timber	16	Electric materials and accessories
7	Paper	17	Vehicles and motors
8	Printing and publishing	18	Other transport equipment
9	Chemicals	19	Furniture
10	Plastic and rubber products	20	Miscellaneous