The impact of trade restrictions on exporters' markups: Evidence from AD against South Korea

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Abstract

The objective of this paper is to analyze how firms adapt their markups to trade restrictions imposed against them. In particular we look at the case of Antidumping (AD) duties imposed by other countries on Korean exports. Additionally, we analyse the change in Korean domestic firms' markups following the imposition of protective AD duties by South Korea. The literature on AD has generally focused on the impact of these policies on firms in the domestic market of the country imposing these measures. In this paper, we extend the analysis by also looking at the effects on firms in the country targeted by AD. South Korea is a particularly interesting case given that it is the second most targeted country in the world after China.

In the analysis presented in this paper, we use information on AD duties imposed against South Korea by its main trading partners between 2004 and 2006, and estimate markups before and after the imposition of duties using firm level data from 2001 to 2008. We estimate markups using the method introduce by Roeger(1995). We complement this analysis by looking at changes on firm performance indicators including sales, profits, price cost margins, employment and value added per worker. To isolate the effect of AD duties, we compare affected firms with control groups selected using covariate nearest neighbour matching techniques. We find evidence of a positive effect on markups following the imposition of protective AD duties by South Korea. As for firms in sectors targeted by AD, we find evidence of a negative impact on firm performance but we fail to pick up a statistically significant effect on markups.

Keywords: Antidumping, Import tariffs, Markup, Competition

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1. Introduction

The main objective of this paper is to analyze how Korean firms' adapt their markups to trade restrictions imposed against them by their trading partners. In particular, we look at the case of Antidumping (AD) duties imposed by other countries on Korean exports. Additionally, and in order to compare the Korean case with previous studies, we also analyse the change in Korean domestic firms' markups following the imposition of AD duties by South Korea. The literature on AD has generally focused on the impact of these policies on firms in the domestic market of the country imposing these measures. In this paper, we extend the analysis by looking at the effects on firms in the country targeted by AD.

In the context of WTO/GATT rules, countries are limited in their ability to use trade restrictions. However, WTO rules allow member countries to use tariffs or quotas via three exceptions: Antidumping and Countervailing duties (CVD) and Safeguard. Among these, AD is the provision more intensively. For example, between 1995 and 2008, 2190 AD measures were reported to the WTO, against only 128 CVD and 89 Safeguards. Unlike Safeguards, which are imposed at a MFN basis, AD and CVD are imposed against a particular trading partner who is suspected of "unfair" trading practices. In particular, according to WTO rules, AD duties can be imposed against another member country if there is evidence that foreign firms are selling their products at a price lower than in their home market. Therefore, AD is a country/product specific trade restriction, meaning that it is imposed against a particular trading partner in a specific product or products.

When trade restrictions are imposed, this has the effect of restricting market competition in the affected products. We would expect foreign producers to adapt by lowering their prices (border price effect) while the domestic price in the protected country increases. Moreover, we will expect to see an increase in domestic firms' market power in detriment of foreign exporters. In consequence, we will expect to see an increase in markups when firms are protected by AD duties in their domestic market, and a decrease when their exports are targeted in foreign markets[2].

However, there are elements that can at least partially offset this effect. Firstly, given that AD duties are imposed against imports of a particular country, trade diversion may occur implying that the reduction in imports from the country or countries targeted by the duties is compensated by imports from other sources. Something similar is true for foreign exporters affected by AD. When Korean firms' are targeted by an AD duty from one country, they can potentially offset this by exporting more to other markets or even start exporting to new ones. Additionally, since AD duties are imposed in specific product lines, firms can offset their effects by shifting sales to other products not affected by the tariff. This is particularly important for our purposes, since we only observe Korean firms' average markups, that is, we are unable to separate markups imposed by firms in different markets and products

[2] For a theoretical model showing this result see Vandenbussche & Zarnic (2008).

Also, the reaction of Korean firms will depend on which country is targeting them. We would expect to find a significant effect only when AD duties are imposed by Korea's main exports destinations, such as China, US, Japan or EU. In fact, the offsetting effect of export diversion discussed above is probably less likely to play an important role when a major player in world trade is restricting its market to Korean exports, given that it may be more difficult for Korean firms to find another market to replace it. For this reason, in this paper we will focus only on AD duties imposed by Korea's main trading partners.

We chose to study the case of South Korea for various reasons. Firstly, due to its location since it is in Asia where much of the current AD action in happening. During the nineteen-eighties Asia was targeted by traditional users of AD such as US and EU. However, since the late nineties Asian countries, especially India and China, have started to use AD much more intensely becoming the world's leading users in terms of initiations and measures imposed (see table 1). Moreover, much of this increasing AD activity is occurring between Asian countries which are targeting each other.

Korea is a particularly good example for our purposes since, unlike other Asian countries such as China and India, it is not a relatively heavy user of AD. As table 1 shows, Korea is the second most targeted country in the world after China, both in terms of initiations and measures. It does not however, make the top 10 of more intensive users. This is important because we would like to separate the effect of duties aimed at the country to that of duties imposed by it. Additionally, South Korea has a consolidated market economy and hence we believe it is a good example to study what happens when a country is affected by other countries' AD.

We are not the first to consider the link between trade policy and market power. Konings & Vandenbussche (2005) study the impact of EU AD duty on domestic firms' markups, using firm balance-sheet data of firms operating in sectors affected by AD duties as well as a randomly drawn control group. They estimate markups using both the method proposed by Roeger (1995) and observed price-cost margins, and find a positive effect of AD duties on markups.

More recently, Blonigen, Liebman & Wilson (2007) studied the impact of different trade measures on market power in the US steel industry using product data and a system of equations to estimate markups. In their study only voluntary restraint agreements (quotas) increase markups, while the rest (mostly tariffs, including AD duties) had little effect on market power.

Rovegno & Vandenbussche (2010) study the impact of US AD on domestic producers' markups using sector-level data and PCM to measure markups. They also find a positive effect following AD protection. Also, Pierce (2009) studies the impact of US AD on domestic producers' productivity using US Census plant level data and finds that revenue based

productivity rises following AD duties, and that this is driven by increments in prices and markups rather than physical productivity.

With respect to the effects on the foreign exporters, Vandenbussche & Zarnic (2008) study the effects of 2002 US safeguards in steel on European firm's markups. They use a panel of EU firms and estimate markups also using the Roeger (1995) method. They find evidence that EU steel firms saw their markups decrease due to US safeguards, with this impact being stronger for single-product firms than multi-product firms.

Our study is different to theirs in many ways. Firstly, we are interested in a different type of trade policy. As we mentioned above AD is country specific while Safeguards are applied at a MFN, therefore here we study the impact on Korean firms of a policy that is directly targeted at their exports, which points in the direction of a potentially stronger effect on markups. However, Safeguards involve in general, though not necessarily, more product lines than AD and hence this may result in smaller effects of AD since firms may shift their export into other products not affected by the duty. Also, previous studies have focused on the impact of AD on the US and EU. We contribute to the literature by extending the analysis to other regions.

In the analysis presented in this paper, we use information on AD duties imposed against South Korea by its main trading partners between 2004 and 2006 coming from the Global Antidumping Database (Brandeis University and World Bank). We use firm level data from 2001 to 2007 which allows us to estimate markups before and after the protection using the method introduced by Roeger (1995). We complemented this analysis by looking at changes on firm performance indicators including sales, profits, price cost margins, employment and value added per worker. To isolate the effect of AD duties from other phenomena affecting markups in the period, we compare affected firms with control groups selected using covariate nearest neighbour matching techniques. We find evidence of a positive effect on markups following the imposition of protective AD duties by South Korea. As for firms in sectors targeted by AD, we find evidence of a negative impact on firm performance, but we fail to pick up a statistically significant effect on markups.

The paper is organized as follows. In the next section, we present a brief description of AD activity involving South Korea. In section three, we describe the empirical methodology used and the data sources. In section four we present our results, and in section five we conclude.

2. Antidumping activity in South Korea

South Korea is not new to AD. Its AD legislation dates from 1963 and was already in use in the 1980s but became more intensely used since the 1990s. It also has a long experience as AD target, especially by the US since the early eighties and later by the EU. Figure 1 presents the share of AD initiations and measures against Korea on total notifications to the WTO between 1995 and 2008.

Both shares present a somewhat erratic evolution, ranging from 5% to 9%. However, a clear tendency emerges from the graph: the share on measures tends to equalize the share on petitions in more recent years. This is the reflection of an increasing tendency for petitions against this country to result in the imposition of measures. In fact, in 1995 measures notified to the WTO represented 30% petitions, while in 2008 this share has escalated to 90%. This is probably explained by the more intensive use of AD by developing countries, in particular in Asia, which have tended to rule in favour AD petitions relative to traditional users. In fact, as table 2 shows, South Korea is frequently targeted by its neighbours, most notably India and China, although the US and EU also target Korea rather frequently.

As for the products affected by AD, table 3 present a list of the products more frequently involved in AD petitions filed between 2000 and 2007 in South Korea (protection) or against its exports in other countries (targeted). There is a clear overlap in the two lists, with chemicals being at number one in both. Other products include paper, wood articles, plastics, iron and steel and electric machinery.

3. Empirical Methodology

Data

The information on AD cases comes from Global Antidumping Database (version 5.0, July 2008), funded by Brandeis University and the World Bank[3]. It contains information on AD petitions for more than 40 countries in a comprehensive and standard format that allows the aggregation of information across different countries. Among those 40 countries, it includes the 27 that, according to WTO notifications, have targeted AD against Korea since 1995. It also includes extensive information on the use of CVD and Safeguards. This data was contrasted with WTO notification to verify its completeness.

The firm-level data comes from the commercially available database ORIANA (version 2009), which contains balance sheet information of Asian firms. Korean firms are classified under the 5-digit Korean Standard Industry Classification Revision 9. Although the data starts in 1998, it has good coverage of South Korean firms only for the period 2001 to 2008. Since we want to observe firms before and after the imposition of AD duties, we focus on AD duties imposed between 2004 and 2006.

ORIANA is highly unbalanced. This imbalance is not so much due to firms exiting and entering the database, but mostly to firms not reporting all the variables we need every year (for example, they report turnover but provide no information on costs). In the estimations presented in this paper we focused on firms that reported all relevant information for at

[3] Bown, Chad P. (2008) "Global Antidumping Database," [version 5.0, July 2008], available at http://people.brandeis.edu/~cbown/global_ad/

least two consecutive years before and after the imposition of duties, which in differences implies at least one observation before and one.

The data was cleaned from abnormal values, such as negative costs, and we only consider firms where the share of total costs in turnover is larger than 1 percent and smaller than 100 percent. We use only unconsolidated accounts since we are interested in firms rather than groups, although, this makes little difference in the Korean case since most firms for which we had complete information report unconsolidated accounts.

As we mentioned in the introduction, we expect a significant effect on markups only when South Korean exports are targeted by major trading partners. Table 4 presents data on export destination of Korean products in 2000 and 2006. In the list we present the top 6 destinations, all countries not reported in the table receive less than 2% of Korean exports. In this paper we focus on AD measures imposed against Korea by one of the listed six countries.

Additionally, in order to have as clean an experiment as possible, we chose sectors in which there were no overlaps with other trade policies during this period. To this end, we also gathered information on CVD and Safeguards by Korea and its six major trading partners. Table 5 lists the cases considered in this study. They include six cases where AD protection was granted by Korea and four cases where Korean firms' were targeted in foreign markets. These include two AD duties imposed by China, one by the US and one by the EU. As for the other three trading partners, Hong Kong does not have independent AD activity, and Japan and Taiwan did not impose any AD duties against Korea between 2004 and 2006.

A difficulty arises when trying to match AD duties (which are identified by HS code) with firms in ORIANA database (which are classified under the 5-digit KSIC Rev. 9) given that no KSIC-HS correspondence table is available. However, the 4-digit KSIC Rev.8 classification is almost identical to the International Standard Industry Classification (ISIC) Rev. 3. The difference is that KSIC is more disaggregated for particular sectors. For example, ISIC 2610 (Manufacture of glass and glass products), corresponds to KSIC 2611 (Manufacture of Glass in Primary Forms), KSIC 2612 (Manufacture of Industrial Glassware) and KSIC 2619 (Manufacture of Other Glass Products). Also, the Korean Statistical Division provided us with a concordance table between revisions 8 and 9 of KSIC. By combining these concordance tables, we obtained the "candidate" 5-digit KSIC sectors for each AD case. The relevant code among them was selected on the basis of the description of products affected by AD. We also complemented this by checking the KSIC code under which the firms named in the AD petitions are classified in ORIANA.

The last two columns of table 5 present the number of firms included for each AD case. We have an unbalanced panel of 825 affected firms (555 in protected sectors and 270 in targeted sectors).

Method to estimate markups

Markups are estimated using the method developed by Roeger (1995). This is an extension of the method introduced by Hall (1988) to control for the presence of imperfect competition in the estimation of productivity. In this subsection we present an quick overview of the method; a more detailed discussion is included Annex A. We start by considering a function of the form $Q_{it} = A_{it}F(K_{it}, L_{it}, M_{it})$, where i denotes the firm, t time, Q_{it} output, A_{it} is total factor productivity, K_{it} capital, L_{it} labour, M_{it} material. If F is homogenous of degree one, we obtain the following expression for the Solow Residual (SR):

$$SR = \left(\hat{Q}_{it} - \hat{K}_{it}\right) - \alpha_{Lit}\left(\hat{L}_{it} - \hat{K}_{it}\right) - \alpha_{Mit}\left(\hat{M}_{it} - \hat{K}_{it}\right) = \left(1 - \frac{1}{\mu_{it}}\right)\left(\hat{Q}_{it} - \hat{K}_{it}\right) + \frac{1}{\mu_{it}}\theta_{it} \quad (1)$$

where α_{Lit} and α_{Mit} are respectively the shares of labour and material costs in revenue, $\mu_{it} = (P/c)_{it}$ is the price-cost markup and $\theta_{it} = dA_{it}/A$ represents productivity growth rate. The symbol "^" indicates the growth rate of the corresponding variable. This is the expression derived by Hall (1988) which decomposes the SR in an imperfect competition term and a productivity term. Since the unobserved productivity term θ and $(\hat{Q}_{it} - \hat{K}_{it})$ are positively correlated, in order to estimate markups using eq. (1) we would need instruments that are correlated to output but not to technological innovation which may not be easy to find. To overcome this problem, Roeger (1995) proposed an alternative specification using the Dual Solow Residual (DSR). Denoting P_{it} the price of the good, R_{it} the rental price of capital, W_{it} wages and P_{Mit} the unit price of materials, under constant returns to scale, we can consider the following generic cost function: $C(R_{it}, W_{it}, P_{Mit}, Q_{it}, A_{it}) = \frac{G(R_{it}, W_{it}, P_{Mit})Q_{it}}{A_{it}}$. Assuming that $G(W, R, P_M)$ is homogeneous of degree one, the DSR under imperfect competition is given by:

$$DSR = (1 - \alpha_{Lit} - \alpha_{Mit})\hat{R}_{it} + \alpha_{Lit}\hat{W}_{it} + \alpha_{Mit}\hat{P}_{Mit} - \hat{P}_{it} = -\left(1 - \frac{1}{\mu_{it}}\right)\left(\hat{P}_{it} - \hat{R}_{it}\right) + \frac{1}{\mu_{it}}\theta_{it} \quad (2)$$

Finally, subtracting DSR in (1) from SR in (2) we obtain:

$$SR - DSR = \left(\hat{Q}_{it} + \hat{P}_{it}\right) - (1 - \alpha_{Lit} - \alpha_{Mit})\left(\hat{K}_{it} + \hat{R}_{it}\right) - \alpha_{Lit}\left(\hat{L}_{it} + \hat{W}_{it}\right) - \alpha_{Mit}\left(\hat{M}_{it} + \hat{P}_{Mit}\right) = \left(1 - \frac{1}{\mu_{it}}\right)\left[\left(\hat{Q}_{it} + \hat{P}_{it}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right)\right] \quad (3)$$

Note that the unobserved productivity term cancels out, which means that eq. (3) can be estimated without the need of instruments. Rearranging, we obtain the following expression to estimate markups directly:

$$\left(\hat{Q}_{it} + \hat{P}_{it}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right) = \mu_{it}\left\{\alpha_{Nit}\left[\left(\hat{L}_{it} + \hat{W}_{it}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right)\right] + \alpha_{Mit}\left[\left(\hat{M}_{it} + \hat{P}_{Mit}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right)\right]\right\} \quad (4)$$

The advantage of this expression is that the terms in parentheses are actually growth rates of nominal variables (sales, payroll, nominal value of material costs and nominal value of capital), and therefore there is no need to use deflators which are not available at firm level. For capital, we use the book value of the fixed tangible assets. As for the rental price of capital (R_{it}), we follow Hall & Jorgenson (1967), Hsieh (2002) and Konings & Vandenbussche (2005), and calculate it as $R_{it} = P_{INV}(r_t + \delta_{it})$, where P_{INV} is an index of investment goods at country level, r_t is the real interest rate at time t and δ_{it} is the firm level depreciation rate, which we fix at 10%. For P_{INV} we use the price index of capital equipment and we calculate the real interest rate as the interest rate of 10-year Korean treasury bonds minus the inflation rate (source: Bank of Korea).

Redefining $\Delta Y_{it} = \left(\hat{Q}_{it} + \hat{P}_{it}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right)$ and $\Delta X_{it} = \left\{\alpha_{Nit}\left[\left(\hat{N}_{it} + \hat{P}_{Nit}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right)\right] + \alpha_{Mit}\left[\left(\hat{M}_{it} + \hat{P}_{Mit}\right) - \left(\hat{K}_{it} + \hat{R}_{it}\right)\right]\right\}$, we can express the basic specification as follows:

$$\Delta Y_{it} = \omega_i + \mu_1 \Delta X_{it} + \mu_2 \Delta X_{it}.AD + \alpha \Delta X_{it}.GDP_t + \beta GDP_t + \varepsilon_{it} \quad (5)$$

where ω_i is a firm level fixed effect and AD is a dummy that takes the value one if an AD duty is in place targeting or protecting the sector where the firm operates. We also interact ΔX_{it} with Korean GDP growth rate to account for the potential cyclicality of markups. This is the specification used by Konings & Vandenbussche (2005) in which the effect of AD duties is captured by the coefficient μ_2.

However, this specification by itself is not completely satisfactory in order to isolate the effect of AD. If for some other motive besides AD, markups are either increasing or decreasing for all firms, coefficient μ_2 will also capture this other effects. For this reason, we need to compare affected firms with a group of counterfactual firms. Previous studies (Konings & Vandenbussche, 2005; Vandenbussche & Zarnic, 2008) have done this by estimating eq. (5) separately for affected and control groups and comparing the results. However, for the purposes of our study we would like to have an estimation that allows us to test whether differences between affected and control firms are significant. To this end, we modified eq. (5) and defined the following adapted difference in difference specification:

$$\Delta Y_{it} = \omega_i + \mu_1 \Delta X_{it} + \mu_2 \Delta X_{it}.AD + \mu_3 \Delta X_{it}.T + \mu_4 \Delta X_{it}.AD.T + \alpha \Delta X_{it}.GDP_t + \beta.GDP_t + \varepsilon_{it} \quad (6)$$

In this equation AD is equal to 1 after the imposition of duties for both affected firms and counterfactuals. T is a dummy that takes the value 1 for firms in affected sectors throughout the period. In this new specification, μ_2 captures the change in markups for all firms after the imposition of the AD duty, μ_3 captures the fact that affected firms may have different average markups with respect to the control group from the outset, and $\mu_4$measures the effect of AD duty.

Alternatively to estimating eq. (5) and eq. (6) as presented here, we experimented with other specifications in which we include as controls year dummies, AD and $AD.T$. Results were almost identical for all alternative specifications and therefore we only present in below those obtained using the more parsimonious one.

Selection of control groups

In order to estimate eq. (6), we need an adequate control group of firms to compare affected firms. AD duties are the result of a process in which domestic firms request import protection to the competent public agencies and these decide whether to grant it on the basis of an investigation in which they analyse firm performance and market conditions. For this reason, we should compare affected firms with firms that are not affected but are as similar as possible to those affected in terms of their likelihood of being protected.

Following Konings and Vandenbussche (2005), the first candidates for a control group would be firms in sectors that were involved in AD petitions that resulted in negative rulings, and hence for which no duties were imposed. The advantage of using this group is that we would expect these firms and sectors to be similar to the ones receiving protection since they also merited an AD investigation. However, in the case of South Korea there were not enough termination cases to be able to construct a control group, especially for targeted sectors.

In light of this, we constructed control groups from the pool of firms in sectors that were not affected by AD (nor CVD or SG) in the period. Ideally, from this pool we would like to draw a sample of firms that are as similar or as likely to be affected by AD as our treated group, ideally on the basis of a propensity score matching. A firm is affected by AD if an AD duty has been imposed in the sector where it operates, which means that here "treatment" is a sector-level phenomenon. Therefore, it does not make much sense to estimate a propensity score at firm-level, we should do it instead at the sector level. However, the sector level data is only available at the 4-digit ISIC level, and it is disaggregated in only 119 sectors[4]. Due to this reduced number, calculating a propensity score, which requires the estimation of a probit or logit model, was not feasible.

[4] Sector-level data on sales, labour and capital is available at 5-digit KSIC from the Korean Statistical Department. In order to obtain information on export intensity and import penetration, we combine this with trade data from UN Comtrade database. However, as mentioned earlier no KSIC – HS concordance table is available, which meant that sector level data had to be aggregated to exactly match 4-digit ISIC. This classification includes 127 codes. Additionally, 8 ISIC sectors are excluded from the UN ISIC-HS concordance table, and hence the resulting dataset contains 119 ISIC sectors.

For these reasons, we turn to alternative ways to construct control groups. We use three different control groups. The first group is composed by all firms operating in sectors similar to those affected by AD, selected on the basis of a covariate nearest neighbour matching with replacement at the sector level. We obtained five matched sectors for each affected industry[5]. From this pool of potential controls, we draw a reduced group of firms using a covariate nearest neighbour matching at the firm level. Therefore, this second control group is composed by the firm most similar to the affected ones operating in the most similar sectors. The third group is constructed also running a covariate nearest neighbour matching at firm level but now drawing firms from the complete pool of sector not affected by AD.

For the sector-level matching we used data coming from the Mining and Manufacturing Survey provided by the Korean Statistical Department, which we merged with UN Comtrade data[6]. As covariates, we selected variables on the basis of the empirical literature on the determinants of AD[7]. For protected sectors these include import penetration, employment, capital per worker, labour intensity calculated (payroll over shipments), and observable price cost margins and number of establishments as proxies for the degree of concentration. For targeted sectors we used the same variables except that we substituted import penetration for export intensity calculated as exports over shipments. For all variables we consider the average of the three years prior to the imposition of the duty.

For the matching at firm level, we selected firm characteristics that we considered relevant for our analysis, including sales, growth rate of sales, price cost margins, labour intensity and capital labour ratio. We could not use any indicators that require the number of workers, such as value added or capital per worker, since information on employment is not available for many firms in various years, and therefore this would have greatly reduced our sample. We also defined the matching algorithm as to find when possible an untreated firm that has the same panel structure to the affected one. That is, if for example for a give firm we had information for 2002, 2003 and 2005, we matched it when possible with a firm for which we also had information only for those years. Descriptive statistics of treated and control groups are presented in table 6.

4. Results

Changes in overall firm performance

Before discussing our results regarding firms' markups, we analyse the differences between affected and non-affected firms on some basic firm performance indicators following the

[5] For further details on the matching technique used in this paper see Abadie *et al.* (2004).

[6] UN Comtrade data is expressed in US dollars, while the industry data from the Korean Statistical Department is presented in Korean wons. In order to combine the two, we transformed industry data into dollars using the average annual exchange rate available from the Bank of Korea.

[7] This includes Hansen (1990), Hansen & Prusa (1996; 1997), Baldwin & Steagall (1994), Sabry (2000), Knetter & Prusa (2003) and Blonigen & Park (2004).

imposition of duties. To this end, we estimated the following difference-in-difference panel regressions:

$$\log(X) = \omega_i + \alpha_t + \beta.\widetilde{AD} + \epsilon_{it}$$

where $\omega_i$is a firm fixed effect, α_i represent a complete set of year dummies and $\widetilde{AD}$ is a dummy equal to one if an AD duty is in place in year t in the sector where firm i operates. We estimated this equation substituting X for sales, gross profits, observable price cost margins (calculated as sales minus material and labour costs, divided by sales), employment and value added per worker. We estimated these regressions comparing firms in protected and targeted sectors with the pool of control firms from the sector level matching and the two control groups obtained from the firm level matching. Table 7 presents a summary of the estimations of β for the alternative performance indicators. In all estimations fixed effects and year dummies are significant. Note that information on employment is only available for a reduced number of firms and periods, and therefore the sample is smaller in the last two regressions.

When we compare protected sectors with the first two groups, we find that following the imposition of AD, these firms enjoy sales and profits 8 and 10% higher than the control groups. They also present a higher level of employment. We do not find a significant difference in terms of price cost margins and value added per worker. When we compare these firms with the third control group, however, we find no significant difference in any of the performance indicators, except employment.

As for the targeted sectors, the results are more consistent. Comparison with the three groups gives similar coefficients, although they are not all significant in all specifications. However, in general we see that these firms seem to perform more poorly than counterfactuals, with lower sales, profits, price cost margins and value added per worker. In fact, the magnitudes of the differences are quite high. Affected firms present sales around 9% smaller and profits 12% lower than controls. Price cost margins are decreasing by around 5% and value added per worker by around 10%.

Changes in markups

We now discuss our results regarding markups. We first estimated the single difference specification in eq. (5). Results for protected and targeted sectors are presented in columns 1 and 5 of table 8 respectively. The first thing to notice is that protected sectors present higher average markups than targeted sectors. The coefficient of ΔX suggests that firms in protected sectors on average markup prices 23% over costs, while firms in targeted sectors enjoy markups of only around 11%. Regarding changes in markups following the imposition of AD duties, protected sectors see their markups increase by 10 perceptual points. This magnitude is similar to the 8 perceptual point increase found by Konings & Vandenbussche (2005) for the EU. As for the targeted sectors, we find no significant change on markups.

These results, although suggestive, do not allow us to conclude what is the real impact of AD on markups. As discussed above, to isolate the effect of AD we use the alternative specification presented in eq. (6). Again, we estimated this equation for protected and targeted using the three alternative control groups. Results are also presented in table 8. When we compare affected sectors to the pool of firms from the sector level matching, we find that markups for all firms seem to be increasing between 2 and 4 perceptual points in the period. However, for protected sectors we see that their markups increase an additional 8 perceptual points and this difference in significant at 5%, which suggests that the increase in markups found before is indeed related to the presence of AD protection. As for targeted sectors, the coefficient of the interaction $\Delta X.AD.T$ is negative and of around the same magnitude than the coefficient of $\Delta X.AD$, which would suggest that unlike all other firm, those in targeted sectors do not see their markups increase in the period. However, this coefficient is non-significant.

When we compare affected firms with the two control groups found using firm level matching, we no longer find an overall increase in markups for all firms, but we still find a positive and significant increase in markups for protected sectors of around 8 to 10 perceptual points. As for targeted sectors, we still find no significant change in markups.

5. Conclusions

In this paper we studied the effect of trade restrictions on firms' market power by analysing the changes in markups when firms are either protected by AD duties or targeted by them. We complemented this analysis by also looking at changes on firm performance indicators. We used data on AD duties involving South Korea and used a panel of firms to estimate markups comparing affected firms with three different control groups.

We found a positive effect on markups when Korean firms are protected by AD duties against imports from abroad. We also found evidence of improve performance in terms of sales and profits; however this results are not robust to the choice of different control groups. Also, we find no evidence of increments on price cost margins or value added per worker. As for targeted sectors, we found evidence of a negative impact on performance, including not only sales and profits but also productivity proxied by value added per worker. However, we do not see any change in their markups following AD actions against them.

How can we interpret these results? First, when domestic firms are protected by AD, they seem to enjoy an increase in market power in the domestic market which translates in higher markups. At the same time, we do not see evidence of improved firm performance. These results gives support to critics who regard AD provisions as mere protectionist measures allowing domestic firms to enjoy more market power to the detriment of foreign competitors and domestic consumers.

As for firms that are targeted by AD in foreign markets, we find evidence that their overall performance is affected. However, they do not seem to be able to adapt by decreasing their markups. Two possible explanations are possible. One reason why we fail to pick up an effect is simply because we are observing average markups which include sales in all markets, therefore we will only observe losses provided they are not compensated by gains in others markets. However, another interpretation is that these firms are in more competitive sectors which limits their ability to decrease markups further when faced with AD. Note that in our estimations average markups in targeted sectors are lower compared to firms in other sectors throughout the period studied. Combined with the fact that we find evidence of adverse effects in other performance indicators, we conclude that firms in targeted sectors are adversely affected by AD but are not able to adapt by decreasing their markups.

Some robustness checks and extensions remain as future agenda. Concerning our methodology, the method used to estimate markups presents two basic shortcomings. Firstly, it assumes constant returns to scale, an assumption that is not likely to hold in the type of sectors considered here. Therefore, we will next complement our analysis using a method that allows for non constant returns. Additionally, there is room for concern of potential endogeneity in the variable ΔX in eq. (5) and (6), due to simultaneity in output and input choice. Other literature has addressed this issue by estimating eq. (5) in first differences instrumenting ΔX using its lags. Due to the limited time span of our database, this option is not available to us, and therefore we are exploring other possibilities including estimating mark-ups using an alternative approach that is not subject to this critic.

Also, as mentioned earlier, in our estimations we used an unbalanced panel of firms. Although missing observations in our dataset are not necessary due to firm entry and exit in the market, average markups may change due to reallocations rather than changes firm level markups. For this reason we are currently running our estimations reducing our sample to the balanced panel. Preliminary results suggest that our conclusions remain unchanged.

As for extensions, firstly we plan to explore the role that firm heterogeneity plays in firms' responses to AD. Also, it would be interesting to see in more detail how productivity is affected following AD, in particular for protected sectors. For these firms we found no effect in price cost margins, which are a proxy for markups that does not control for changes in productivity, while we find a positive effect on markups when using the Roeger (1995) method which controls for productivity. Combined with the fact that we find no evidence of an increase in value added per worker (a proxy for productivity that does not control for changes in markups), this may suggest that average productivity is decreasing in this sectors, a result that would contrast what has been found previously for the EU (Konings & Vandenbussche, 2008).

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Appendix A: Description of the method to estimate markups

In this appendix we present the derivation of eq. (5) used to estimate markups. It is based on the method developed by Hall (1988) and Roeger (1995). To simplify notation we omit the subscripts it, however it should be clear that the following derivations refer to a representative firm i at time t. We start by considering the following production function:

$$Q = AF(K, L, M) \tag{A.1}$$

where Q is output, A is total factor productivity, K capital, L labour, M materials and F is homogenous of degree one (constant returns to scale). Totally differentiating (A.1) and dividing by Q, yields:

$$\frac{dQ}{Q} = \theta + AF_K \frac{dK}{Q} + AF_L \frac{dL}{Q} + AF_M \frac{dM}{Q} \tag{A.2}$$

where $\theta = dA/A$ the rate of growth of productivity, and $F_z = \partial F/\partial z$ for $z = K, L, M$ (arguments are omitted for brevity). Also, $AF_z = \partial Q/\partial z$, the marginal product of factor z. In equilibrium the return to factor z equals marginal revenue times its marginal product. Also in equilibrium marginal revenue equals marginal cost, so we have that $AF_z = P_z/c$, that is the marginal product of factor z equals its price divided by marginal cost. Denoting wages by W, the rental price of capital R and the price of materials P_M, we can then express (A.2) as:

$$\frac{dQ}{Q} = \theta + \frac{RK}{cQ}\frac{dK}{K} + \frac{WL}{cQ}\frac{dL}{L} + \frac{P_M M}{cQ}\frac{dM}{M} \tag{A.3}$$

Under constant returns to scale, the sum of the shares of labour, capital and materials on total costs is equal to one. Also, let $\alpha_j = P_j j/PQ$ the share in revenue of input j and $\mu = P/c$ the markup, then we have that $\alpha_j \mu = P_j j/cQ$, that is the share of input j in revenue times the markup equals the sher of input j in total costs. Substituting in (A.3) we get that:

$$\hat{Q} = \theta + (1 - \alpha_L \mu - \alpha_M \mu)\hat{K} + \alpha_L \mu \hat{L} + \alpha_M \mu \hat{M} \tag{A.4}$$

where $\hat{X} = dlog(X) = dX/X$ denotes the marginal rate of change of X. Adding and subtracting $(1 - 1/\mu)\hat{Q}$ on the right hand side of (A.4) and rearranging, we get the following expression for the Solow residual under imperfect competition:

$$SR = \left(\hat{Q} - \hat{K}\right) - \alpha_L\left(\hat{L} - \hat{K}\right) - \alpha_M(\hat{M} - \hat{K}) = \left(1 - \frac{1}{\mu}\right)\left(\hat{Q} - \hat{K}\right) + \frac{1}{\mu}\theta$$

(A.5)

Therefore, the SR can be decomposed in an imperfect competition term and a productivity term. Since the unobserved productivity term θ and $(\hat{Q} - \hat{K})$ are positively correlated, in order to estimate markups using equation (A.5) we would need instruments that are correlated to output but not to technological innovation which may not be easy to find. To overcome this problem, Roeger (1995) proposed an alternative specification using the dual Solow residual.

Under constant returns to scale, we can consider the following generic cost function:

$$C(R, W, P_M, Q, A) = \frac{G(R, W, P_M)Q}{A}$$

(A.6)

$G(W, R, P_M)$ is homogeneous of degree one. Marginal cost is $c = G(W, R, PM)/A$, which after applying logarithms and differentiating yields the following expression for the rate of growth of marginal costs:

$$\frac{dc}{c} = \frac{G_R R}{G(.)}\frac{dR}{R} + \frac{G_W W}{G(.)}\frac{dW}{W} + \frac{G_M M}{G(.)}\frac{dP_M}{P_M} - \theta$$

(A.7)

where $G_j = \partial G/\partial j$ for $j = R, W, M$, function arguments are omitted for brevity. Following Shephard's lemma, the derivative of the cost function with respect to the price of an input z is equal the demand for the input, $(G_{P_z}Q)/A = z$, rearranging and substituting for G_{P_z} in (A.7) yields:

$$\hat{c} = \left[\frac{RK}{C(.)}\right]\hat{R} + \left[\frac{WL}{C(.)}\right]\widehat{W} + \left[\frac{P_M M}{C(.)}\right]\hat{P}_M - \theta$$

$$= \left[\frac{RK}{cQ}\right]\hat{R} + \left[\frac{WL}{cQ}\right]\widehat{W} + \left[\frac{P_M M}{cQ}\right]\hat{P}_M - \theta$$

(A.8)

Now, assuming markups are constant, then $\hat{c} = \hat{P}$. Substituting $\alpha_j\mu = P_j j/cQ$ as before, gives:

$$\hat{c} = \hat{P} = (1 - \alpha_L\mu - \alpha_M\mu)\hat{R} + \alpha_L\mu\widehat{W} + \alpha_M\mu\hat{P}_M - \theta$$

(A.9)

which after some computations yields the following expression for the dual Solow residual:

$$DSR = (1 - \alpha_L - \alpha_M)\hat{R} + \alpha_L\widehat{W} + \alpha_M\hat{P}_M - \hat{P} = -\left(1 - \frac{1}{\mu}\right)(\hat{P} - \hat{R}) + \frac{1}{\mu}\theta$$

(A.10)

Finally, subtracting DSR in (A.10) from SR in (A.5) we obtain:

$$SR - DSR = (\hat{Q} + \hat{P}) - (1 - \alpha_L - \alpha_M)(\hat{K} + \hat{R}) - \alpha_L(\hat{L} + \widehat{W}) - \alpha_M(\widehat{M} + \hat{P}_M) =$$
$$= \left(1 - \frac{1}{\mu}\right)[(\hat{Q} + \hat{P}) - (\hat{K} + \hat{R})]$$

(A.11)

The unobserved productivity term cancels out, so (A.11) can be estimated without the need of instruments. Rearranging, we obtain the expression to used to estimate markups:

$$(\hat{Q} + \hat{P}) - (\hat{K} + \hat{R}) = \mu\{\alpha_L[(\hat{L} + \widehat{W}) - (\hat{K} + \hat{R})] - \alpha_M[(\widehat{M} + \hat{P}_M) - (\hat{K} + \hat{R})]\}$$

(A.12)

Appendix B: Tables and figures

Table 1: Main AD users and target countries

Top 10 AD users, 1995-2008			Top 10 countries targeted by AD, 1995-2008		
Country	Initiations	Measures	Country	Initiations	Measures
India	564	386	China	677	479
United States	418	268	South Korea	252	150
European Union	391	258	United States	189	115
Argentina	241	167	Taiwan	187	120
South Africa	206	124	Indonesia	145	82
Australia	197	75	Japan	144	106
Brazil	170	86	Thailand	142	84
China, P.R.	151	108	India	137	84
Canada	145	90	Russia	109	90
Turkey	137	124	Brazil	97	74
Total	3427	2190	Total	3427	2190

Source: own calculations using data from WTO

Figure 1: Share of AD initiations and measures against Korea on initiations and measures worldwide

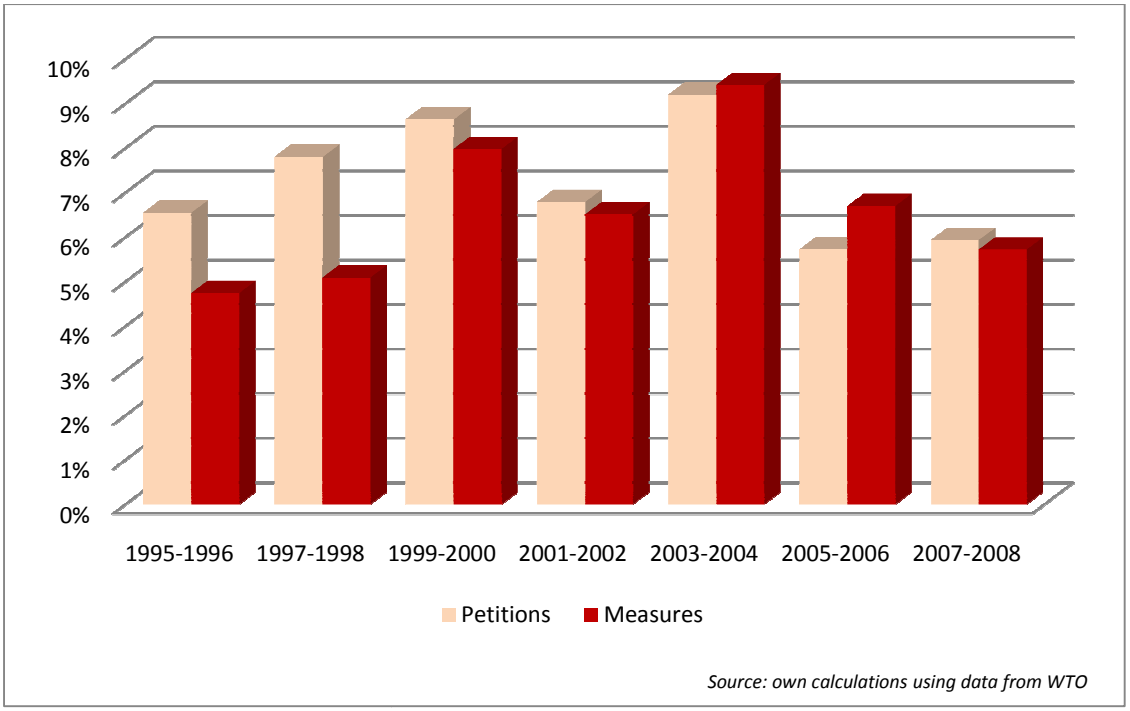

Table 2: AD against Korea 1995-2008, countries ranked by number of measures

	Initiations	Measures
India	44	30
China	27	20
South Africa	15	16
United States	29	12
EU	27	12
Australia	21	11
Argentina	11	10
Turkey	7	7
Canada	8	5
Malaysia	7	5
Indonesia	10	3
Others	46	19
Total	252	150

Source: own calculations using data from WTO

Table 3: Products involved in AD petitions by and against South Korea, 2000-2007

		Protection
HS*	**Description**	**Petitions**
29	Organic chemicals	14
48	Paper and paperboard	10
44	Wood and articles of wood	8
23	Residues and waste from the food industries; prepared animal fodder	6
39	Plastics and articles	6
85	Electrical machinery and equipment	5
15	Animal or vegetable fats and oils	3
52	Cotton	3
54	Man-made filaments	3
72	Iron and steel	3
	Other	2 or less

Table 3: *cont.*

Targeted		
HS*	**Description**	**Petitions**
29	Organic chemicals	25
39	Plastics and articles	20
72	Iron and steel	13
48	Paper and paperboard	10
73	Articles of iron or steel	10
84	Nuclear reactors, boilers, machinery and mechanical appliances	10
54	Man-made filaments	9
28	Inorganic chemicals	6
55	Man-made staple fibres	6
85	Electrical machinery and equipment	5
	Other	3 or less

Source: Own calculations using data from the Global Antidumping Database
*Note: * 2-digit HS trade code reported in AD petition*

Table 4: Main export destinations for Korean products

2000			2006		
Destination	**Value of exports U$S 1000**	**Share on total exports**	**Destination**	**Value of exports U$S 1000**	**Share on total exports**
U.S.A	37.610.630	22%	China	69.459.178	21%
EU25	24.678.339	14%	EU25	48.450.006	15%
(EU15)	*(23.423.660)*	*(14%)*	*(EU15)*	*(40.736.514)*	*(13%)*
Japan	20.466.016	12%	U.S.A	43.183.502	13%
China	18.454.540	11%	Japan	26.534.015	8%
Hong Kong	10.708.094	6%	Hong Kong	18.978.863	6%
Taiwan	8.026.625	5%	Taiwan	12.995.658	4%

Source: own calculations using data from the Korean International Trade Association

Table 5: AD cases considered

Product	**Imposing country**	**Type of protection**	**Year of Imposition**	**Number of firms**
Protected sectors				
Lithium Battery	Korea	AVD	2004	39
Choline Chloride	Korea	AVD	2004	204
Particle Board	Korea	DPU	2004	68
Ceramic Tiles	Korea	AVD	2005	93
Industrial Robot	Korea	AVD	2005	68
Automated Guide Hole Puncher	Korea	AVD	2006	83
			Total	**555**

Table 5: *cont.*

Targeted sectors				
Prestressed Concrete Steel Wire Strand	USA	AVD	2004	95
Certain Optical Fibre	China	AVD	2005	18
Unbleached Kraft Liner/Linerboard	China	AVD	2005	11
Side-By-Side Refrigerators	EU	AVD	2006	146
			Total	**270**

Table 6: Descriptive statistics before AD

	Protected sectors		**Pool of control**		**Control group 1**		**Control group 2**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Sales	9580,50	*26339,06*	3598,99	*16716,04*	6390,26	*15483,28*	8224,52	*25137,97*
Price cost margins	0,248	*0,143*	0,179	*0,088*	0,227	*0,120*	0,234	*0,291*
Labour intensity	0,089	*0,075*	0,060	*0,055*	0,076	*0,058*	0,096	*0,152*
Capital/labour ratio	14,47	*123,62*	17,88	*152,88*	9,70	*16,43*	23,37	*520,28*
Employment	74,28	*117,75*	37,60	*124,01*	63,09	*127,52*	63,78	*125,73*
Profits	2776,4	*8384,2*	646,7	*3474,5*	1609,7	*4462,7*	2219,9	*8048,2*
Value Added per worker	47,22	*38,49*	36,33	*49,07*	44,64	*42,22*	49,00	*46,58*
Log dif in sales	0,235	*0,484*	0,195	*0,511*	0,210	*0,411*	0,238	*0,577*
Log dif labour costs	0,223	*0,494*	0,209	*0,660*	0,245	*0,503*	0,253	*0,597*
Log dif material costs	0,237	*0,639*	0,185	*0,608*	0,199	*0,497*	0,217	*0,639*
Log dif tangible fixed assets	0,225	*0,678*	0,206	*0,706*	0,188	*0,554*	0,257	*0,768*

	Targeted sectors		**Pool of control**		**Control group 1**		**Control group 2**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Sales	14253,17	*102612,30*	4547,82	*28458,94*	9852,47	*53685,75*	12293,56	*98985,75*
Price cost margins	0,176	*0,102*	0,180	*0,091*	0,175	*0,095*	0,178	*0,116*
Labour intensity	0,058	*0,051*	0,062	*0,057*	0,057	*0,042*	0,072	*0,221*
Capital/labour ratio	20,30	*221,35*	13,87	*111,03*	10,08	*39,85*	12,79	*49,21*
Employment	75,86	*238,43*	36,45	*111,40*	59,63	*229,55*	50,61	*151,95*
Profits	1691,05	*8298,43*	717,90	*4056,74*	1702,27	*10651,20*	1540,54	*9443,49*
Value Added per worker	34,87	*28,10*	35,95	*44,36*	37,30	*31,03*	37,98	*31,32*
Log dif in sales	0,273	*0,541*	0,222	*0,526*	0,258	*0,543*	0,281	*0,600*
Log dif labour costs	0,286	*0,631*	0,210	*0,642*	0,246	*0,598*	0,267	*0,623*
Log dif material costs	0,275	*0,638*	0,219	*0,653*	0,265	*0,618*	0,273	*0,628*
Log dif tangible fixed assets	0,243	*0,637*	0,215	*0,704*	0,223	*0,640*	0,243	*0,677*

Table 7: Effect of AD on firm overall performance

	Protected sectors			Targeted sectors		
	Pool	Control 1	Control 2	Pool	Control 1	Control 2
Sales	0.075***	0.079***	-0.0179	-0.085**	-0.062	-0.087**
Gross profits	0.083***	0.109***	0.017	-0.131***	-0.114**	-0.123**
Price cost margins	0.008	0.030	0.034	-0.046*	-0.052*	-0.042
Observations	43598	6969	7220	45348	3172	3336
Number of firms	9402	1110	1110	9289	540	540
Employment	0.057***	0.0811***	0.0473*	-0.0546*	-0.036	-0.049
Value added per worker	0.003	0.0199	-0.0226	-0.107**	-0.107**	-0.093*
Observations	17095	4259	4336	19119	1647	1725
Number of firms	4617	846	856	4895	384	377

Note: ***/**/* denotes statistically different from zero at 1/5/10% levels respectively

Table 8: Effect of AD duties on markups

	Protected sectors				Targeted sectors			
	Single	Difference in Difference			Single	Difference in Difference		
	difference	Pool	Control 1	Control 2	difference	Pool	Control 1	Control 2
Dependent variable: ΔY	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔX	1.232***	1.189***	1.269***	1.261***	1.113***	1.149***	1.222***	1.123***
	(0.0641)	(0.0126)	(0.0520)	(0.0448)	(0.0703)	(0.0116)	(0.0470)	(0.0324)
$\Delta X.AD$	0.103***	0.0213**	0.0205	-0.0158	0.00168	0.0391***	-0.0573*	0.0214
	(0.0360)	(0.00885)	(0.0217)	(0.0422)	(0.0320)	(0.00775)	(0.0293)	(0.0238)
$\Delta X.AD.T$		0.0808**	0.0826*	0.118**		-0.0376	0.0589	-0.0198
		(0.0367)	(0.0445)	(0.0565)		(0.0330)	(0.0433)	(0.0399)
$\Delta X.T$		0.0137	-0.0109	-0.0307		0.0202	-0.0809**	-0.000325
		(0.0276)	(0.0358)	(0.0428)		(0.0264)	(0.0384)	(0.0301)
$\Delta X.GDP$	-1.127	-0.435*	-1.733*	-1.091	1.290	0.0306	0.667	1.052
	(1.820)	(0.261)	(1.033)	(1.100)	(1.210)	(0.231)	(0.973)	(0.696)
GDP	-0.252	-0.173***	-0.191	-0.412**	-0.0341	-0.209***	0.0171	-0.220
	(0.245)	(0.0550)	(0.155)	(0.194)	(0.259)	(0.0531)	(0.199)	(0.183)
Constant	-0.00463	-0.00811***	-0.00542	-8.44e-05	-0.0164	-0.00841***	-0.0148	-0.00512
	(0.0112)	(0.00254)	(0.00707)	(0.00882)	(0.0121)	(0.00247)	(0.00922)	(0.00836)
Observations	3049	35979	6083	6129	1393	38030	2504	2791
R-squared	0.911	0.959	0.928	0.912	0.954	0.963	0.954	0.960
Number of firms	555	9100	1110	1110	270	9049	468	540

Note: Robust standard errors in parentheses. ***/**/* denotes statistically different from zero at 1/5/10% levels respectively