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ABSTRACT

EXPORT IMPACT ON DIVIDEND POLICY FOR BIG COLOMBIAN EXPORTING FIRMS, 2006 – 2014*

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This paper studies the impact of exogenous export demand shocks on firms' dividend policy using firm specific real exchange rate variation as instrumental variable. IV exclusion restriction is plausibly satisfied because real exchange rate shocks were unanticipated -partly explained because of international oil price fluctuation-, and first stage results confirm relevance condition fulfillment. The results indicate that big private Colombian exporting firms decree dividends as a way to mitigate the agency cost generated by exogeneous exports variation via higher free cash flow and cash flow volatility, especially in poor managerial quality firms. Evidence supports *agency cost* theory and denies *signaling*.

Keywords: dividends, exports, agency cost, free cash flow, volatility

JEL classification: F14, F10, G30, G32, G14, G35

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1 Introduction

Why do firms decree and pay dividends? Perhaps surprisingly, no clear answer exists to this relevant question, despite extensive corporate finance research. Two recent literature review papers (Al-Najjar and Kilincarslan (2019); El Attar and Jabbouri (2018)) suggest to develop new perspectives and to conduct more studies for developing countries in order to put together the "*dividend puzzle*".[1] Although more recent papers have brought new elements to the debate, like managers' career concerns,[2] the international trade role impact on dividend policy is conspicuous by its absence. As far as I know, only two papers relate trade and dividends.

From the import perspective, Booth et al. (2013) estimates sectoral import penetration impact on firm dividend payment probability, reporting that between 33% and 40% of the "*disappearing dividends*" phenomenon occurred in US[3] between 1978 and 1999 could be attributed to import competition rise (due to higher uncertainty in future performance). From the export perspective, Goldman and Viswanath (2015) found that cashflow diversification through exports is positively correlated with higher dividend payouts in India between 2000 and 2009. However, the potential endogeneity of main independent variables in these papers (sectoral import penetration ratio and firm exports ratio relative to sales[4]) is not addressed, hence, it is not possible to infer causality.

This paper brings up three novelties that encounter recommendations for future research made by literature review papers and also allow causality inference. First, it estimates the impact of exogenous export demand shocks on decreeing dividends probability and its respective amount. Exported value is instrumented with firm specific real exchange rate weighted by export destination countries shares in total firms' exports in its first sample year. This empirical approach may be one of the missing pieces to put together the "*dividend puzzle*" because it allows to analyze firm's response when experiencing exogeneous inflow or outflow resources from a volatile source which rises free cash flow. Section IV discusses the fulfillment of relevance condition and exclusion restriction.

Secondly, the analysis is made for a developing country: Colombia.[5] Although information cover most of the required variables for the analysis (sample is composed by a merge of financial statements and customs data for the biggest private exporting firms[6]), some dividend theories which refer capital gains will not be tested for two reasons. First, including stock market information would reduce the sample substantially as only 15 (37%) firms with stock market capitalization produce goods, while the remaining

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[1] The lack of consensus about dividend policy determinants is known in the corporate finance literature as "dividend puzzle", whose concept dates back to the next quote: "The harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just don't fit together" (Black, 1976, p.1)

[2] Dang et al. (2020) suggest that managers career concerns role can explain that S&P1500 firms either maintained or increased dividend payment during COVID-19 crisis.

[3] The proportion listed US firms that pay dividends decreased from 66.5% in 1978 to 20.8% in 1999. This reduction can be explained for a mix of new publicly traded firms with typical non-paying dividends characteristics (small size, low earnings, and high growth) and a lower paying probability of existing firms (Fama and French, 2001).

[4] They also use ExpIntenRel = 1-2|expintensity-0.5| as a proxy variable for sales diversification.

[5] Jaramillo (2021) explores Colombian dividend payment determinants with the same financial statement dataset used in this paper. However, its main focus is not international trade (although one of the explanatory variables included in the regression is the nominal exchange rate between Colombia and USA, whose coefficient is not significant).

[6] Firms whose total assets or operating income value exceed 30,000 Colombian legal minimum wages.

26 (63%) services.[7] Secondly, information about shares or participative quotas[8] issued when firms not listed at the stock market were founded (quantity and nominal value) and their transactions is not public.[9]

Third, baseline econometric specification is estimated disaggregated by the Colombian international managerial quality variable calculated by Merchan (2023), which aims to measure manager's organizational capital contribution to improve quality capacity and production efficiency of firms' exported products. This variable was calculated with the same dataset of this paper and allows to test empirically dividend theories which mention managerial quality as one firm dividend policy determinant.

This document proceeds as follows. Section II describes the theoretical framework, section III shows the descriptive statistics, section IV presents the empirical methodology, section V analyzes the results, and section VI concludes.

2 Theoretical framework

Although different firms' dividend policy theories have been established across several decades of corporate finance research (see Al-Najjar and Kilincarslan (2019); El Attar and Jabbouri (2018) for a detailed literature review for each theory), the potential trade role impact on dividend policy has not been precisely defined. Those theories are grouped in two according if they can be tested empirically with data used in this document: i) theories which require information about share transactions to measure capital gains, and ii) theories which do not refer capital gains.

In the first group, *bird in the hand* theory follows the popular saying that one bird in the hand is better than two in the bush, which means that investors prefer dividends than capital gains because dividends are less risky. Therefore, firms that pay frequent and high dividend rate would reduce investors' cash flow uncertainty and would increase firm's value. The usual criticism to this theory is that firm's risk is more determined by its investment projects than by the way it distributes profits. On the contrary, *tax preference theory* emphasizes that usual higher tax rate on dividends than capital gains would spur investors to prefer firms with lower dividend payment due to fiscal benefits. Firms should also avoid dividend payments to increase their share prices.

In the Colombian context, *tax preference theory* would not apply because capital gains of shares traded out of the stock market were taxed between 2006 and 2014 but not dividend payment.[10] Nonetheless, exports could modify investor' choice between capital gains or dividends. On one hand, exporting could be perceived by investors as a signal of positive future firm performance, which could raise firms' shares demand and would make capital gains more profitable (ceteris paribus). In this regard, Bjørnland (2008) found that 10 percent oil price increase rises stock returns by 2.5 percent in Norway (oil exporting country). However, firms could simultaneously pay higher dividends rate at higher

[7] *There are 41 Colombian firms with stock market capitalization. 37% (15) produce goods and 63% (26) services. See: bvc.com.co (Information downloaded on 1st March 2023)*

[8] *The legal firm type will determine if share capital is distributed in shares (Sociedades anonimas, sociedades por acciones simplificadas, sociedades en comandita por acciones) or in participative quotas (sociedades limitadas).*

[9] *Shareholders are free to sell their shares in private transactions out of the stock market as long as their price is larger than their nominal value. Some exceptions are contemplated for privileged shares, common shares in which the right of preference has been expressly agreed, among others (403 article, Colombian Commercial Code).*

[10] *However, the corporate income tax decreased the resources available to be distributed to shareholders.*

frequency with exports resources. The aggregate net export effect on investor' choice between capital gains and dividends is an empirical question.

In the second group, *agency cost theory* emphasizes that firms pay dividends as a mechanism to mitigate the agency cost between manager and shareholders associated with free cash flow[11] subject to manager discretion. Dividend payment would avoid manager overinvestment in projects with negative net present value or that does not represent shareholders' interest. Also, Jensen (1986) suggests that debt could be an alternative mechanism to alleviate this agency cost, as the capital market scrutiny could monitor efficiently that managers behave according to shareholder's aim.

Exports could exacerbate or calm priorities differences between managers and shareholders depending on its impact on free cash flow (FCF). Its net effect will depend if cash flow from operating activities increases in a higher magnitude than capital expenditures and debt payment because of export variation (assuming FCF = cash flow from operating activities – capital expenditures – debt payment[12]). Although academic literature has studied export effect on capital expenditures (Campa and Shaver (2002) found that under liquidity constrains, Spanish exporters' capital investments are higher than non-exporters because of more stable cash flow associated with negative correlation of destination countries' business cycles), it would be necessary to consider export effect on other FCF components to determine its aggregate impact.

In addition, cash flow volatility could be another agency cost source: "*when cash flows are variable, it is difficult for investors to accurately attribute deviations in cash flows to the actions of corporate managers or to factors beyond managements' control. Thus, the higher the expected variance in cash flows, the greater the potential agency cost, and the greater the reliance on dividend distributions*" (Bradley et al., 1998, p.556). While some papers found that exporting has a negative effect on cash flow volatility (see Goldman and Viswanath (2011) for India and Campa and Shaver (2002) for Spain), there is evidence in the opposite direction for sales volatility (see Vannoorenbergue (2012) for France and Riaño (2011) for Colombia). Although dynamics between cash flow volatility and sales volatility has not been studied yet, appendix B shows that export share is positive correlated with both volatilities.

Additionally, *pecking order* theory states that dividend policy should be adjusted to firms' financial policy. Firms would prioritize internal funds when looking for financing and they would pay dividends just if there are available resources once firms' financing needs are met. Academic literature has found that exporting could not flexibilize firms' financial constraints: "*evidence points to less constrained firms self-selecting into exporting rather than exporting alleviating firms' financial constraints*" (Manole and Spatareanu, 2010, p.1), consequently, exporting could be a non-relevant determinant of firms' prioritization between financing sources (internal resources, debt, equity) and their decision about dividend payment.

Finally, *signaling* is maybe the most referenced dividend theory which could be classified in both groups. It states that under asymmetric information between managers and investors, managers use dividends to communicate their private information about current and future firms' performance. Managers increase dividend payments only if they expect positive and low volatile earnings (Farre et al., 2014) and avoid cutting or making volatile payments since it could be interpreted by investors as a negative sign about firms' performance. In this sense, investors would prefer to buy shares of those

[11] *"Free cash flow is cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital" (Jensen, 1986, p.323).*

[12] *Bhandari and Adams (2017) provide a review of FCF definitions implemented in the literature.*

firms paying high and non-volatile dividends (which in turn would rise firms' share prices).[13] From this perspective, exogenous export demand shocks should not increase dividend payment because dividend policy should communicate permanent and not temporary earnings variations.

In conclusion, export impact on dividend policy can be analyzed from different viewpoints. It is expected that empirical results of this paper become a starting point to lead how international trade role impact on firms' dividend policy should be theoretically modeled.

3 Descriptive statistics

The database of this paper is composed by the merge of two public Colombian databases covering 2006-2014 period. The first one is customs data, which includes exported (imported) value for all Colombian firms disaggregated at HS 10 product digit – quantity – destination (origin) country- firm id reported by the DANE.[14] The second one is financial statements (balance sheet, income statement, and cash flow) for the biggest private Colombian firms (those whose total assets or operating income value exceeds 30,000 Colombian legal minimum wages), which is reported by the Colombian Companies Superintendence.[15] Both databases are public and were download in February 2021. On annual average, big private exporting firms represent 14% of big private firms (3,529 from 24,668), 42% of total exporting firms (3,529 from 8,339) and account for 62% of total exported value (US$ 28,766 million from US$ 46,255 USD million).

The primary variable of the analysis is the amount decreed in dividends, not paid, because payments can be done up to one year after general shareholders assembly[16] decides to decree dividends.[17] Graph 1 indicates that annual average percentage of firms that decreed dividends is significantly higher for exporting firms (18%) than for non-exporting firms (9%), however, the tendency for both type of firms during the analyzed period is similar: a minor increasing slope with an unusual rise in 2010. This trend denies that "*disappearing and appearing dividends*" phenomenon experienced for the biggest American firms from 1980 to 2018[18] (Michaely and Moin, 2022) occurred in Colombia from 2006 to 2014. Nevertheless, the same countercyclical dividend payment pattern experienced during the recent COVID crisis in America (Dang et al., 2020) occurred post 2008 global financial crisis in Colombia, in which percentage of firms that decree dividends increased during low economic growth years.

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[13] Lintner (1956) developed the pioneering partial dividend adjustment model, which explains a payment process in which managers smooth dividend payments and converge to a target dividend payout ratio, rather than adjusting immediately to earnings, in order to signal firms' stability.

[14] National Colombian Statistics Agency (DANE, by its acronym in Spanish). Imported and exported value were deflated using Colombian Producer Price Index (2014 is the base year).

[15] The variables from this dataset were deflated using an industrial-specific annual Producer Price Index (PPI) reported by the Colombian Central Bank (2014 is the base year).

[16] According to the Colombian Commercial Code (Article 420) one of the functions of the general shareholders assembly is to "set the amount of the dividend, as well as the form and terms in which it will be paid".

[17] "The profits that are distributed will be paid in cash within the year following the date on which they are decreed" Colombian Commercial Code, Article 156.

[18] The fraction of the biggest dividend-paying firms in the United States fell dramatically from 73% in 1978 to 23% in 2000 recovering to 36% in 2018. See Michaely and Moin (2022) which follows the academic discussion lead by Fama and French (2001).

In terms of amount decreed, graph 2 illustrates that annual average percentage of decreed dividends relative to equity is very similar for exporting firms (8%) than for non-exporting firms (9%).[19] Analogously, graph 3 shows that annual average percentage of decreed dividends relative to assets for exporting firms is slightly smaller (3.6%) than for non-exporting firms (4.4%). In general, graphs 1, 2 and 3 lead to conclude that exporting is positive correlated with '*dividend extensive margin'* (dummy variable if the firm decreed dividends) but not with *'dividend intensive margin'* (amount decreed). Moreover, firms must allocate resources from different accounting items to pay dividends since profits could be insufficient; amount decreed in dividends is on average higher than profits (graph 4) and 11% of observations in which firms decree dividends reported negative profits. For example, firms could also discount retained earnings; graph 5 indicates that, in the median, amount decreed in dividends is lower than retained earnings independently of firms' export status.

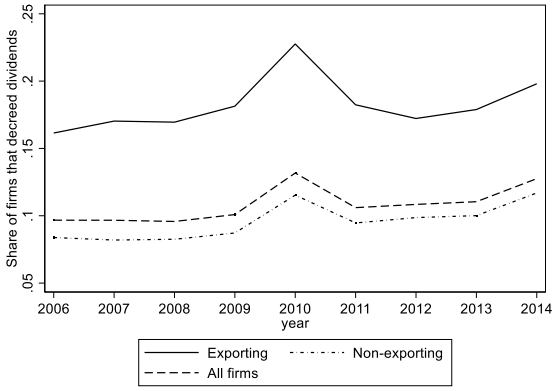
Lastly, graph 6 shows that real exchange rate (instrumental variable) diminished between 2006 and 2014, indicating an aggregate Colombian competitiveness loss in the international market. Nevertheless, this trend did not occur with all trading partners. Bilateral real exchange rates show an appreciation with US, Ecuador and Netherlands, and depreciation with China and Venezuela (see graph A1). Analogously, there was a nominal exchange rate appreciation with most of the principal Colombian trading partners' currencies (graph A2). Real exchange rate appreciation is highly correlated with oil price increase occurred during those years (see graph A3).

In addition, table A1 shows the simple average of the main independent and dependent variables (defined in the next section) disaggregated by firm types, classified according whether firms exported and decreed dividends. Some interesting patterns emerge from the descriptive statistics. First, ranking firm types from the largest to the smallest in terms of size indicates that exporting firms that decreed dividends are the biggest, followed by exporting firms that did not decreed dividends, non-exporting firms that decreed dividends, and non-exporting firms that did not decreed dividends. This implies that firms' size is positively correlated in a higher proportion with exporting than with decreeing dividends.

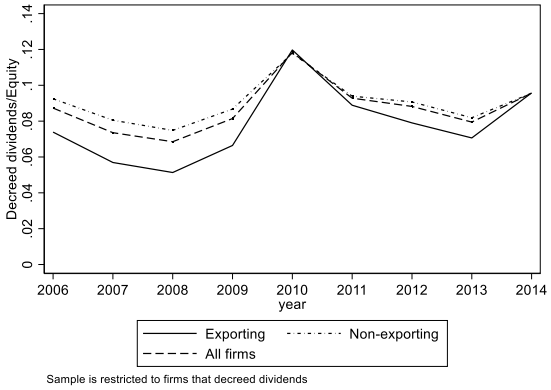
Secondly, more profitable firms (higher return on assets - ROA) are more likely to decree dividends, which is consistent with international evidence (Fama and French, 2001). It is suggested to study specific countercyclical behavior in 2010 post international financial crisis in another paper. Third, debt is higher for exporting firms than for non-exporting firms, confirming evidence cited before about positive correlation between exports and financing access. Finally, table A2 and A3 in the appendix show the simple average for the same variables in table A1 calculated for one-year and two-year differences.

[19] *Restricting the sample to firms that decreed dividends.*

Graph 1: Share of big private Colombian firms that decreed dividends, 2006 – 2014

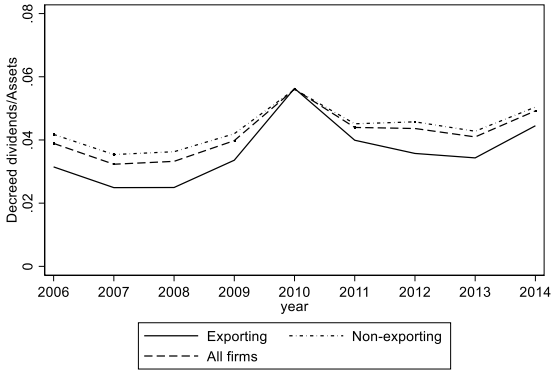


Graph 2: Average share of decreed dividends relative to equity, 2006 – 2014



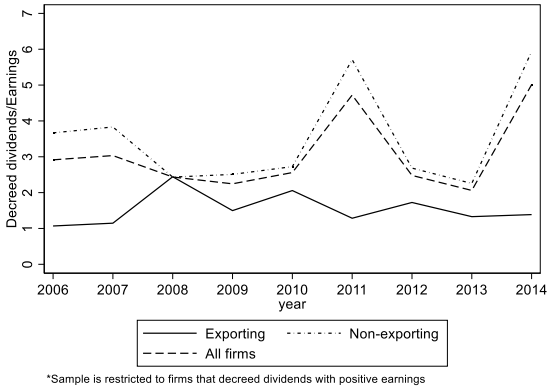
Sample is restricted to firms that decreed dividends

Graph 3: Average share of decreed dividends relative to assets, 2006 – 2014



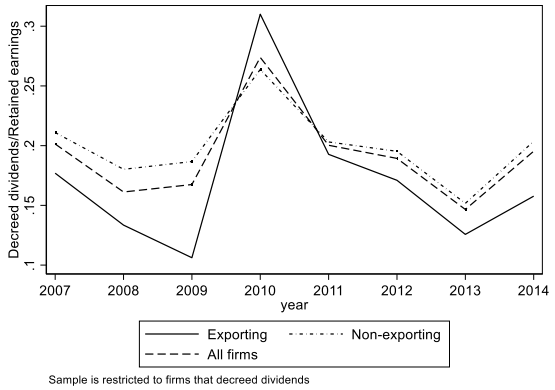
Sample is restricted to firms that decreed dividends

Graph 4: Average share of decreed dividends relative to earnings*, 2006 – 2014



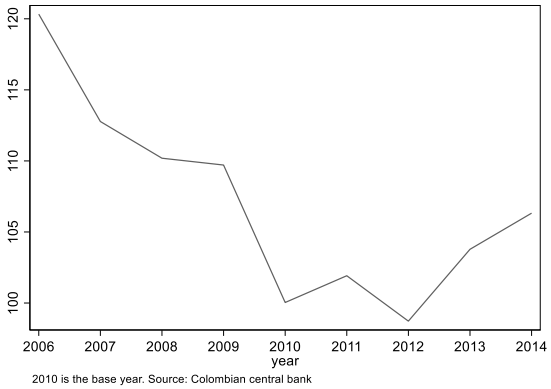
*Sample is restricted to firms that decreed dividends with positive earnings

Graph 5: Median share of decreed dividends relative to retained earnings, 2007 – 2014



Sample is restricted to firms that decreed dividends

Graph 6: Colombian real exchange rate index, 2006 – 2014



2010 is the base year. Source: Colombian central bank

Source: Own calculations based on Colombian Companies Superintendence (biggest private Colombian firms' financial statements) and Colombian Central Bank (real exchange rate index).

4 Methodology

Equations 1 and 2 calculate export impact on firm's dividend policy. The sample is restricted to exporting firms:

$$Decreed\ dividends\ (1 = Yes, 0 = No)_{fst} = \beta_o + \beta_1 \Delta\ Log\ exp_{fst} + \Gamma \Delta X_{fst} + \partial_f\ + \partial_{st} + \Delta e_{fst} \quad (1)$$

$$\Delta\ Y_{fst} = \beta_o + \beta_1 \Delta\ Log\ exp_{fst} + \Gamma \Delta X_{fst} + \partial_f\ + \partial_{st} + \Delta e_{fst} \quad (2)$$

where *f* denotes firm, *s* industry[20], and *t* year. Y_{fst} is the amount decreed in dividends relative to equity and assets by firm *f* in industry *s* in year *t*. X_{fst} includes firm-level explanatory variables: log operating expenses, return on assets (ROA = profit before taxes/assets), share non-tangible assets, international managerial quality (Merchan, 2023), TFP (clean of international managerial quality)[21], and imported value. Appendix A5 describes these explanatory variables. $\Delta\ Log\ exp_{fst}$ is the change of real exported value measured in Colombian Pesos (COP). ∂_f are firm fixed effects, and ∂_{st} are sector-year fixed effects, which control for annual shocks common to all firms in one industry. Robust standard errors are clustered at firm level.

One econometric issue related with corporate finance literature is that omitted variable bias is particularly severe: "*a number of factors relevant for corporate behavior are unobservable to econometricians.*" (Roberts and Whited, 2013, p.498)[22], warning about endogeneity in equation 1 and 2. In this case, firms' exports could be correlated with unobservable variables like "*unreported liabilities, corporate strategy, anticipated competitive pressures, expected revenue growth, etc*" (Roberts and Whited, 2013, p.509), which would make $\hat{\beta}_1$ biased and inconsistent.

For this reason, fixed effects included in equation 1 and 2 already control for time-invariant firm characteristics and annual industry shocks. Additionally, $\Delta\ Log\ exp_{fst}$ is instrumented with firm specific real exchange rate, defined formally as: $\Delta\ Log\ real\ exchange\ rate_{fst} = \Delta \ln(\sum_k (RER_{kt} * share\_exp_{fsk,t=0}))$, where RER_{kt} is the real exchange rate between Colombia and destination country k, and $share\_exp_{fsk,t=0}$ is the exported value share to destination country *k* in total exports of firm *f* in its first sample year. RER_{kt} is calculated following equation from Banco de la Republica (2021) - Colombian Central Bank methodological guide to calculate real exchange rate-, in which $RER_{kt} = \frac{S}{S^*}\frac{P^*}{P}$, where P^* is the external price level, P is the local price level, S is the exchange rate from Colombia with US, and S^* is the exchange rate from country k with United States.[23] RER_{kt} growth implies real exchange depreciation, which makes Colombian goods more competitive in the international market and theoretically should incentive exports. Similar instrumental variable approach has been implemented previously in the academic literature by Jiang et al (2010) and Bastos et al. (2018).[24]

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[20] *ISIC 3 digit.*

[21] *Residual of a regression of TFP on international managerial quality as in Bloom et al. (2021). TFP calculation based on Levinsohn & Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2017). See appendix table A4.*

[22] *They provide a deep analysis of endogeneity issue in empirical corporate finance literature.*

[23] *Consumer prices index and nominal exchanges rates were obtained from International Monetary Fund, International Financial Statistics.*

[24] *Jiang et al. (2010) calculated firm specific real exchange rate to measure export demand shock impact on Chinese exporters (productivity and other outcomes) during the Asian financial crisis. Bastos et al. (2018) calculated real exchange rate changes interacted with exports destination country dummies at the initial year to study export destinations effect on input prices.*

Theoretically, relevance condition is fulfilled because firms which export to countries with a higher real exchange rate depreciation are more likely to increase their exports than similar exporting firms which export to different countries, since their products become internationally cheaper encouraging external demand. For instance, two similar Colombian exporting firms in terms of observable variables faced different exogeneous export demand shocks if one exported to China and the other to US (see graph A2). Nevertheless, both firms' income measured in COP are likely to absorb nominal exchange variation because most of them are not financially covered by currency risk.[25] First stage statistics results confirm that firm specific real exchange rate impacts positively and significative the exported value (see section V).

In addition, three elements allow to infer that exclusion restriction is plausibly satisfied. First, real exchange rate variation occurred between 2006 and 2014 was unpredictable and highly correlated with international oil price increase (Acero, 2017), reducing the probability that non-observables (like expected revenue growth, corporate strategy, among others) are correlated with the instrument.[26] Secondly, international managerial quality variable in equation 1 and 2 absorbs potential manager strategies implemented under accurately assumptions about real exchange rate and oil price fluctuation. Also, two other components of the econometric approach contribute to minimize correlation between manager strategy and instrumental variable: i) export shares of firm specific exchange rates are fixed at initial year, and ii) equation 1 and 2 were calculated for one-year and two-year differences, assuming that firms would take more than two years to react optimally to exchange rate incentives.

Third, although big private Colombian exporting firms tend to export to different countries where they import from - correlation between firm specific real exchange rate from exports with firm specific real exchange rate from imports[27] is just 1.5% (non-significative) (graph A4), and $\Delta\, Log\ export\ real\ exchange\ rate_{ft}$ does not explain significative imported value (table A6 shows baseline regression results when imported value is treated as another endogenous variable)-,[28] imported value as explanatory variable in equation 1 and 2 controls a potential reverse effect of real exchange rate on dividend policy via imports for particular groups of firms, like the ones with parent companies abroad.[29]

Beyond the fulfillment of relevance and exogeneity instrumental variable conditions, the potential selectivity bias of big private exporting firms that decreed dividends (sub-sample) relative to all big private exporting firms would generate incorrect standard errors in the IV estimation. Therefore, Heckman (1979) procedure correction is implemented in conjunction with IV; equation 3 shows the selection equation from which the inverse mill ratio (probability density function/ standard normal

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[25] The percentage of the 5000+ biggest Colombian firms that contracted exports exchange rate forwards increased from 3% in 2006 to 6.5% in 2014 (Alfonso, 2018)

[26] Also, there was an unprecedent high inflation rate in Venezuela.

[27] $\Delta\, Log\ real\ import\ exchange\ rate_{ft} = \Delta\, ln(\sum_{pj}(RER_{jt})(sh\_origin\_country_{fj,t=0}))$*, where* RER_{kt} *is the real exchange rate between Colombia and origin country j, and* $sh\_origin\_country_{fpj,t=0}$ *is the share of imported value from origin country j in total imports of firm f at its first sample year.*

[28] Also, firm specific real exchange rate from imports has a positive counterintuitive effect on imported value. It is suggested as a future research topic to look for an instrumental variable specific for imports.

[29] "For example, Chinese firms may import intermediate inputs from parent companies overseas, assemble these inputs into finished products, and then send them back to their parent companies in the same locations. For such firms, exchange rate appreciation in a firm's overseas export locations also makes intermediate inputs more expensive. The firm's exports should rise, while the prices of intermediate inputs (in Chinese yuan) should also rise." (Jiang et al. 2010, p.837)

cumulative distribution) is calculated and then it is included as one explanatory variable in the IV estimation restricting the sample to those firms that decreed dividends (equation 4):

$$Decreed\ dividends\ (1 = Yes,\ 0 = No)_{fst} = \varphi(\Gamma X_{fst}) \quad (3)$$

$$\Delta Y_{fst} = \beta_o + \beta_1 \Delta\ Log\ exp_{fst} + \beta_2 \Delta\ Inverse\ mills\ ratio_{fst} + \Gamma \Delta Y_{fst} + \partial_f + \partial_{st} + \Delta e_{fst} \quad (4)$$

where X include the same explanatory variables defined in equation 2, and Y is the same set of variables included in X but excluding one. This excluded variable should explain selection (why firms decreed dividends) but not the outcome (decreed dividends/equity). It contributes to get precise estimates and avoid issues specifications (Sartori, 2003). It will be defined in the next section. In the same way, $\Delta\ Log\ exp_{fst}$ is instrumented as defined before. β_2 statistical significance in equation 4 would determine if it is necessary to correct standard errors in IV estimation.

Finally, two methodological appendixes are included at the end of the document. Appendix B shows the estimation of export share impact on different firm level volatility measures and appendix C describes Richardson (2006) methodology to calculate overinvestment. Both variables (volatility and overinvestment) are relevant to interpret empirical results in the light of dividend theories described before.

5 Results

Table 1 displays results of equation 1 and 2. On one hand, first stage statistics indicate that: i) firm specific real exchange rate depreciation boosts exported value in a significant and positive magnitude (column 1), and ii) instrumental variable is strong: F-statistic is larger than 10 and under identification and weak identification are rejected. Both stylized facts confirm relevance condition fulfillment. On the other hand, second IV stage results show a positive significative effect of exogenous exports shocks on decreeing dividends probability (column 2) and amount decreed relative to equity and assets (column 4 and 5) in the two-year differentiated specification. The payment is not made during the same year than they are decreed (column 3) given the one-year period that Colombian law allows. Also, there are no significative results on one-year differentiated specification (column 7-10), indicating that exogenous international market conditions influence firms' general assembly decision about dividends if they persist for more than one year.

These findings contradict signaling theory because firms adapt dividend policy to volatile and temporary earnings variation. This could be explained because most of these firms are not listed in the stock market, which makes them prioritize meeting shareholders requirements or alleviating agency cost than sending signals to potential investors. Oppositely, results seem to support agency cost theory, which states that firms decree dividends as a way to mitigate agency cost between manager and shareholders because of free cash flow (in this case related with exports). Although exported value in equation 1 and 2 is not measured relative to free cash flow – high proportion of negative free cash flow values would lead to a non-sense ratio (see Yozzo (2003)) –,[30] three additional findings confirm agency cost theory.

[30] *46.3% of observations (5,276) reported negative free cash flow (FCF) values: 26% of them (1,397) because of negative cash flow from operating activities, while 74% (3,897) because capital expenditures + debt payment were larger than cash flow from operating activities. It is assumed that FCF = cash flow from operating activities - capital*

First, table 2 indicates that exogeneous export shocks have also a positive impact on free cash flow. Resources from exogeneous exports increases in higher magnitude cash flow from operations than capital expenditures and debt payment, releasing cash subject to agency cost between shareholders and managers. Graph 7 shows the positive correlation between exports and FCF. Secondly, appendix B suggest that export share is positively correlated with higher operating income, free cash flow, and cash flow volatility, which is another agency cost source as described before. One potential explanation for this pattern could be provided by Riaño (2011) who calibrated a dynamic model with Colombian manufacturing firms, finding that despite firm risk aversion, correlation between demand shocks is not an important determinant of exporting when idiosyncratic firm productivity is highly persistent, leading to a positive correlation between exporting and sales volatility.

Third, table 3 highlights that positive exogeneous export shocks effect on probability to decree dividends is driven by poor managerial quality firms – measured with the international managerial quality in Merchan (2023)[31] –, which are more likely to suffer manager overinvestment. This finding is aligned with Morris and Roseman (2014) who found for US that less transparent firms pay dividends to remove free cash flow, using Compustat database from 1993 to 2010 and the analysists quantity that cover a firm as firms' transparency proxy variable. However, poor managerial firms on average do not decree more dividends (see graph A5), they are just more prone to decree them facing exogeneous export shocks.

A complete analysis about agency cost and managerial quality should add corporate governance concept, since this factor could boost or discourage managers' ability. Colombian data about this aspect is scarce, and perhaps the Good Business Practices Report 2020 published by the Colombian Companies Superintendence (Superintendencia de Sociedades, 2020) is the most reliable source, whose micro data is not public.[32] However, basic descriptive statistics provide valuable inputs. First, shareholders general assembly size is on average small; 70% of big private Colombian firms (including non-exporters) have 5 or less shareholders, indicating that agency cost is in practice an interest conflict between few people. Secondly, 61% of managers are appointed by the shareholders general assembly, suggesting that hiring managers in this way does not prevent firms from agency cost. Third, proportion of firms with board of directors is relatively low (58%), which is as a signal of aggregate weak corporate governance quality. It is suggested as a future research topic to explore the impact of exogeneous changes in corporate governance on firm dividend policy.[33]

On another note, table A7 shows the selection equation results (equation 3) of the Heckman correction procedure, from which the inverse mills ratio is calculated. Then, table 4 shows the IV outcome equation, which estimates the baseline model restricting the sample to firms that decreed dividends adding the inverse mills ratio as one explanatory variable and omitting operating expenses (which is the variable selected to meet exclusion restriction under the imperfect criteria that it was the most consistent-significant variable in the selection probit equations). As inverse mills ratio coefficient

expenditures – debt payment, which is one of the FCF definitions from the ones provided by Bhandari and Adams (2017).

[31] High management firms are those firms whose international managerial quality (Merchan, 2023) is above the median in year t-2, and the other half is classified as low-management.

[32] Colombian Companies Superintendence did not provide the micro data because of confidentiality reasons.

[33] Ramirez and Usma (2010) found a positive correlation between corporate Governance Code (GC) implementation and dividend payment for a subsample of 279 Colombian firms listed at the stock market (with and without market capitalization) between 1997 and 2008. However, the endogeneity of the code implementation is not addressed.

was not significative, big private exporting firms that decreed dividends conform a random sample from big private exporting firms. Therefore, robust standard errors reported previously are correct.

A back-of-the-envelope calculation of aggregate export effect on dividends presents two limitations. First, IV coefficients are consistent but not unbiased, and secondly, baseline model for binary dependent variables were calculated with linear probability models, not probit, because of the incidental parameter problem. Just as a reference point, IV magnitude coefficient of exported value on decreeing dividend probability (0.0359, column 2 in table 1) is around 13 times higher than OLS coefficient (0.00260, see table A8). Since these limitations cannot be resolved, 0.0359 coefficient is interpreted like 1% increase in exported value rises 0.000359 the probability that one firm decrees dividend. In aggregate terms, it implies that 1 standard deviation change in log real exported value (1.10) accounts for 17% of observed decreeing dividends rate (23%).[34]

Finally, equation 2 was estimated including debt and overinvestment as dependent variables. Table A9 shows that exogenous export shocks did not increase neither debt, denying Jansen (1986) hypothesis that debt is another mechanism acquired by firms to mitigate agency cost, nor overinvestment. It is suggested as a future research topic to estimate a simultaneous equation system with dividends, debt and overinvestment as dependent variables (as far as I know, no Stata command estimates structural equations system with instrumental variables and fixed effects) and to test pecking order theory based on a regression of deficit on debt (Frank and Goyal, 2003).

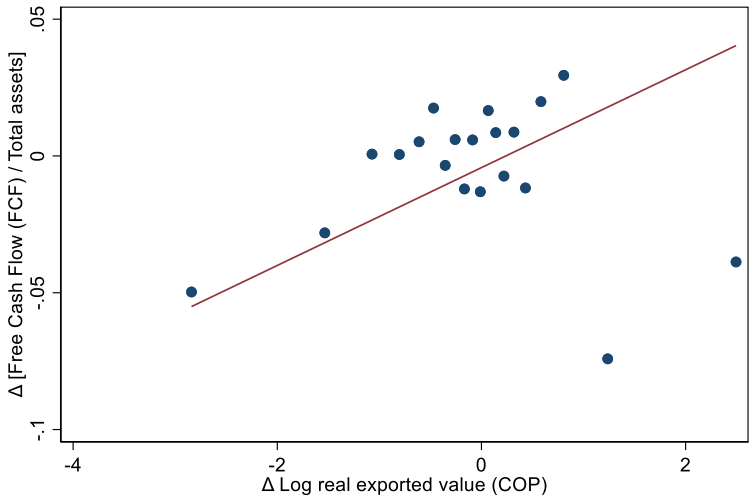
[34] *0.17 = (0.0359/ 100) * (110.03/0.2312).*

Table 1: **Exogenous export shocks effect on firms' dividend policy, IV**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Second difference (t+2)-t					First difference (t+1)-t			
Dependent variable	Δ Log real exported value (COP)	Decreed dividends (1=Yes, 0=No)	Payment dividends (1=Yes, 0=No)	Δ [Decreed dividends/ equity]	Δ [Decreed dividends/ assets]	Δ Log real exported value (COP)	Decreed dividends (1=Yes, 0=No)	Payment dividends (1=Yes, 0=No)	Δ [Decreed dividends/ equity]	Δ [Decreed dividends/ assets]
Method	First stage	IV	IV	IV	IV	IV	IV	IV	IV	IV
Δ Log real exported value (COP)		0.0335*	-0.0167	0.00971*	0.00627**		-0.00385	-0.0141	0.00191	0.00285
		(0.0186)	(0.0229)	(0.00564)	(0.00272)		(0.0149)	(0.0202)	(0.00448)	(0.00235)
Δ Log firm-specific real exchange rate (share destination country t=0)	0.11***					0.09***				
	(0.0167)					(0.0113)				
Observations	11,393	11,393	11,393	11,058	11,392	15,319	15,319	15,319	14,853	15,318
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects					Firm, industry-year					
F-first stage		53.25	53.25	17.24	55.8		13.54	13.54	13.54	13.54
Under identification test pi-value		0.00	0.00	0.00	0.0		0.00	0.00	0.00	0.00
Weak identification test		47.21	47.21	45.03	47.2		70.47	70.47	63.43	70.47

Robust standard errors in parentheses clustered at firm level. Sample is restricted to big private exporting firms. *** p<0.01, ** p<0.05, * p<0.1. First-stage coefficient in column 1 corresponds to second stage results from column 2 to 5. First-stage coefficient in column 6 corresponds to second stage results from column 7 to 10. Firm controls includes the difference of log operating expenses, return on assets (ROA = Profit before taxes / assets), share non-tangible assets, international managerial quality (Merchan, 2023), TFP (clean of international managerial quality), and imported value

Graph 7: **Binned scatterplot between exported value and free cash flow (second difference)**



FCF = Cash flow from operating activities - capital expenditures - debt payment
Coefficient regression Y on X = 0.0073*, n=11,393

Table 2: **Export effect on free cash flow**

VARIABLES	(1) Δ_2 [FCF/Assets]	(2) Δ_2 Log real exported value (COP)	(3) Δ_2 [FCF/Assets]
Method	OLS	IV – First stage	IV – Second stage
Δ_2 Log real exported value (COP)	-0.0180		0.0365*
	(0.0142)		(0.0215)
Δ_2 Log real operating expenses (COP)	0.0111	0.378***	-0.00957
	(0.0107)	(0.0715)	(0.0136)
Δ_2 TFP (excluding int index management component)	0.0825***	0.288***	0.0668**
	(0.0301)	(0.0833)	(0.0288)
Δ_2 International managerial quality	-0.00906	0.0608	-0.0122
	(0.0109)	(0.0391)	(0.0121)
Δ_2 Share non-tangible assets	0.0830	-0.105	0.0922
	(0.106)	(0.415)	(0.106)
Δ_2 Profit before taxes / Assets	0.443***	0.0590***	0.439***
	(0.0184)	(0.00399)	(0.0183)
Δ_2 Log real imported value (COP)	0.000689	0.00604**	0.000384
	(0.00169)	(0.00270)	(0.00169)
Δ_2 Log firm-specific exp real exchange rate (RER, share t=0)		0.115***	
		(0.0167)	
Observations	11,393	11,393	11,393
R-squared	0.355	0.356	0.276
Firm fixed effects	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes
F-first stage			53.25
Under identification test pi-value			0.00
Weak identification test			47.21

Robust standard errors in parentheses clustered at firm level. Sample is restricted to big private exporting firms. *** p<0.01, ** p<0.05, * p<0.1. FCF = Cash flow from operating activities – capital expenditures (fixed assets) – debt payment.

Table 3: **Exogenous export shocks effects on firms' dividend policy disaggregated by managerial quality –IV**

	(1)	(2)
	High quality management	*Low quality management*
VARIABLES	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)
Δ_2 Log real exported value (COP)	-0.0103	0.0843**
	(0.0282)	(0.0349)
Δ_2 Log real operating expenses (COP)	0.00184	-0.0665***
	(0.0118)	(0.0244)
Δ_2 TFP (excluding int management component)	-0.0247	0.00101
	(0.0264)	(0.0389)
Δ_2 International managerial quality	0.0113	-0.00605
	(0.0101)	(0.0123)
Δ_2 Share non-tangible assets	0.121	0.227
	(0.0989)	(0.148)
Δ_2 Profit before taxes / Assets	0.00811***	0.00624**
	(0.00187)	(0.00299)
Δ_2 Log real imported value (COP)	0.000650	-0.000171
	(0.000843)	(0.000881)
Observations	5,128	5,098
Firm fixed effects	Yes	Yes
Industry-year fixed effects	Yes	Yes
F-first stage	86.58	36.64
Under identification test pi-value	0.00	0.00
Weak identification test	24.35	26.63

Robust standard errors in parentheses clustered at firm level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Sample is restricted to exporting firms. A firm is defined as high quality management if its international managerial quality (Merchan, 2023) is above the sample median in t-2.

Table 4: **Exogenous export shocks effects on dividends– second difference, heckman correction, IV**

	(1)	(2)
VARIABLES		
	Δ_2 [Decreed dividends/equity]	Δ_2 [Decreed dividends/assets]
Method	IV	IV
Δ_2 Log real exported value (COP)	0.0543	0.0344
	(0.0426)	(0.0235)
Δ_2 Profit before taxes / assets	-0.270***	-0.0877**
	(0.0777)	(0.0345)
Δ_2 Share non-tangible assets	-0.0754	-0.100*
	(0.118)	(0.0557)
Δ_2 International managerial quality	-0.0177**	-0.00246
	(0.00925)	(0.00458)
Δ_2 TFP (excluding int managerial quality component)	0.00791	-0.00686
	(0.0271)	(0.0116)
Δ_2 Log real imported value (COP)	-0.00147	-0.000260
	(0.00150)	(0.000643)
Δ_2 Inverse mills ratio	-0.00258	0.0236
	(0.0759)	(0.0393)
Observations	2,222	2,285
R-squared		
Firm fixed effects	Yes	Yes
Industry-year fixed effects	Yes	Yes
Variable included in the selection equation	Operating expenses	
Under identification test pi-value	0.003	0.003
Weak identification test	7.54	7.65
F-first stage	3.41	2.03

Robust standard errors in parentheses clustered at firm level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Sample is restricted to exporting firms. Selection equation is shown in appendix A7.

6 Conclusion

Exports could be one of the missing pieces to put together the "*dividend puzzle*". For this reason, this paper estimates the impact of exogeneous export demand shocks on firm dividend policy using firm specific real exchange rate variation as instrumental variable. The sample is composed by the merge of customs and financial statements of the biggest private Colombian exporting firms from 2006 to 2014, when an unpredictable real exchange rate fluctuation occurred in part because of oil price increase. Fulfillment of relevance and exogeneity instrumental variable conditions and sample selection bias rejection are theoretically and empirically supported.

IV results indicate a positive and significative effect of exogenous exports shocks on decreeing dividends probability and its respective amount. This finding denies signaling theory because firms modify dividend policy due to temporary and volatile profit variation. On the contrary, agency cost theory is supported since positive effect of exogenous exports shocks on decreeing dividends probability is driven by poor managerial quality firms, which are more likely to suffer manager overinvestment. Also, exogeneous exports shocks increase significative free cash flow, and export share is positive correlated with cash flow volatility. Both (free cash flow and cash flow volatility) are agency cost sources.

Finally, complementary results suggest that exports did not rise neither debt nor overinvestment. It is suggested as a future relevant investigation topic from a policy perspective to calculate a counterfactual scenario that determines if dividend payment avoided overinvestment.

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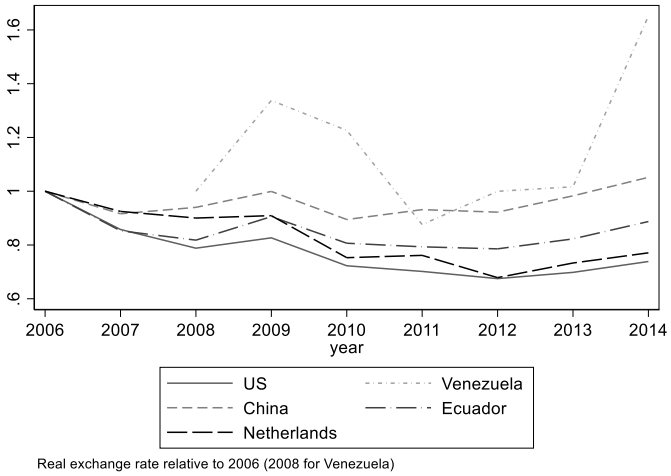
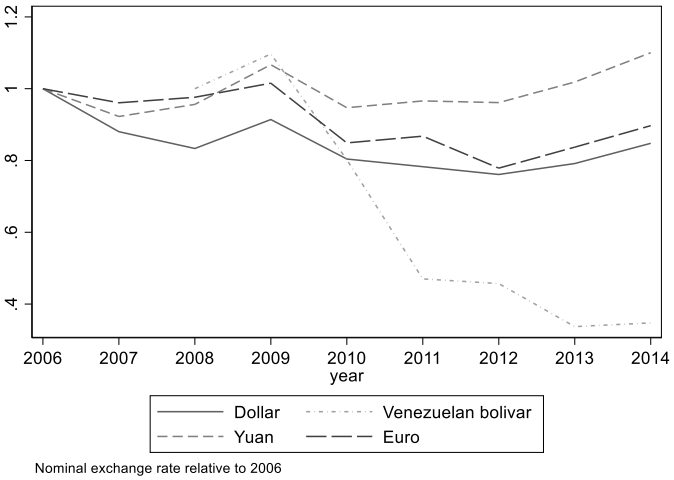
APPENDIX A

Graph A1: **Bilateral real exchange rate (main export destinations)**



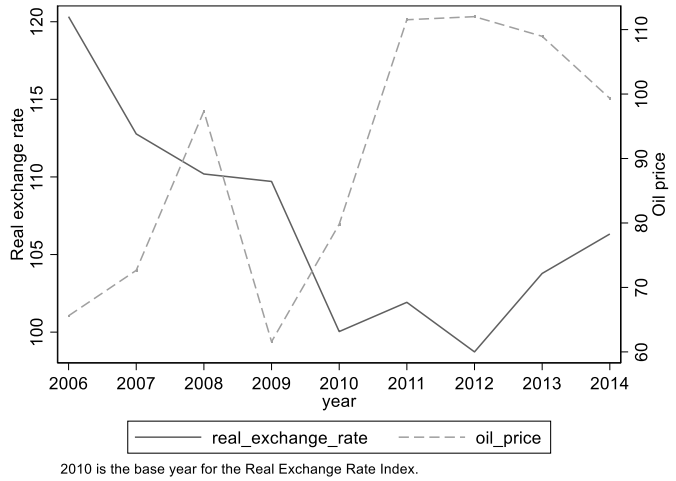
***Source*: Own calculations based on IMF data and Colombian Central Bank methodology, Banco de la Republica (2021).**

Graph A2: **Bilateral nominal exchange rate (main trading patterns' currencies)**



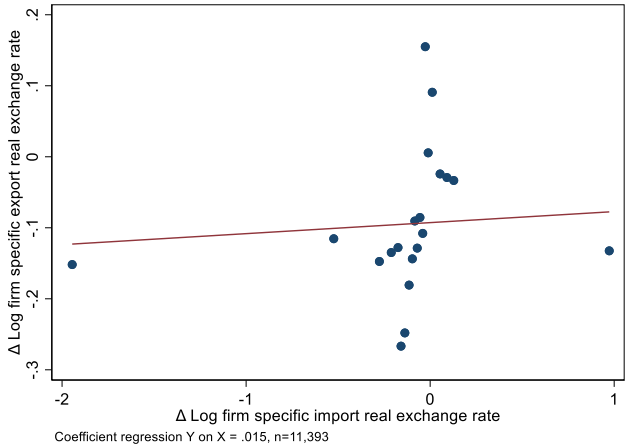
***Source*: Own calculations based on IMF data and Colombian Central Bank methodology, Banco de la Republica (2021).**

Graph A3: **Real exchange rate index and oil price**



Source**: Colombian Central Bank and FRED, Federal Reserve Bank of St. Louis.**

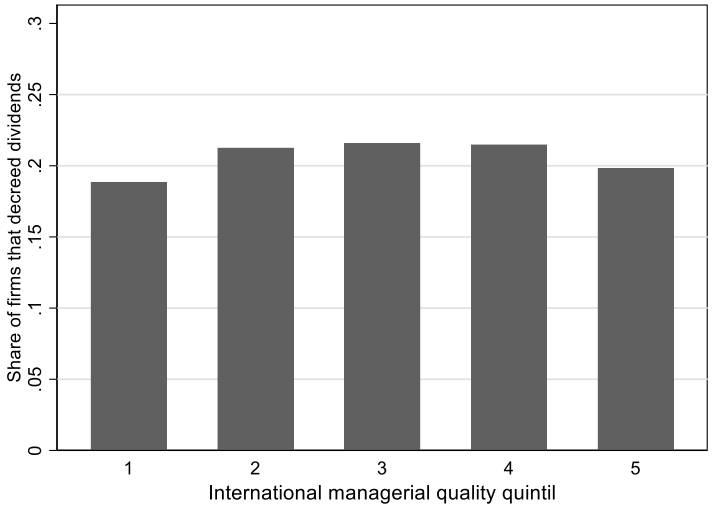
Graph A4: **Binned scatter plot between firm specific real exchange from exports and imports - second difference**



Note 1: $\Delta\, Log\ real\ export\ exchange\ rate_{ft} = \Delta \ln(\sum_{pk}(RER_{kt})(share\_exp_{fk,t=0}))$, where RER_{kt} is the real exchange rate between Colombia and destination country k, and $share\_exp_{fpk,t=0}$ is the share of exported value to destination country k in total exports of firm f at its first sample year.

Note 2: $\Delta\, Log\ real\ import\ exchange\ rate_{ft} = \Delta \ln(\sum_{pj}(RER_{jt})(sh\_origin\_country_{fj,t=0}))$, where RER_{kt} is the real exchange rate between Colombia and origin country j, and $sh\_origin\_country_{fpj,t=0}$ is the share of imported value from origin country j in total imports of firm f at its first sample year.

Graph A5: **Share of firms that decreed dividends by international managerial quality quintiles**



Note: International managerial quality was obtained from Merchan (2023)

***Table A1*: Descriptive statistics – variables in levels**

Variable	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends
Log real exported value (COP)			19.7591	20.0687
Log real firm specific exchange rate			5.6414	5.5922
Log real imported value (COP)	19.6187	20.2176	20.9181	21.6773
Log real firm specific exchange rate (imports)	6.5619	6.5874	6.7071	6.7273
Exported value / operating income			0.2100	0.1298
Imported value / sales cost	0.0989	0.1356	0.2518	0.2875
Log real decreed dividends (COP)		10.9624		11.5831
Decreed dividends/equity		0.0905		0.0781
Decreed dividends/assets		0.0439		0.0362
Retained earnings / equity	0.2015	0.1448	0.1833	0.1370
Log real operating expenses (COP)	12.5220	13.7278	14.4487	15.2185
Log real fixed assets (COP)	11.3690	12.4059	13.3738	14.3672
Log real non-tangible assets (COP)	2.4584	3.3950	4.2219	5.5692
Share non-tangible assets	0.0186	0.0169	0.0189	0.0190
Share fixed assets	0.2053	0.1664	0.1712	0.1653
International managerial quality			0.0007	0.0052
TFP (excluding international managerial quality)			0.0169	-0.0652
TFP	-0.5696	-0.6144	-0.8342	-0.9236
ROA (Profit before taxes / assets)	-1.0805	0.0821	0.0183	0.0806
Debt (liabilities / assets)	0.4843	0.4400	0.5464	0.4861
Financial investments /equity	0.0356	0.0502	0.0171	0.0286
Financial obligations/equity	0.1877	0.1485	0.2375	0.1903
Cash flow/assets	0.0750	0.0702	0.0572	0.0538
FCF/assets	-0.3333	-0.0104	-0.0370	-0.0385
Net expenditure investments (fixed assets)/assets	-0.3571	0.0222	-0.00446	0.0263
Net expenditure investment (total)/assets	-0.3640	0.0285	0.0018	0.0357
Overinvestment total /assets	-0.0029	0.0096	0.0084	0.0049
Number of observations	19,082	2,038	2,884	643

Note: Simple average by year. Overinvestment calculation follows Richardson (2006) methodology (appendix C). TFP calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2017) (table A4). International managerial quality variable is calculated from Merchan (2023). FCF = Cash flow from operating activities – capital expenditures (fixed assets) – debt payment.

Table A2: **Descriptive statistics - first difference**

Variable	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends
Δ_1 Log real exported value (COP)			-0.0477	-0.0153
Δ_1 Log real firm specific exchange rate			-0.2478	-0.1994
Δ_1 Log real imported value (COP)	0.0009	-0.0017	0.0141	0.0332
Δ_1 Log real firm specific exchange rate (imports)	-0.0933	-0.0895	-0.0826	-0.0660
Δ_1 Exported value / operating income			-0.0025	-0.0032
Δ_1 Imported value / sales cost	-0.00268	0.0008	-0.0010	0.0030
Δ_1 Log real decreed dividends (COP)		3.4614		2.9825
Δ_1 Decreed dividends/equity		0.0261		0.0202
Δ_1 Decreed dividends/assets		0.0136		0.0092
Δ_1 Retained earnings / equity	0.0108	-0.0050	0.0113	-0.0018
Δ_1 Log real operating expenses (COP)	0.0208	0.0482	0.0515	0.0699
Δ_1 Log real fixed assets (COP)	-0.0280	0.0340	-0.0007	0.0497
Δ_1 Log real non-tangible assets (COP)	0.2397	0.3459	0.3127	0.4854
Δ_1 Share non-tangible assets	0.0018	0.0021	0.0017	0.0027
Δ_1 Share fixed assets	-0.0058	-0.0046	-0.0043	-0.0035
Δ_1 International managerial quality			0.0007	0.0026
Δ_1 TFP (excluding international managerial quality)			-0.0020	-0.0061
Δ_1 TFP	-0.0010	-0.0052	-0.0009	-0.0063
Δ_1 ROA (Profit before taxes / Assets)	0.2816	-0.0108	-0.0196	-0.0146
Δ_1 Liabilities / Assets	-0.0106	0.0075	-0.0047	0.0102
Δ_1 Financial investments /equity	-0.0001	-0.0009	0.0004	0.0005
Δ_1 Financial obligations/equity	-0.0079	0.0033	0.0003	0.0074
Δ_1 Cash flow/assets	-0.0003	-0.0013	0.0000	-0.0004
Δ_1 FCF/assets	-0.0200	-0.0027	-0.0092	-0.0059
Δ_1 Net expenditure investment (fixed assets)/assets	0.4683	-0.0028	-0.0053	-0.0043
Δ_1 Net expenditure investment (total)/assets	0.4584	-0.0059	-0.0052	-0.0023
Δ_1 Overinvestment total /assets	-0.0004	-0.0010	-0.0028	0.0026
Number of observations	16,667	1,957	2,649	624

Note: Simple average by year. Overinvestment calculation follows Richardson (2006) methodology (appendix C). TFP calculation based on Levinsohn and Petrin (2003) methodology and *prodest* Stata command (Mollisi and Rovigatti, 2017) (Table A4). International managerial quality variable is calculated from Merchan (2023). FCF = Cash flow from operating activities – capital expenditures (fixed assets) – debt payment.

***Table A3*: Descriptive statistics - second difference**

Variable	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends
Δ_2 Log real exported value (COP)			-0.0904	-0.0557
Δ_2 Log real firm specific exchange rate			-0.3470	-0.3290
Δ_2 Log real imported value (COP)	0.0008	0.0238	0.0320	0.0657
Δ_2 Log real firm specific exchange rate (imports)	-0.1600	-0.1486	-0.1420	-0.1266
Δ_2 Exported value / operating income			-0.0053	-0.0058
Δ_2 Imported value / sales cost	-0.0025	0.0008	-0.00011	0.0057
Δ_2 Log real decreed dividends (COP)		4.7484		4.0947
Δ_2 Decreed dividends/equity		0.0361		0.0292
Δ_2 Decreed dividends/assets		0.0188		0.0142
Δ_2 Retained earnings / equity	0.0182	-0.0039	0.0182	-0.0002
Δ_2 Log real operating expenses (COP)	0.0220	0.1122	0.1119	0.1434
Δ_2 Log real fixed assets (COP)	-0.0374	0.0974	0.0262	0.1215
Δ_2 Log real non-tangible assets (COP)	0.5043	0.7087	0.6691	0.9654
Δ_2 Share non-tangible assets	0.0038	0.0037	0.0037	0.0052
Δ_2 Share fixed assets	-0.0124	-0.0094	-0.0086	-0.0060
Δ_2 International managerial quality			0.0016	0.0039
Δ_2 TFP (excluding international managerial quality)			-0.0062	-0.0115
Δ_2 TFP	-0.0038	-0.0118	-0.0043	-0.0146
Δ_2 ROA (Profit before taxes / Assets)	-0.2043	-0.0162	-0.0321	-0.0218
Δ_2 Liabilities / Assets	-0.0211	0.0052	-0.0090	0.0112
Δ_2 Financial investments /equity	-0.0003	-0.0009	0.0005	0.0002
Δ_2 Financial obligations/equity	-0.0079	0.0084	0.0079	0.0179
Δ_2 Cash flow/assets	-0.0006	-0.0034	-0.0006	-0.0011
Δ_2 FCF /assets	-0.0036	-0.0050	-0.0072	-0.0041
Δ_2 Net expenditure investment (fixed assets)/assets	-0.0149	-0.0054	-0.0098	-0.0084
Δ_2 Net expenditure investment (total)/assets	-0.0223	-0.0106	-0.0099	-0.0060
Δ_2 Overinvestment total /assets	-0.0130	-0.0018	-0.0047	0.0003
Number of observations	15,243	1,919	2,476	618

Note: Simple average by year. Overinvestment calculation follows Richardson (2006) methodology (appendix C). TFP calculation based on Levinsohn and Petrin (2003) methodology and *prodest* Stata command (Mollisi and Rovigatti, 2017), see appendix A4. International managerial quality variable is calculated from Merchan (2023). FCF = Cash flow from operating activities – capital expenditures (fixed assets) – debt payment.

***Table A4*: TFP calculation**

VARIABLES	(1) Log real operating income (USD)
Log real operating expenses (USD)	0.731***
	(0.00696)
Log real property, plant and equipment (USD)	0.0935***
	(0.00765)
Log real sales cost (USD)	0.338***
	(0.00550)
Observations	222,000
Number of groups	40,859

***Source:* TFP calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2017). Free variable is operating expenses, state variable is property plant and equipment, and proxy variable is sales cost.**

Table A5: **Explanatory variables description**

Variable	Definition	Description	Source
Log operating expenses	Log (administrative operating expenses + sales operating expenses)	Total operating expenses adds up administrative operating expenses and sales operating expenses. *Administrative operating expenses* are expenses related to the administrative management aimed at the direction, planning, organization of the policies established for the development of the firms' operational activity, including those incurred in the executive, financial, commercial, legal and administrative areas. It includes payroll expenses, commissions, taxes, leases and rentals, contributions and affiliations, insurance, services and supplies. *Sales operating expenses* are expenses related to the sales management aimed at the direction, planning, organization of the policies established for the development of the firms' operational activity, including those incurred in the executive, distribution, marketing, trading, promotion, advertising and sales. It includes payroll, commissions, taxes, leases and rentals, contributions and affiliations, insurance, services and supplies.	Own calculations based on *Supersociedades* dataset
ROA	Profit before taxes / total assets		Own calculations based on *Supersociedades* dataset
Share non-tangible assets	Share non-tangible assets / total assets	Intangible assets account for commercial credit, trademarks, patents, concessions and franchises, rights, know-how, licenses, accumulated amortization and provisions.	Own calculations based on *Supersociedades* dataset
International managerial quality		*"The international managerial quality is calculated through the median of detailed export unit value regression residuals multiplied by -1 for those products that compete internationally by price, which is a proxy variable of the degree to which the organizational capital invested by the manager allows to improve international production efficiency and/or quality capacity mechanisms described by Bloom et al. (2021)"* (Merchan 2023, p.4)	Merchan (2023)
TFP (clean of international managerial quality)		Residual of a regression of TFP on international managerial quality. TFP calculation follows Mollisi and Rovigatti (2017) methodology, see appendix A.4	
Imported value	Imported value	CIF value	Own calculations based on customs datasets.

Source: **Definitions are taken from: PUC - Plan Único de Cuentas (https://puc.com.co)**

Table A6: **Exogenous export and import shock effects on firms' dividend policy, IV**

VARIABLES	OLS (1) Δ2 [Decreed dividends/Assets]	First-stage (2) Δ2 Log real exported value (COP)	First-stage (3) Δ2 Log real imported value (COP)	IV - Second stage (4) Δ2 [Decreed dividends/Assets]
Δ_2 Log real exported value (COP)	-3.96e-05 (0.000632)			0.0104** (0.00467)
Δ_2 Log real imported value (COP)	-0.000959 (0.000638)			0.000279 (0.00435)
Δ_2 Log firm-specific exp real exchange rate (RER, share t=0)		0.109*** (0.0214)	0.00158 (0.00910)	
Δ_2 Log firm-specific imp real exchange rate (RER, share t=0)		0.0195 (0.0188)	0.159*** (0.0292)	
Δ_2 Log real operating expenses (COP)	-0.00404 (0.00262)	0.480*** (0.0576)	0.429*** (0.0570)	-0.00964** (0.00441)
Δ_2 TFP (excluding int managerial component)	-0.00512 (0.00418)	0.154 (0.0971)	0.0219 (0.0807)	-0.00681 (0.00443)
Δ_2 International managerial quality var	-0.000784 (0.00113)	0.0684 (0.0488)	0.0234 (0.0216)	-0.00155 (0.00127)
Δ_2 Share non-tangible assets	-0.00866 (0.01000)	-0.0911 (0.515)	-0.0259 (0.234)	-0.00654 (0.0118)
Δ_2 Profit before taxes / Assets	-0.00844* (0.00479)	0.395*** (0.137)	0.573*** (0.108)	-0.0136** (0.00617)
Observations	8,225	8,225	8,225	8,225
Firm fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Year fixed effects				Yes
Industry fixed effects				Yes
F-first stage exports				20.10
F-first stage imports				17.90
Under identification test pi-value				0.00
Weak identification test				15.05

Robust standard errors clustered at firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A7: **Probit selection equation by year – marginal effects reported**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
VARIABLES	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)	Decreed dividends (1=Yes, 0=No)
Log real operating expenses (COP)	0.0359***	0.0283***	0.0292***	0.0254***	0.0358***	0.0206***	0.0168***	0.0169***	0.0216***
	(0.00721)	(0.00649)	(0.00622)	(0.00625)	(0.00695)	(0.00610)	(0.00586)	(0.00631)	(0.00638)
TFP (excluding int index management component)	-0.0609*	-0.0460	-0.0529*	-0.0562**	-0.0409	-0.0191	-0.0465*	-0.0749***	-0.0765***
	(0.0333)	(0.0298)	(0.0287)	(0.0280)	(0.0300)	(0.0260)	(0.0258)	(0.0272)	(0.0285)
International managerial quality	-0.0130	0.0348	0.00596	-0.0265	0.0276	-0.00172	0.00185	0.0157	0.0126
	(0.0276)	(0.0268)	(0.0267)	(0.0225)	(0.0259)	(0.0229)	(0.0225)	(0.0230)	(0.0287)
Non-tangible assets / Total assets	-0.0629	-0.0971	-0.113	0.0729	-0.100	-0.0607	-0.0117	-0.0548	-0.0631
	(0.180)	(0.170)	(0.170)	(0.150)	(0.169)	(0.123)	(0.110)	(0.113)	(0.123)
Profit before taxes/Assets	0.250***	0.245***	0.0979	0.337***	0.277***	0.323***	0.279***	-0.00936	0.425***
	(0.0769)	(0.0678)	(0.107)	(0.0748)	(0.0902)	(0.0730)	(0.0753)	(0.0287)	(0.0707)
Imports / sales cost	0.00331**	0.00322***	0.00447***	0.00547***	0.00518***	0.00582***	0.00299**	0.00327**	0.000733
	(0.00135)	(0.00123)	(0.00119)	(0.00122)	(0.00139)	(0.00133)	(0.00124)	(0.00133)	(0.00137)
Observations	1,886	2,206	2,252	2,369	2,264	2,314	2,312	2,168	1,888

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Sample is restricted to big private exporting firms.

Table A8: **Exogenous export shock effects on firms' dividend policy, OLS**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Second difference (t+2)-t				First difference (t+1)-t			
Dependent variable	Decreed dividends (1=Yes,0=No)	Payment dividends (1=Yes,0=No)	Δ [Decreed dividends/equity]	Δ [Decreed dividends/assets]	Decreed dividends (1=Yes,0=No)	Payment dividends (1=Yes,0=No)	Δ [Decreed dividends/equity]	Δ [Decreed dividends/assets]
Method	FE	FE	FE	FE	FE	FE	FE	FE
Δ Log real exported value (COP)	0.00260	0.00697*	-0.000292	-0.000291	-0.00247	0.00697*	-0.000292	-0.000291
	(0.00286)	(0.00377)	(0.00107)	(0.000454)	(0.00216)	(0.00377)	(0.00107)	(0.000454)
Observations	11,393	11,393	11,058	11,392	15,319	11,393	11,058	11,392
R-squared	0.681	0.607	0.208	0.195	0.664	0.607	0.208	0.195
Firm controls (difference)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm, industry-year							

Robust standard errors in parentheses clustered at firm level. Sample is restricted to big private exporting firms. *** p<0.01, ** p<0.05, * p<0.1. Firm controls includes the difference of log operating expenses, return on assets (ROA = Profit before taxes / assets), share non-tangible assets, international managerial quality (Merchan, 2023), TFP (clean of international managerial quality), and imported value.

Table A9: **Exogenous export shocks effect on firms' debt and overinvestment, IV**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Second difference (t+2)-t				First difference (t+1)-t			
Dependent variable	Δ Log real exported value (COP)	Δ Debt [Liabilities / assets]	Δ Log real exported value (COP)	Δ [Total overinvestment[1] / assets]	Δ Log real exported value (COP)	Δ Debt [Liabilities / assets]	Δ Log real exported value (COP)	Δ [Total overinvestment[1] / assets]
Method	First stage	IV	First stage	IV	First stage	IV	IV	
Δ Log real exported value (COP)		-0.00116		0.00442		-0.0147		-0.00348
		(0.0137)		(0.0106)		(0.00946)		(0.0121)
Δ Log firm-specific real exchange rate (share destination country t=0)	0.115***		0.148***		0.0948***		0.1000***	
	(0.0167)		(0.0212)		(0.0113)		(0.0128)	
Observations	11,393	11,393	6,980	6,980	15,319	15,319	12,171	12,171
Firm controls (difference)	Yes	Yes		Yes	Yes	Yes	Yes	
Fixed effects				Firm, industry-year				
F-first stage		53.25		78.54		13.54		13.82
Under identification test pi-value		0.00		0.00		0.00		0.00
Weak identification test		47.21		48.31		70.47		60.67

Robust standard errors in parentheses clustered at firm level. Sample is restricted to exporting firms. *** p<0.01, ** p<0.05, * p<0.1. [1]Overinvestment calculation follows Richardson (2006) methodology, which computes overinvestment as the residual of a regression of log of expenditure in investment on its lag, lag of ratio cash flow/assets, lag of ratio liabilities/assets, lag of operating expenses. Firm controls includes the difference of log operating expenses, return on assets (ROA = Profit before taxes / assets), share non-tangible assets, international managerial quality (Merchan, 2023), TFP (clean of international managerial quality), and imported value.

APPENDIX B

Exports and volatility

Table B1 regression explores the determinants of different firm outcomes volatility (standard deviation of operating income, free cash flow, and cash flow), including firm-level variables and industry fixed effects as explanatory variables. It is included only one observation per firm calculating the average across years. The sample covers all big private exporting firms with 5 or more observations during the 2006-2014 period. The results suggest a positive correlation of export share on operating income, free cash flow and cash flow volatility.

***Table B1*: Export share effect on volatility**

VARIABLES	(1) SD Operating income	(2) SD [FCF/Assets]	(3) Ln(SD FCF)	(4) SD [CF/Assets]	(5) Ln(SD CF)
Mean export share (exported value/operating income)	0.251***	0.136***	0.256**	0.0116***	0.0470
	(0.0354)	(0.0477)	(0.108)	(0.00389)	(0.103)
Mean log real property, plant, equipment (USD)	-0.0227**	0.0167	1.080***	-0.00259***	0.950***
	(0.00952)	(0.0142)	(0.0349)	(0.000871)	(0.0333)
Mean debt (liabilities/assets)	0.268***	0.198***	0.797***	-0.0300***	-1.261***
	(0.0449)	(0.0508)	(0.112)	(0.00387)	(0.120)
TFP	-0.0900	0.131*	4.154***	0.0170***	4.650***
	(0.0730)	(0.0765)	(0.288)	(0.00658)	(0.265)
Constant	0.381***	-0.119	2.403***	0.0988***	4.037***
	(0.0748)	(0.120)	(0.290)	(0.00720)	(0.269)
Observations	2,997	2,997	2,997	2,997	2,997
R-squared	0.162	0.029	0.661	0.159	0.571
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. SD: Standard deviation. FCF (Free Cash Flow) = Cash flow from operations – capital expenditures – debt payment. CF: Cash flow. *** p<0.01, ** p<0.05, * p<0.1

A more robust causal econometric approach about the effect of exporting on income volatility is implemented in Vannoorenberghe (2012), which calculates a two-step methodology in which sales growth residuals variance per firm is computed, and then, it is included in a second stage regression as dependent variable. As the sample of this paper does not contain information disaggregated at firm-year-product (local and international market) level, their methodology is replicated but at firm-year level. Table B2 show the sales growth residuals estimations (replication of table 2 - column 2 and 4 in Vannoorenberghe (2012)). Then, table B3 regression indicates that export share has a positive impact on conditional operating income volatility. Analogously to previous estimation, the sample is restricted to exporting firms with 5 or more observations in the 2006–2014 period.

This estimation provides additional support that higher export share boosts operating income volatility, however, it is required one paper to fully determine a causal relationship. This estimation did not include free cash flow and cash flow as dependent variables since Vannoorenberghe (2012)

methodology is intended to measure sales volatility for each product and FCF and CF are measured at firm level.

***Table B2*: Log operating income calculation residuals**

VARIABLES	(1) Δ Log real total operating income (USD)	(2) Δ Log real total operating income (USD)
Δ Log real property, plant and equipment (USD)		0.0866*** (0.0169)
Constant	0.0230*** (0.00614)	0.0.316*** (0.000437)
Observations	17,578	16,656
R-squared	0.107	0.479
Firm fixed effects	No	Yes
Industry-year fixed effects	Yes	Yes

Robust standard errors in parentheses clustered at firm-level
*** p<0.01, ** p<0.05, * p<0.1

***Table B3*: Export share effect on operating income growth residuals variance**

VARIABLES	(1) Operating income growth residuals variance reg 1	(2) Operating income growth residuals variance reg 1	(3) Operating income growth residuals variance reg 2	(4) Operating income growth residuals variance reg 2
Mean export share (exported value/operating income)	0.848*** (0.206)	1.247*** (0.412)	0.801*** (0.195)	1.174*** (0.401)
Mean log real operating income (USD)		-0.726** (0.343)		-0.681** (0.334)
Mean log real property, plant and equipment (USD)		0.0836 (0.0653)		0.0787 (0.0627)
Mean log real operating income (USD)		0.530* (0.308)		0.489 (0.299)
Mean debt (liabilities/assets)		0.850*** (0.307)		0.728** (0.289)
Constant	0.207*** (0.0464)	2.502*** (0.899)	0.196*** (0.0431)	2.489*** (0.870)
Observations	2,931	2,931	2,931	2,931
R-squared	0.031	0.050	0.029	0.048
Firm fixed effects	No	No	No	No
Industry-year fixed effects	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

APPENDIX C

Overinvestment calculation

Richardson (2006) calculates overinvestment as the residual of the next equation:

$$I(new)_{ft} = \beta_o + \beta_1 Debt_{ft-l} + \beta_2 Cash_{ft-l} + \beta_3 Operating\ expenses_{ft-l} + \beta_4 I(new)_{ft-l} + \partial_s + \partial_y + v_{ft} \quad (5)$$

where $I(new)_{ft}$ is investment expenditure, $Debt_{ft-l}$ is the lag of liabilities/assets share, $Cash_{ft-l}$ is the lag of cash/total assets ratio, ∂_s are sectoral fixed effect, and ∂_y are year fixed effects. Second lag regression is shown in table C1.

***Table C1*: Overinvestment calculation – second difference**

VARIABLES	(1) Net expenditure investment (total)/assets	(2) Net expenditure investment (fixed asset)/assets	(3) Net expenditure investment (permanent asset)/assets	(4) Net expenditure investment (temporal asset)/assets
Net expenditure investment (total)/assets (t-2)	0.00793			
	(0.0114)			
Net expenditure investment (fixed asset)/assets (t-2)		0.00782		
		(0.0115)		
Net expenditure investment (permanent asset)/assets (t-2)			-0.000763	
			(0.0101)	
Net expenditure investment (temporal asset)/assets (t-2)				0.00113
				(0.0194)
Log real operating expenses (USD) (t-2)	0.00231**	0.00203**	0.000335	-0.000402
	(0.00108)	(0.000989)	(0.000213)	(0.000255)
Cash flow/assets (t-2)	0.0383**	0.0196	-0.00309	0.0201***
	(0.0159)	(0.0127)	(0.00573)	(0.00637)
Liabilities/Assets (t-2)	0.00587	0.00276	0.00174	-0.000699
	(0.00501)	(0.00396)	(0.00247)	(0.00143)
Constant	-0.00825	-0.00869	-0.00408	0.00713*
	(0.0142)	(0.0129)	(0.00348)	(0.00371)
Observations	17,693	17,693	17,693	17,693
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
R-squared	0.007	0.006	0.009	0.006

Robust standard errors clustered at firm level. *** p<0.01, ** p<0.05, * p<0.1.