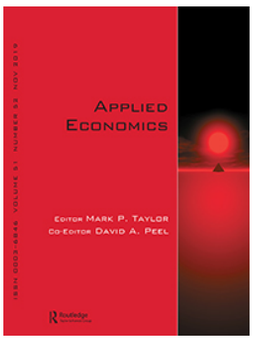

Routledge
Taylor & Francis Group

Applied Economics

ISSN: 0003-6846 (Print) 1466-4283 (Online) Journal homepage: https://www.tandfonline.com/loi/raec20

Does antidumping cause investment and R&D?: Evidence from Turkey

Veysel Avsar & Nurgul Sevinc

To cite this article: Veysel Avsar & Nurgul Sevinc (2019) Does antidumping cause investment and R&D?: Evidence from Turkey, Applied Economics, 51:52, 5674-5682, DOI: 10.1080/00036846.2019.1617397

To link to this article: https://doi.org/10.1080/00036846.2019.1617397

APPLIED ECONOMICS
2019, VOL. 51, NO. 52, 5674–5682
https://doi.org/10.1080/00036846.2019.1617397

Routledge
Taylor & Francis Group

Does antidumping cause investment and R&D?: Evidence from Turkey

Veysel Avsar[a] and Nurgul Sevinc[b]

[a]Texas A&M University, Corpus Christi, TX, USA; [b]Istanbul Sabahattin Zaim University, Istanbul, Turkey

ABSTRACT
This article employs Turkish firm-level data and analyses the effect of antidumping protection on capital spending and Research and Development (R&D). Using matching techniques and alternative control groups and applying difference-in-difference methodology, we find that antidumping duties imposed by the Turkish government significantly increase fixed investment and R&D expenditures. We also show that antidumping duties are effective in terms of increasing the domestic sales. To our knowledge, our article represents the first attempt to analyse the effect of antidumping policy in Turkey, a very active user of temporary trade barriers, using firm-level data.

KEYWORDS
Antidumping; temporary protection; capital spending; investment; R&D

JEL CLASSIFICATION
F13; F14; C20

I. Introduction

In 2012, *Para*, one of the most famous Turkish business magazine, published an article about the effects of antidumping duties on the textile industry. The article stated that the recent antidumping duties on textile products had dramatically changed the dynamics of the industry. [1] According to the surveys, retailers who had brought a significant portion of their products from China began to produce their orders on the domestic market, some big workshops that were shut down in the past started re-operating after the imposition of duties and most of the retailers had problems finding a workshop to keep up with their increasing orders.

The article also included interviews with famous businessmen in the sector as well as the presidents of the *Association of the Exporters of Textile and Its Raw Materials* and the *Association of the Industry of Textile Finishing*. The most important detail in the interviews was the argument that the effect of antidumping duties was not limited to the retail sector. They also mentioned that administrative import restrictions led to a substantial increase in capital spending, particularly on modernizing the spinning mills, investing in painting and finishing facilities and purchasing new weaving machines. According to Turkish Statistical Agency's (TURKSTAT) statistics, textile and garment industry, traditionally a locomotive in Turkish economy, was the world's eighth largest exporter with a global share of 3.4% in 2014. But something even more intriguing was that, between the years 2011 and 2013, the spending on capital increased by around 400%, the amount of incentive funds granted by the Turkish Ministry of Economics to the sector was more than 8 billion dollars, and the increase in employment was 140 thousand. These impressive findings were not surprising in the sense that the same period also witnessed an intensive antidumping protection where importers from eight countries faced duties for 25 unique six-digit harmonized system (HS) products in the textile industry, and the average duty rate was 25.38% which is almost 10 times higher than the mean tariff rates levied over the same period.

The substantial impact of antidumping duties on capital spending for solar panels and tyres industry was also cited in several popular media outlets. In addition, shortly before the Turkish government revoked the temporary protection in tyres in 2016, *Association of Petroleum Chemicals and Tires Industry Workers* released a press statement to warn the authorities against the loss in production and investment in the tyre sector that

CONTACT Veysel Avsar veysel.avsar@tamucc.edu Texas A&M University Corpus Christi, Corpus Christi, TX, USA
[1]This article was published in the 401. issue of Para (which translates as Money) with the title 'Antidamping Yatırımları Bunlar' (These Are Antidumping Investments). The link to this article is http://www.paradergi.com.tr/hab20,401.html.

could occur if the current import measures were not renewed.[2] The statement indicated that tyres industry requires high start-up costs, fixed capital investment and advanced technology, and thus, the recent antidumping protection played a key role in its strength against the competition from world's giant multinationals.[3] In fact, after the imposition of antidumping duties on tyres, the market for tyres in Turkey had grown by 7.3% between 2009 and 2015 compared to the world average increase of 1% mainly due to the temporary protection in Turkey in the same period.

In line with the worldwide antidumping activity, Turkey's antidumping is also concentrated in industries where Research and Development (R&D) and capital spending are important. In this regard, the above noted cases and the potential impact of temporary protection on investment are particularly important. To our knowledge, the literature has not yet documented the effects of antidumping protection on the investment decision of protected firms in a developing country context. This study aims to fill this gap. Using detailed firm-level information on capital formation and R&D, we present evidence that antidumping in Turkey was effective in terms of innovation and investment.

Turkey, especially considering the time period in our sample, is a useful starting point for our analysis.[4] First, while antidumping legislation and protection have spread rapidly all over the world, Turkey has become one of the most active antidumping users and has filed antidumping investigations for more than 1000 products since its antidumping legislation went into effect in 1989. Seventy-five per cent of these investigations resulted in a protection decision, and an average of around 35% antidumping duties was imposed. This figure is three times higher than the average tariffs that Turkey has applied following its World Trade Organization (WTO) membership. Second, post-millennium Turkey has experienced a dramatic stimulation in R&D activity. In 2001, R&D expenditures were recorded as 1.3 billion Turkish Lira (TL), and this number increased to 15.03 billion TL in 2010 and to 22.18 billion TL in 2015. The share of R&D expenditures in GDP rose from 0.5% to 1.06%, and the share of R&D personnel in total employment rose from 1% to 5% between 2001 and 2013. Obviously, R&D investment is one of the important factors to avoid middle-income trap for an economy like Turkey, and the policies to promote R&D have been widely discussed. However, the focus of this discussion is usually the effect of investment subsidies, government funding and tax incentives. We believe that understanding the effect of a major trade policy tool such as antidumping is important in this regard, given its increasing role in the global trade system.

Using alternative control groups and applying difference-in-difference methodology, we document that antidumping duties imposed by Turkey have a significant positive effect on firm R&D spending and gross fixed capital information. On the other hand, we do not find a significant effect of these duties on employment. The effect of these duties on the investment decision of the firms is particularly important, given the dominance of R&D-intensive industries in worldwide antidumping activity and also in Turkey. Our findings are also parallel to the theory of international trade, which suggests that the price increase resulting from import protection is more likely to affect the more intensively used factor in that industry. While employment may be more pronounced in labour-intensive sectors, antidumping protection, which appears to be relatively more in R&D-intensive industries, caused firms to attach more weight to their capital spending.

Our contribution to the international trade literature is twofold. First, we contribute to the group of papers that analyse the effect of import competition on investment.[5] The main focus in that literature is the effect of import competition on R&D activity. For instance, one study very similar to ours is Liebman and Reynolds (2013) which examines the impact of safeguards on innovation in the US. As

[2]The link to the press statement is https://www.petrol-is.org.tr/haber/lastikte-anti-damping-uygulamalari-surdurulmelidir-10151.
[3]The share of Bridgestone (Japan), Michelin (France) and Goodyear (USA) is 37% in the world total production of tires.
[4]Our sample covers the years between 2005 and 2013.
[5]Including (not limited to) Krugman (1984), Grossman and Helpman (1991), Scherer and Huh (1992), Funk (2003), Bloom, Draca, and Van Reenen 2016) and Fernandes and Paunov (2010).

also noted in their piece, there is no clear theoretical consensus on what impact trade liberalization and protection has on the investment decision of the firms, and the evidence is generally mixed. Our study also provides support to the well-known work of Miyagiwa and Ohno (199) which argues that trade restriction increases the investment if the restriction is a credible temporary one.

Second, we also contribute to the small number of studies that analyse the impact of antidumping duties using firm-level data. Konings and Vandenbussche (2008) analyse the effect of antidumping on the productivity of import-competing firms in the EU. Pierce (2011) examines the effect of antidumping duties on protected plants in the US. Using Brazilian firm-level data, Avsar (2013) shows that firms increase price in their export markets if there is a threat of retaliation because of domestic antidumping activity. Konings and Vandenbussche (2013) show that temporary protection hurts exporters of the same product. Lu, Tao, and Zhang (2013) investigate how Chinese exporters react to US antidumping duties and uncover the heterogeneous effect of protection across firms within the same product category. Avsar (2017) investigate the effect of past export status on trade deflection in response to antidumping duties. Our article represents the first attempt to analyse Turkish antidumping activity using firm-level data.

The rest of the article is organized as follows: The next section gives a brief information on antidumping and Turkish industries' antidumping experience. The third section describes the data, construction of treatment and control groups, estimation methodology and results. Finally, Section IV concludes.

II. Antidumping and Turkey's antidumping practice

Antidumping has dominated international trade policy over the last three decades. Since the inception of the WTO, global tariff rates remained at very low levels, and many countries switched to alternative temporary means of protection. Out of these instruments, antidumping is by far the mostly implemented one and has the highest commercial impact.[6] Although it seems to concern a rather small group of products when we consider the entire global trade, large trade effects of these duties have made antidumping an important field for both scholars and policymakers.

Dumping is defined as exporting a product to a market under its fair price. According to the WTO rules, when domestic industries believe that they face dumping, they can initiate an antidumping petition and request temporary antidumping protection for the dumped products. In these investigations, firms in the importing country are obliged to prove the existence of dumping, and the material injury in the domestic industry associated with it. If the government agencies respond affirmatively to domestic firms, then they place antidumping duties on the imported products to ensure that the price of the product in question gets closer to its fair price.

In Table 1, we document the top 20 countries in terms of antidumping practices. Turkey has enacted the Law on Prevention of Unfair Competition in Imports in 1989 and filed the first antidumping investigation that year. Although Turkey has entered the antidumping club later than the developed countries, it is now one of the top 10 countries in terms of the number of petitions in the post-WTO era. Turkey, on the other hand, is the most active antidumping user in the Middle Eastern and Eastern

Table 1. Antidumping investigations in the post-WTO period.

Country	Number of investigations
India	740
USA	527
European Union	468
Brazil	369
Argentina	316
Australia	289
South Africa	229
China	218
Canada	196
Turkey	180
Mexico	129
South Korea	127
Indonesia	122
Egypt	82
Pakistan	82
Colombia	73
Peru	72
Malaysia	70
Thailand	61
New Zealand	57

Source: World Trade Organization.

[6]Pierce (2011) notes that the 259% antidumping duty imposed by the US on Venezuela for aluminium sulfate in 1989 led to a 98% reduction in Venezuela's exports of this product to the US.

European region. Countries targeted in antidumping investigations are shown in Table 2. Approximately 20% of the world's antidumping investigations have been filed against Chinese products. Considering the WTO members, Turkey is also among the top 20 in terms of being a target in antidumping investigations.

Table 3 shows the numbers of total and affirmative antidumping investigations in Turkey. From 1989 to 1995, Turkey filed 70 investigations and 37 of them resulted in duty imposition. Shortly after the inception of the WTO, antidumping investigations in Turkey slowed down partly because of the process of learning the rules and enforcement of WTO. No investigation in 1995 and 1996 was followed by only single-digit number of investigations up to 2001. In the millennium, antidumping investigations gained a significant momentum and 145 antidumping investigations were initiated between 2000 and 2010. Especially 2008, the year of the global economic slowdown, witnessed one of the highest number of antidumping investigations in our sample.

Another important detail that appears in Table 3 is that most antidumping investigations in Turkey, particularly those filed in the 2000s, resulted in duty imposition. The outcome of 87% of the petitions between 2000 and 2014 was affirmative. Before 2000, this number was around 60%. This change points out the experience accumulated by domestic industries related to procedures and bureaucracy of antidumping, which has led them to be more successful in their cases in terms of showing evidence of dumping and injury.

Table 4 shows the top 20 countries targeted in antidumping investigations in Turkey. Antidumping in Turkey is mainly targeting Chinese exporters. Chinese cases outweigh all other countries' cases combined. This is related to the fact that China has a high penetration ratio in the Turkish market for the products of the textile industry, the leading industry in the field of antidumping practices in Turkey. When

Table 2. Countries and antidumping investigations targeting them in the post-WTO period.

Country	Number of investigations
China	1052
South Korea	349
USA	266
Taiwan	265
Thailand	197
India	192
Japan	187
Indonesia	183
Russia	136
Malaysia	125
Brazil	122
European Union	108
Germany	106
Ukraine	79
Turkey	72
South Africa	68
Mexico	66
Italy	59
Spain	54
Singapore	53

Source: World Trade Organization.

Table 3. Turkey's antidumping investigations by years.

Year	Number of investigations	Number of affirmative investigations
1989	8	5
1990	17	8
1991	13	7
1992	4	4
1993	7	5
1994	21	8
1995	-	-
1996	-	-
1997	5	1
1998	1	1
1999	8	7
2000	7	7
2001	15	14
2002	17	17
2003	17	17
2004	32	32
2005	12	12
2006	8	8
2007	6	6
2008	23	18
2009	6	4
2010	2	2
2011	2	2
2012	12	12
2013	5	5
2014	1	1

Source: The World Bank

Table 4. Countries targeted by Turkey's antidumping investigations.

Country	Number of investigations
China	279
Taiwan	18
India	16
Romania	13
Thailand	13
Indonesia	12
Russia	11
South Korea	9
Malaysia	8
Vietnam	6
Bulgaria	5
Hungary	4
Ukraine	4
Egypt	4
Hong Kong	4
Israel	4
Italy	4
Pakistan	4
Saudi Arabia	4
USA	4

Source: The World Bank.

Table 5. Antidumping investigations by industry.

Industry code	1989–1995	1996–2000	2001–2005	2006–2010	2011–2015	Total
311–312	0	0	4	0	0	4
313	0	0	0	0	0	0
314	0	0	0	0	0	0
321–322	18	13	14	16	11	72
323–324	0	0	0	0	0	0
331–332	0	0	0	3	0	3
341–342	10	0	2	1	2	15
351–352	5	3	20	3	7	38
353–354	0	0	0	0	0	0
355–356	0	0	20	6	1	27
361	1	0	0	0	0	1
362	5	0	1	3	5	14
369	0	0	0	3	2	5
371	3	1	2	3	9	18
372	0	0	2	0	1	3
381	5	2	15	3	3	28
382	5	2	1	1	2	11
383	2	0	2	0	3	7
384	1	0	2	0	0	3
385	0	0	1	0	0	1
390	1	0	4	0	0	5

Source: The World Bank.

Note: Industry codes: 311–312: food, 313: beverages/drinks, 314: tobacco products, 321–322: textile, 323–324: leather, 331–332: wood/furniture, 341–342: paper, publishing and printing, 351–352: chemicals, 353–354: oil refineries, 355–356: rubber products, 361: porcelain, tile, ceramics, 362: glass and glass products, 369: other industries based on stone and earth, 371: iron and steel, 372: non-ferrous metal, 381: metal goods industry, 382: machinery, 383: electrical machinery, 384: transportation vehicles, 385: professional scientific instruments, 390: manufacture not elsewhere classified.

we look at the other countries that are subject to antidumping investigations, we observe mainly the large economies in Asia and the countries in the Middle Eastern and Eastern European region.

Table 5 documents the antidumping investigations by three-digit ISIC industries over the years of our sample. As shown, almost all industries have been involved in antidumping practices. With 72 antidumping investigations, the textile industry stands out as the heaviest antidumping user in Turkey. Moreover, the number of products subject to filings by the textile industry is over 600. In line with the worldwide antidumping activity, Table 5 suggests that antidumping in Turkey is also concentrated in industries that rely more on R&D such as chemicals, metal goods and iron and steel industry.

III. Data and empirical analysis

A first glance at the data

The aim of this study is to test the effectiveness of antidumping duties on the investment and R&D activity of protected companies. To do so, we combined two databases. The first one is the Annual Industry and Services statistics provided by the Turkish Statistical Institute (TURKSTAT). Annual Industry and Service Statistics contain firm-level information such as output, number of workers and capital formation. The statistics are firm level and include sector details according to NACE (rev 1.1) in four digits. This database includes all firms with more than 20 employees which accounts for 90% of the production and 75% of the total employment in 2010 and covers the years 2005–2013.

The second database we utilized is the *Temporary Trade Barriers Database of the World Bank*.[7] This database contains detailed information on the antidumping investigations such as the initiation date of the investigation, the participating firm(s), the target country(s), the HS codes of the products, the outcome of the petition and the date of the beginning of the duty imposition if the decision is affirmative.

Before we begin our econometric analysis, we think it would be useful to look at the effect of antidumping duties with some descriptive statistics. Table 6 gives the averages of the growth rates of the variables of interest for the protected firms one year before the antidumping investigations initiated and for the first 3 years after the duty was imposed. In the second column, the table reports the averages of all years for the same set of firms for comparison.

First, when we compare the average percentage change in sales and employment in the years of the investigation to the general average, we observe a remarkable difference. Economic slowdown triggered the firms to seek temporary protection. For example, the average for the percentage change in sales was above 5% between 2005 and 2013, while this number is 2% for the years of antidumping investigations. On the other hand, there is a negative growth rate in employment in the years of investigations. Domestic firms are required to show evidence in terms of injury in the domestic market resulting from antidumping, and the information in Table 6 is consistent with the WTO requirements.

Similar findings are documented for textile and chemical industry. The decline in the average growth rates of sales and employment of firms in

[7]Bown, Chad P. (2016) 'Global Antidumping Database', The World Bank, June, available at **http://econ.worldbank.org/ttbd/gad/**.

Table 6. Growth averages of firm variables after antidumping duty.

Variables	All years	1 year before antidumping	1 year later	2 years later	3 years later
Sales	5.09	1.99	3.03	3.91	6.88
Employment	3.40	−0.17	2.80	1.31	2.60
Fixed investment	4.77	2.31	4.40	7.77	8.73
R&D expenditures	4.40	4.32	4.89	9.12	6.51
Panel B: 321: Textile industry					
Sales	5.03	−0.67	2.41	4.01	6.23
Employment	4.47	1.74	2.01	4.09	5.98
Fixed investment	3.90	0.62	2.68	4.47	5.51
R&D expenditures	5.12	5.13	4.81	6.38	7.92
Panel C: 351: Chemical industry					
Sales	6.85	6.01	7.94	2.9	3.72
Employment	5.96	3.56	6.42	4.21	4.34
Fixed investment	5.14	1.16	2.43	2.12	4.68
R&D expenditures	7.21	5.35	5.12	6.72	8.96

Source: TURKSTAT

the textile industry is noteworthy. For instance, the growth rate in sales, which was around 5% on average, was recorded as −0.67% one year before the investigation. Employment also depicts a similar pattern. In chemical industry, the most visible difference for pre-investigation compared to the sample average was in employment. While the average growth in employment for the protected firms was around 5%, it was around 1% one year before the investigation.

Focusing on the fixed investment, we observe that the average growth rate was 2.3% before the initiations of antidumping compared to 4.7% in all years. What is intriguing here is the fact that the average growth rate in fixed investment is shown as 8.72% in the third year of antidumping protection for the firms that produce goods subject to antidumping. For the firms in the textile industry, there was an average growth of only 0.62% one year before the investigation but around 6% three years after the protection. A similar pattern is observed for R&D expenditures. Two years after the imposition of antidumping duties, the average growth in R&D expenditures was 9.12%. For textile and chemicals, the average growth in R&D expenditures was 7.9% and 8.9%, respectively. The positive effect of antidumping duties after their imposition is not only evident in investment but also in sales and employment. For example, the average growth rate for the sales was around 2% before the investigation but 4% in the second year and 7% in the third. Overall, Table 6 provides a preview of our econometric results and supports the antidumping investment argument often cited in the popular press in Turkey. It also shows the economic slowdown before the investigations and the suggestive positive impact of antidumping on firm performance.

Definition of treatment and control groups

To investigate the impact of antidumping duties on the firm-level economic variables, we compare the firms in a treatment group that receive antidumping protection to firms in a control group. Our treatment group includes the firms that sell products subject to antidumping duties, whereas the control group is composed of firms that produce products similar to protected products in terms of being subject to protection.

As also noted in Pierce (2011) and Pierce (2013), the control group is constructed to attenuate two potential biases. The first one is the self-selection bias that exists if industries that file an antidumping investigation are different than those that do not. This is an obvious case in antidumping practices. For example, the industries demanding temporary protection face serious international competition in the domestic market, and they also have the financial power and lobbying capacity to meet the costs of the investigation. Moreover, antidumping protection has become a form of protection concentrated in a few industries both in Turkey and in the world. The second one is the government selection bias which results from the fact that the decision of the government agencies that evaluate the antidumping petitions is correlated with our dependent variables.

What needs to be done in order to avoid the problem of these two biases is to ensure that the

observable characteristics of the firms in treatment and control groups are similar in terms of the likelihood of receiving antidumping protection. We constructed three different control groups of firms to test the effect of antidumping duties. In the first one, we used the firms that produce products within the industries that filed at least one investigation but did never receive any antidumping protection.

The second control group is constructed using the method in Blonigen and Park (2004) and Lu, Tao, and Zhang (2013). In particular, we estimate the probability of a product being named in antidumping investigations. The regressors in this probability model are lagged import penetration (IP_{it-1}), lagged labor productivity of the industry (LP_{it-1}), lagged industry employment (TE_{it-1}), GDP growth (GDP_t) and total number of antidumping investigations (AD_i) in the past 5 years. The estimates of the logit model are documented in Table 7. As shown, all of the variables provide estimates with expected signs, and they are all significant except the labour productivity variable. The probability of protection by antidumping increases with import penetration, past antidumping experience and total employment. After estimating the probability model, we calculate the fitted values, and the product categories in the upper 75th percentile of these values constitute the second control group.

In addition to the aforementioned control groups, we create a different control group by applying the Propensity Score Matching method. The propensity score, based on the probability model above, determines one propensity score each for product groups in the industry according to import penetration, employment, economic growth, past antidumping practice and labour productivity and identifies the treatment and control groups by matching the products according to this score.[8] In other words, this method creates such two product groups that the products in both groups have similar characteristics and the likelihood of exposure to antidumping. We use the difference-in-difference method to control for time-invariant and unobservable effects and interpret the average treatment effect obtained from these estimates as the effect of antidumping protection on firm-level variables.

Table 7. Logit regression results.

Variables	Coefficients
IP_{it-1}	−8.749***
	(0.772)
TE_{it-1}	0.073**
	(0.033)
GDP_t	0.039***
	(0.007)
AD_i	0.358***
	(0.010)
LP_{it-1}	0.023
	(0.06)
Number of observations	38,258
Pseudo-R^2	0.20

Notes: Robust standard errors in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

Empirical analysis and results

This section analyses the effects of antidumping duties on protected domestic firms taking into account each of the control groups we created. As mentioned above, the treatment group consists of firms that produce products subject to antidumping duties, whereas the control group consists of firms that were not subject to antidumping but produce products that are very similar in terms of the likelihood of being investigated. The difference-in-difference method ensures that the effect of antidumping is isolated by removing all the time-invariant and unobservable effects.

We define the set of products subject to antidumping duty as T, a set of products in the control group as C and also the year in which the antidumping duty is in effect for product i as I_i. In this case, the difference-in-difference effect can be estimated with the following model:

$$y_{ft} = \alpha + \beta_1 Treatment_i \; x \; Post_{it} + \vartheta t + \mu i + \varepsilon_{ft} \quad (1)$$

where $Treatment_i = 1 \; \forall \; i \in T$ and $Treatment_i = 0 \; \forall \; i \in C$, also $Post_{it} = 1 \; \forall \; t > I$. y_{ft} is the outcome variable such as fixed capital formation, sales, employment and R&D expenditures. Year-fixed effects, ϑt, control for aggregate shocks that affect both the treatment and control groups equally and the product-fixed effects, ϑt, control for time-invariant differences between products. The

[8]We used the nearest neighbourhood method as the matching algorithm.

coefficient on the interaction term is the difference-in-difference effect of antidumping duties on the protected firms.

Table 8 documents the estimates for the first control group. All specifications include the fixed effects. We have around 71,000 observations when we used the firms producing the products not subject to antidumping within the same industry as the control group. As shown, we find statistically significant and positive estimates for fixed investment and R&D expenditure. Protected firms increased their fixed investment by 12.4% and R&D expenditures by 9.6% compared to the unprotected firms. Further, from column 3, we note that antidumping protection results in a significant increase in total sales of about 16% on average over the protected firms. On the other hand, we do not find a significant effect of antidumping duties on firm employment.

The estimation results when we use the second control group arereported in Table 9. The sample size in this table is reduced to 46,925 as we restrict the control group to the products only at the top 75th percentile in terms of the likelihood of being named in an antidumping investigation. The estimations mirror those we have found in Table 9, the only difference being the magnitude of the coefficients. Relative to the control group of unprotected firms, protected firms increased capital spending by 8.6%, R&D spending by 6.4% and sales by 13.2%. The estimate of the employment coefficient remains insignificant in this specification. Finally, estimates using the control group of firms obtained from propensity score matching is documented in Table 10. Similar to the earlier specifications, the impact of antidumping duties on investment, R&D and sales is significant, but the effect on employment is not. Compared to the most similar firms which did not receive temporary protection, protected firms had 7.3% more investment and 10.3% more sales.

Overall, our estimates clearly show that protected firms increased sales at the expense of their international competitors and more importantly had the opportunity to free funds to stimulate their capital spending and R&D expenditures. This result is also in line with Liebman and Reynolds (2013) which analyses the effect of safeguards, another form of temporary protection, on investment in R&D using US manufacturing data. Our findings are also consistent with the theory of international trade, which suggests that the price increase resulting from import protection is more likely to affect the more intensively used factor in that industry. While employment may be more pronounced in labour-intensive sectors, antidumping protection, which is concentrated on R&D-intensive industries, has caused firms to attach more weight to their capital spending and investment rather than hiring more workers.

Table 8. The effect of antidumping duties on protected firms. Control group 1

	Dependent variables			
	Fixed investment	R&D expenditures	Sales	Employment
$Treatment_i$ x $Post_{it}$	0.124**	0.096***	0.158**	0.070
	(0.051)	(0.011)	(0.076)	(0.058)
Fixed effects	Yes	Yes	Yes	Yes
R^2	0.56	0.47	0.49	0.37
Number of observations	71,117	71,117	71,117	71,117

Notes: All dependent variables are in logs. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9. The effect of antidumping duties on protected firms. Control group 2

	Dependent variables			
	Fixed investment	R&D expenditures	Sales	Employment
$Treatment_i$ x $Post_{it}$	0.086**	0.064**	0.132**	0.063
	(0.038)	(0.031)	(0.057)	(0.070)
Fixed effects	Yes	Yes	Yes	Yes
R^2	0.12	0.20	0.38	0.27
Number of observations	46,925	46,925	46,925	46,925

Notes: All dependent variables are in logs. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10. The effect of antidumping duties on protected firms. Control group 3

	Dependent variables			
	Fixed investment	R&D expenditures	Sales	Employment
$Treatment_i$ x $Post_{it}$	0.073*	0.045***	0.103***	0.044
	(0.038)	(0.010)	(0.028)	(0.162)
Fixed effects	Yes	Yes	Yes	Yes
R^2	0.31	0.29	0.37	0.36
Number of observations	14,441	14,441	14,441	14,441

Notes: All dependent variables are in logs. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

IV. Conclusion

Motivated by the theoretical work by Miyagiwa and Ohno (1999), this study places the microscope on the effect of antidumping duties on protected firms' investment decision. Despite the abundance of theoretical work on the relationship between import competition and innovation, there is only a small number of empirical papers on this topic. To our knowledge, our article represents the first attempt to analyse the impact of antidumping on investment using firm-level data from a developing country. Combining the detailed information on antidumping activity and firm-level investment and applying matching techniques to avoid the selection bias, we show that protected Turkish firms increased their capital spending and R&D expenditures as a result of antidumping duties. Our estimates suggest that imposed AD duties increased the spending on fixed capital by 7–12% and on R&D expenditures by 6–9%. However, we did not find a statistically significant impact of antidumping duties on the number of workers employed.

Another fundamental result of our study is that antidumping duties in Turkey are effective in terms of protecting the domestic industry. The increase in the sales of protected firms compared to a control group of unprotected ones at the expense of raising prices in the domestic market shows that these duties also reach their goals in this regard.

Acknowledgements

For helpful discussions, we thank Justin Pierce, Benjamin Liebman, Kemal Turkcan and Mehmet Ulubasoglu. Our study was supported by a generous grant (Project number: 113K736) from TUBITAK (the Scientific and Technological Research Council of Turkey).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Scientific and Technological Research Council of Turkey [113K736].

References

Avsar, V. 2013. "Antidumping, Retaliation Threats, and Export Prices." *World Bank Economic Review* 27 (1): 133–148.

Avsar, V. 2017. "The Anatomy of Trade Deflection." *Global Economy Journal* 17 (4).

Blonigen, B. A., and J. H. Park. 2004. "Dynamic Pricing in the Presence of Antidumping Policy: Theory and Evidence." *American Economic Review* 94 (1): 134–154.

Bloom, N., M. Draca, and J. Van Reenen. 2016. "Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity." *The Review of Economic Studies* 83 (1): 87–117.

Fernandes, A. M., and C. Paunov. 2010. "*Does Trade Stimulate Innovation? Evidence from Firm-Product Data*." Working Paper No. 286. Paris, France: OECD Publishing.

Funk, M. 2003. "The Effects of Trade on Research and Development." *Open Economies Review* 14 (1): 29–42.

Grossman, G., and E. Helpman. 1991. *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.

Konings, J., and H. Vandenbussche. 2008. "Heterogeneous Responses of Firms to Trade Protection." *Journal of International Economics* 76 (2): 371–383.

Konings, J., and H. Vandenbussche. 2013. "Antidumping Protection Hurts Exporters: Firm-Level Evidence." *Review of World Economics* 149 (2): 295–320.

Krugman, P. R. 1984. *Import Protection as Export Promotion: International Competition in the Presence of Oligopoly and Economies of Scale. In Monopolistic Competition in International Trade*, edited by H. Kierzkowski., 180–193. Oxford: Oxford University Press.

Liebman, B. H., and K. M. Reynolds. 2013. "Innovation through Protection: Does Safeguard Protection Increase Investment in Research and Development?" *Southern Economic Journal* 80 (1): 205–225.

Lu, Y., Z. Tao, and Y. Zhang. 2013. "How Do Exporters Respond to Antidumping Investigations?" *Journal of International Economics* 91 (2): 290–300.

Miyagiwa, K., and Y. Ohno. 1999. "Credibility of Protection and Incentives to Innovate." *International Economic Review* 40 (1): 143–163.

Pierce, J. R. 2011. "Plant-Level Responses to Antidumping Duties: Evidence from US Manufacturers." *Journal of International Economics* 85 (2): 222–233.

Pierce, J. R. 2013. "Antidumping Duties and Plant-Level Restructuring." *Review of Industrial Organization* 42 (4): 435–447.

Scherer, F. M., and K. Huh. 1992. "R&D Reactions to High-Technology Import Competition." In *The Review of Economics and Statistics* (1992): 202–212.