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Import Penetration and Executive Compensation

Erik Lie
Tippie College of Business, University of Iowa, USA

Keyang (Daniel) Yang
Carson College of Business, Washington State University, USA

We first compare several measures of import penetration and find that total imports, tariffs, and exchange rates are endogenous, while imports from China are largely exogenous. Then we examine the effects of Chinese import penetration on executive compensation of U.S. firms. We document that Chinese import penetration reduces executives' stock grants and wealth-performance sensitivity, suggesting that competition mitigates agency problems and the need for conventional alignment mechanisms. (*JEL* J33, M52, L1, F1)

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> Monopoly […] is a great enemy to good management.
> —Adam Smith (1776)

In recent decades, improved transport and containerization, trade agreements, and new communication technologies have accelerated globalization and, in turn, dramatically affected the competitive landscape. The intensified competition creates new challenges and alters firms' optimal strategies. For example, the extant literature shows that firms facing greater import competition scale down their operations (Autor, Dorn, and Hanson 2013; Pierce and Schott 2016).

The dramatic change in the competitive landscape has spurred numerous researchers to study the impact of import penetration. Many of these studies use tariff cuts as a proxy for an increase in import penetration to examine

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the effect of competition on corporate policy. The foundational assumption is that lower tariffs encourage more competition that exerts pressure on incumbent firms. However, an extensive international trade literature argues that trade protection is endogenous (Hillman 1989; Mayer 1984; Magee, Brock, and Young 1989; Bohara and Kaempfer 1991; Trefler 1993). For example, politicians might increase tariffs to protect U.S. firms in industries that face increasing competition from foreign firms or cut tariffs to meet strong domestic demand that raises total imports and the sales of U.S. firms. Thus, it is difficult to interpret the effect of tariffs. Consistent with the endogeneity of tariffs, our initial results show that tariffs are negatively related to U.S. firm-level sales. Furthermore, while lower tariffs are associated with higher imports, the explanatory power of tariffs is low, rendering tariffs a weak instrument and a poor proxy for import penetration.

Similar arguments apply to exchange rates as a measure of import penetration. Krugman, Obsfeld, and Melitz (2017) argue that the domestic demand for American products partly drives exchange rates, and it that can also affect U.S. firms' sales and executive compensation. We first confirm the intuitive positive relation between an appreciation of the U.S. dollar and the total U.S. imports. Still, exchange rates only explain about 4% of the variation of total imports, and an appreciation of the U.S. dollar has no discernible effect on firm sales. Thus, we conclude that changes in exchange rates fail to serve as an exogenous shock to import penetration.

Mindful of the pitfalls of testing the effects of competition on firm policies, we examine how competition affects executive compensation. Economic theories offer ambiguous predictions on the relation between competition and incentive pay. On the one hand, Hart (1983) models the "performance informativeness effect" that competition mitigates managerial slack and discretionary behavior because owners are better informed about executives' actions and performance in a competitive environment. An implication is that competition reduces the need for shareholders to design compensation that helps align incentives between shareholders and executives, resulting in a negative relationship between competition and incentive pay. Another possible mechanism contributing to the negative relation is the "threat of liquidation effect" proposed by Schmidt (1997). Higher competition increases the threat of liquidation, which, in turn, induces greater managerial efforts to avoid bankruptcy and reduces the need for incentive pay. On the other hand, Raith (2003) argues for the "business stealing effect" that more competition raises the reward to cost reduction and business stealing activities. Therefore, firms offer more incentive pay to induce managerial effort, leading to a positive relationship between competition and incentive pay.

Our empirical tests examine the effects of Chinese import penetration in the United States on the level and structure of executive compensation, including the use of stock and stock options. Chinese import penetration is particularly suited for studying the effect of competition. First, the dramatic increase in

Chinese import penetration, as indicated by a ninefold increase in U.S. imports from China from 1992 to 2005, should prompt a measurable effect. Second, imports from China are largely exogenous, driven mainly by the productivity improvement in China. Third, because Chinese manufacturers also penetrated markets outside the United States, we can instrument for the Chinese trade penetration in the United States using the Chinese trade penetration in other developed countries, following Autor, Dorn, and Hanson's (2013) identification strategy.

Our evidence shows that a one percentage point increase in Chinese import penetration reduces the value of stock grants by 3%. The decline in stock grants contributes to a decrease in wealth-performance sensitivity (delta) of 2.2%. We interpret our results as consistent with the prediction of Hart (1983) that competition mitigates agency problems, reducing executives' ability to extract excessive compensation and the need for compensation to align incentives. Our results also support Giroud and Mueller's (2010, 2011) conclusion that product market competition alleviates agency problems.

We further investigate the effect of import penetration on the CEO pay slice, that is, the fraction of aggregate compensation for the top-five executive team captured by the CEO. Bebchuk, Cremers, and Peyer (2011) show that high CEO pay slice indicates agency problems. Moreover, Kale, Reis, and Venkateswaran (2009) argue that high CEO pay slice provides promotion incentives for the next level of managers to step up their efforts, which is especially beneficial in the presence of agency problems. In either case, if competition mitigates agency problems, as in Hart (1983), we conjecture that increased competition reduces the CEO pay slice. The results support this conjecture.

We contribute to the extensive literature on product market competition and executive compensation in two ways. First, we examine the validity of total imports, tariff cuts, and exchange rates as exogenous shocks to import penetration. We find that prior measures of import penetration, such as total imports, tariff cuts, and exchange rates, are endogenous. Moreover, we show that tariff levels and cuts are weak instruments for total imports. By contrast, we report evidence that imports from China are largely exogenous and associated with low firm sales. We further alleviate any residual endogeneity concern by using an instrumental variable (IV), other imports from China, which measures the other high-income countries' imports from China. This IV is highly correlated with imports from China. Moreover, it is plausible that other imports from China only affect U.S. executive compensation through imports from China. Therefore, our identification strategy improves upon the prior studies that use tariffs and exchange rates as exogenous shocks to import penetration.

Second, equipped with our identification strategy, we find results that differ from prior literature. Unlike past studies, we document that competition reduces total pay and wealth-performance sensitivity. Hubbard and Palia (1995), Crawford, Ezzell, and Miles (1995), Cuñat and Guadalupe (2009a, 2009b), and

Dasgupta, Li, and Wang (2018) report that competition *raises* pay-performance sensitivity, and Hubbard and Palia (1995) also find that competition *raises* total pay. Hubbard and Palia (1995), Crawford, Ezzell, and Miles (1995), and Cuñat and Guadalupe (2009b) employ banking deregulation as an exogenous shock to competition. But a secular trend among banks might explain these results, and it is unclear whether the results for the commercial banking sector can be generalized to other firms. Cuñat and Guadalupe (2009a) and Dasgupta, Li, and Wang (2018) examine the effect of competition shocks triggered by tariff changes. We complement these studies by comparing the effects of Chinese import penetration and tariffs on executive compensation.

In addition to the literature on product market competition and executive compensation, our paper is related to economic research on the U.S.-China relationship. For example, Autor, Dorn, and Hanson (2013) and Pierce and Schott (2016) find that Chinese import penetration raises the U.S. unemployment rate. Hombert and Matray (2018) show that R&D-intensive U.S. firms are more resilient to trade shocks from China. Han, Jiang, and Mei (2021) document that US-China technology decoupling trends downward during the first two decades of the 21st century, but China's technological dependence on the United States peaked in 2009.

1. Methodology

The Chinese government began to reform its economy in 1978, and the reform accelerated after its leader Deng inspected Southern China (the "Southern Tour") in 1992. The reform efforts led to explosive growth in productivity, rural to urban migration, and capital accumulation (Naughton 2007). As a result, manufacturing production and exports skyrocketed; China's share of world manufacturing exports grew from 2.3% in 1991 to 18.8% in 2013 (Autor, Dorn, and Hanson 2016). Autor, Dorn, and Hanson (2013), Acemoglu et al. (2016), and Pierce and Schott (2016) report that this development substantially affected the U.S. labor market.

We study the effects of Chinese import penetration on executive compensation of U.S. firms. Following Autor et al. (2014) and Acemoglu et al. (2016), we define imports from China for the SIC three-digit industry j in year t as

$$\text{Imports from China}_{jt} = \frac{M_{jt}^{UC}}{Y_{j,91} + M_{j,91} - E_{j,91}},$$

where the numerator M_{jt}^{UC} is the imports from China in year t, and the denominator is the initial absorption in 1991 measured as industry shipment, $Y_{j,91}$, plus industry imports, $M_{j,91}$, minus industry exports, $E_{j,91}$. We use 1991 as the base year because it is the first year for which a large number of bilateral industry-level trade data is available.

We further alleviate the concern that domestic shocks induce changes in executive compensation by employing Chinese import penetration in

other high-income countries as an instrumental variable. These high-income countries include Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland. Following Acemoglu et al. (2016), we define other imports from China for the SIC three-digit industry j in year t as

$$\text{Other imports from China}_{jt} = \frac{M_{jt}^{OC}}{Y_{j,91} + M_{j,91} - E_{j,91}},$$

where M_{jt}^{OC} is the other high-income countries' imports from China in year t. Using this instrumental variable, we assume that Chinese import penetration in the United States is highly correlated with Chinese import penetration in other high-income countries. Another assumption is that other imports from China only affect U.S. firms' compensation decisions through U.S. import penetration.

To study how import penetration affects executive compensation, we construct several compensation variables. Total compensation consists of salary, bonus, the value of restricted stock granted, the value of options granted, long-term incentive payouts, and other compensation. Stock option compensation is defined as the Black-Scholes value of options grants evaluated at the end of the fiscal year. We choose the fiscal year-end value of the options to be consistent with the calculation of delta and vega. Also, this mitigates concerns regarding opportunistic timing of grant dates (Lie 2005; Heron and Lie 2007, 2009). We compute option values by ourselves. The correlation between our *log(1+Stock option grant)* and the one based on the option value from Execucomp is about 99%. We compute delta and vega following Core and Guay (2002) and Coles, Daniel, and Naveen (2006).[1] For our volatility measure, we follow the methodology of Execucomp and Coles, Daniel, and Naveen (2006). We use the annualized standard deviation of stock returns estimated over the 60 months before the beginning of the fiscal period and require at least 12 months of returns data. If 12 months of stock return data are not available, we use mean volatility (across all firms) for that year. Moreover, we winsorize the volatility estimates at the 5th and 95th percentiles. Delta is the estimated dollar change in executives' wealth for a 1% change in stock price. Vega is the estimated dollar change in executives' wealth for a 0.01 change in the standard deviation of returns.

Our primary regression is

$$\begin{aligned} &log\left(1+Compensation_{i,t}\right) \\ &\quad = \gamma_0 + \gamma_1 ImportsfromChina_{i,t-1} + \boldsymbol{\gamma}' \mathbf{x}_{i,t-1} + c_i + \lambda_t + \epsilon_{i,t}, \end{aligned} \tag{1}$$

where $Compensation_{i,t}$ denotes various compensation variables, including stock grant value, option grant value, delta, and vega. We transform compensation using the natural logarithm to mitigate skewness. The

[1] For early work on pay-performance sensitivity, see, for example, Jensen and Murphy (1990).

explanatory variable of interest, $ImportsfromChina_{i,t-1}$, is the lagged (SIC three-digit) industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). We instrument for lagged Chinese import penetration in the United States with lagged Chinese import penetration in other high-income countries.

We also include several control variables, with the caveat that they are noisy proxies and might not rule out alternate channels. Thus, our primary identification strategy is to use the instrumented Chinese import penetration. The lagged control variables, $\mathbf{x}_{i,t-1}$, include the logarithm of total assets, return on assets, Tobin's q, logarithm of sales, and the fiscal year stock return, Capex, leverage, and dividend dummy. Capex is capital expenditure over assets. Leverage is the book value of total debt divided by total assets. The dividend dummy equals one if a firm has positive dividends and zero otherwise. All regressions include executive-firm fixed effects, c_i, because we are interested in the change in compensation within an executive-firm pair. Graham, Li, and Qiu (2012) show that a large portion of the executive compensation is explained by managerial talent or other managerial traits as proxied by executive-firm fixed effects. We also include year fixed effects, λ_t, because of strong trends in executive compensation (Murphy 2013). In addition, we cluster the standard errors at the executive-firm level. The appendix defines all variables.

2. Data

Our sample consists of U.S. manufacturing firm executives (SIC codes 2000–3999). Our sample starts in 1992, the first year with available data from Execucomp. Because FAS123R changed the reporting requirements of the compensation data in 2006, we end our sample in 2005 to ensure that all variable definitions are consistent and comparable over time. Our sample period also has other benefits. First, we bypass any confounding effects from the financial crisis. Second, Bettis et al. (2018) show that performance-vesting is prevalent after 2006, thus blurring the boundary between stocks and options and further complicating the calculations of grant values, deltas, and vegas. Third, our sample period exhibits the largest time-series variation in the Chinese import penetration, thus providing strong statistical power for our tests.

We require that firms have positive assets and nonmissing SIC codes to be included each year. We obtain trade data from the UN Comtrade database and use David Dorn's crosswalk between HS6 and SIC to find the industry-level trade flows.[2] The Harmonized System (HS) was developed by the World Customs Organization (WCO). The WCO assigns products into six-digit HS codes based on physical characteristics, while the SIC classification is based on physical characteristics and the type of economic activity.

[2] The crosswalk information is available from David Dorn's website: http://www.ddorn.net/data.htm.

Table 1
Summary statistics

	Mean	Median	SD
Total compensation ($ thousand)	1,665	840	2,404
Salary ($ thousand)	328	270	207
Bonus ($ thousand)	234	120	343
Stock grant ($ thousand)	90	0	322
Stock option grant ($ thousand)	996	238	2165
Delta ($ thousand)	187	46	456
Vega ($ thousand)	40	13	79
Imports from China (%)	4.09	0.92	8.66
Other imports from China (%)	2.84	0.97	4.72
Tobin's q	2.18	1.67	1.51
Asset ($ million)	3,551	917	7,459
ROA	0.03	0.05	0.12
Stock return	0.19	0.10	0.58

The table presents summary statistics for the sample of the U.S. manufacturing executive-firm-years from 1992 to 2005. Total compensation (TDC1) consists of salary, bonus, restricted stock grant value, stock option grant value (using the Black-Scholes formula), long-term incentive payouts, and other compensation. Delta is the dollar change in executives' wealth for a 1% change in stock price. Vega is the dollar change in executives' wealth for a 0.01 change in the standard deviation of returns. Imports from China (as a percentage) are the U.S. (SIC three-digit) industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). Other imports from China (as a percentage) are defined as imports from China in the (SIC three-digit) industry across eight other high-income countries divided by the initial absorption in the industry in 1991. These high-income countries are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland. Tobin's q is the market value of assets (the book value of assets less the book value of equity plus the market value of equity) divided by the book value of assets. Assets are the total book value of assets. Sales are net sales. ROA is the ratio of the firm's net income to total assets. Stock return is the annual stock return. All variables are winsorized at the 1st and 99th percentiles.

Pierce and Schott (2012) and Autor, Dorn, and Hanson (2013) construct the concordance between HS and SIC codes based on the data provided by Census' Foreign Trade Division. Firm financial data come from Compustat, stock return data from CRSP, and compensation data from Execucomp. To reduce the effect of outliers, we winsorize all variables at the 1st and 99th percentiles.

Table 1 presents summary statistics. The average compensation is almost $1.7 million. The average delta and vega are $187,000 and $40,000, respectively, suggesting that compensation is quite sensitive to changes in stock prices and volatility. The average Chinese import penetration in the United States is 4.1% (with a standard deviation of 8.7%), compared to 2.8% (and a standard deviation of 4.7%) in other high-income countries.

3. A Comparison of Import Competition Measures

Import competition measures include imports from China, total imports, two measures based on tariffs, and exchange rates. We first study whether tariffs and exchange rates are strong instruments for total imports. We also examine the strength of other imports from China as an instrumental variable for imports from China. Next, we determine whether these import competition measures reduce domestic firms' sales.

3.1 First-stage regressions

Jiang (2017) surveys many papers using instrumental variables and published in top-tier finance journals and concludes that weak instruments can produce severe biases. This conclusion is rooted in the extensive literature on weak instruments (e.g., Bound, Jaeger, and Baker 1995; Staiger and Stock 1997) and provides essential guidance for research using the instrumental variable approach. Many researchers use the first-stage F-test to assess the relevance of instrumental variables. By contrast, Jiang emphasizes the importance of the partial R-squared because the sample size can increase the first-stage F-statistic but cannot inflate the partial R-squared of the excluded instruments. Indeed, Bohara and Kaempfer (1991) and Larcker and Rusticus (2010) show that the 2SLS estimator has a smaller absolute bias than the ordinary least squares (OLS) estimator if $R^2_{zu} < R^2_{xz} R^2_{xu}$, where R^2_{zu} is the squared correlation between the IV and the error term, R^2_{xz} is the partial R-squared of the IV, and R^2_{xu} is the squared correlation between the endogenous regressor and the error term. Because perfect exogeneity is rare, this inequality shows the important role played by the partial R-squared in bringing us closer to the truth in the spirit of Jiang.

Using partial R-squared, among other statistics, we investigate whether tariffs and other imports from China are highly correlated with total imports and imports from China, respectively. Total imports are the U.S. (SIC three-digit) industry's total imports from foreign countries divided by the year 1991 initial absorption. We obtain tariff data from Bernard, Jensen, and Schott (2006), Frésard (2010), Valta (2012), and Frésard and Valta (2016). For each three-digit SIC industry-year, the tariff rate is estimated as the duties collected by U.S. customs divided by the free-on-board value of imports. We also examine an alternate tariff measure. Following Dasgupta, Li, and Wang (2018), we construct a tariff cut dummy that equals one during the 3 years after an industry has experienced a tariff rate reduction that exceeds three times the median tariff rate reduction in the same industry, and zero otherwise. Moreover, consistent with Dasgupta, Li, and Wang, we exclude tariff cuts followed by equally large tariff increases within the subsequent 3 years. Dasgupta, Li, and Wang use this dummy variable to capture large and nontransitory tariff reductions.

Moreover, we study whether exchange rates serve as a good proxy for import penetration. Following Cuñat and Guadalupe (2009b), we define the exchange rate at the three-digit SIC industry level as the weighted average of importing countries' logarithm of real exchange rates. The weights are the share of each foreign country's imports in total U.S. imports for each industry in a base period (1990–1991). Real exchange rates are nominal exchange rates (expressed in foreign currency per U.S. dollar) multiplied by the U.S. CPI and divided by the foreign country CPI. Nominal exchange rates and CPI data are from the International Financial Statistics of the International Monetary Fund and the Global Economic Monitor of the World Bank.

Table 2 shows that a one-percentage-point increase in other imports from China raises imports from China by more than 1.4 percentage points, with the coefficient statistically significant at the 0.01 level. The partial R-squared indicates that other imports from China explain about 65% of the variation of imports from China.[3] In addition, the F-test for the first stage regression rejects the hypothesis that the IV is weak. Thus, we conclude that the IV, other imports from China, satisfies the relevance criteria as an instrumental variable for imports from China. Columns 3 and 4 show that a one-percentage-point increase in tariff reduces total imports by 0.9 percentage points, with the coefficient significant at 0.01 level. Although the F-tests of first-stage regressions reject the weak instrument hypothesis, the partial R-squared is about zero. The partial R-squared for the tariff cut dummy in columns 5 and 6 is also around zero. Columns 7 and 8 show that an appreciation of the U.S. dollar raises total imports, but the exchange rate's partial R-squared is about 4%. Moreover, we regress total imports on tariff, tariff cut dummy, and the exchange rate in columns 9 and 10. The partial R-squared statistics for these three variables are still about 5% compared with 65% for the regressions in columns 1 and 2. Given the small partial R-squared's of tariff, tariff cut dummy, and the exchange rate, we argue that they are poor proxies and weak instruments for total imports.

3.2 Import competition and firm sales

We now examine the effect of different import competition measures on sales. *Ceteris paribus*, an increase in import competition should negatively affect the sales of domestic firms, because foreign firms either capture market share or drive down product market prices. Thus, an increase in exogenous import competition measures should portend domestic firms' sales declines. The following analysis aims to validate this fundamental property for these import competition measures.

Panel A of Table 3 presents results from regressing the sales of U.S. firms against various import penetration measures using OLS. The results indicate that an increase in Chinese import penetration induces a slippage in sales among U.S. firms in the affected industry; a one-percentage-point increase in Chinese import penetration lowers the sales by about 0.6%, which is statistically significant at the 1% level. If we use 2SLS, the decrease in sales is 0.9%, as shown in panel B. Alternatively, a one-standard-deviation increase in Chinese import penetration reduces sales by 7.8% based on the 2SLS estimate. These results validate the use of imports from China as an appropriate measure of import competition.

Panel A of Table 3 further shows that total imports are positively related to sales if we do not include control variables. This result suggests that total imports are endogenous; positive shocks to domestic demand raise both firm

[3] We compute the partial R-squared following Angrist and Pischke (2009).

Table 2
First-stage regressions

	Imports from China		Total imports							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Other imports from China	1.466***	1.475***								
	(0.00)	(0.00)								
Tariff			−0.900***	−0.579***					−1.425***	−1.151***
			(0.00)	(0.00)					(0.00)	(0.00)
Tariff cut dummy					0.953***	0.834***			0.630***	0.613***
					(0.00)	(0.00)			(0.00)	(0.00)
Exchange rate							11.531***	12.054***	13.312***	13.490***
							(0.00)	(0.00)	(0.00)	(0.00)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partial R-squared	.65	.65	.00	.00	.00	.00	.04	.04	.05	.05
F-test p-value	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Observations	42,823	42,823	42,823	42,823	40,898	40,898	42,823	42,823	40,898	40,898

The table presents the first-stage regressions. The observations are at the executive-firm-year level. In columns 2, 4, 6, 8, and 10, we control for *log(Assets)*, *tangibility*, *Tobin's q*, *capital expenditure*, *selling expense*, *leverage*, and a *dividend dummy*. Imports from China (as a percentage) are the U.S. (SIC three-digit) industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). Other imports from China are defined as imports from China in the (SIC three-digit) industry across eight other high-income countries divided by the initial absorption in the industry in 1991. These high-income countries are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland. Total imports (as a percentage) are the U.S. (SIC three-digit) industry's total imports from foreign countries divided by the year 1991 initial absorption. For each three-digit SIC industry-year, the tariff rate (as a percentage) is equal to the duties collected by U.S. customs divided by the free-on-board value of imports. The tariff cut dummy is set to one for the first 3 years after an industry has experienced a tariff rate reduction that is larger than three times the median tariff rate reduction in the same industry and zero otherwise. The exchange rate is defined at the industry level (SIC three-digit) as the weighted average of the logarithm real exchange rates of importing countries (expressed in foreign currency per dollar). *Tangibility* is net property, plant, and equipment divided by the book value of assets. *Tobin's q* is the market value of assets (the book value of assets less the book value of equity plus the market value of equity) divided by the book value of assets. Total annual capital expenditures are scaled by total assets. *Selling expense* is the logarithm of advertising and selling expenses. Leverage is defined as long-term debt plus debt in current liabilities, all divided by total assets. The dividend dummy is equal to one if a firm has positive dividends and zero otherwise. All regressions include executive-firm fixed effects and year fixed effects. All variables are lagged by 1 year. p-values based on standard errors clustered at the executive-firm level are reported in parentheses. We also report the partial R-squared of the excluded instruments and the p-value of the F-test. *$p < .1$; **$p < .05$; ***$p < .01$.

Table 3
The effects of import competition measures on sales

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	A. OLS regressions with dependent variable: log(1+Sales)									
Imports from China	−0.009***	−0.006***								
	(0.00)	(0.00)								
Total imports			0.002***	−0.000						
			(0.00)	(0.26)						
Tariff					−0.017*	−0.000				
					(0.07)	(0.97)				
Tariff cut dummy							0.003	−0.016*		
							(0.81)	(0.09)		
Exchange rate									−0.002	0.012
									(0.97)	(0.66)
log(Assets)		0.590***		0.592***		0.591***		0.581***		0.591***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Tangibility		0.311***		0.313***		0.314***		0.287***		0.314***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Tobin's q		0.027***		0.027***		0.027***		0.027***		0.027***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Capex		0.155*		0.165**		0.160*		0.169**		0.160*
		(0.06)		(0.05)		(0.05)		(0.04)		(0.05)
Selling expense		0.109***		0.109***		0.109***		0.108***		0.109***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Leverage		−0.023		−0.025		−0.026		−0.027		−0.026
		(0.30)		(0.26)		(0.24)		(0.23)		(0.24)
Dividend dummy		0.052***		0.050***		0.050***		0.049***		0.050***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,570	39,570	39,570	39,570	39,570	39,570	37,228	37,228	39,570	39,570
R-squared	.963	.979	.963	.979	.963	.979	.965	.979	.963	.979

(Continued)

Table 3
Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
B. 2SLS regressions with dependent variable: log(1+Sales)										
Imports from China	−0.011***	−0.009***								
	(0.00)	(0.00)								
Total imports			0.008*	0.000	0.002	−0.011	−0.000	0.001	0.003	0.001
			(0.05)	(0.97)	(0.81)	(0.10)	(0.97)	(0.66)	(0.28)	(0.69)
log(Assets)		0.589***		0.591***		0.590***		0.591***		0.580***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Tangibility		0.310***		0.314***		0.259***		0.316***		0.290***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Tobin's q		0.027***		0.027***		0.029***		0.027***		0.027***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Capex		0.153*		0.159*		0.292***		0.150*		0.164*
		(0.06)		(0.07)		(0.01)		(0.08)		(0.06)
Selling expense		0.109***		0.109***		0.116***		0.108***		0.107***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Leverage		−0.022		−0.026		−0.007		−0.028		−0.028
		(0.32)		(0.24)		(0.79)		(0.22)		(0.22)
Dividend dummy		0.052***		0.050***		0.050***		0.049***		0.049***
		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
IVs										
Other imports from China	Yes	Yes	No	No	No	No	No	No	No	No
Tariffs	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Tariff cut dummy	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Exchange rate	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,570	39,570	39,570	39,570	37,228	37,228	39,570	39,570	37,228	37,228
R-squared	.963	.979	.963	.979	.965	.979	.963	.979	.965	.979
J-test p-value									.280	.186

The table presents the effects of various import competition measures on sales. The observations are at the firm-year level. The regressions in panel A are estimated with OLS, while those in panels B are estimated with 2SLS. In panel B, we instrument for imports from China with other imports from China. Total imports are instrumented by tariffs in columns 3 and 4, the tariff cut dummy in columns 5 and 6, and exchange rate in columns 7 and 8, and tariff, the tariff cut dummy, and exchange rate in columns 9 and 10. All regressors and instrumental variables are lagged by 1 year. All regressions include firm fixed effects and year fixed effects. p-values based on standard errors clustered at the firm level are reported in parentheses. We also report the p-values of Hansen's J-tests. *$p < .1$; **$p < .05$; ***$p < .01$.

sales and total imports, resulting in a positive correlation between total imports and sales. The control variables, such as Tobin's q, are partly driven by domestic demand. Once we include control variables in column 4, total imports have no significant effects on sales. As a potential remedy to the endogeneity of total imports, one might assume that tariffs are exogenous and, thus, use tariffs as a proxy for the exogenous portion of import penetration. However, the international trade literature has long recognized the endogeneity of tariffs (e.g., Hillman 1989; Mayer 1984; Magee, Brock, and Young 1989; Bohara and Kaempfer 1991; Trefler 1993). Indeed, column 5 shows that greater tariffs are associated with weaker sales, suggesting that politicians use tariffs to protect domestic industries facing dwindling sales. Again, the results largely disappear in column 6 if we include control variables that partially account for domestic demand. Even if we focus on large and permanent tariff cuts, column 7 shows that they still fail to lower sales, and the sign of the tariff cut dummy's coefficient switches after we include control variables in column 8. Similar arguments apply to exchange rates as a measure of import penetration. Because exchange rates are partly driven by domestic demand (Krugman, Obsfeld, and Melitz 2017), they also suffer from endogeneity problems. Columns 9 and 10 show that exchange rates do not significantly affect sales.

We also try to use tariffs as an instrumental variable to correct for the endogeneity of total imports. We use tariffs as an instrumental variable for total imports in panel B and find that total imports are positively related to sales without controls in column 3. Still, the relation between instrumented total imports and sales is insignificant with controls in column 4. In columns 5 and 6, total imports are instrumented by the tariff cut dummy. Similarly, we use exchange rates as an instrumental variable for total imports in columns 7 and 8. The coefficient of total imports is insignificant at the 0.1 level in columns 5–8. Columns 9 and 10 use tariffs, the tariff cut dummy, and exchange rates as instruments. The coefficient of total imports is positive but statistically insignificant at the 0.1 level. In short, total imports instrumented by tariffs or exchange rates still do not dampen sales.

Overall, the results in this section suggest that the instrumented Chinese import penetration on which we rely in later analysis serves as an exogenous measure of import competition for U.S. firms. In contrast, the results suggest that the tariff measures and exchange rates are plagued by endogeneity and are unsuitable for measuring exogenous variation in import competition.

4. Import Penetration and Executive Compensation

This section explores the effects of Chinese import penetration on stock grants and option grants. We do this by regressing the compensation measures against instrumented import penetration and control variables.

Table 4 presents the estimated effects of Chinese import penetration on the value of stock grants to executives. It shows that imports from China reduce

Table 4
The effect of Chinese import penetration on stock grants

	Dependent variable: *log(1+Stock grant)*					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Imports from China	−0.020***	−0.020***	−0.020***	−0.029***	−0.030***	−0.030***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
log(Assets)		−0.022	−0.035		−0.017	−0.030
		(0.58)	(0.39)		(0.68)	(0.47)
ROA		−0.188*	−0.151		−0.188*	−0.152
		(0.05)	(0.13)		(0.05)	(0.13)
log(Sales)		0.083*	0.087*		0.079*	0.083*
		(0.07)	(0.06)		(0.08)	(0.07)
Stock return		0.034**	0.034**		0.033**	0.033**
		(0.01)	(0.01)		(0.01)	(0.01)
Tobin's q		−0.038***	−0.037***		−0.038***	−0.037***
		(0.00)	(0.00)		(0.00)	(0.00)
Capex			−0.078			−0.089
			(0.78)			(0.75)
Leverage			0.154			0.151
			(0.13)			(0.14)
Dividend dummy			0.070			0.073
			(0.18)			(0.16)
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	61,560	61,560	61,560	61,560	61,560	61,560
R-squared	.547	.547	.548	.547	.548	.548

The table presents the effect of Chinese import penetration on stock grants. Stock grant (RSTKGRNT) is the value of restricted stock granted during the year. Imports from China (as a percentage) are the U.S. industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). Other imports from China (as a percentage) are defined as imports from China in the industry across eight other high-income countries divided by the initial absorption in the industry in 1991. The regressions in columns 1–3 are estimated with OLS, while those in columns 4–6 are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

the value of stock grants. In particular, a one percentage point increase in imports from China induces an average reduction in stock grant values of about 2.9% (based on the 2SLS estimate), which is statistically significant at the 0.01 level. After controlling for firm characteristics and corporate policies, the 2SLS estimate increases slightly to –0.030, implying a 3% reduction in stock grant values.

To the extent that our identification strategy is imperfect, the control variables alleviate the concern about omitted variable bias relative to the model in column 4 with no controls. For example, controlling for firm performance addresses the possibility that stock grant declines because of inferior firm performance. But because the controls are likely endogenous, we should be wary of the causal interpretation of their coefficients. A large number of controls also increase collinearity, which might cause the coefficient to have the "wrong" sign (Greene 2018). For example, *log(Assets)* has a negative coefficient in Table 4 because it is highly correlated with *log(Sales)*. If *log(Sales)* is dropped, the *log(Assets)* has a positive coefficient, as predicted by Gabaix and Landier (2008). The more

severe problem is that the endogeneity of controls might contaminate 2SLS estimates. Standard 2SLS procedures (Wooldridge 2002; Angrist and Pischke 2009) require the first-stage regressions to include all controls. However, the consistency of the 2SLS estimators requires the exogeneity of all first-stage regressors, not just the excluded IV (Wooldridge 2002). Frölich (2008) shows that endogenous controls make 2SLS estimators inconsistent. Therefore, if we had perfect IVs, we should not include any endogenous controls. But the reality is that perfect IVs are rare. Empirical researchers face the trade-off between omitted variable bias and the bias stemming from endogenous controls. Thus, the practical compromise is to report the regressions with and without controls. We take comfort in the relative stability of the coefficient of interest but tolerate certain changes in coefficients.

The OLS estimates in Table 4 suggest that a one percentage point increase in imports from China reduces the stock grant value by about 2% (statistically significant at the 0.01 level). The economic magnitude of OLS estimates is smaller, possibly because imports from China are partly exogenous (driven by the productivity improvement in China) and partly endogenous (driven by the U.S. domestic demand). While the exogenous component reduces stock grants, the endogenous component increases stock grants, and, hence, these two forces partially offset each other and lead to weaker results. We use variance decomposition to understand better the differences between OLS and 2SLS in a later section. While imports from China reduce stock grants, Table 5 shows that Chinese import penetration does not significantly affect the value of option grants.

Grants of stock and stock options to executives naturally affect the sensitivity of those executives' portfolios to both stock prices and volatility. We, therefore, examine how import penetration affects delta and vega. Table 6 presents the results of regressions of delta. The results indicate that a one percentage point increase in imports from China reduces delta by 2.2% (based on the 2SLS estimate with controls). The effect on the delta is statistically significant at the 0.01 level.[4] Table 7 shows that Chinese import penetration does not significantly affect vega because its effect on option grants is insignificant.

The negative effects of Chinese import penetration on executive stock grants and delta are consistent with the prediction of Hart (1983) that competition mitigates agency problems as any mismanagement becomes more visible to outsiders. When allowed to flourish, agency problems escalate the need for compensation to be tied to shareholder wealth to curtail mismanagement of

[4] Edmans, Gabaix, and Landier (2009) suggest scaling the delta by the total pay to filter out the size effect. We control for the size effect by including the logarithm of total assets as a control variable. In our setting, import penetration reduces both the delta and total pay, leading to a less pronounced effect on the scaled delta. To alleviate the effects of import penetration coming through the scaling variable, we divide the delta by the lagged total pay and find that import penetration significantly reduces the scaled delta in Table A4 in the Internet Appendix.

Table 5
The effect of Chinese import penetration on stock option grants

	Dependent variable: *log(1+Stock option grant)*					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Imports from China	−0.001	−0.001	−0.001	−0.006	−0.007	−0.008
	(0.89)	(0.84)	(0.83)	(0.45)	(0.37)	(0.29)
log(Assets)		0.229***	0.277***		0.232***	0.281***
		(0.00)	(0.00)		(0.00)	(0.00)
ROA		0.884***	0.668***		0.885***	0.668***
		(0.00)	(0.00)		(0.00)	(0.00)
log(Sales)		0.074	0.065		0.072	0.062
		(0.34)	(0.41)		(0.36)	(0.43)
Stock return		−0.028	−0.028		−0.028	−0.029
		(0.29)	(0.30)		(0.29)	(0.29)
Tobin's q		0.056***	0.051***		0.056***	0.051***
		(0.00)	(0.01)		(0.00)	(0.01)
Capex			−0.587			−0.595
			(0.26)			(0.26)
Leverage			−0.884***			−0.885***
			(0.00)			(0.00)
Dividend dummy			−0.123			−0.120
			(0.12)			(0.13)
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50,098	50,098	50,098	50,098	50,098	50,098
R-squared	.529	.530	.531	.529	.530	.531

The table presents the effect of Chinese import penetration on stock option grants. *Stock option grant* is defined as the Black-Scholes value of options grants evaluated at the end of the fiscal year. *Imports from China* (as a percentage) are the U.S. industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). *Other imports from China* (as a percentage) are defined as imports from China in the industry across eight other high-income countries divided by the initial absorption in the industry in 1991. The regressions in columns 1–3 are estimated with OLS, while those in columns 4–6 are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

corporate resources.[5] Therefore, import penetration should reduce executive compensation designed to align executives' incentives with shareholders', including stock grants.

Moreover, two opposing forces might explain the insignificant effects of Chinese import penetration on option grants and vega. On the one hand, Chinese import penetration reduces the need for incentive alignment, including delta and vega in executive compensation, thus inducing firms to scale back executive option grants (which raise both delta and vega). On the other hand, Arrow (1962) shows that enhanced competition increases firms' need to innovate to remain competitive. Thus, Chinese import penetration might spur firms to grant more options to encourage innovation in a fierce marketplace (Lie and Yang 2017).

[5] Edmans, Gabaix, and Jenter (2017) discuss in detail how shareholder value maximization by boards and rent extraction by executives affect compensation.

Table 6
The effect of Chinese import penetration on delta

	Dependent variable: *log(1+Delta)*					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Imports from China	−0.013***	−0.010***	−0.010***	−0.027***	−0.022***	−0.022***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
log(Assets)		0.036	0.056**		0.042	0.062**
		(0.18)	(0.04)		(0.11)	(0.02)
ROA		0.847***	0.775***		0.848***	0.775***
		(0.00)	(0.00)		(0.00)	(0.00)
log(Sales)		0.048*	0.045		0.045	0.042
		(0.09)	(0.11)		(0.11)	(0.14)
Stock return		0.072***	0.072***		0.071***	0.071***
		(0.00)	(0.00)		(0.00)	(0.00)
Tobin's q		0.108***	0.106***		0.107***	0.106***
		(0.00)	(0.00)		(0.00)	(0.00)
Capex			−0.042			−0.063
			(0.78)			(0.67)
Leverage			−0.290***			−0.292***
			(0.00)			(0.00)
Dividend dummy			−0.086***			−0.081***
			(0.00)			(0.00)
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,823	42,823	42,823	42,823	42,823	42,823
R-squared	.889	.897	.897	.890	.898	.898

The table presents the effect of Chinese import penetration on delta. *Delta* is the dollar change in executives' wealth for a 1% change in stock price. *Imports from China* (as a percentage) are the U.S. industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). *Other imports from China* (as a percentage) are defined as imports from China in the industry across eight other high-income countries divided by the initial absorption in the industry in 1991. The regressions in columns 1–3 are estimated with OLS, while those in columns 4–6 are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $*p < .1$; $**p < .05$; $***p < .01$.

5. Tariffs, Exchange Rates, and Delta

Several past studies report that higher import penetration and tariff cuts are associated with higher delta, whereas we show that imports from China reduce delta.[6] To better understand the differences in the results, we regress delta on total imports, tariffs, and exchange rates. Panel A of Table 8 shows that if we include no control variables, higher total imports and large tariff cuts are associated with higher delta, broadly consistent with the extant literature. However, after adding control variables, the statistical significance of the coefficient of total imports declines substantially in columns 4 relative to 3, while the sign of the coefficient of tariff cut dummy reverses from positive in column 7 to negative in column 8.

Positive domestic demand shocks might raise total imports and make tariff cuts more likely, while they also increase incentive pay, resulting in the positive correlation between total imports (or tariff cuts) and delta. Control variables,

[6] See, for example, Cuñat and Guadalupe (2009b) and Dasgupta, Li, and Wang (2018).

Table 7
The effect of Chinese import penetration on vega

	Dependent variable: *log(1+Vega)*					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Imports from China	0.001	0.000	0.000	−0.002	−0.003	−0.003
	(0.82)	(0.95)	(0.98)	(0.61)	(0.37)	(0.30)
log(Assets)		0.266***	0.281***		0.267***	0.283***
		(0.00)	(0.00)		(0.00)	(0.00)
ROA		0.607***	0.539***		0.607***	0.539***
		(0.00)	(0.00)		(0.00)	(0.00)
log(Sales)		0.041	0.036		0.040	0.035
		(0.11)	(0.16)		(0.12)	(0.18)
Stock return		−0.001	0.000		−0.002	−0.000
		(0.86)	(1.00)		(0.84)	(0.98)
Tobin's q		0.059***	0.057***		0.059***	0.056***
		(0.00)	(0.00)		(0.00)	(0.00)
Capex			−0.048			−0.053
			(0.74)			(0.72)
Leverage			−0.271***			−0.272***
			(0.00)			(0.00)
Dividend dummy			−0.008			−0.007
			(0.78)			(0.81)
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46,606	46,606	46,606	46,606	46,606	46,606
R-squared	.860	.865	.865	.860	.865	.865

The table presents the effect of Chinese import penetration on vega. *Vega* is the dollar change in executives' wealth for a 0.01 change in standard deviation of returns. *Imports from China* (as a percentage) are the U.S. industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). *Other imports from China* (as a percentage) are defined as imports from China in the industry across eight other high-income countries divided by the initial absorption in the industry in 1991. The regressions in columns 1–3 are estimated with OLS, while those in columns 4–6 are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

especially measures of firm performance, such as sales, Tobin's q, and stock return, serve as imperfect proxies for domestic demand shock. When these omitted variables are controlled for, the results change substantially. We observe similar patterns of change even when we use tariff levels and cuts as instrumental variables for total imports in panel B. For example, the coefficient of total imports instrumented with the tariff cut dummy changes from positive in column 5 to negative in column 6. While the large changes in coefficients raise serious concerns, we recognize that there might be no perfect proxy for domestic demand shock. Moreover, these endogenous control variables alleviate omitted variable bias but increase collinearity and might amplify bias due to their endogeneity (Frölich 2008).

In addition, we consider the impact of exchange rates on delta. Table 2 confirms the intuitive relation that an appreciation of the U.S. dollar induces more total imports. If higher total imports were to increase delta and exchange rates were a good proxy for import penetration, we should observe a positive association between exchange rates and delta. The regressions in columns 9 and 10 of panel A of Table 8 nevertheless fail to find a positive relationship

Table 8
The effects of various import competition measures on delta

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	A. OLS regressions with dependent variable: log(1+Delta)									
Imports from China	−0.013***	−0.010***								
	(0.00)	(0.00)								
Total imports			0.003***	0.001						
			(0.00)	(0.38)						
Tariff					0.013	0.031***				
					(0.17)	(0.00)				
Tariff cut dummy							0.036**	−0.001		
							(0.02)	(0.92)		
Exchange rate									−0.080**	−0.045
									(0.02)	(0.18)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,823	42,823	42,823	42,823	42,823	42,823	40,898	40,898	42,823	42,823
R-squared	.889	.897	.889	.897	.889	.897	.890	.898	.889	.897

(*Continued*)

Table 8
Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B. 2SLS regressions with dependent variable: log(1+Delta)									
Imports from China	−0.027***	−0.022***								
	(0.00)	(0.00)								
Total imports			−0.015	−0.054**	0.037**	−0.002	−0.007**	−0.004	−0.008***	−0.008***
			(0.19)	(0.03)	(0.03)	(0.92)	(0.02)	(0.17)	(0.00)	(0.00)
IVs										
Other imports from China	Yes	Yes	No	No	No	No	No	No	No	No
Tariffs	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Tariff cut dummy	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Exchange rate	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,823	42,823	42,823	42,823	40,898	40,898	42,823	42,823	40,898	40,898
R-squared	.890	.898	.889	.897	.890	.898	.889	.897	.890	.898
J-test p-value									.009	.007

The table presents the effects of various import competition measures on delta. The observations are at the executive-firm-year level. Imports from China (as a percentage) are the U.S. (SIC three-digit) industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). Total imports (as a percentage) are the U.S. (SIC three-digit) industry's total imports from foreign countries divided by the year 1991 initial absorption. For each three-digit SIC industry-year, the tariff rate (as a percentage) is equal to the duties collected by U.S. customs divided by the free-on-board value of imports. The tariff cut dummy is set to one for the first 3 years after an industry has experienced a tariff rate reduction that is larger than three times the median tariff rate reduction in the same industry and zero otherwise. The exchange rate is defined at the industry level (SIC three-digit) as the weighted average of the logarithm of the real exchange rates of importing countries (expressed in foreign currency per dollar). The regressions in panel A are estimated with OLS, while those in panels B are estimated with 2SLS. In panel B, we instrument for imports from China with other imports from China. Total imports are instrumented with tariff in columns 3 and 4, the tariff cut dummy in columns 5 and 6, and exchange rate in columns 7 and 8, and tariff, the tariff cut dummy, and exchange rate in columns 9 and 10. In columns 2, 4, 6, 8, and 10, we control for *log(Assets), ROA, log(Sales), stock return, Tobin's q, Capex, leverage*, and a *dividend dummy*. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. p-values based on standard errors clustered at the executive-firm level are reported in parentheses. We also report the p-values of Hansen's J tests. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

between an appreciation of the U.S. dollar and delta. Moreover, columns 7 and 8 of panel B show that total imports instrumented by exchange rates reduce delta, contradicting the positive relation between total imports and delta in column 3 of panel A. We argue that there are two main reasons for the counterintuitive effects of exchange rates on delta. First, Table 3 shows that an appreciation of the U.S. dollar does not significantly reduce firm sales and, thus, does not pose a competitive threat to domestic firms. Second, the small partial R-squared in column 7 of Table 2 shows that exchanges rates only explain a small portion of the total variation of total imports. Consequently, it should not be surprising that exchange rates by themselves in the OLS regressions and total imports instrumented with exchange rates seem to negatively affect delta, in contrast to the positive effects of total imports on delta in the OLS regressions.

If tariffs, the tariff cut dummy, and exchange rates were all valid instruments, the coefficients in columns 3–8 of panel B of Table 8 should be similar (Angrist and Pischke 2009). We, however, observe drastically different coefficients in those columns depending on the choice of IVs and inclusion of control variables. For example, total imports instrumented by the tariff cut dummy have a positive coefficient in column 5, but the sign is negative if we use tariffs as an IV in column 3. We formally test the overidentifying restriction in columns 9 and 10 of panel B. The p-value of the Hansen's J test is close to zero, strongly rejecting the null hypothesis that tariffs, the tariff cut dummy, and exchange rates are all valid instruments. Thus, we argue that these instruments (i.e., tariffs, the tariff cut dummy, and exchange rates) cannot allay endogeneity concerns about total imports effectively.

6. Discrepancies between OLS versus 2SLS Estimates

Confronting the wide discrepancy between OLS and 2SLS estimates, Jiang (2017) urges researchers to reconcile the relative magnitude of these two types of estimates and clarify the force of endogeneity against finding desired results. In our case, the OLS estimates generally have the same signs as the 2SLS estimates, and for our key results (e.g., stock grants and delta), the 2SLS estimates are about twice as large as the OLS estimates. We argue that these estimates are relatively close because imports from China are largely, but not completely, exogenous. Many studies (e.g., Naughton 2007; Zhu 2012) show that the striking improvement in productivity in China leads to a dramatic increase in the Chinese import penetration in the United States. Moreover, the productivity improvement in China was largely exogenous to U.S. firms' decision-making. However, U.S. domestic demand may be responsible for part of the imports from China.

To quantify the extent to which imports from China are exogenous and reconcile the difference between OLS and 2SLS estimates, we follow the variance decomposition methodology used by Autor, Dorn, and Hanson (2013). We find that 65% of the variation of imports from China is exogenous, while the

rest might be driven by domestic demand and is endogenous. This proportion of exogenous variation coincides with the partial R-squared of the first-stage regression of the imports from China on other imports from China. As it turns out, the high partial R-squared helps keep the OLS and 2SLS estimates relatively close. To understand the intuition, consider the extreme case in which the partial R-squared is 100%. Then the regressor of interest would be exogenous, and the OLS and 2SLS estimates would coincide. This argument is essentially a restatement of Jiang's (2017) view that a small partial R-squared could lead to a large discrepancy between OLS and 2SLS estimates.

We use a key result about delta as an example to demonstrate the variance decomposition. To simplify the notation, we assume that the OLS regression is

$$Y = \beta \times IP + e,$$

where Y is the logarithm of delta, and IP is imports from China. Both Y and IP are demeaned. In addition, executive-firm and year fixed effects have been partialled out of Y and IP. Then, $\hat{\beta}_{OLS} = \frac{\sigma_{YI}}{\sigma_I^2}$ where $\sigma_{YI} = Cov(IP, Y)$ and $\sigma_I^2 = Var(IP)$. Similarly, with the instrumented imports from China, we obtain the 2SLS estimator, $\hat{\beta}_{IV} = \frac{\sigma_{YI_{IV}}}{\sigma_{I_{IV}}^2}$ where $\sigma_{YI_{IV}} = Cov(IP_{IV}, Y), \sigma_{I_{IV}}^2 = Var(IP_{IV})$, and IP_{IV} is the instrumented imports from China with the instrument being other imports from China.

The IV partition the variation in IP into an exogenous component and a residual,

$$IP = IP_{IV} + IP_e.$$

Because IP_{IV} and IP_e are orthogonal by construction,

$$\hat{\beta}_{OLS} = \frac{\sigma_{YI}}{\sigma_I^2} = \frac{Cov(IP, Y)}{Var(IP)} = \frac{Cov(IP_{IV}, Y) + Cov(IP_e, Y)}{Var(IP_{IV}) + Var(IP_e)} = \frac{\sigma_{YI_{IV}} + \sigma_{YI_e}}{\sigma_{I_{IV}}^2 + \sigma_{I_e}^2}$$

Thus,

$$\hat{\beta}_{OLS} = \hat{\beta}_{IV} \frac{\sigma_{I_{IV}}^2}{\sigma_{I_{IV}}^2 + \sigma_{I_e}^2} + \hat{\beta}_e \frac{\sigma_{I_e}^2}{\sigma_{I_{IV}}^2 + \sigma_{I_e}^2} = \hat{\beta}_{IV} W + \hat{\beta}_e (1 - W),$$

where

$$\hat{\beta}_e = \frac{\sigma_{YI_e}}{\sigma_{I_e}^2} \equiv \frac{Cov(IP_e, Y)}{Var(IP_e)} \text{ and } W \equiv \frac{\sigma_{I_{IV}}^2}{\sigma_{I_{IV}}^2 + \sigma_{I_e}^2}.$$

Thus, the OLS estimate is a weighted average of the coefficient of exogenous import-driven component, $\hat{\beta}_{IV}$, and the coefficient for the residual (demand-driven) component, where the weights correspond to the fraction of the variance in import exposure explained by each.

In the context of the delta regression, $\hat{\beta}_{IV} = -0.027$, $\hat{\beta}_e = 0.014$, and

$$W = \frac{\sigma^2_{I_{IV}}}{\sigma^2_{I_{IV}} + \sigma^2_{I_e}} = \frac{1.760^2}{1.760^2 + 1.284^2} = 0.653.$$

Thus,

$$\hat{\beta}_{IV} \frac{\sigma^2_{I_{IV}}}{\sigma^2_{I_{IV}} + \sigma^2_{I_e}} + \hat{\beta}_e \frac{\sigma^2_{I_e}}{\sigma^2_{I_{IV}} + \sigma^2_{I_e}} = -0.027 \times 0.653 + 0.014 \times 0.347 = -0.013$$

which is identical to $\hat{\beta}_{OLS} = -0.013$. This decomposition shows that part of the bias of OLS estimate is caused by the demand-driven component, $\hat{\beta}_e(1 - W)$. The economic intuition behind the positive $\hat{\beta}_e$ is that a positive domestic demand shock increases the imports from China and the U.S. executives' delta in that industry, leading to the positive correlation between import penetration and delta. This result partly explains why the OLS underestimates the negative impact of import penetration on delta. Nevertheless, the weight of the exogenous component of imports from China, $W = 0.653$, dominates the weight of the residual component, $1 - W = 0.347$. Thus, the OLS estimate is reasonably close to the 2SLS estimate. The $|\hat{\beta}_{IV}|/|\hat{\beta}_{OLS}|$ in the regressions about delta (with no controls) is about 2.08, much smaller than nine, the average $|\hat{\beta}_{IV}|/|\hat{\beta}_{OLS}|$ ratio in the finance publications that use the instrumental variable approach (Jiang 2017).

It is no coincidence that $W = 0.653$ is equal to the first-stage partial R-squared, 0.65. For the first-stage partial R^2, we have

$$R^2 = \frac{SSE}{SST} = \frac{\sum IP^2_{IV,i}}{\sum IP^2_i} = \frac{\sigma^2_{I_{IV}}}{\sigma^2_{I_{IV}} + \sigma^2_{I_e}} = W.$$

The above equation demonstrates that the high partial R^2 of the first-stage regression implies a high weight assigned to $\hat{\beta}_{IV}$ and therefore helps the OLS and 2SLS estimates stay relatively close.

7. Import Penetration and CEO Pay Slice

Bebchuk, Cremers, and Peyer (2011) define the CEO pay slice as the fraction of the aggregate compensation of the top-five executive team that is captured by the CEO. They show that a high CEO pay slice signifies agency problems. On the other hand, Kale, Reis, and Venkateswaran (2009) argue that a high CEO pay slice provides an incentive for the next level of managers to expend more effort to be promoted. This promotion incentive is especially beneficial in the presence of agency problems. Either way, if competition mitigates agency problems and reduces the need for promotion incentives, as in Hart (1983), we conjecture that increased competition reduces the CEO pay slice.

Table 9
The effect of Chinese import penetration on CEO pay slice

	Dependent variable: *CEO pay slice*					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Imports from China	−0.002***	−0.002***	−0.002***	−0.003***	−0.003***	−0.003***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
log(Assets)		−0.004	−0.001		−0.003	−0.000
		(0.66)	(0.94)		(0.70)	(0.99)
ROA		0.049**	0.039*		0.049**	0.039*
		(0.03)	(0.09)		(0.03)	(0.09)
log(Sales)		−0.000	−0.001		−0.001	−0.001
		(0.96)	(0.93)		(0.91)	(0.88)
Stock return		0.004	0.004		0.004	0.004
		(0.15)	(0.15)		(0.15)	(0.15)
Tobin's q		0.002	0.002		0.002	0.002
		(0.16)	(0.20)		(0.18)	(0.22)
Capex			−0.008			−0.010
			(0.88)			(0.86)
Leverage			−0.042**			−0.043**
			(0.02)			(0.02)
Dividend dummy			−0.016**			−0.015**
			(0.02)			(0.02)
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,129	8,129	8,129	8,129	8,129	8,129
R-squared	.519	.522	.523	.520	.522	.523

The table presents the effect of Chinese import penetration on CEO pay slice. CEO pay slice is defined as the fraction of the aggregate compensation of the top-five executive team captured by the CEO. Imports from China (as a percentage) are the U.S. industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). Other imports from China (as a percentage) are defined as imports from China in the industry across eight other high-income countries divided by the initial absorption in the industry in 1991. The regressions in columns 1–3 are estimated with OLS, while those in columns 4–6 are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

To compute the CEO pay slice, we need to identify which executives are CEOs. We rely on CEOANN in Execucomp, which indicates whether an executive served as CEO for all or most of the indicated fiscal year.

Table 9 presents the results of the CEO pay slice regressions. Imports from China have a negative and statically significant effect on the CEO pay slice. A one percentage point increase in imports from China reduces the CEO pay slice by about 0.003 (based on 2SLS estimates), representing a 0.8% decline relative to the mean of 0.374. The OLS coefficient of imports from China is –0.002, implying a 0.5% decline. We interpret the negative effect of import penetration on pay slice to mean that import penetration resolves agency problems and reduces the need to use an extra carrot for the top executive team to exert effort.[7]

[7] Kini and Williams (2012) and Shen and Zhang (2018) show that a higher CEO pay slice encourages managerial risk-taking. Therefore, a lower CEO pay slice can reduce risk-taking incentives. This interpretation does not contradict ours. The alleviation of agency problems leads to lower CEO pay slice, which, in turn, might lower risk-taking incentives.

Table 10
The interaction between Chinese import penetration and excess compensation

	(1) Stock grant	(2) Stock option grant	(3) Delta	(4) Vega	(5) Total compensation
			A. OLS regressions		
Imports from China	−0.025***	0.003	−0.010***	0.000	−0.007***
	(0.00)	(0.76)	(0.00)	(0.94)	(0.00)
Excess	−0.135***	−0.294***	0.666***	0.586***	−0.055**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)
Imports from China × Excess	−0.017***	−0.011***	−0.020***	−0.018***	−0.021***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	47,010	35,545	29,544	32,823	35,436
R-squared	.581	.562	.916	.888	.823
			B. 2SLS regressions		
Imports from China	−0.035***	−0.003	−0.022***	0.000	−0.013***
	(0.00)	(0.79)	(0.00)	(0.93)	(0.00)
Excess	−0.092***	−0.262***	0.712***	0.622***	−0.013
	(0.00)	(0.00)	(0.00)	(0.00)	(0.58)
Imports from China × Excess	−0.031***	−0.020***	−0.033***	−0.029***	−0.031***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	47,010	35,545	29,544	32,823	35,436
R-squared	.583	.563	.917	.888	.824

The table presents the interaction between Chinese import competition and excess compensation. The dependent variables are *log(1+Stock grant)*, *log(1+Stock option grant)*, *log(1+Delta)*, *log(1+Vega)*, and *log(1+Total compensation)*, respectively. For columns 1–5, *Excess* is defined as excess stock grants, excess stock option grants, excess delta, excess vega, and excess total compensation, respectively. Excess stock grant is the moving average (over years $t-5$ to $t-1$) of the residuals from regression (1). Other excess compensation variables are defined similarly. We control for *log(Assets)*, *ROA*, *log(Sales)*, *stock return*, *Tobin's q*, *Capex*, *leverage*, and a *dividend dummy*. The regressions in panel A are estimated with OLS, while those in panel B are estimated with 2SLS. We instrument imports from China with other imports from China, and *Imports from China × Excess* with *Other imports from China × Excess*. All regressors and instrumental variables are lagged by 1 year. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. *$p < .1$; **$p < .05$; ***$p < .01$.

8. Import Penetration and Excess Compensation

Core, Holthausen, and Larcker (1999) show that excess compensation is symptomatic of agency problems. We hypothesize that if import penetration alleviates agency problems, it should have a more pronounced negative impact on compensation when prior excess compensation is high, reflecting more severe agency problems. Our results support this hypothesis. Following Core, Holthausen, and Larcker (1999) and Core, Guay, and Larcker (2008), we measure prior excess compensation as the lagged 5-year moving average of the residual of the compensation regression. For example, the excess delta in column 3 of panel A in Table 10 is the lagged 5-year moving average of the regression residual in column 3 of Table 6. Moreover, the excess delta in column 3 of panel B in Table 10 is the lagged 5-year moving average of the regression residual in column 6 of Table 6.

Table 4 demonstrates that imports from China negatively affect stock grants. Column 1 of Table 10 shows that this negative effect is magnified as excess stock grants swell. The same logic applies to stock option grants, total compensation, delta, and vega. We conclude that the results about excess compensation boost our confidence that Chinese import penetration alleviates agency problems. This conclusion is subject to two caveats: (1) excess compensation has measurement error because there is no perfect proxy for the optimal compensation, and (2) excess compensation is endogenous with no available instruments.

9. CEOs, CFOs, and Other Executives

CEOs and CFOs are consistently among the most highly compensated employees, and prior studies show that their incentives have substantial and sometimes different effects on corporate policies.[8] Thus, we are interested in how Chinese import penetration affects the compensation of subgroups of executives, including CEOs, CFOs, and other executives who are neither CEOs nor CFOs. According to Jiang, Petroni, and Wang (2010) and Chava and Purnanandam (2010b), CFOs are defined as managers whose titles ("titleann" in Execucomp) include "CFO," "chief financial officer," "treasurer," "controller," "finance," or "vice president-finance." If more than one executive satisfies these criteria for a firm-year, we assume that the CFO is the one with the highest total compensation (TDC1).

Table 11 shows that our main results about stock grants and delta still hold if we use CEO, CFO, or other executive subsamples. Panel B of Table 11 shows that a one percentage point increase in Chinese import penetration reduces CEO and CFO stock grant values by 4% and their delta by 2.2% and 1.7%, respectively. The reductions in the stock grant values are smaller for other executives than for CEOs and CFOs. A one percentage point increase in Chinese import penetration reduces other executives' stock grant value by 2.4% and their delta by 2.2%, based on the 2SLS estimates in panel B.

10. Local Employment Growth

Autor, Dorn, and Hanson (2013) and Acemoglu et al. (2016) find that Chinese import penetration reduces local manufacturing employment. They focus on labor markets for rank-and-file employees, while our focus is the executive labor markets. Because these two types of labor markets might be linked, we study whether Chinese import penetration affects executive compensation through local labor markets for rank-and-file employees.

[8] See, for example, Mehran, Nogler, and Schwartz (1998), Jiang, Petroni, and Wang (2010), Chava and Purnanandam (2010b), and Kim, Li, and Zhang (2011).

Table 11
CEOs, CFOs, and other executives

A. OLS regressions

	Stock grant			Stock option			Delta			Vega		
	CEO (1)	CFO (2)	Other (3)	CEO (4)	CFO (5)	Other (6)	CEO (7)	CFO (8)	Other (9)	CEO (10)	CFO (11)	Other (12)
Imports from China	−0.029**	−0.029*	−0.018***	0.010	0.014	−0.007	−0.012***	−0.002	−0.009***	−0.001	0.009**	0.000
	(0.02)	(0.06)	(0.00)	(0.43)	(0.36)	(0.36)	(0.00)	(0.74)	(0.00)	(0.80)	(0.04)	(0.92)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,725	6,296	44,636	8,645	6,241	33,511	8,106	5,743	27,504	8,543	6,137	30,366
R-squared	.578	.598	.571	.532	.539	.564	.871	.884	.897	.867	.884	.873
B. 2SLS regressions												
Imports from China	−0.040***	−0.040**	−0.024***	0.021	0.000	−0.014	−0.022***	−0.017**	−0.022***	−0.002	0.005	−0.002
	(0.01)	(0.05)	(0.00)	(0.25)	(1.00)	(0.15)	(0.00)	(0.01)	(0.00)	(0.75)	(0.42)	(0.53)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,725	6,296	44,636	8,645	6,241	33,511	8,106	5,743	27,504	8,543	6,137	30,366
R-squared	.578	.598	.571	.532	.538	.564	.872	.884	.898	.867	.884	.873

The table presents the subsample analysis of Chinese import penetration on executive compensation. Columns 1, 4, 7, and 10 present results about CEOs. Columns 2, 5, 8, and 11 present results about CFOs. Columns 3, 6, 9, and 12 present results about all the executives who are neither CEOs nor CFOs. The dependent variables are *log(1+Stock grant)*, *log(1+Stock option)*, *log(1+Delta)*, and *log(1+Vega)*, respectively. We control for *log(Assets)*, *ROA*, *log(Sales)*, *stock return*, *Tobin's q*, *Capex*, *leverage*, and a *dividend dummy*. All regressors and instrumental variables are lagged by 1 year. The regressions in panel A are estimated with OLS, while those in panel B are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 12
Controlling for local employment growth

	Stock grant		Stock option		Delta		Vega	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. OLS regressions								
Imports from China	−0.020***	−0.020***	−0.001	−0.001	−0.010***	−0.010***	0.000	0.000
	(0.00)	(0.00)	(0.83)	(0.93)	(0.00)	(0.00)	(0.98)	(0.88)
Local employment growth		0.012		0.081***		0.007		−0.008
		(0.49)		(0.01)		(0.39)		(0.29)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	61,560	59,979	50,098	48,913	42,823	41,887	46,606	45,482
R-squared	.548	.546	.531	.532	.897	.898	.865	.867
B. 2SLS regressions								
Imports from China	−0.030***	−0.031***	−0.008	−0.008	−0.022***	−0.022***	−0.003	−0.003
	(0.00)	(0.00)	(0.29)	(0.30)	(0.00)	(0.00)	(0.30)	(0.35)
Local employment growth		0.011		0.080***		0.007		−0.009
		(0.52)		(0.01)		(0.43)		(0.28)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	61,560	59,979	50,098	48,913	42,823	41,887	46,606	45,482
R-squared	.548	.546	.531	.532	.898	.898	.865	.867

The table presents robustness tests that control for local employment growth. The dependent variables are *log(1+Stock grant)*, *log(1+Stock option)*, *log(1+Delta)*, and *log(1+Vega)*, respectively. Local employment growth (as a percentage) is defined as the annual change in the ratio of total manufacturing employment to the working-age population in a commuting zone where the firm is headquartered. We control for *log(Assets)*, *ROA*, *log(Sales)*, *stock return*, *Tobin's q*, *Capex*, *leverage*, and *dividend dummy*. All regressors and instrumental variables are lagged by 1 year. The regressions in panel A are estimated with OLS, while those in panel B are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

Similar to Autor, Dorn, and Hanson (2013), we measure local labor market conditions using local employment growth, defined as the annual change in the ratio of total manufacturing employment to the working-age population in a commuting zone where the firm is headquartered. We obtain the county-industry level employment data from Eckert et al. (2021), whose original data source is County Business Patterns (CBP).[9] Next, we aggregate the county-industry level employment data to the commuting zone-industry level because Autor and Dorn (2013) and Autor, Dorn, and Hanson (2013) argue that commuting zones are suitable for the analysis of local labor markets.

Our executive compensation regressions control for local employment growth. Table 12 shows that the inclusion of this additional control variable has little impact on the coefficient of imports from China, possibly because labor markets for rank-and-file employees and executive labor markets are segmented. Thus, our findings on executive compensation cannot be subsumed by the prior results about local labor markets.

[9] Eckert et al. (2021) impute missing values in employment and make the industry classification consistent over time for the CBP data.

11. Flow Delta

Our main measure of executive incentives is wealth-performance sensitivity, that is, delta, instead of pay-performance sensitivity, that is, flow delta, because Edmans, Gabaix, and Jenter (2017, p. 405) argue that delta is a more comprehensive measure of executive incentive, whereas flow delta misses a majority of incentives coming from equity holdings. Similarly, Core and Guay (1999) point out that firms aim to attain an optimal level of incentives for executives based on both the equity holdings and new incentive grants when designing optimal contracts.

Nevertheless, Gormley, Matsa, and Milbourn (2013) argue that the board can modify the stock and option components of the manager's current pay. Therefore, if the board scales back stock grants, but not option grants, we should observe a decrease in flow delta, which serves as a useful robustness test. Flow delta has the same definition as delta but is calculated using only stocks and options granted each year.

Column 4 of Table 13 shows that a one-percentage-point increase in imports from China reduces flow delta by about 1.9% (based on the 2SLS estimate), which is statistically significant at the 0.01 level. After controlling for firm characteristics and corporate policies, the 2SLS estimate decreases slightly to –0.018, implying a 1.8% reduction in flow delta. Thus, our conclusion that Chinese import penetration reduces the need for conventional alignment mechanisms remains robust if we use flow delta as an alternative measure for incentive alignment.

12. Chinese Import Penetration and Corporate Policies

Because Chinese import penetration poses a considerable threat to US companies, it can potentially affect an array of corporate policies. Our research focuses on the executive compensation policy, but Chinese import penetration can also affect policies related to, for example, investments, dividends, and leverage.

We investigate the direct effects of Chinese import penetration on investments, the propensity to pay dividends, and leverage in Table A17 in the Internet Appendix. The regressions suggest that Chinese import penetration reduces capital expenditures and increases leverage and the propensity to pay dividends. We view these results as evidence that increased competition reduces agency problems in the form of excess expenditures and hoarding of resources.

To examine whether Chinese import penetration affects executive compensation through its effects on corporate policies, we include capital expenditures, a dividend dummy, and leverage as control variables in our main regressions. Our main results about stock grants and delta are robust to the inclusion of these variables, suggesting that the changes in stock grants and delta do not stem from other corporate policy changes.

Table 13
The effect of Chinese import penetration on flow delta

	Dependent variable: *log(1+Flow delta)*					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Imports from China	−0.010***	−0.009***	−0.009***	−0.019***	−0.017***	−0.018***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
log(Assets)		0.067**	0.085***		0.072**	0.090***
		(0.04)	(0.01)		(0.02)	(0.01)
ROA		0.524***	0.429***		0.525***	0.430***
		(0.00)	(0.00)		(0.00)	(0.00)
log(Sales)		0.078**	0.079**		0.075**	0.075**
		(0.03)	(0.03)		(0.03)	(0.03)
Stock return		−0.002	−0.005		−0.003	−0.005
		(0.83)	(0.70)		(0.80)	(0.67)
Tobin's q		0.060***	0.059***		0.059***	0.058***
		(0.00)	(0.00)		(0.00)	(0.00)
Capex			−0.531**			−0.541**
			(0.01)			(0.01)
Leverage			−0.395***			−0.397***
			(0.00)			(0.00)
Dividend dummy			−0.064*			−0.061*
			(0.05)			(0.07)
Executive-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50,098	50,098	50,098	50,098	50,098	50,098
R-squared	.616	.619	.619	.616	.619	.620

The table presents the effect of Chinese import penetration on flow delta. Flow delta has the same definition as delta but is calculated using only stocks and options granted each year. *Imports from China* (as a percentage) are the U.S. industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports). *Other imports from China* (as a percentage) are defined as imports from China in the industry across eight other high-income countries divided by the initial absorption in the industry in 1991. The regressions in columns 1–3 are estimated with OLS, while those in columns 4–6 are estimated with 2SLS. We instrument for imports from China with other imports from China. All regressions include executive-firm fixed effects and year fixed effects. *p*-values based on standard errors clustered at the executive-firm level are reported in parentheses. $*p < .1$; $**p < .05$; $***p < .01$.

13. Firm Exits and Segment Exits

Chinese import penetration might cause bankruptcy and sample selection issues. We study this possibility by defining the delisting dummy as one if the firm is bankrupt or acquired within 1 year and zero otherwise. We determine a firm's bankruptcy status based on the delisting type from Compustat, complemented by the bankruptcy data from Sudheer Chava (Chava and Jarrow 2004; Chava and Purnanandam 2010a; Chava, Stefanescu, and Turnbull 2011; Chava 2014; Alanis, Chava, and Kumar 2018). Moreover, we decide whether a firm is acquired based on the SDC Platinum mergers and acquisitions database. Internet Appendix Table A1 shows that imports from China do not significantly raise the delisting likelihood. In particular, it does not increase the probability of a firm going bankrupt or being acquired. Therefore, our results are not driven by firm attrition.

Though Chinese import penetration does not increase the delisting likelihood, it might still induce firms to exit manufacturing segments. We define the segment exit dummy as one if the firm exits a manufacturing industry

segment and zero otherwise to explore this possibility. The segment data are from the Compustat industry segment database. Panel B of Table A1 shows that imports from China do not increase the likelihood of firms' exits from manufacturing segments.

14. The Strength of Our Instrumental Variable

Bakke et al. (2020, p. 6) disagree with our assessment of the IV strength and claim that "Chinese import share to non-US high-income countries" is a weak instrument for "foreign competition in US industries." We believe differences in the instrumentation strategies cause the disagreement between Bakke et al. (2020) and us. We agree with Bakke et al. (2020) that "Chinese import share to non-US high-income countries" is a weak instrument for "foreign competition in US industries" but emphasize that we do not adopt that instrumentation strategy. Our primary endogenous variable and IV are different from those critiqued by Bakke et al. (2020). The primary endogenous variable in Bakke et al. (2020) is foreign competition, defined as total imports in each industry divided by the sum of total imports and domestic production minus total exports. Their endogenous variable is somewhat similar to our definition of total imports defined as the U.S. industry's total imports from foreign countries divided by the year 1991 initial absorption.

Moreover, Bakke et al. (2020, p. 36) define their IV, Chinese import share to non-U.S. high-income countries, as "the value of Chinese imports in all high-income countries minus that in the US, divided by the value of total imports in all high-income countries minus that in the US." Their IV is similar to ours, other imports from China, defined as imports from China in the (SIC three-digit) industry across eight other high-income countries divided by the initial absorption in the industry in 1991.

The crucial difference between Bakke et al. (2020) and our IV strategies is that we do not use other imports from China as an IV for total imports. Instead, we use other imports from China as an IV for imports from China. We agree with Bakke et al. (2020) that other imports from China is a weak IV for total imports, but we do not use that instrumentation strategy. Tables 2 and 3 show that total imports are endogenous. We critique the existing IVs for total imports but do not propose a new IV for total imports. In the Internet Appendix, we compare the instrumentation strategies of Bakke et al. (2020) and ours in detail.

15. Conclusion

Initially, we compare various measures of import penetration. We find that total imports, tariffs, and exchange rates are endogenous. Moreover, we find that tariffs, the tariff cut dummy, and exchange rates are weak instruments for total imports in that these IVs can only explain a small proportion of variation in total imports. By contrast, imports from China reduce domestic firms' sales,

and other imports from China are highly correlated with imports from China. Thus, instrumented imports from China are more suitable for causal studies of how competition from overseas affects corporate policies.

Using Chinese import penetration and its IV, we study the empirical effects of competition on executive compensation. Our results are consistent with Hart's (1983) prediction that product market competition alleviates agency problems, thus reducing the need for traditional incentive alignment. In particular, Chinese import penetration reduces stock grant values and delta, which indicates that incentive alignment via stock and, correspondingly, delta moderates. Moreover, Chinese import penetration flattens the pay structure among top executives, thus decreasing the incentives to exert effort to be promoted to CEO.

Appendix

Table A1
Variable definitions

Variable	Definition
Bonus	The dollar value of a bonus earned by the named executive officer during the fiscal year
Capex	Capital expenditure over total assets
CEO pay slice	The fraction of the aggregate compensation of the top-five executive team captured by the CEO
Delta	Dollar change in executives' wealth for a 1% change in stock price
Dividend dummy	One if a firm has positive dividends and zero otherwise
Exchange rate	The weighted average of the logarithm of real exchange rates of importing countries (expressed in foreign currency per U.S. dollar). Estimated at the industry level (SIC three-digit)
Imports from China	The U.S. (SIC three-digit) industry's imports from China divided by the year 1991 initial absorption (measured as industry shipments plus industry net imports)
Leverage	The book value of total debt divided by total assets
Local employment growth	The annual change in the ratio of total manufacturing employment to the working-age population in a commuting zone where the firm is headquartered
Other imports from China	Imports from China in the (SIC three-digit) industry across eight other high-income countries divided by the initial absorption in the industry in 1991. These high-income countries are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland
ROA	The ratio of the firm's net income to total assets
Selling expense	The logarithm of advertising and selling expenses
Stock grant	The value of restricted stock granted during the year
Stock option grant	The Black-Scholes value of options grants evaluated at the end of the fiscal year
Tangibility	Net property, plant, and equipment divided by the book value of assets
Tariff	For each three-digit SIC industry-year, the tariff rate is equal to the duties collected by U.S. customs divided by the free-on-board value of imports
Tariff cut dummy	Set to one for the first 3 years after an industry has experienced a tariff rate reduction that is larger than three times the median tariff rate reduction in the same industry and zero otherwise. We exclude tariff cuts that are followed by equally large increases in tariffs within the subsequent 3 years
Tobin's q	The market value of assets (the book value of assets less the book value of equity plus the market value of equity) divided by the book value of assets
Total compensation	The sum of salary, bonus, restricted stock grant value, stock option grant value (using the Black-Scholes formula), long-term incentive payouts, and other compensation
Total imports	The U.S. (SIC three-digit) industry's total imports from foreign countries divided by the year 1991 initial absorption
Vega	The dollar change in executives' wealth for a 0.01 change in standard deviation of returns

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