Profitability, leverage and competition. How did Norwegian firms react to China's exports shocks?

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Abstract

For Fama and French (2002), the established evidence of negative profitability-leverage relation contradicts Trade-Off theory (TOT). I test TOT under its static and dynamic versions by using exogenous expected profitability. In a "double instrumental variable" approach, the first stage predicts the exogenous competition from China where the instrument is the vector of Chinese exports towards rich countries; the second stage predicts the decrease of Norwegian firms' profitability that is explained by the increases of exogenous competition from China; the third stage investigates how leverage reacts to the predicted profitability. Concerning the tests of the static TOT, I find that profitability decreases leverage, assets and retained earnings, while debt remains stable. Moreover, tests of the dynamic TOT illustrate a negative profitability-leverage relation at non-refinancing points, which corroborates the dynamic TOT. I also find, at refinancing points, insignificant profitability-leverage relation, which does not corroborate the dynamic TOT.

1 Introduction

An essential prediction in numerous corporate capital structure models is represented by the relation between leverage and profitability. For instance, for Fama and French (2002) this relation has a central role in the empirical assessment of the merits of pecking order and trade-off theories (TOT). As explained by Graham and Leary (2011), the tests of trade-off models

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have focused on the *static* trade-off theory's prediction that "more profitable firms should more highly value the tax-shield benefits of debt". The current paper tests the predictions about the profitability-leverage relation building on the trade-off theory. In doing so, it addresses the empirical challenges of the previous literature and includes predictions not only from the *static*, but also from the more recent *dynamic* version of the trade-off theory. I find that the leverage of Norwegian firms react insignificantly or negatively to expected profitability's shocks; the results reject the *static* TOT while partially contradicting the *dynamic* TOT.

An established empirical literature[1] tests the *static* TOT and finds a negative relation between realized profitability and leverage. Fama and French (2002) find that book leverage is higher in less profitable firms and they conclude that this evidence contradicts the trade-off theory. This discrepancy between theoretical prediction and empirics is explained by the trade-off dynamic inaction theories[2], which show that the evidence of a negative relation between expected profitability and leverage is consistent with adjustment costs towards equilibrium leverage.

This discrepancy is also addressed with another approach. According to Xu (2012), since the crucial predicions of TOT involve the *expected* profitability (rather than the *lagged realized* profitability used in previous contributions), new proxies of expected profitability can improve the empirical assessment of TOT. Building on the established empirical evidence that import competition deteriorates profitability[3] and illustrating that it decreases *profit margin*[4], Xu (2012) assumes that (increments of) import competition is a *proxy* for (decreases of) expected profitability. By finding a positive relation between leverage and expected profitability, Xu (2012)[5] contrasts the conclusions of Fama and French (2002).

Nevertheless, Xu (2012)'s analyses do not consider the predictions from the dynamic inaction models and they also reveal important endogeneity concerns. The current paper addresses both

[1] For instance, Rajan and Zingales (1995), Baker and Wurgler (2002), Titman and Wessels (1988) and Myers (2003).

[2] According to the definition of Danis, Rettl and Whited (2014), it is the class of models that includes, for instance, Fisher et al. (1989), Strebulaev (2007) and Hennessy and Whited (2005). The trade-off dynamic inaction theories will also be referred to as dynamic trade-off theories or dynamic TOT.

[3] Katics and Pedersen (1994), DeRosa and Goldstein (1981), Pagoulatos and Sorensen (1976)

[4] Xu (2012) explicitely assumes that profit margin is able to measure the component of expected profitability inbedded into import competition.

[5] Xu (2012) is the only paper investigating the trade-off theory under the competition-profitability-leverage relations, to the best of my knowledge.

of these points: it tests not only the static but also the dynamic trade-off theory by using a measure of expected profitability that tackles the endogeneity concerns.

Regarding the endogeneity issues, an analysis of the impact of import competition on capital structure must require that capital structure does not drive the import competition. Since simple imports from China are endogenous with capital structure, Xu (2012), attempts to introduce an exogenous shock by using the import competition that is predicted by the US import tariffs, assuming that the import tariffs are assigned to industries independently from their capital structures. However, US' tariffs reveal a documented endogeneity. Previous contributions[6] recognize not only that large rich countries (for instance, the US) have strong bargaining power in deciding which industries have to be liberalized, but also that tariffs are driven by the lobbying activity. Since the lobbying is driven by specific capital structure and competitive patterns, it is difficult to argue that the treatment "liberalization in the USA" is assigned to firms independently from their capital structures.[7] The presence of this issue interferes with our understanding of the impact of import competition on financing decisions. Hence, the current paper uses the imports shocks regarding Norway in order to predict an exogenous import competition. This setting has the advantage of being based on a small open economy, where the lobbying activity of firms scarcely influences the timing and extent of multilateral import tariffs and non-tariff barriers to trade (NTBs).

Differently from previous literature, I do not use just the tariff changes as the source of shocks to import competition because the tariff barriers represent only a portion of the barriers to trade. Indeed, as illustrated by Antras (2014), and Mansfield and Busch (1995), the non-tariff barriers

[6] Krugman, Obsfeld, and Melitz (2012), Grossman and Helpman (1992) and Krishna, Mitra (2005).

[7] There is anecdotal evidence that among finance authors this endogeneity is considered as a primary concern in the studies about the effects of competition on corporate financing. The reason is that firms have different lobbying incentives or different probabilities of enjoying protectionism and these differences are not exogenous with respect to profitability, probability of default, leverage, diversification and governance. For instance, Lenway, Mork and Yeung (1996) explain that, in the steel industry, lobbyer firms follow very different paths compared to non-lobbyer firms. Lobbyers are less profitable, bigger, older, less diversified, less innovative, pay more workers and CEO's, have greater tenures for CEO's. These dimensions may have an impact on the leverage decisions. Moreover, Liebman and Tomlin (2006) explain that the Bush administration in 2002 adopted the steel safeguards (a protectionist measure on steel products) as a response to the requests of the steel industry after a period of increased probability of defaults (between 1997 and 2001, 35 companies representing about one-third of all U.S. steel capacity fell into bankruptcy). When several factors helped the steel industry return to profitability the Bush administration decided to cut the trade barriers. In addition, Liebman and Tomlin (2006) illustrate that the firms which benefited the most from the imposition of "steel safeguards" were the ones with high leverage.

to trade (NTBs) represent a crucial determinant of foreign competition. I follow the approach of Acemoglu et al. (2015), Balsvik et al. (2014) and Autor et al. (2013) because it does not concentrate only on the effect of tariffs and, instead, it predicts foreign competition by means of the shocks to the supply of Chinese exports. More precisely, the exogenous competition affecting Norwegian firms is *predicted* by the shocks to the supply of Chinese goods towards nine rich countries. Hence, these shocks allow us to *exclude* the Chinese competition against Norwegian firms that is explained by Norwegian policies or other domestic idiosyncratic shocks (which can be driven by firms' preferences). I use the years around China's access to WTO (December 2001) because, for Chinese exports, it represented an exceptional event about which Norwegian firms had a scarce decision power.

My analysis starts with a series of tests of the *static* trade-off theory. I implement several "double instrumental variable" models in which the first stages predicts the exogenous competition from China where Chinese exports towards other rich countries is the instrument (following Autor et al. (2013)); the second stage predicts the decrease of Norwegian firms' profitability that is explained by the increases of exogenous competition from China; the third stage investigates how leverage reacts to the predicted profitability. I find that leverage reacts insignificantly to lagged profitability and negatively to contemporaneous profitability. I also investigate the mechanism behind this negative response to expected profitability shocks. A lower (higher) expected profitability produces a decrease (increase) in the value of assets. Firms respond to it with a drop (growth) of retained earnings while maintaining unaltered debt levels.

There is a discrepancy in outcomes with respect to the evidence of a positive reaction of leverage to expected profitability that has been reported by previous research. To ease the comparison with earlier results, in addition to the instrumental variable (IV) framework, I test the static theory with an empirical approach that tightly follows Xu (2012)'s proxy framework. The fact that the discrepancy remains even after implementing the proxy approach can suggest that the different results are driven by two main components. First, Norwegian import policy is less affected by endogeneity problems (as we have seen before). Additionally, the lower adjustment speed of capital structure in Norway, compared to USA, can contribute to explain the discrepancy.

Importantly, I extend the analyses previous research by testing the *dynamic* inaction models. They recognize that the sign of profitability-leverage relation strongly depends on whether or not the firm is actively adjusting its capital structure. Specifically, these models provide two main predictions (Danis et al. (2014)). First, if the firm is not at adjustment points, a negative profitability-leverage relation occurs. Second, if the firm is at adjustment points, the profitability-leverage relation is positive. The results show a negative profitability-leverage relation at non-adjustment points, coherently with Hennessy and Whited (2005). On the other hand, at adjustment points, I find an insignificant reaction of leverage to exogenous expected profitability, which does not corroborate the second prediction of Danis et al. (2014).

The variability of adjustment costs is an additional element that can describe the fact that the profitability-leverage relation depends on the occurrence of active adjustments. As argued by Brav (2009), firms with higher adjustment costs (i.e., private firms in his - and also in my - setting) undertake the active corrections of leverage less frequently. Therefore, the time series of these firms should contain fewer observations in which the profitability-leverage relationship is positive. If we test the profitability-leverage relation unconditionally with respect to refinancings, we expect the estimator to be less negative for firms with lower adjustment costs. Specifically, this paper tests the prediction that public firms decrease leverage less than private firms in response to higher exogenous profitability. I find that public firms have an insignificant profitability-leverage relation, which is more positive than the negative reaction of private firms. Additionally, it should be noticed that the previous related literature describes a sample that is composed of public entities only. Instead, the the current study contains both public and private firms. This fact not only allows variability in the adjustment costs but it also allows to study for the first time the competition-profitability-leverage relations for private firms, which have a very important weight in the economy.[8]

Furthermore, previous related research also overlooks another fact (in addition to the considerations that it is based on USA importing policy, it does not consider the refinancing points and that it focuses only on public firms). A tariff cut might actually generate a decrease of rela-

[8]For instance, Michealy and Roberts (2012) and Brav (2009) show that, in the case of UK, private firms account for 97% of the UK's firms and for 60% firms' assets.

tive competition in the cases when the new foreign market is populated by weak manifacturing competitors. In a robustness check, I predict profitability also by means of a measure of export penetration in order to account for the fact that some Norwegian industries could have actually benefited from China's entry into WTO. The results do not change.

Further related literature

The scrutiny of recent key empirical contributions[9] illustrates that product market competition is a central driver of firms' funding costs and financing decisions. Nonetheless, other recent works (Valta (2012) and Fresard (2010)) points out that these empirical contributions fail to address the endogeneity that is motivated by the fact that cash holdings and leverage have a direct impact on the product market choices of a firm and its competitors [10]. However, similarly to Xu (2012)'s case, these recent papers use the USA import tariff policy, which is affected by lobbying concerns.

2 Sample description

The final sample consists of 14,005 non-financial Norwegian private and public firms. They are part of an unbalanced panel dataset of 72,400 firm-year observations from 1998 to 2006. The Norwegian Corporate Accounts (which has been described by Berner, Mjøs and Olving (2012)) constitutes the source for the information about financial statements and firms' ownership characteristics; it contains 2,191,262 firm-year observations[11]. A second dataset is based on the Comtrade's sample. It contains the imports from China and from the rest of the World (for Norway and other nine rich countries) [12].

By merging these two sources of data, I generate an "intermediate sample" of 145,689 observations (which considers only manufacturing firms and excludes utilities and financial firms). From this sample I eliminate observations with missing data concerning the total invested cap-

[9] Hoberg and Phillips (2010), Hoberg and Phillips (2010), Hoberg and Phillips and Prabhala (2014), Peress (2010), Gaspar and Massa (2006), Hou and Robinson (2006), Irvine and Pontiff (2009).

[10] For instance, a firm can suppress competitors' profitability through predatory pricing or distribution networks that are sustainable (in the short run) only if the company has a strong balance sheet (Bolton and Scharfstein (1990), Campello (2006)).

[11] All the data in NOK are converted into Dollars by means of the exchange rate of the Norwegian Central Bank. All the variables are winsorized at 1% level.

[12] See Appendix 1 for further details regarding the dataset of imports from China.

Table 1: Descriptive statistics: private firms. The sample period is from 1998 to 2006. Total leverage is defined as total interest bearing debt over total assets; short-term leverage is defined as short-term interest bearing debt over total assets; long-term leverage is defined as long-term interest bearing debt over total assets; depretiation to sales is a measure of operating efficiency and it is defined as depretiation divided by sales; profit margin is the sum of pre-tax income, interest expense and depreciation, divided by sales; Capex to assets is the measure of growth opportunities; log sales is the measure of firms' size

Year	Tot.Leverage	Short Lev.	Long Lev.	Depr./Sales	ProfitMargin	CapX/Assets	LogSales
1998	0,479	0,233	0,233	0,049	0,072	-0,049	10,740
1999	0,455	0,204	0,238	0,056	0,075	-0,067	10,673
2000	0,441	0,197	0,232	0,055	0,056	-0,070	10,885
2001	0,454	0,214	0,228	0,052	0,058	-0,073	11,017
2002	0,474	0,230	0,232	0,051	0,055	-0,079	10,919
2003	0,452	0,210	0,234	0,051	0,066	-0,078	10,808
2004	0,466	0,233	0,225	0,047	0,090	-0,068	10,806
2005	0,403	0,168	0,226	0,044	0,078	-0,060	10,781
2006	0,392	0,174	0,210	0,041	0,086	-0,053	10,935
Total	0,446	0,207	0,229	0,050	0,071	-0,066	10,840

ital, the number of employees or the indicator for being listed or non-listed (sample decreases to 119,960 obs.). I exclude observations with missing data concerning depreciation and sales (sample decreases to 105,659 obs.) and the observations without information on net property plant and equipment (sample decreases to 91,351 obs.). I include only firms with at least two years of contiguous balance sheet data (sample decreases to 72,400 obs.).

Table 1 and Table 2 contain the descriptive statistics of the most relevant variables for private Norwegian firms from 1998 to 2006.

Table 2: Descriptive statistics: private firms. The sample period is from 1998 to 2006. Capital-labor intensity is defined as total invested capital over number of employees; IPI is the import penetration and it is defined as total imports from China over the sum of total imports from the world and total Norwegian sales (see the text for further details), asset tangibility is defined as fixed assets over assets.

Year	Cap-labor int.	Tangibility	IPI	Firms' number
1998	649,241	0,286	0,015	7892
1999	899,556	0,282	0,017	8365
2000	1012,915	0,272	0,022	8266
2001	1009,986	0,268	0,022	7931
2002	1073,969	0,263	0,033	7821
2003	1324,287	0,259	0,033	7777
2004	1308,011	0,243	0,033	7866
2005	1324,082	0,234	0,035	8243
2006	1557,382	0,222	0,036	7957
Total	1129,033	0,259	0,027	72118

Table 3: Descriptive statistics: public firms. The sample period is from 1998 to 2006. Total leverage is defined as total interest bearing debt over total assets; short-term leverage is defined as short-term interest bearing debt over total assets; long-term leverage is defined as long-term interest bearing debt over total assets; depretiation to sales is a measure of operating efficiency and it is defined as depretiation divided by sales; profit margin is the sum of pre-tax income, interest expense and depreciation, divided by sales; Capex to assets is the measure of growth opportunities; log sales is the measure of firms' size.

Year	Tot.Leverage	Short Lev.	Long Lev.	Depr./Sales	ProfitMargin	CapX/Assets	LogSales
1998	0,331	0,113	0,214	0,073	0,254	-0,012	14,404
1999	0,312	0,114	0,202	0,072	0,412	-0,054	14,394
2000	0,312	0,152	0,163	0,104	0,894	-0,032	13,854
2001	0,372	0,134	0,242	0,127	0,595	-0,028	14,216
2002	0,376	0,148	0,238	0,127	0,648	-0,036	14,086
2003	0,336	0,146	0,196	0,105	-0,078	-0,028	13,825
2004	0,334	0,176	0,165	0,105	0,515	-0,025	13,307
2005	0,277	0,125	0,154	0,105	0,867	-0,027	13,405
2006	0,314	0,147	0,177	0,097	0,897	-0,017	13,376
Total	0,326	0,137	0,197	0,097	0,567	-0,026	13,835

Table 4: Descriptive statistics: public firms. The sample period is from 1998 to 2006. Capital-labor intensity is defined as total invested capital over number of employees; IPI is the import penetration and it is defined as total imports from China over the sum of total imports from the world and total Norwegian sales (see the text for further details), asset tangibility is defined as fixed assets over assets.

Year	Cap-labor int.	Tangibility	IPI	Firms' number
1998	10530,340	0,218	0,010	30
1999	9045,796	0,181	0,013	32
2000	26449,310	0,130	0,016	30
2001	20263,840	0,175	0,017	31
2002	15418,650	0,156	0,031	30
2003	29424,960	0,121	0,028	30
2004	43347,980	0,105	0,034	32
2005	28225,650	0,098	0,036	35
2006	32061,580	0,089	0,034	32
Total	24542,890	0,138	0,025	282

Table 3 and Table 4 present the descriptive statistics of the variables regarding Norwegian public firms from 1998 to 2006. Table 5 illustrates the descriptive statistics of the debt issues and of the asset growth for the Norwegian private firms from 1998 to 2006.

Table 5: Descriptive statistics: changes of debt and asset for private firms. Tot.Debt issues (annual changes in total debt divided by lagged assets), S.t.Debt issues (annual changes in short term debt divided by lagged assets), L.t.Debt issues (annual changes in long term debt divided by lagged assets), asset growth (annual change in logarithm of assets),

Year	Tot.Debt issue	S.t.Debt issue	L.t.Debt issue	Asset growth	Firms' number
1998	0,074	0,035	0,026	0,060	7892
1999	0,049	0,011	0,028	0,028	8365
2000	0,040	0,018	0,035	0,031	8266
2001	0,127	0,066	0,020	0,013	7931
2002	0,118	0,055	0,065	-0,021	7821
2003	0,026	-0,018	0,025	-0,027	7777
2004	0,050	0,050	0,016	0,030	7866
2005	-0,040	-0,052	0,011	0,042	8243
2006	0,113	0,068	0,012	0,084	7957
Total	0,061	0,025	0,026	0,027	72118

While the number of public firms appears low (approximately 30 per year), we can compare this number with the size of some previous works' dataset. For instance, Khanna and Tice (2000) (who study the impact product market competition on corporate choices, like the current paper) considers 20 private firms and 38 public companies.

For the Norwegian private firms leverage is higher than for the public firms. Following Brav (2009), the interpretation for this evidence is that equity is more expensive for private firms than for public firms. Hence, the relative cost of equity to debt is higher for private than for public firms. This condition implies that private firms rely more on debt financing relative to public firms. If we want to compare the leverage of this work with Xu (2012), we can notice that Norwegian public firms maintain leverage that is a similar vis-à-vis American public firms.

For public firms, the ratio of depreciation to sales is not different from the ratio in the previous

literature; for the private firms, the depreciation to sales is lower than public ones, which is consistent with a lower efficiency of the production equipments (according to Gildersleeve (1999), Wu et al. (2007), Krishnaswami et al. (1999), Barclay and Smith (1995)). Also the capex to assets ratio and the size seem lower among private firms relatively to public firms. It is interesting to notice that the profitability among private entities is lower than among public ones. This fact is coherent with the established evidence that, compared to similar firms, the firms that go public are the ones that, on average, enjoyed a higher profitability, have higher growth opportunities and have larger size (Pagano and Panetta (1998)). Also the lower efficiency of private firms provide an additional intuition behind the higher profitability of public entities, because low depreciation to sales can be associated with low productivity. For instance, Gildersleeve (1999) suggests that low depreciation to sales signals an inadequate asset replacement which may decrease the productive efficiency. In Tables 2 and 4, it is important to notice that the measure of exogenous import competition (which is described in details in the next section), shows a sharp increment in 2002, the first year after China's access to the WTO in December 2001. This is in line with the fact that Chinese firms represented a stronger competitor in Norwegian manifacturing markets after China's entry (which generated a sharp cut of tariff and non-tariff-barries to trade).

Effect of non-exogenous profitability on leverage

The main hypotheses are centered on investigating how profitability impacts on the book leverage. As a benchmark case, I describe the relation between book leverage and profitability by investigating the following regression (from 1998 to 2006).

$$TotLeverage_{jit} = \beta * Profitability_{jit-1} + \gamma * X_{jit-1} + \varepsilon_{jit}$$

Profitability is measured by means of profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales) and by means of ROA (net earnings over total assets). The specifications in Table 6 control for the same set of covariates used in the standard leverage regressions of previous literature (Baker and Wurgler (2002) and Leary and Roberts (2005)): asset tangibility, firms' size and growth opportunities (proxied by capital expenditures to total

assets (Brav (2009)). Year fixed effects control for the time trends in book leverage that are common across all firms. The inclusion of firm fixed effects controls for firm specific and time invariant components in book leverage (Lemmon, Roberts and Zender (2008)). Moreover, firm fixed effects decrease the concerns of time series correlations in book leverage due to firm or industry factors (Pedersen (2009)). Since this empirical model tests the leverage-profitability relation unconditionally with respect to the occurrence of refinancing, we consider specifications with firm fixed effects (not just with industry fixed effects) because they are more in line with the theory of Danis et al. (2014).[13] Similarly to Xu (2012), we have to account for the fact that firms can vary their levels of productive efficiency in the usage of the assets; thus, I control for depreciation to sales (Gildersleeve (1999)).[14]

The columns in Table 6 illustrate that measures of profitability used in the previous literature are negatively correlated with leverage, which is in line with established empirical literature (Fama and French (2002), Baker and Wurgler (2002)).

[13] In the following sections, I also investigate regressions at refinancing points. They include industry fixed effects, in accordance with the predictions of Danis et al. (2014)).

[14] Moreover, these specifications account for capital-labor intensity to have a set of control variables that is consistent with the main regressions of this paper, which will involve the capital-labor intensity.

Table 6. Impact of profitability on leverage. Private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variable is leverage (total interest bearing debt divided by assets). The regressors are: profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), ROA (EBITDA over assets), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)	(3)	(4)
	Leverage	Leverage	Leverage	Leverage
ROA	-0.141***	-0.142***		
	(0.00)	(0.00)		
Profit Margin			-0.017**	-0.017**
			(0.02)	(0.02)
Tangibility	0.144***	0.135***	0.188***	0.183***
	(0.00)	(0.00)	(0.00)	(0.00)
Size	-0.011**	-0.006	-0.023***	-0.019***
	(0.04)	(0.37)	(0.00)	(0.00)
CapEx.toAssets	-0.047**	-0.042**	-0.089***	-0.086***
	(0.01)	(0.02)	(0.00)	(0.00)
Depr.ToSales		0.076*		0.047
		(0.08)		(0.28)
Cap.Lab.Int.		0.000		0.000
		(0.50)		(0.96)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	72118	72118	72118	72118

However, as argued by earlier research in this area, the previous regression model reveals two concerns. First, we cannot study the impact of profitability on *contemporaneous* leverage because leverage endogenously affects current profits. For instance, Hortascu et al. (2010) illustrate that consumers prefer to buy the goods that are produced by firms with lower risk of distress, which depends on leverage. Hopler and Titman (1994) show that higher leverage decreases profitability and sales, especially regarding specialized products. Hence, firms with a leverage that is high enough to increase the distress probability might deteriorate their current profits. Previous literature tried to address this problem by proxying *current* profitability with *lagged realized* profitability, but this approach constrains our knowledge about the leverage-profitability relation. Moreover, this issue is also reinforced by a second concern: the trade-off theories focus on *expected* profitability, not on *current realized* profitability or on *lagged realized* profitability. Thus, the literature about capital structure tests can benefit from the study of an exogenous measure of current profitability that gives strong emphasis on future prospects. For these arguments, Xu (2012) opts to measure profitability by means of a shock on future prospects that derives from import competition (indeed, evidence suggests that import competition diminishes profitability also in the long-run. [15]). More precisely, Xu (2012) even assumes that import competition is itself a proxy for expected profitability. She does so after checking that import competition deteriorates a more intuitive measure of profitability, i.e., *profit margins*. The current paper relaxes the assumption of import competition being directly a proxy for expected profitability. Instead, I address the two aforementioned concerns, by instrumenting the profit margins by means of the exogenous import competition shocks in a "double instrumental variable" design (Becker and Woessmann (2009)). The baseline "double instrumental variable" design consists of a first stage regression which predicts the exogenous import competition from China where Chinese exports towards other rich countries is the instrument (following Autor et al. (2013)); the second stage predicts the decrease of Norwegian firms' profitability that is explained by the increases of exogenous import competition from China; the third stage investigates how leverage reacts to the predicted profitability.

[15] For instance, competition can force firms to long and costly restructuring processes or it can increase the probability of default. See for instance Coucke and Sleuwaegen (2008), Bloom et al. (2012), Katics, Pedersen (1994), DeRosa, Goldstein (1981), Pagoulatos, Sorensen (1976).

3 Import competition, import penetration and profitability

The import competition is the competitive threat that is generated by the expansion of foreign competitors' sales into the domestic markets. In particular, import competition increases for Norwegian industry i if it is experiencing an increment of the competition due to the increase of imports into Norway of the goods that are produced by foreign competitors and that constitute the output of Norwegian industry i . The intensity of the import competition from China is measured by the *import penetration* from China. It is defined (similarly to Xu (2012) and Bertrand (2004)) as:

$$Import\ Penetration_{it} = \frac{Norwegian\ imports\ from\ China_{it}}{Norwegian\ imports_{it} + Total\ sales_{it}}$$

The Norwegian imports from China are the Dollar value of goods imported from China into Norway that represent the outputs of an industry i defined by the NACE system at the 4-digits level. The source of this data is the Comtrade database which provides the dollar value of imports for each product code identified at the 6-digits HS code. See Appendix 2 for further details on the construction of import penetration.

As argued in previous research, we need to predict a measure of import competition that has to be exogenous with respect to capital structure decisions. Indeed, the simple import penetration would produce inconsistent coefficients if it is used as explanatory variable for the capital structure decisions.[16] Moreover, there is a problem of third confounding factor. An expansive monetary policy can cut open-market interest rate, which decreases external finance premium (according to Bernanke and Gertler (1995)) and, hence, corporates' leverage becomes cheaper. This cut to interest rates also depreciates the currency, which negatively affects the imports into Norway.

To solve this endogeneity problem, Xu (2012) uses USA's import tariff cuts and the dollar exchange rates as the two instruments for import penetration. Both of these instruments might

[16] As argued by Xu (2012), the main reason behind this inconsistency is that capital structure variables endogenously affect import competition by affecting firm's competition strategies (as described in Brader and Lewis (1986), Maksimovic (1988)) or firm's resilience to predatory pricing strategies (Bolton and Sharfstein (1990), Campello (2006)).

be endogeous in Xu's setting because of companies' lobbying activity, which can drive both the import policy and the monetary policy. Furthermore, the dollar exchange rate depends on the monetary policy, which, in turn, affect corporates leverage. Instead, by applying in a small country the design inspired by Acemoglu et al. (2015), Balsvik et al. (2014) and Autor et al. (2013), we are able to address this problem. This design consists in the prediction of a vector of exogenous Norwegian imports from China by means of exogenous shock to the supply of Chinese goods towards rich countries. More precisely, a vector of exogenous Chinese import penetration into Norway is predicted. It is the result of a regression of industry-level Chinese import penetration into Norway on the Chinese import penetration into nine other rich countries (USA, UK, Germany, France, Italy, Canada, Australia, New Zealand, Sweden). This regression predicts exogenous imports from China that are explained only by the exports that Chinese competitors have been able to realize towards nine rich countries (other than Norway). This IV methodology addresses the endogeneity concerns under the assumption that the shocks that are endogenous with Norwegian firms' capital structure variable are not also correlated across the nine rich countries (this assumption is similar to the one in Autor et al. (2013)). The results of this regression model (which are shown in the column "First Stage" of successive tables) say that the Chinese exports to the group of rich countries positively (and significantly) affect the exports towards Norway (as in Acemoglu et al. (2015), Balsvik et al. (2014) and Autor et al. (2013)). This instrumenting defines whether, in a given year, a Norwegian firm operates in an industry that is experiencing a shock to the value of Chinese competitors who succeeded in expanding their sales in nine rich countries. Importantly, the next tables show that the coefficients of the firm-level control variables are insignificant, which suggests that the predicted import penetration into Norway is significantly explained only by industry-level import penetration. For this reason I consider the predicted import penetration into Norway as an industry-level variable.

Effect of exogenous import penetration on profitability

In this empirical analysis it is important to confirm the hypothesis that import competition deteriorates profit margins. Previous studies have shown that the increase of foreign supply

has cut the price-cost margins, market shares and profit margins[17]. Hence, also in the current sample we can expect to assess that import competition is negatively related to profitability. This hypothesis is tested by the following model for the period from 1998 to 2006:

$$ProfitMargins_{jit} = \beta * Import\ \widehat{Penetration}_{it} + \gamma * X_{jit} + \varepsilon_{jit}$$

The model controls for capital-labor intensity in order to characterize firms' production's technology (Xu (2012)) and the same set of covariates used in the standard leverage regressions of previous literature (Baker and Wurgler (2002) and Leary and Roberts (2005)).[18] Hence, we account for: asset tangibility, firms' size and growth opportunities (proxied by capital expenditures to total assets (Brav (2009)). Furthermore, I control for depreciation to sales [19] and I also include year and firm fixed effects. Since the test of this hypothesis represents the second stage of our double IV approach, the results confirming the hypothesis are presented in the respective columns. For instance, the column "Second stage" of Tables 7 presents the result of the second stage relative to the regression which tests the static trade-off theory. The outcomes verify the conjecture that the increase of foreign supply deteriorates profitability. The exogenous import penetration has a significant negative impact on profit margins. Interestingly, the coefficient is higher with respect to those reported in the previous literature. [20] The evidence that import shocks have been more harmful for Norwegian firms with respect to American ones is in line with the fact that for Norwegian firms it has been more difficult to shape the import tariff policy in order to minimize the shocks on their profitability.[21]

[17] Xu (2012), Katics, Pedersen (1994), DeRosa, Goldstein (1981), Pagoulatos, Sorensen (1976).

[18] We have to use the standard covariates of leverage regressions even though the dependent variable is profit margins, not leverage. These controls are necessary in order to solve simultaneous systems (Koopmans and Hood (1953)).

[19] According to Gildersleeve (1999), it allows to indicate whether the firm has a sufficient replacement of existing assets or whether it is in a cost-reducing phase.

[20] Using samples of US manufacturing industries, Xu (2012) reports a coefficient of -0.172. Katics and Petersen (1994) show a coefficient of -0.175.

[21] A further related discussion is presented when I compare my results to those of Xu (2012).

4 Tests of Static Trade-Off Theory

In this section we test the predictions of the static trade-off theory by using (as main regressor) the expected profitability that has been predicted by exogenous import penetration. The following model is studied for the private firms in the years from 1998 to 2006:

$$Leverage_{jit} = \beta * Profit\widehat{Margin}_{jit-1} + \gamma * X_{jit-1} + \varepsilon_{jit}$$

Leverage is the total book leverage gauged by the ratio of interest bearing debt divided by total assets. Profit margins is the vector of predicted profit margins generated by the second stage (whose outcomes are presented in Column 3 of Table 7). The set of controls contains growth opportunities, size and asset tangibility. Also year and firm fixed effects are included. The results in the first column of Table 7 show that predicted profitability has a negative impact on leverage. Since the previous specification did not control also for capital-labor intensity and depreciation to sales, its results in Column 1 might be inconsistent. After controlling for these variables, we see in Column 2 that the coefficient becomes insignificant. In addition, we control for the lagged profitability in order to improve the capability of the predicted profit margin to identify the effect of the future profitability. As we notice from Column 3, the coefficient of profit margin remains insignificant.

Table 7. Impact of lagged exogenous profitability on leverage. The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variables is leverage. The regressors are: predicted profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)	(3)	Second Stage	First Stage
	Leverage	Leverage	Leverage	L.Profit Margin	L.Import Penetration
L.Profit Margin	-0.016**	-0.010	-0.009		
L.Import Penetration				-0.294***	
L.ORC Import Penetration					0.091***
L.Tangibility	0.181***	0.181***	0.173***	-0.006	0.000
L.Size	-0.011***	-0.021***	-0.025***	-0.000	1.665
L.CapEx.To.Assets	-0.122***	-0.083***	-0.082***	-0.030***	0.823
L.Depr.To.Sales		0.051***	0.062***	0.004	0.345
L.Cap.Lab.Int.		-0.000	-0.000	0.021***	0.087
L.ROA			-0.125***	0.701***	0.074
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	72118	72118	72118	72118	72118

This evidence recalls the negative (though significant) coefficients in Fama and French (2002) and Rajan and Zingales (1995) and, instead, it is not in line with Xu (2012). The interpretation of this incongruence with the latter paper will be clarified in a specific subsequent sub-section. It is important to notice that the first and the second stages show the expected results. Concerning the first stage, the import penetration regarding nine rich countries has a positive and significant impact on the Norwegian import penetration. Concerning the second stage, the exogenous import penetration has a negative and significant impact on the profit margin of Norwegian firms. Also next tables illustrate similar results regarding the first and of the second stages.

With the previous model we have studied the response of leverage to lagged exogenous expected profitability. The current IV framework allows us to gauge also the reaction of leverage to contemporaneous profitability. Table 8 shows the results of the regression of leverage on contemporaneous predicted profitability. The model is:

$$Leverage_{jit} = \beta * \widehat{ProfitMargin}_{jit} + \gamma * X_{jit-1} + \varepsilon_{jit}$$

The results of the first and the second stages are presented in the relative columns of Table 8 and illustrate, again, that import penetration (of Chinese products) regarding nine rich countries has a positive and significant impact on the Norwegian import penetration and that exogenous Norwegian import penetration deteriorates profitability. Importantly, the significant negative coefficients of the second stages, in Columns 1 and 2, suggest that the leverage of Norwegian private firms increases (decreases) in correspondence with exogenous profitability's cuts (growth). Since the *static* trade-off theory's prediction is that "more profitable firms should more highly value the tax-shield benefits of debt" (Graham and Leary (2011)), these results might suggest that the trade-off theory is not corroborated by the evidence regarding Norwegian private firms. However, as anticipated in the introduction, according to the dynamic trade-off models the previous empirical investigations are not a conclusive test of the trade-off theory since they do not account for the occurrence of capital structure's adjustments. The details will be discussed and analized in the next section. Instead, the next two sub-sections investigate, first, the mechanics of the negative coefficient and, second, the incongruences between these results and the previous literature.

Table 8. Impact of predicted expected profitability on leverage. Private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variable is leverage (total interest bearing debt divided by assets). The regressors are: predicted profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)	(3)	Second Stage	First Stage
	Leverage	Leverage	Leverage	Profit Margin	Import Penetration
Profit Margin	-0.091**	-0.074**	-0.057*		
Import Penetration				-0.213***	
ORC Import Penetration					0.086***
L.Tangibility	0.186***	0.183***	0.181***	0.000	0.000
L.Size	-0.014***	-0.025***	-0.032***	-0.016***	0.346
L.CapEx.To.Assets	-0.127***	-0.085***	-0.063***	0.002	0.634
L.Depr.To.Sales		0.048**	0.083**	-0.025	0.823
L.Cap.Lab.Int.		0.000	0.000	0.000*	0.103
L.ROA			-0.123***	0.692***	0.403
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	72118	72118	72118	72118	72118

4.1 Debt issuances and asset growth

To have a better understanding of what drives the negative profitability-leverage relation, we should investigate the dynamics of specific variables that describe firms' behaviors regarding

debt issuance, assets' growth, equity growth, payout policy, retaining earnings or issuing paid-up equity. Therefore, the set of regression models is:

$$DebtIssue_{jit} = \beta * \Delta \widehat{ProfirMargins}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

$$AssetGwth_{jit} = \beta * \Delta \widehat{ProfirMargins}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

$$EquityGwt_{jit} = \beta * \Delta \widehat{ProfirMargins}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

$$PayoutGwt_{jit} = \beta * \Delta \widehat{ProfirMargins}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

$$Ret.Earn.Gwt_{jit} = \beta * \Delta \widehat{ProfirMargins}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

$$PaidEq.Issue_{jit} = \beta * \Delta \widehat{ProfirMargins}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

In order to examine these choices, I specify a change regression model where the dependent variables are: payout's growth (annual change in payouts to shareholders over lagged assets), asset growth (defined as the annual change in logarithm of assets), total equity growth (annual change in total equity over lagged assets), retained earnings growth (annual change in retained earnings over lagged assets) and paid-up equity issuance (annual change in paid-up equity over lagged assets). The key regressor is the change of profitability that is predicted by the following first-stage regression:

$$\Delta ProfirMargins_{jit} = \beta * \Delta \widehat{ImportPen}_{ijt} + \gamma * \Delta X_{jit-1} + \delta * E/A_{jit-1} + \varepsilon_{jit}$$

The results of the first and the second stages are presented in the relative columns of Table 9 (Panel B). The control variables are the lagged annual changes of the covariates' set characterizing previous regressions. I control for the lagged equity over lagged total assets since it is necessary to account for the cumulative impact of past capital structure decisions. The results of the third stages are summarized in Table 9 (Panel A).

Table 9, Panel A. Impact of changes of expected profitability on flow variables. The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variables are: asset growth (annual change in logarithm of assets), net debt issues (annual changes in debt divided by lagged assets), payout's growth (annual change in payouts to shareholders over lagged assets), total equity growth (annual change in total equity over lagged assets). The regressors are: annual change of profit margins, annual changes of standard control variables, equity over assets. Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)	(3)	(4)	Second Stage	First Stage
	Debt issue	Asset gwt	Equity gwt	Payout gwt	Chg in Profit Margin	Chg in Import Penetr.
Chg in Profit Margin	-1.389	0.839**	0.439**	0.022		
	(0.58)	(0.01)	(0.02)	(0.74)		
Chg in Import Penetr.					-0.779**	
					(0.01)	
Chg in ORC Import Penetr.						0.102**
						(0.04)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
N	59060	59060	59060	59060	59060	59060

The first column illustrates that the relation of exogenous profitability shocks and net debt issuance is insignificant, which suggests that private firms do not correct their debt when expected profitability changes, although these changes might have modified the ideal leverage, according to the trade-off theory. The reaction of asset growth is positive. This means that firms decrease their assets when profitability decreases for reasons linked to the increase of competition. This result

recalls the conclusion of Fresard and Valta (2015); they show that firms react to increased product market threat by decreasing their assets (more precisely they decrease capital expenditure). The response of dividends is positive but insignificant, which does not corroborate the hypothesis[22] that a more profitable firm has more need for dividends because they discipline the agency problems generated by free cash flow.[23] The reaction of equity is positive, which suggests that the increase of the assets side of balance sheet is reflected into an increase of equity, in the liability side. Since the cost of paid-up equity is high for private firms (Brav (2009)), we would expect that the increase of equity is driven by the increase of retained earnings.

To understand this point, we should investigate whether retained earnings have a significant positive coefficient. Panel B of Table 9 illustrates that the coefficient of retained earnings growth is significantly positive, while the coefficient for changes in paid-up equity is non-significant. This suggests that the increases of equity in response to increments of profitability are driven by retained earnings. Therefore, in the same year of profitability shock, the scenario arising from the data does not represent a situation of issuance (or retiring) activity. On the contrary, a passive behavior seems more plausible, where firms accomodate the changes in profitability with positively correlated variations of assets. The changes are balanced, in the liability side, with the changes of retained earnings and not with debt's corrections. This inactive behavior is in line with the importance of retained earning for financing the assets that has been illustrated by Frank and Goyal (2007): they show that private firms's retained earnings are highly correlated with capital expenditures. An interpretation is that, when firms face a decrease of profitability (generated by the increase of competition), they tend to consume the retained earnings they have accrued in the previous years, rather than decreasing immediately the level of debt to adapt to the lower level of profitability.

[22] This hypothesis has been tested, for instance, in Allen and Michaely (1995) and Fama and French (2002).

[23] However, better tests of the payout policy usually involve the analyses of target payouts, which is not implemented in the current paper.

Table 9, Panel B. Impact of changes of expected profitability on flow variables. The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variables are: retained earnings growth (annual change in retained earnings over lagged assets) and paid-up equity issuance (annual change in paid-up equity over lagged assets). The regressors are: annual change of profit margins, annual changes of standard control variables, equity over assets. Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)
	Ret.Earnings gwt	Paid-up Equity gwt
Chg in Profit Margin	0.378**	0.098
	(0.03)	(0.17)
Chg in Import Penetr.		
Chg in ORC Import Penetr.		
Controls	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	51458	51458

4.2 Effect of import penetration on leverage

In this section I discuss and, then, implement an empirical approach that tightly follows Xu (2012). It assumes that import penetration is itself the proxy of expected profitability and, therefore, regresses leverage directly on import penetration. Since the assumption that import penetration is directly a proxy of expected profitability might not be straightforward *per se*, Xu (2012) supports it by checking that import penetration deteriorates a more recognizable

measure of profitability, i.e. profit margins[24]. In addition to this, Xu (2012) motivates the proxy approach by regressing profit margins on simple import penetration (not, instead, *exogenous import penetration*). This fact is a concern because, if Xu (2012) convincingly assumes that simple import competition is endogenous with capital structure decisions, it is more difficult to think that the profitability of firms does not impact on the import penetration. For instance, domestic entrepreneurs might divest in the industries with lower profitability and, hence, leave the domestic market to foreign manifacturers. For these considerations, my paper finds it useful to add the 2SLS as an alternative empirical approach in this research area.

Nonetheless, the current sub-section implements Xu (2012) approach to compare the differences in results between the two papers. The following model is regressed, in the years from 1998 to 2006, for private and, subsequently, also for public firms:

$$Leverage_{jit} = \beta * Import\ \widehat{Penetration}_{jt-1} + \gamma * X_{jit-1} + \varepsilon_{jit}$$

Since this model is testing the leverage-profitability relation unconditionally with respect to the occurrence of refinancing, we consider specifications with firm fixed effects (not just with industry fixed effects) because they are more in line with the theory of Danis et al. (2014). Columns of Table 10 illustrate the outcomes under multiple specifications depending on an increasing set of covariates. The specification of Column 1 contains asset tangibility, growth opportunities and expected profitability as regressors. The results show that leverage has an insignificantly positive reaction to import competition. Since, firms can vary their levels of productive efficiency in the usage of the assets, we should control for depreciation to sales. Moreover, since, firms can modify their capital-labor intensity (which is related to the exposition of competition from China), we have to control for the capital-labor intensity. in Columns 2, we see that the sign of the coefficient for import competition is significantly positive. According to Xu (2012), we can interpret this finding as a *negative reaction to expected profitability,* which is coherent with the results of the "double IV" design.

In order to add a specification that is more comparable to Xu (2012), in Column 4, I run

[24] Also market shares are used as benchmark in order to check whether import penetration deteriorates expected profitability.

a specification in which the industry fixed effects substitute the firm fixed effects. The results show an insignificant leverage-competition relation. If we also control for previous profitability, as suggested by Xu (2012); the coefficient remains insignificantly negative, though it becomes slightly less insignificant (Column 5).

Table 10. Impact of lagged exogenous import penetration on leverage. The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variables is leverage. The regressors are: exogenous import penetration (import penetration that has been predicted by means of the exogenous Chinese exporting shocks, following Autor et al. (2013)), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)	(3)	(4)	First Stage
	Leverage	Leverage	Leverage	Leverage	L.Import Penetration
L.Import Penetration	0.117	0.121*	-0.065	-0.021	
	(0.26)	(0.09)	(0.58)	(0.85)	
L.ORC Import Penetration					0.091***
					(0.00)
L.Tangibility	0.189***	0.184***	0.275***	0.260***	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.24)
L.Size	-0.026***	-0.022***	-0.032***	-0.020***	1.665
	(0.00)	(0.00)	(0.00)	(0.00)	(0.19)
L.CapEx.To.Assets	-0.089***	-0.086***	-0.334***	-0.201***	0.823
	(0.00)	(0.00)	(0.00)	(0.00)	(0.54)
L.Depr.To.Sales		0.052	0.095***	0.016	0.345
		(0.24)	(0.00)	(0.61)	(0.34)
L.Cap.Lab.Int.		-0.000	-0.000	0.000	0.087
		(0.83)	(0.20)	(0.82)	(0.72)
L.ROA				-0.381***	
				(0.00)	
Firm FE	YES	YES	NO	NO	YES
Industry FE	NO	NO	YES	YES	NO
Year FE	YES	YES	YES	YES	YES
N	72118	72118	72118	72118	72118

To increase the comparability with previous research, which regards only public firms, Table

11 provides results for listed entities. It is interesting to notice that competition's coefficients are more negative with respect to the case of private firms (hence, the leverage-profitability relation is more positive)[25]. With firm fixed effect, coefficients are always insignificantly negative and, thus, smaller than the ones in the sample of private firms. With industry fixed effects, the impact remains insignificant but with coefficients that seem more strongly negative with respect to the ones of private firms, in the previous table. These results suggest that the competition-leverage relation is more negative for public firms and, according to Xu (2012), profitability-leverage relation is more positive. As we will see in the next sections, these findings are in line with the fact that the unconditional regressions of private firms likely involve less refinancing points, that is points where the leverage-profitability relation is predicted to be positive.

[25]However, a proper comparison of coefficients between two different regressions would require to compute the p-value regarding the z-score of the difference between the unstandardized betas.

Table 11. Impact of lagged expected profitability on leverage. The regression involves public firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variables is leverage. The regressors are: exogenous import penetration (import penetration that has been predicted by means of the exogenous Chinese exporting shocks, following Autor et al. (2013)), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	(2)	(3)	(4)	First Stage
	Leverage	Leverage	Leverage	Leverage	L.Import Penetration
L.Import Penetration	-0.119	-0.056	-0.242	-0.276	
	(0.75)	(0.88)	(0.53)	(0.46)	
L.ORC Import Penetration					0.089*
					(0.08)
L.Tangibility	-0.007	-0.063	-0.143	-0.163*	0.000
	(0.96)	(0.64)	(0.10)	(0.06)	(0.43)
L.Size	0.021*	0.045***	0.041***	0.046***	0.432
	(0.09)	(0.01)	(0.00)	(0.00)	(0.74)
L.CapEx.To.Assets	0.044	-0.003	-0.040	-0.016	0.765
	(0.62)	(0.98)	(0.74)	(0.89)	(0.43)
L.Depr.To.Sales		0.118***	0.130**	0.152**	0.786
		(0.01)	(0.04)	(0.02)	(0.68)
L.Cap.Lab.Int.		0.000	0.000***	0.000***	0.102
		(0.42)	(0.00)	(0.00)	(0.25)
L.ROA				-0.063	
				(0.11)	
Firm FE	YES	YES	NO	NO	YES
Industry FE	NO	NO	YES	YES	NO
Year FE	YES	YES	YES	YES	YES
N	282	282	282	282	282

This set of results indicate a negative or insignificant response of leverage to profitability

shocks, which is not in line with Xu (2012)'s evidence of positive reaction. The discrepancy can be explained essentially by two factors. First, the current study opts to use the import policy of a small country to address the endogenity that results from the fact that in large countries tariffs are driven by firms' preferences about import policy. A literature (for instance Bloom et al. (2012) and Grossman and Helpman (1992)) confirms the motives behind this concern.

Some types of businesses are more able than others in increasing the investments in the most innovative and complex areas of produtction. Bloom et al. (2012) suggest that businesses with an ability to increase innovation are more likely to survive after an initial shock of competition and, therefore, have a lower aversion for import tariff cuts. This lower aversion can be translated into the fact that the set of liberalized industries used by USA' studies might not be random for which concerns firm's ability to expand the most innovative areas of production. These firms will have a different response in terms of leverage with respect to others that instead have stronger aversion to the entrance into the set of liberalized industries.

Another intuition for the faster reaction of American firms, vis-à-vis Norwegian ones, can be attributed to the fact that USA's capital markets are able to offer a higher adjustment speed. The fact that USA's equity markets have lower trading costs (Domowitz and Madhavan (2001)) might be suggestive of higher adjustment speed of capital structure, though the equity is only one of the sources of capital.

5 Tests of Dynamic Trade-Off Models

Hitherto, the leverage regression using contemporaneous profitability shocks illustrated that leverage increases in response to profitability cuts. The mechanics of this movement show that Norwegian firms do not retire debt while assets decrease, which is reflected into a decline of retained earnings. These steps represented a method to test the hypotheses that firms follow the static trade-off theory.

In this section, instead, we test the predictions from the dynamic inaction models. These models give strong emphasis on the fact that the relation has to be positive *conditionally* on the fact that the firm is actively implementing costly adjustments of capital structure. Indeed, the

time series of each firm is constituted by periods of in which leverage fluctuates in-between the thresholds of the inactivity region[26] and by periods of adjusting activity, where firms undertake costly corrections of capital structure.

To propose a description of how the leverage-profitability relationship depends on adjustments, we can check whether firms with different adjustment costs have different a relationship. The intuition is the following: as argued by Brav (2009), firms with relatively high adjustment costs (i.e. private firms in his - and also in my - setting) undertake less frequently the active corrections of leverage; thus, the time series of these firms should contain less adjustment points in which the profitability-leverage relationship is positive. Symmetrically, firms with lower adjustment costs should have more adjustment points. If we test the profitability-leverage relation, we expect the estimator to be more positive (or less negative) for firms with low adjustment costs. This paper tests whether public firms' leverage react less negatively to exogenous expected profitability. The following model is studied for the public firms in the years from 1998 to 2006:

$$Leverage_{jit} = \beta * \widehat{ProfitMargin}_{jit} + \gamma * X_{jit-1} + \varepsilon_{jit}$$

The outcomes in Table 12 show that public firms have an insignificant profitability-leverage relation. They confirm the prediction that public entities, which have more adjustments than private ones, have a leverage that correlates less negatively with profitability shocks. The first and the second stage's outcomes in Table 12 illustrate that exogenous import penetration has a negative impact on profit margins also for public firms.[27]

[26] These patterns are explained, for example, by Strabulaev and Whited (2012)

[27] There is a limitation in the analysis of this heterogeneity: the low number of observations does not allow the matching of private firms with firms that are similar but public, although I control for size, growth opportunities, depreciation to sales, capital labor intensity and tangibility. Moreover, the number of observation is in line with other research (for instance, Khanna and Tice (2000)).

Table 12. Impact of lagged expected profitability on leverage. The regression involves public firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variables is leverage. The regressors are: predicted profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). Import Penetration is the import penetration of Chinese products into Norway, ORC Import Penetration is the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1) Leverage	(2) Leverage
Profit Margin	-0.031*** (0.00)	-0.011** (0.04)
(Prof.Marg.)*(Ref)	0.010* (0.06)	0.010* (0.09)
Controls	YES	YES
Firm FE	NO	YES
Year FE	YES	YES
N	72118	72118

A second method builds on two precise predictions from Danis et al. (2014) and aims to study the profitability-leverage relation precisely at adjustment points. By means of a conventional rule, we identify the refinancing points as the relevant adjustment points in which we expect to observe a positive profitability-leverage relation.

The refinancing points are the firm-year observations in which there is a sufficient issuance of debt joint with a sufficient payout to shareholders. It is important to motivate why the debt reductions are not eligible as testable adjustment points. Danis, Rettl and Whited (2014) argues that dynamic trade off models are difficult to be examined using their predictions about debt reductions. Indeed, they normally do not consider debt reductions as an optimizing behavior, apart from the moments close to default or to strategic renegotiations, which we do not observe

in the current paper. The specification relative to this approach is the following:

$$Leverage_{jit} = \beta * \widehat{Profitab}_{jit} + \delta * (Ref_{jit} * \widehat{Profitab}_{jit}) + \gamma * X_{ji(t-1)} + \varepsilon_{jit}$$

Ref is the dummy variable that identifies the refinancing points. They are the firm-year observations exceeding the thresholds of 5% for the debt issues (defined as the annual changes in long term debt minus cash changes, divided by assets) and the level of 5% for the dividend payouts to shareholders (i.e. dividend payouts divided by assets). Importantly, the inclusion of an interaction between profitability and refinancing allows us to separate the profitability-leverage correlation at refinancings from the one at non-refinancings. This separation is crucial for tightly testing the dynamic trade off theory of Danis et al. (2014), which makes different predictions depending on whether refinancing is occurring or not. First, they predict a significantly negative profitability-leverage relation in the non-refinancing periods. This means that they predict a negative sign for (β), which is the coefficient of profitability at non-refinancing points. Second, concerning cross-sectional models, they predict a positive relation at refinancing points. Thus, we expect a positive sign for $(\beta + \delta)$ that is the sum of the coefficient of profitability at refinancings and the coefficient of the interaction variable between profitability and the occurrence of refinancing (this interaction describes the differencial impact of profitability between refinancing point and non-refinancing points). The specifications in Table 13 test the first prediction. The results show that the exogenous profitability has a negative impact on leverage at the non-refinancing points. This evidence corroborate the dynamic trade-off theory.

Table 13. Impact of predicted expected profitability on leverage at non-refinancing points. The regressors are: predicted profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), Refinancing dummy (it equal one if the firm-year observation exceeds 5% of long term debt issues and 5% of payout to shareholders, see the text for further details), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1) Leverage	(2) Leverage
Profit Margin	-0.031***	-0.011**
	(0.00)	(0.04)
(Prof.Marg.)*(Ref)	0.010*	0.010*
	(0.06)	(0.09)
Controls	YES	YES
Firm FE	NO	YES
Year FE	YES	YES
N	72118	72118

Table 14 contains cross-sectional regressions with the industry-fixed effects in order to test the second hypothesis. The crucial investigation regards the Wald test that aims to assess whether the null that the sum of the coefficients $(\beta + \delta)$ is equal to zero. Column 1 shows the outcomes of the specification with only the most basic controls of the leverage regression, that is size, growth opportunities and tangibility. The p-value relative to the Wald-test is very small and, hence, we can reject the null hypothesis that expected profitability has no impact on leverage. By means of shown tests, I assess that the sum has a negative sign. However, the results in Column 1

are likely biased becauseIn Columns 1 and 2, the row labeled "Hp sum = 0" illustrates that we cannot reject the null that the sum is equal to zero with a Wald-test p-value equal to 0.27 (in the specification with only the standard control variables) and 0.28 (in the specification that considers also the depreciation to sales and the capital labor intensity). This evidence does not corroborate the second prediction for which the cross-sectional profitability-leverage relation is positive at refinancing points. These results are not in line with the results regarding USA's public firms in Danis, Rettl and Whited (2014).

Table 14. Impact of predicted expected profitability on leverage at refinancing points. The regressors are: predicted profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), Refinancing dummy (it equal one if the firm-year observation exceeds 5% of long term debt issues and 5% of payout to shareholders, see the text for further details), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over sales), firms' size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). The Wald test has the null hypothesis that the sum $(\beta + \delta)$ is zero. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1) Leverage	(2) Leverage
Profit Margin	-0.031***	-0.011**
	(0.00)	(0.04)
(Prof.Marg.)*(Ref)	0.010*	0.010*
	(0.06)	(0.09)
Controls	YES	YES
Firm FE	NO	YES
Year FE	YES	YES
N	72118	72118

6 Conclusions

Static Trade-Off Theory (TOT) of capital structure predicts that profitability increases the advantage of debt by increasing its tax-shield benefit. For Fama and French (2002), the established evidence of negative profitability-leverage relation contradicts TOT. In this paper, I test TOT under its static and dynamic versions by using an exogenous expected profitability.

By means of a double IV approach, the first stage predicts the exogenous competition from China where Chinese exports towards other rich countries is the instrument (following Autor et al. (2013)); the second stage predicts the Norwegian firms' profitability by means of the increases of exogenous competition from China; the third stage analyzes the response of leverage to the predicted profitability. When I focus on the tests of the static TOT, I find that leverage increases when predicted profitability drops. This response is driven by the assets' decrease and the retained earnings' decrease. On the other hand, debt is not adapted to the lowered level of profitability. Moreover, I introduce tests of the dynamic TOT in the literature concerning competition-profitability-leverage. With the "double instrumental variable" approach, I find a negative profitability-leverage relation at non-refinancing points, which corroborates the dynamic TOT. However, I also find, at refinancing points, insignificant profitability-leverage relation, which does not corroborate the dynamic TOT.

Appendix 1

Imports are listed at the 6-digits Harmonized System (HS) product code, which are provided by Comtrade. I associate the 6-digits HS codes to the relative NACE (revision 1.1) industry codes by means of the conversion tables of RAMON's database. The NACE industries that have data on imports span from 0100 to 3800, which concerns the primary and the manufacturing industries.

By merging these two datasets, I eliminate 2,044,571 firm-year observation because the initial Norwegian Corporate Accounts contains the universe of Norwegian industries, including the NACE codes from 3810 to 9999 whose outputs are not the tangible products described by Comtrade. The other two reasons for this decrease of observations are: first, my initial Norwegian Corporate Accounts dataset (which spans from 1995 to 2007) contained more years than my imports dataset (which spans from 1996 to 2006); second, some firms have missing data for which concerns the NACE code.

Appendix 2

The Norwegian imports are the Dollar value of goods imported from the whole world in Norway that are the outputs of an industry i defined by the NACE system at the 4-digit level. The source of this data is the Comtrade database.

Total sales are the Dollar value of products that have been sold by Norwegian industry i defined by the NACE system at the 4-digit level. The source of this information is the Norwegian Corporate Accounts' database, which is discussed by Berner, Mjøs and Olving (2012).

The NACE (revision 1.1) codes that are involved are from 0100 to 3800, which concerns the primary and the manufacturing industries. The conversion tables from HS6 to NACE are provided by the RAMON's database.

Appendix 3

The negotiations for China's access to WTO openly involved the high USA Trade Representatives starting from March, 1999, even though "significant gaps" were still present. The NATO bombs on Chinese embassy in Belgrade delayed WTO negotiations until the end of 1999. From November 1999 to mid-2001, multiple pacts with China were signed and several industries gradually entered in the agreements. In June 2001 a consensus was reached between USA and China and, in July, the consensus with EU follows. The approval by the WTO Conference occurs in November 2001 and the month of actual entrance is December 2001.

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