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Multinationals and cash holdings



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ABSTRACT

This study examines the relationship between cash holdings and the level of multinationality for a large international sample of firms from 40 countries. We consider two dimensions of diversification, geographical and industrial, and find a direct negative relation between both geographic and industrial diversification and cash holdings. This finding is consistent with the diversification argument that multinationals' headquarters plan their investment and cash needs in an efficient way across geographically diversified operations. We further examine whether there is a trade-off between two diversification strategies. The evidence shows that the effect of industrial diversification is negligible once firms are geographically diversified. By performing country-level tests, we also document some new evidence of international differences for the impacts of tax systems, investor protection, political stability, stock market development, economic size and growth, and national culture on the separate and joint effects of geographic and industrial diversifications.

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1. Introduction

One of the most widely accepted stylized facts in the literature is an upward trend in the cash holdings of US public firms during the 2000s relative to the previous decade (Bates et al., 2009). The literature explains this trend with the precautionary motive, which implies that companies hoard cash today so as not to miss future investment opportunities. This explanation is consistent with Almeida et al. (2004), who find that firms mitigate the adverse effects of financial constraints by adopting a policy of greater cash retention. In a recent work, Harford et al. (2014) show that the level of cash is determined by the refinancing risk of firms, the goal being prevention of underinvestment problems.

Raising cash levels has also been an important phenomenon for multinational companies (MNCs). Indeed, the media frequently highlights MNCs such as Apple, Microsoft, and other companies whose cash holdings keep increasing. Pinkowitz et al. (2016) show that the trend of increased cash holdings occurs all around the world, with the increase being more pronounced in the United States. Despite this development, the cash holding policy of global MNCs has been underexplored in the literature, which mainly focuses on US MNCs. In this paper, we aim at investigating MNCs around the world to find out whether geographic diversification influences their cash holdings. In addition, we include industrial diversification in our analysis as another important dimension of diversification strategies. We are particularly interested in the contribution of industrial diversification to the cash holdings of geographically diversified firms, which we investigate by examining the interaction between these two dimensions. Thus, this study is a natural extension of studies examining the effects of geographic and industrial diversification on other corporate choices. In particular, we study the relation between cash holdings and geographic/industrial diversification, using a large

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sample of over 203,000 firm-year observations from 40 countries. The joint impact on cash holdings of these two dimensions of diversification has not been considered in the previous literature. Furthermore, we examine the associations of several country-level variables with the relationships between cash management policy and diversification strategies to identify international implications.

MNCs manage their dispersed operations with several product segments in geographically diverse markets. In the literature, Duchin (2010) studies the relationship between industrial diversification and the level of cash, and demonstrates that in the United States, the average cash holdings of diversified firms are almost half of those of stand-alone firms. The major argument here is that the corporate headquarters of diversified firms can better plan their investment and cash needs, and the efficient cross-divisional transfer of funds lowers the required level of cash holdings. On the other hand, there are studies supporting the idea that MNCs hold more cash because of the higher tax cost associated with repatriating foreign income. Foley et al. (2007) show that the consolidated level of cash of US firms increases along with the level of repatriation taxes, and this cash is held abroad. However, extensive analyses by Pinkowitz et al. (2016) indicate that the increase in US MNC cash holdings since the late 1990s cannot be explained by tax treatment of profit repatriations, regulation, or poor governance.

We first reexamine the links between companies' cash management policies and their geographic and industrial diversification activities in our international sample of MNCs. We measure geographic diversification by using three alternative proxies for the multinationality level of firms. The first one, a widely used proxy, is annual levels of foreign sales.¹ The next two proxies are based on annual geographic segment sales; we calculate the number of geographic regions where the firm reports its geographic segment sales, as well as the Herfindahl index for each year. In our first analysis, we run pooled OLS regressions of cash holdings against several determinants by controlling for country, industry, and year fixed effects. In this setting, the main challenge, looking at whether a firm is an MNC, is that geographic diversification can be seen as an endogenous decision. A firm becomes multinational to create value whenever some opportunities exist. However, there is no doubt that the decision to sell outside the domestic market and/or start or stop doing business across countries is subject to constraints. This also means that firms defined as multinationals in our sample may not be selected randomly. Unfortunately, it is not easy to overcome this challenge, and owing to those characteristics, it is almost impossible to identify econometrically valid instruments that identify MNCs. Therefore, we run our regressions and report the results by including firm fixed effects, which allows us to examine how cash changes when foreign sales change. In addition, we deploy panel autoregressive GMM estimation to disentangle the causality effect (joint determination of cash holdings, our diversification proxies, and leverage).

Our analysis shows negative relationships between both industrial and geographic diversifications and cash holdings at the firm level. The negative association of geographic diversification is interesting and suggests the existence of economies of scale in cash management for MNCs. The international activities of MNCs confer operational and financial advantages over domestic firms. MNCs collect revenues and have access to more sources of capital in different currencies from multiple countries with different risk characteristics. Alternatively, this result suggests that MNCs having imperfectly correlated cash flows from different geographic regions have less need for precautionary cash.

Next, we investigate the impact on cash holdings as multinational firms diversify across different industries. This analysis allows us to examine whether the cash management of an MNC that is diversified also in different product segments is similar relative to that of an MNC focused in terms of product segments. Our results indicate that MNCs selling multiple products in multiple geographic regions hold more cash than focused MNCs. This finding shows how the dimensions of diversification are not independent of each other, and there is a significant trade-off: once a firm is geographically diversified, industrial diversification has a lower impact on the firm's cash holdings.

We explore the implications of several country-level variables, such as tax systems, investor protection, political stability, stock market development, economic size and growth, and national culture, that have been documented as important determinants of cash holdings on the separate and joint effects of geographic and industrial diversifications to identify cross-country asymmetries. We compare territorial and worldwide tax systems, which regulate the taxation of foreign income differently, to observe how diversification strategies would be explored in these two different tax systems. We use the *anti*-director rights index, a broad World Bank governance index, and the political stability index to examine whether the role of strong country legal protection of investors in reducing agency problems is also relevant for the impact of diversification strategies on cash holdings. We analyze the impact of diversification strategies on cash holdings across countries having different stock market development. The literature provides evidence of two alternative views about the impact of stock market development on cash holdings; less need for cash savings from cash flows and higher cash savings from equity issues especially when prices are higher. Another important country-level factor is economic growth. MNCs in countries with higher economic growth may prefer to have large cash holdings in order to avoid missing growth opportunities regardless of their diversification perspectives. Lastly, we test if the individualism and uncertainty avoidance dimensions of national culture determine our major relationships between diversification strategies and cash holdings.

We find that several country characteristics moderate the impact of diversification on cash holdings. The impact of geographic diversification on cash holdings is smaller (or more negative) in countries with a territorial tax system (relative to a worldwide tax system) and with stronger legal protection of investors. The effects are stronger in countries with a higher GDP growth and uncertainty avoidance. This strong result implies that MNCs in countries with higher economic growth increase their cash holdings to finance their multinational expansion. The impact of industrial diversification on cash holdings decreases in countries with

¹ We also repeat our analyses by using annual levels of foreign assets and foreign income. The results are similar to those reported in our tables.

stronger legal protection of investors, a higher stock market capitalization, and individualism. Finally, the trade-off between geographic and industrial diversification increases with stronger legal protection of investors and political stability, with a larger economic size, and with a higher individuality and lower uncertainty avoidance.

This paper contributes to different areas of financial research. The first is cash management by multinational firms. Opler et al. (1999) have analyzed a trade-off theory of cash (according to which firms balance the benefits and costs of holding cash). The later literature highlights the benefits and costs of cash associated with financing corporate investments (Acharya et al., 2007; Almeida et al., 2004; Bates et al., 2009; Denis and Sibilkov, 2010; Duchin et al., 2010; Harford et al., 2014) and agency problems (e.g., for the US firms Dittmar and Mahrt-Smith, 2007; Dittmar et al., 2003; Harford et al., 2008; Jensen, 1986; Pinkowitz et al., 2006; and Huang et al., 2013). We show that diversification is also a crucial variable that can explain significantly differing patterns of cash holdings around the world. Our findings complement the research by Pinkowitz et al. (2016) – which indicates that US multinationals have significantly increased their cash holdings since the late 1990s – and show that this cannot be explained by tax treatment of profit repatriations, regulation, or poor governance. In fact, we show that the relationships between the two dimensions of diversification (global and industrial) and cash holdings, and the trade-off effect, indicating that industrial diversification in global diversified firms has no additional impact on the firm's cash holdings, exist at the firm level for MNCs from around the world, while legal protection of investors, economic growth, and national culture appear to be dominant country-level factors to explain the impact of diversification strategies on cash holdings.

The rest of the paper is organized as follows: In Section 2, we provide detailed information on our major variables for the proxies of geographical and industrial diversifications, and present our data. In Section 3, we present our results. In Section 4, we examine the asymmetry in our results across countries. In Section 5, robustness tests of the findings are provided, and the conclusions are presented in Section 6.

2. Data and variables

The analysis covers firms in the Worldscope database for the years 1990 through 2011. Financial firms (SIC 6000–6999) and utilities (SIC 4900–4999) are excluded from the analysis. We also exclude countries with fewer than 100 firm-year observations in the sample.

One focus of this paper is to examine the relationship between the level of internationalization and the level of cash holdings. We use the ratio of foreign sales to total sales (WC08731) as the first proxy for the level of international involvement [*Foreign Sales*].² We identify a firm as an MNC with a dummy variable [*MNC Dummy*] that takes the value of one if the level of foreign sales is higher than 25% of the consolidated sales in a given year.³ In addition, we use a number of other variables to identify MNCs.

We construct geographic segment sales data from segment sales data provided by Worldscope (WC19601 to WC19691), which includes up to 10 geographic segments. The formats of individual geographic segments are not standard because of the differences in firm disclosures. In Worldscope, a particular geographic segment represents a single country, or a broad geographic region,⁴ or several broad geographic regions and countries together. This nonstandard reporting format prevents us from working on country-level classifications of geographic segments. We also compute a [*Herfindahl Index*] of a firm's sales across geographic regions. According to this, firms with low Herfindahl scores have sales dispersed across multiple regions and therefore have plausibly imperfectly correlated prospects. On the other hand, higher Herfindahl scores suggest a concentration of the sales in a single (or few) geographic region(s).

Our main variable of interest is cash holdings, measured by the ratio of cash and short-term investments to total assets [*Cash Ratio*]. Fig. 1 shows the evolution of the cash ratio for each year in the sample period from 1990 to 2011. The average cash holdings increased substantially over the sample period. The mean ratios of cash and short-term investments to total assets were 12.93% in 1990 and 18.26% in 2011 for our full sample of firms. The figure also shows that single-segment firms had a larger increase in cash holdings than diversified firms.

The sample data includes an unbalanced panel of 203,139 firm-year observations in 40 countries. Table 1 describes the sample and provides mean values of major variables. In our sample, the mean of the foreign sales ratios is 18.63%.

The rest of Table 1 reports country-level variables we use in our country-level tests. [*Territorial*] is the tax system classification whose value depends on whether a country applies a territorial tax system (1), where foreign income is exempted from home-

² Our sample includes some companies with foreign sales higher than 25% of their total sales for which no foreign assets and foreign income are reported. This indicates that, although those observations are identified as MNCs on the basis of the proxy of foreign sales, they may not be geographically diversified in terms of assets or income for a certain period. We search a random number of observations to see if these companies acquired foreign assets as a result of merger and acquisition activities in the years since Worldscope began reporting foreign assets or income. A good example of such a company is US-based Kraft Foods Inc. Worldscope did not report any foreign assets for Kraft until 2000 even though its foreign sales were higher than the 25% threshold. There is no doubt that the firm expanded worldwide even in the 1960s with intensive product development over several food products. However, the expansion of the firm abroad with real assets occurred only in 2000 when the parent company of Philip Morris acquired Nabisco Holdings and merged the company with Kraft Foods in the same year. Since 2001, Worldscope has reported foreign assets and income of around 20%.

³ MNCs hold cash across multiple countries. Ideally, a better understanding of the relation between MNCs and cash holdings would be to examine foreign cash holdings in each country, instead of focusing on the consolidated level of cash. However, the data for separation of foreign and domestic cash holdings are not available for large samples of firms. The foreign sales measure is widely used in the literature and is also one of two measures used by Pinkowitz et al. (2016). Foreign sales are used as the primary measure by Park et al. (2013), and foreign assets are used in robustness tests.

⁴ Geographic regions are related to continents and are determined as follows: Africa, Asia, Eastern Europe, Latin America, North America, Oceania, Western Europe, and Others (for unclassified regions).

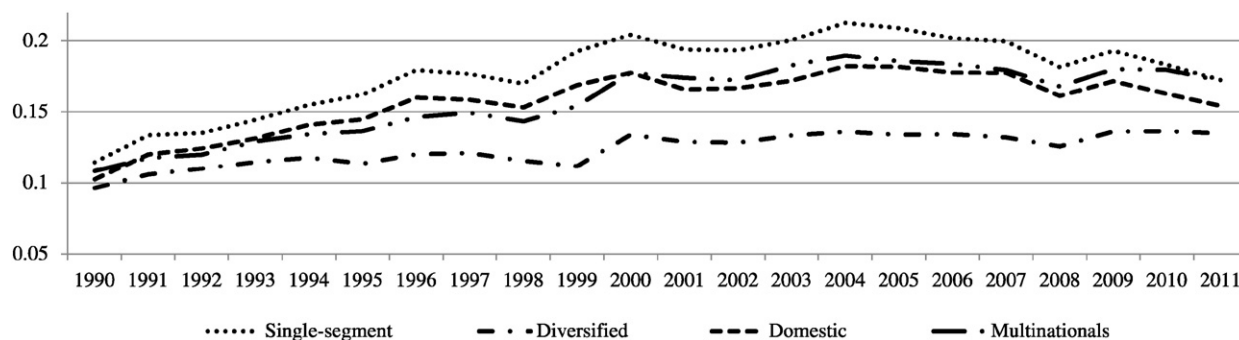


Fig. 1. Annual trend in mean cash ratio. This figure plots the mean values of the cash ratio for industrially diversified, single-segment, multinational and domestic firms for the sample period from 1990 to 2011. Industrial segments are determined with the total number of industrial segments based on two-digit SIC codes each year. Diversified firms are defined as those having two or more product segments based on the two-digit SIC codes. Single-segment firms have only one segment. Multinationals (MNCs) are firms with foreign sales higher than 25% of the consolidated sales in a given year. Cash ratio is the cash and short-term investments/book value of the total assets.

country tax, or a worldwide tax system (0), where firms are allowed to have tax credits for the foreign tax paid when foreign income is repatriated. 35% of the observations pertain to firms located in territorial-tax-system countries. We use two proxies to measure the country-level legal protection for investors: (1) the revised *anti-director rights index* [*Inv.Protection*] by Djankov et al. (2008) and (2) World Bank Governance Indicators [*WBGovIndex*] as a broad definition of country governance measured by the World Bank.⁵ In addition to these variables, we also utilize political stability [*Pol.Stability*] and absence of violence as a separate proxy, it being one of the six dimensions included in *WBGovIndex*. Higher values of these indices indicate better legal protection of investors and institutions. We use the stock-market-capitalization-to-GDP ratio as a percentage [*StockMktCap*] to measure the level of access to equity financing. It is spread over a wide range on average in the sample period, spanning countries from the lowest of 20.13% (Pakistan) to the highest of 177.47% (Switzerland). Annual GDP growth and GDP per capita are obtained from the World Bank's Development Indicators. We use individualism and uncertainty avoidance as two of Hofstede's national cultural dimensions.

Table 2 reports summary statistics of the firm-level variables used.⁶ The mean values of the ratios of cash to total assets [*Cash Ratio*] and foreign sales to total sales [*Foreign Sales*] for the total sample are 16.42% and 18.63%, respectively. The sample covers 28.5% of firms having a foreign sales ratio of 25% or higher [*MNC Dummy*].

Firm industrial diversification is computed using Worldscope's annual product segment information. We extract annual product segment SIC codes and annual sales, which are available for up to 10 different product segments determined by four-digit SIC codes (WC19506 to WC19596 for SIC codes and WC19501 to WC19591 for segment sales). Our industrial diversification metric [*Ind.Diversification*] is the total number of different product segments measured at the two-digit SIC level (following Opler et al., 1999, for the United States).⁷ The number of product segments changes over time as firms concentrate or diversify their business activities.⁸ Firms in our sample have on average 1.54 product segments.

We use a number of control variables found by previous authors to explain cash holdings. Table 2 also reports the mean and median values of our control variables.

3. Geographic and industrial diversification and cash holdings

3.1. The determinants of cash holdings

We start by investigating the relations between cash holdings and two diversification dimensions at the firm level. Table 3 presents results obtained by examining pooled time-series cross-sectional regressions of the cash ratio. Our main variables of interest

⁵ These two proxies are also used by Pinkowitz et al. (2016). *WBGovIndex* is measured by the average of six dimensions, which are voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Even though it is a time-variant variable by country, the values are not available for all sample years, and therefore we calculate it as a grand mean by country.

⁶ Definitions of all of these variables are given in Table 2. We winsorize firm-level variables at the 1% level, except Tobin's Q, net working capital, cash flow, net equity, and net debt issues, which are winsorized at the 5% level.

⁷ Because we have information for the value of annual sales for each four-digit product segment, in the calculation of the total number of two-digit product segments as an alternative industrial diversification metric, we exclude segments having sales of less than 10% of firms' total sales. We also compute a Herfindahl index by using the information from all two-digit product segments reported. The results are robust on the basis of these three alternative proxies.

⁸ Consider the example of Albany International, a US textile multinational company (with 60% foreign sales). In 2000, the company introduced an additional product segment (Fabricated Metal Products, Except Machinery and Transportation Equipment). Press releases on October 4, 2000; <http://www.albint.com>: Albany, New York—Metso Corporation's (NYSE: MX; HEX: MEO) fiber and paper technology business area, Valmet, and Albany International Corp. (NYSE/PSE: AIN) announced today that they have agreed to a program intended to produce a broad cooperation in technology, marketing, sales, and services for the paper industry. From 2000 to 2010, the company continued to report data for three segments. However, in 2011, the number of the company's product segments dropped to two again because of the divestiture of a business unit. Press releases on October 28, 2011 (BUSINESS WIRE); <http://www.albint.com>: Albany International Corp. (NYSE:AIN) announced today that it had agreed to sell its global Albany Door Systems ("ADS") business to ASSA ABLOY AB (the "Buyer") for \$130 million, subject to customary post-closing adjustments.

Table 1

Sample countries and summary statistics. This table reports the number of observations and means of firm- and country-level variables for sample countries. The sample period is from 1990 to 2011. Firm-level variables are Cash Ratio: cash and short-term investments/book value of total assets; Foreign Sales: foreign sales/total sales; Ind.Diversification: total number of industrial segments based on two-digit SIC codes in each year. Country-level variables are as follows: The classification of countries based on the tax system includes territorial (1) and worldwide (0) tax systems. Inv. Protection is the revised *anti*-director rights index by Djankov et al. (2008), WBGovIndex is the World Bank Governance Indicators as a broad definition of country governance measured by the World Bank, and political stability and absence of violence as a separate proxy being one of the six dimensions included in this index. Stock market capitalization to GDP (StockMktCap) and current annual GDP growth are both in percentages. GDP Per Capita as a proxy of economic size is in constant 2005 USD. Individualism and Uncertainty Avoidance are two Hofstede's national culture dimensions.

Country	N	Cash Ratio	Foreign Sales	Ind.Diversification	Territorial tax sys.	Inv. Protection	WBGovIndex	Pol. stability	StockMktCap (%)	GDP growth (%)	GDP per cap.	Individualism	Uncer. avoid.
Argentina	244	0.0715	0.0718	2.0328	0	2	-0.2292	-0.1548	26.69	4.28	5389.63	46	86
Australia	7966	0.1599	0.1921	1.5392	0	4	1.5952	0.9465	103.52	3.14	32,875.28	90	51
Austria	335	0.1374	0.5295	1.7731	1	2.5	1.6099	1.1473	22.62	1.98	37,126.85	55	70
Belgium	541	0.1100	0.4649	1.8909	0	3	1.3196	0.8429	59.73	1.78	35,740.26	75	94
Brazil	443	0.1599	0.1042	1.5734	1	5	0.0198	-0.1090	50.81	3.71	5000.87	38	76
Canada	9648	0.1389	0.3162	1.2753	0	4	1.6215	0.9903	95.23	2.47	33,364.87	80	48
Chile	362	0.0714	0.1176	1.8204	1	4	1.1644	0.5673	100.89	5.21	7329.82	23	86
China	3967	0.1740	0.0622	2.2387	0	1	-0.5350	-0.4874	61.67	10.30	1982.03	20	30
Denmark	1120	0.1546	0.3982	1.9304	1	4	1.8465	1.1720	49.81	1.71	44,646.37	74	23
Finland	1177	0.1372	0.4583	1.8615	1	3.5	1.8802	1.4935	89.04	2.23	35,558.50	63	59
France	4504	0.1387	0.3524	1.9609	1	3.5	1.2230	0.5598	63.30	1.62	32,885.05	71	86
Germany	3241	0.1493	0.4027	1.7226	1	3.5	1.4781	0.8933	42.32	1.50	34,758.38	67	65
Greece	371	0.0985	0.2104	1.8410	1	2	0.5318	0.1666	41.55	-1.30	22,230.45	35	112
Hungary	166	0.0980	0.2245	1.7892	1	2	0.8787	0.8741	22.31	2.42	9726.06	80	82
India	8342	0.0741	0.0831	1.4860	1	5	-0.2554	-1.1966	67.02	7.72	853.68	48	40
Indonesia	2878	0.1226	0.0459	1.7957	0	4	-0.6595	-1.4035	26.65	4.86	1266.63	14	48
Ireland	866	0.1536	0.4422	1.5266	0	5	1.5225	1.2294	52.49	2.95	39,751.03	70	35
Israel	671	0.2068	0.4484	1.7481	0	4	0.5729	-1.3286	70.15	4.28	20,526.49	54	81
Italy	1755	0.1257	0.3396	2.0120	0	2	0.6777	0.5972	32.62	1.17	30,228.08	76	75
Japan	15806	0.1707	0.1285	1.9343	1	4.5	1.1540	0.9914	76.99	0.82	35,134.95	46	92
Malaysia	7623	0.1176	0.1124	2.1966	1	5	0.3664	0.2374	142.91	5.32	5354.95	26	36
Mexico	716	0.0884	0.1041	1.9665	1	3	-0.1075	-0.5276	26.14	3.02	7615.27	30	82
Netherlands	1952	0.1047	0.4625	1.6506	0	2.5	1.7212	1.1244	88.17	2.42	38,257.08	80	53
New Zealand	671	0.0652	0.1882	1.5976	1	4	1.7639	1.2286	40.75	2.59	25,305.30	79	49
Norway	1349	0.1633	0.3417	1.6345	0	3.5	1.7024	1.2871	41.85	2.55	59,364.69	69	50
Pakistan	793	0.1276	0.0110	1.2711	1	4	-0.9939	-2.0653	20.13	3.87	658.68	14	70
Peru	163	0.0839	0.0186	1.8037	0	4.5	-0.3011	-0.9404	44.19	5.79	2969.21	16	87
Philippines	1065	0.1115	0.0312	1.6526	0	4	-0.4224	-1.3868	50.95	4.31	1180.72	32	44
Poland	434	0.1006	0.0970	2.0184	0	2	0.6502	0.6758	25.87	4.27	8471.20	60	93
Portugal	384	0.0516	0.2220	1.7995	0	2.5	1.1285	1.0392	33.53	1.45	17,911.37	27	104
Singapore	5123	0.1731	0.4102	2.0835	0	5	1.4788	1.1202	163.71	6.12	28,072.68	20	8
South Africa	1982	0.1196	0.1293	1.8179	1	5	0.3434	-0.1390	167.01	2.98	5262.21	65	49
Spain	587	0.0987	0.2256	1.8654	1	5	1.0098	-0.0331	58.73	2.34	23,522.82	51	86
Sri Lanka	228	0.1026	0.1385	3.0921	1	4	-0.3523	-1.2695	17.95	5.76	1264.53	35	45
Sweden	2055	0.1395	0.4618	1.8428	0	3.5	1.7499	1.2473	85.83	2.17	38,711.46	71	29
Switzerland	1657	0.1549	0.5270	1.8208	1	3	1.7344	1.2853	177.47	1.57	53,048.54	68	58
Thailand	4030	0.0918	0.0579	1.4211	0	4	-0.0563	-0.6134	56.81	4.04	2534.27	20	64
Turkey	550	0.1119	0.0525	1.3527	0	3	-0.0706	-0.9099	27.30	4.06	7229.71	37	85
United Kingdom	21643	0.1426	0.2601	1.5268	1	5	1.4904	0.5019	120.54	2.36	35,424.80	89	35
United States	85731	0.2004	0.1343	1.3085	0	3	1.3336	0.4299	116.41	2.71	40,499.35	91	46
Total	203139	0.1642	0.1863	1.5491	0.35	3.69	1.0890	0.3988	101.86	3.07	31,903.90	72.58	49.88

Table 2

Descriptive statistics. This table provides descriptive statistics of the firm-level variables used in the analysis. The sample period is from 1990 to 2011. Each variable is defined as follows. Cash Ratio: cash and short-term investments / book value of total assets; Foreign Sales: foreign sales / total sales; MNC Dummy is for firms with foreign sales higher than 25% of the consolidated sales in a given year. # Geo Regions: total number of regions based of geographic sales; Herfindahl index is based on a firm's sales across geographic regions; Ind.Diversification: total number of industrial segments based on two-digit SIC codes in each year; Tobinq: (book value of total assets + market value of common equity – book value of common equity) / book value of total assets; Size: natural logarithm of book value of assets in USD; NWC (net working capital): [(current assets – cash) – current liabilities] / book value of total assets; R&D: R&D/book value of total assets; Cash flow: (net income + depreciation) / book value of total assets; Leverage: book value of total long- and short-term debt/(book value of total long- and short-term debt + book value of common equity + book value of preferred stocks); Capexp: capital expenditures / book value of total assets; Payer: 1 if common dividend is paid, otherwise 0; Acquisitions: net assets from acquisitions / book value of total assets; NetEquityIssues: (net proceeds from sale or issue of common and preferred stocks – stocks purchased, retired, converted, redeemed) / book value of total assets; NetDebtIssues: (long-term borrowings – reduction in long-term debt) / book value of total assets; Tangibility: plant, property, and equipment / book value of total assets. CloselyHeldShares: percentage of shares held by insiders and also by individuals that own 5% or more of a firm's share. The significance of differences is based on a *t*-test for mean differences and a Wilcoxon rank-sum test for median differences, and *** denotes statistical significance at the 1% level.

	Number of observations (N) = 203,139		
	Mean	Median	StdDev.
Cash ratio	0.1642	0.0918	0.1928
Foreign sales	0.1863	0.0000	0.2841
MNC dummy	0.2854	0.0000	0.4516
# of Geo Regions	1.2523	1.0000	0.6195
Herfindahl index	0.8162	1.0000	0.2527
Ind.Diversification	1.5491	1.0000	0.8794
Tobinq	1.8683	1.3263	1.4352
Size	12.0265	12.0289	2.2652
NWC	0.0219	0.0266	0.1932
R&D	0.0349	0.0000	0.1055
CashFlow	0.0092	0.0691	0.2103
Leverage	0.3163	0.2793	0.2793
Capexp	0.0602	0.0385	0.0694
Payer	0.4797	0.0000	0.4996
Acquisitions	0.0176	0.0000	0.0523
NetEquityIssues	0.0507	0.0000	0.1338
NetDebtIssues	0.0079	0.0000	0.0640
Tangibility	0.3045	0.2547	0.2349
CloselyHeldShares	0.5092	0.4756	0.3300

are [*Multinationality*] and [*Ind.Diversification*]. Table 3 reports several regressions for the following alternative measures of multinationality: Foreign Sales, # of Geographic Regions, and the Inverse Herfindahl Index⁹ based on a firm's sales across geographic regions. Standard errors are clustered at the firm level to take into account the fact that residuals may not be independent within a firm. All models include firm and year fixed effects. Firm fixed effects capture other omitted variables correlated with cash holdings. To the extent that these characteristics are specific to a firm but do not change over time, we can control for them with firm fixed effects using pooled cross-sectional time-series data.

In all models, Multinationality is negatively and significantly related to cash holdings. This evidence shows that as a firm's international involvement increases, its sources of revenues are more diversified, and it needs to hold less cash than pure domestic firms.

In addition to diversifying through foreign expansion, firms can also pursue industrial diversification, which can impact cash holdings through firms' internal capital markets.¹⁰ On the positive side (in terms of cash holdings), in diversified firms, corporate headquarters can better plan the firms' cash needs, taking into account the different cycles and the investment needs of each business. Diversification can insulate firms from the costs of external capital markets, through the workings of internal capital markets. As a result, firms that operate across a variety of business segments are better positioned to pursue their investment opportunities in spite of holding lower amounts of cash. On the other hand, there are potential agency conflicts if divisional managers behave as rent-seeking agents and misallocate corporate resources (Rajan et al., 2000; Scharfstein and Stein, 2000). This would suggest higher cash holdings as firms become more diversified. Our results in Table 3 show how industrial diversification is associated with lower cash holdings. This is consistent with evidence provided by Duchin (2010) for the United States.

The coefficients of our control variables are mostly consistent with prior findings (e.g., Bates et al., 2009; Dittmar and Mahrt-Smith, 2007; Foley et al., 2007; Harford et al., 2008; Opler et al., 1999). Firms with greater growth potential, higher cash flows, and equity and debt issues hold higher cash reserves. These characteristics are also related to the firm's financing constraints. Denis and Sibilkov (2010) show that a value of higher cash holdings can stem from the ability of firms to undertake value-increasing projects that might otherwise be forgone. On the other hand, firms with higher net working capital, leverage, capital expenditures and acquisition activities, tangible assets, and dividend payouts hold lower cash reserves. Size affects cash holdings

⁹ We take the inverse of the index to be consistent with all other proxies of diversification. Thus, in our regressions, a higher inverse Herfindahl index implies higher geographic diversification.

¹⁰ See Stein (2003) for a review of the potential benefits and costs of internal capital allocation.

Table 3

Geographic and industrial diversification and cash holdings. This table reports pooled OLS regression results with firm and year fixed effects to obtain the effects of geographic (Multinationality), industrial diversification, and the trade-off between two dimensions on Cash Ratio. The definitions of variables are given in Table 2. Variables of Multinationality and Ind.Diversification are centralized by country in each year to prevent potential multicollinearity. The sample period is from 1990 to 2011. Robust standard errors are provided in brackets and clustered at the firm level. Clustering standard errors at the country/year do not affect the results.

	Foreign Sales				# of Geo Regions			Inverse Herfindahl index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Multinationality	−0.010*** [0.003]		−0.010*** [0.003]	−0.010*** [0.003]	−0.003*** [0.001]	−0.003*** [0.001]	−0.003*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]
Ind.Diversification		−0.004*** [0.001]	−0.005*** [0.001]	−0.005*** [0.001]		−0.005*** [0.001]	−0.005*** [0.001]		−0.004*** [0.001]	−0.005*** [0.001]
Multinationality * Ind.Diversification				0.010*** [0.002]			0.002*** [0.001]			0.003*** [0.001]
Tobinq	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]
Size	−0.005*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]	−0.005*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]	−0.005*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]
NWC	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]	−0.194*** [0.005]
R&D	−0.117*** [0.011]	−0.117*** [0.011]	−0.116*** [0.011]	−0.116*** [0.011]	−0.117*** [0.011]	−0.117*** [0.011]	−0.117*** [0.011]	−0.117*** [0.011]	−0.117*** [0.011]	−0.116*** [0.011]
Leverage	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]	−0.119*** [0.003]
CashFlow	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]	0.043*** [0.004]
Capexp	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]	−0.090*** [0.007]
Payer	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]
Acquisitions	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]	−0.302*** [0.007]
NetEquityIssues	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]	0.201*** [0.004]
NetDebtIssues	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]	0.132*** [0.006]
Tangibility	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]	−0.332*** [0.006]
CloselyHeldShares	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]	−0.005*** [0.002]
Constant	0.359*** [0.014]	0.358*** [0.014]	0.354*** [0.014]	0.354*** [0.014]	0.361*** [0.014]	0.356*** [0.014]	0.356*** [0.014]	0.359*** [0.014]	0.354*** [0.014]	0.354*** [0.014]
Adjusted R-sq	0.754	0.754	0.754	0.754	0.754	0.754	0.754	0.754	0.754	0.754
Observations	203,139	203,139	203,139	203,139	202,426	202,426	202,426	202,497	202,497	202,497
Year	x	x	x	x	x	x	x	x	x	x
Firm	x	x	x	x	x	x	x	x	x	x

*** Denotes statistical significance at 1% level.

negatively. This result indicates that large firms (typically interpreted as indicating firms that have a greater ability to access capital) have less need for cash.

We find that firms with more tangible assets hold less cash. There are at least two explanations for this result. First, tangible assets can be sold if a sudden need for cash arises. Second, firms with more collateral have more access to debt. Indeed, tangibility of assets has been found to be an important determinant of leverage policies (Allayannis et al., 2003; Booth et al., 2001; Fernandes, 2011; Titman and Wessels, 1988).¹¹ The agency problem is another important determinant of cash holdings. Managers in firms with agency problems may waste resources on perks or projects with negative net present values.¹² Such managers prefer to hold more cash to make it easier to extract private benefits. We use the percentage of shares held by insiders and outsiders that own at least 5% of total outstanding shares (from Worldscope) as an additional control. This variable captures ownership of large shareholders, and thus the higher level of ownership may indicate an increase in monitoring activities,¹³ which in turn should reduce cash holdings. On the other hand, this variable may capture concentrated ownership with a few major shareholders, and in turn create agency problems for minority shareholders (with majority shareholders diverting funds to themselves through tunneling). This possibility suggests increased cash holdings in firms with concentrated ownership. In Table 3, the estimated coefficients of the ownership structure variable [*CloselyHeldShares*] are always negative and significant, which indicates that increasing block holding provides better monitoring of managers to reduce cash holdings.

Overall, the results in Table 3 indicate that higher international sales and number of product segments are associated with lower cash holdings. Next, we study the combined impact of global and industry diversification on cash holdings. Morck and Yeung (1991) show that both industrial diversification and international diversification can add value owing to synergies that can be explored by multinational companies. This idea suggests an interaction between global and industrial diversification. If they complement each other, a negative relation should exist between this interaction variable and cash holdings. Otherwise, a positive relation would suggest a trade-off between the two dimensions of diversification, and industrial diversification would not create any additional impact on the firm's cash holdings once a firm becomes geographically diversified.

To explore the hypothesis that the effects of the two dimensions of diversification are interconnected, we expand the baseline model by including an interaction term between geographic and industrial diversification. We report the results in Table 3, columns 4, 7, and 10.¹⁴ The results still show a negative and significant relationship between cash holdings and both multinationality and industrial diversification. However, the estimated coefficients of the interaction term between two dimensions of diversifications are positive and significant. This captures the mechanism by which MNCs selling multiple products in multiple geographic regions hold more cash than focused MNCs. This supports the idea that industrial diversification in global diversified firms has no additional impact on the firm's cash holdings.

4. Country-level tests

In this section, we examine the effects of tax systems, stock market development, legal protection of investors, political stability, economic size and growth, and national culture on the relationship between cash holdings and two dimensions of diversification (geographical and industrial) and the trade-off between the two dimensions. Thus, we aim to identify cross-country asymmetries pertaining to those factors.

Table 1 documents the fact that the number of observations in each country is different, and some countries, such as United States, United Kingdom, and Japan, have more than 15,000 firm-year observations, whereas others have fewer than 1000 firm-year observations. Therefore, including country-level and firm-level variables together in empirical analysis becomes problematic because any tests performed by using firm-level observations give equal weights to each firm, and the results can be attributed to the countries with an extreme number of observations. Therefore, we use a two-stage estimation procedure. In the first stage, we estimate the slope coefficients of the two dimensions of diversification and the interaction between the two dimensions for each country. This estimation uses the same variables employed in model 4 (Foreign Sales), model 7 (# of Geo Regions), and model 10 (Inverse Herfindahl Index) in Table 3. This analysis is performed by a single estimation of country-specific coefficients for each of our three key variables of interest (geographic and industrial diversifications and the interaction between the two). In the second stage, we use those estimates and regress them against country-level determinants, using both Ordinary Least Squares (OLS) and Weighted Least Squares (WLS) estimation, where the weight is the inverse of the standard errors of the country-level estimated coefficients (thus, we place more weights on countries in which the first-stage regression coefficients are estimated more precisely).¹⁵

¹¹ Falato et al. (2013) develop a dynamic model of corporate cash holdings that suggests that greater amounts of intangible assets reduce firms' debt capacity and lead them to hold more cash in order to preserve financial flexibility. Also, tangibility of assets has been related to the investment–cash flow sensitivity by Almeida and Campello (2007).

¹² Tong (2011) investigates the relationship between the value of cash and the level of industrial diversification and finds that agency problems in diversified firms reduce the value of cash holdings.

¹³ This would not be accepted as an ideal variable to include the role of ownership structure in capturing agency problems. For a large international sample, we are restricted to the coverage of Worldscope, which only provides a combined ownership structure by insider and outsider block owners.

¹⁴ One potential problem for including the interaction term between two continuous variables is multicollinearity between the interaction term and continuous variables. As Aiken and West (1991) recommend, we centralize diversification variables, Multinationality and Ind.Diversification, in all regression models reported in Table 3 to prevent this problem.

¹⁵ We are grateful to the referee for suggesting this analysis.

Table 4

Second-stage country-level OLS and WLS regressions. This table reports country-level OLS and WLS regression results from the second stage, where the dependent variables are main regressors' estimated coefficient obtained from our basic regressions with firm and year fixed effects in Table 3 for each country in the first step. The weight is the inverse of the standard errors of the country-level estimated coefficients. This second-step country-level regressions evaluate the effects of several country-level factors: The classification of countries based on the tax system includes territorial (1) and worldwide (0) tax systems. Inv.Protection is the revised anti-director rights index by Djankov et al. (2008), WBGovIndex is the World Bank Governance Indicators as a broad definition of country governance measured by the World Bank, and political stability and absence of violence as a separate proxy being one of the six dimensions included in this index. Stock market capitalization to GDP (StockMktCap) and current annual GDP growth are both in percentages. GDPPerCapita as a proxy of economic size is in constant 2005 USD. Individualism and UncerAvoidance are two Hofstede's national culture dimensions. The sample period is from 1990 to 2011. Robust standard errors are provided in brackets.

	OLS				WLS					
<i>Panel A: Country-level effects on geographical diversification (foreign sales)</i>										
Territorial	−0.032*	−0.033*			−0.016**	−0.015*				
	[0.016]	[0.017]			[0.007]	[0.008]				
Inv.Protection	−0.001	−0.002			−0.001	−0.002				
	[0.006]	[0.006]			[0.003]	[0.003]				
WBGovIndex	−0.005				−0.014*					
	[0.014]				[0.007]					
Pol.Stability		0.00					−0.01			
		[0.013]					[0.007]			
StockMktCap			−0.003	−0.001			−0.007	0		
			[0.018]	[0.013]			[0.011]	[0.010]		
GDP growth			0.507				0.467***			
			[0.317]				[0.172]			
GDPPerCapita				−0.001				−0.007*		
				[0.009]				[0.004]		
Individualism					−0.01					−0.025
					[0.044]					[0.016]
UncerAvoidance					0.037*					0.006
					[0.021]					[0.016]
Constant	0.022	0.019	−0.018	0.01	−0.021	0.019*	0.015	−0.015	0.064	0.006
	[0.017]	[0.017]	[0.016]	[0.096]	[0.029]	[0.011]	[0.012]	[0.011]	[0.042]	[0.014]
Adjusted R-sq	0.067	0.058	−0.002	−0.052	−0.009	0.127	0.078	0.068	0.044	−0.005
Observations	40	40	40	40	40	40	40	40	40	40
<i>Panel B: Country-level effects on industrial diversification</i>										
Territorial	0.003	0.003			0.002					
	[0.002]	[0.002]			[0.002]					
Inv.Protection	0.00	0.00			−0.001	−0.001				
	[0.001]	[0.001]			[0.001]	[0.001]				
WBGovIndex	−0.003				−0.003**					
	[0.002]				[0.001]					
Pol.Stability		−0.002					−0.002			
		[0.002]					[0.001]			
StockMktCap			−0.008***	−0.007***			−0.008***	−0.007***		
			[0.003]	[0.002]			[0.002]	[0.002]		
GDP growth			0.013				0.026			
			[0.033]				[0.031]			
GDPPerCapita				−0.001				−0.001		
				[0.001]				[0.001]		
Individualism					−0.008					−0.008**
					[0.006]					[0.004]
UncerAvoidance					0.001					0.004
					[0.004]					[0.004]
Constant	0.002	0.001	0.006**	0.014	0.004	0.003	0.002	0.004*	0.014**	0.001
	[0.003]	[0.003]	[0.002]	[0.011]	[0.005]	[0.003]	[0.003]	[0.002]	[0.006]	[0.003]
Adjusted R-sq	0.045	0.013	0.189	0.216	0.016	0.072	0.007	0.258	0.287	0.089
Observations	40	40	40	40	40	40	40	40	40	40
<i>Panel C: Country-level effects on trade-off between geographical (foreign sales) and industrial diversification</i>										
Territorial	0.011	0.01			0.004	0.003				
	[0.020]	[0.021]			[0.009]	[0.009]				
Inv.Protection	−0.004	−0.001			0	0.001				
	[0.009]	[0.008]			[0.004]	[0.004]				
WBGovIndex	0.022*				0.011*					
	[0.013]				[0.006]					
Pol.Stability		0.018*					0.010*			
		[0.010]					[0.006]			
StockMktCap			0.021	0.009			0.01	0.005		
			[0.015]	[0.009]			[0.008]	[0.007]		
GDP growth			−0.603				−0.183			
			[0.515]				[0.186]			
GDPPerCapita				0.013*				0.005		

(continued on next page)

Table 4 (continued)

	OLS				WLS								
Individualism					[0.007]						[0.003]		
						0.067							0.030*
						[0.047]							[0.016]
UncerAvoidance						−0.042							−0.022*
						[0.028]							[0.011]
Constant	−0.011	−0.008	0.002	−0.129	−0.012	−0.007	−0.005	0.002	−0.052	0.001	−0.052	0.004	0.001
	[0.019]	[0.019]	[0.012]	[0.079]	[0.023]	[0.012]	[0.011]	[0.009]	[0.035]	[0.010]	[0.035]	[0.004]	[0.010]
Adjusted R-sq	0.053	0.037	0.023	0.06	0.089	−0.002	−0.009	−0.022	0.004	0.049	−0.022	0.004	0.049
Observations	40	40	40	40	40	40	40	40	40	40	40	40	40
<i>Panel D: Country-level effects on geographical diversification (# of Geo Regions)</i>													
Territorial	0.022	0.021					−0.001	−0.001					
	[0.021]	[0.021]					[0.003]	[0.003]					
Inv.Protection	−0.012	−0.011					−0.001	−0.001					
	[0.010]	[0.008]					[0.001]	[0.001]					
WBGovIndex	0.011						−0.002						
	[0.012]						[0.003]						
Pol.Stability		0.009						−0.001					
		[0.009]						[0.002]					
StockMktCap			0.006	0.00				−0.005	−0.003				
			[0.013]	[0.008]				[0.003]	[0.003]				
GDP growth			−0.429					0.105*					
			[0.561]					[0.059]					
GDPPerCapita				0.007					−0.001				
				[0.007]					[0.001]				
Individualism						0.055							−0.001
						[0.050]							[0.005]
UncerAvoidance						−0.015							0.006
						[0.029]							[0.005]
Constant	0.014	0.015	0	−0.071	−0.029	0.006	0.004	−0.002	0.01	−0.005	−0.002	0.01	−0.005
	[0.013]	[0.013]	[0.008]	[0.077]	[0.021]	[0.005]	[0.005]	[0.003]	[0.016]	[0.004]	[0.003]	[0.016]	[0.004]
Adjusted R-sq	0.032	0.027	−0.025	−0.028	0.017	−0.044	−0.06	−0.003	−0.023	−0.041	−0.003	−0.023	−0.041
Observations	40	40	40	40	40	40	40	40	40	40	40	40	40
<i>Panel E: Country-level effects on trade-off between geographical (# of Geo Regions) and industrial diversification</i>													
Territorial	0.015	0.015					−0.001	−0.002					
	[0.016]	[0.016]					[0.003]	[0.003]					
Inv.Protection	−0.002	0.00					0.002	0.002					
	[0.007]	[0.006]					[0.001]	[0.001]					
WBGovIndex	0.012						0.004**						
	[0.009]						[0.002]						
Pol.Stability		0.009						0.002*					
		[0.008]						[0.001]					
StockMktCap			0.011	0.005				0.001	0.00				
			[0.010]	[0.005]				[0.003]	[0.002]				
GDP growth			−0.467					−0.072					
			[0.401]					[0.072]					
GDPPerCapita				0.006					0.002				
				[0.006]					[0.001]				
Individualism						0.039							0.009*
						[0.035]							[0.004]
UncerAvoidance						−0.038*							−0.011**
						[0.021]							[0.004]
Constant	−0.017	−0.015	0.002	−0.062	−0.002	−0.008	−0.007	0.002	−0.017	0.002	−0.017	0.002	0.002
	[0.010]	[0.011]	[0.007]	[0.060]	[0.015]	[0.006]	[0.006]	[0.004]	[0.011]	[0.004]	[0.011]	[0.004]	[0.004]
Adjusted R-sq	0.021	−0.001	0.015	−0.01	0.073	−0.005	−0.026	−0.037	−0.018	0.049	−0.037	−0.018	0.049
Observations	40	40	40	40	40	40	40	40	40	40	40	40	40
<i>Panel F: Country-level effects on geographical diversification (inverse Herfindahl index)</i>													
Territorial	−0.006	−0.006					−0.002	−0.001					
	[0.005]	[0.005]					[0.003]	[0.003]					
Inv.Protection	−0.002	−0.002					−0.001	−0.001					
	[0.002]	[0.002]					[0.001]	[0.001]					
WBGovIndex	−0.005						−0.004*						
	[0.004]						[0.003]						
Pol.Stability		−0.003						−0.003					
		[0.004]						[0.003]					
StockMktCap			−0.009	−0.006				−0.007**	−0.005				
			[0.005]	[0.004]				[0.003]	[0.003]				
GDP growth			0.176*					0.120**					
			[0.100]					[0.056]					

Table 4 (continued)

	OLS				WLS						
GDPPerCapita				−0.002 [0.003]						−0.002 [0.002]	
Individualism					−0.008 [0.011]						−0.005 [0.005]
UncerAvoidance					0.023** [0.009]						0.011* [0.006]
Constant	0.013* [0.007]	0.011 [0.007]	0 [0.006]	0.024 [0.026]	−0.01 [0.008]	0.007 [0.005]	0.005 [0.005]	0 [0.004]	0.022 [0.016]	−0.006 [0.005]	
Adjusted R-sq	0.069	0.022	0.058	0.032	0.118	0.047	0.005	0.071	0.073	0.037	
Observations	40	40	40	40	40	40	40	40	40	40	
<i>Panel G: Country-level effects on trade-off between geographical (inverse Herfindahl index) and industrial diversification</i>											
Territorial	0.003 [0.008]	0.003 [0.008]				0 [0.003]	0 [0.003]				
Inv.Protection	−0.002 [0.003]	−0.001 [0.003]				−0.001 [0.001]	0 [0.001]				
WBGovIndex	0.007 [0.004]					0.004* [0.002]					
Pol.Stability		0.005 [0.004]					0.003 [0.002]				
StockMktCap			0.006 [0.005]	0.002 [0.003]				0.003 [0.002]	0.001 [0.002]		
GDP growth			−0.199 [0.189]					−0.072 [0.068]			
GDPPerCapita				0.004 [0.003]					0.002* [0.001]		
Individualism					0.023 [0.016]						0.012** [0.005]
UncerAvoidance					−0.018* [0.010]						−0.010** [0.004]
Constant	−0.002 [0.006]	0 [0.007]	0.001 [0.004]	−0.042 [0.027]	−0.003 [0.007]	−0.001 [0.004]	0 [0.004]	0.001 [0.003]	−0.022* [0.012]	0 [0.003]	
Adjusted R-sq	0.017	−0.015	0.005	0.032	0.097	−0.01	−0.04	−0.023	0.017	0.094	
Observations	40	40	40	40	40	40	40	40	40	40	

*** Denotes statistical significance at 1% level.

** Denotes statistical significance at 5% level.

* Denotes statistical significance at 10% level.

The results from country-level tests are reported in Table 4. Panels A, B, and C report the results for country-level effects on the country-level estimated coefficients of foreign sales, industrial diversification, and the interaction between the two, respectively. Panels D and E report the results by using # of geographic regions, and Panels F and G report the results by using the inverse Herfindahl index to measure multinationality. The estimation used is OLS in the first part and WLS in the second part of each panel. We have to include some country-level variables separately in different models because of the high correlation between pairs of those variables. In the end, we have three proxies for multinationality (foreign sales, # of regions, Herfindahl), with OLS and WLS. In the discussion below, we focus on coefficients that are significant in at least three out of the six potential estimations in Panels A–G.

4.1. Tax systems

We use the classification by Markle (2010), of countries applying territorial and worldwide tax systems, to examine if the difference in tax treatment of foreign income creates international differences for the impact of diversification strategies. In territorial countries, foreign income is exempted from home-country tax, whereas in worldwide tax systems, such as in the United States, home corporate marginal tax rate is applied to tax foreign income, and firms are allowed to have tax credits for the foreign tax paid when foreign income is repatriated. Thus, MNCs in countries applying a worldwide tax system will be subject to their home countries' corporate tax rate when they repatriate their foreign earnings and pay extra tax in the case of a lower tax rate in foreign countries.

Foley et al. (2007) show that US firms increase their cash holdings abroad to ease this tax burden. However, there is no prior evidence to indicate that diversification efficiency would work differently in these two different tax systems. One argument would be that if the worldwide tax system creates a tax cost from repatriations of foreign income, we would expect to see that MNCs from countries applying this tax system will not be willing to reduce their cash holdings, because of their diversified operations. Therefore, it is highly likely that MNCs from territorial tax systems will be willing to reduce their cash holdings because of the tax treatment. This argument suggests that diversification strategies would be more efficient in reducing the amount of cash holdings in countries where territorial tax is applied, and then the possibility of the trade-off between the two dimensions would exist for firms operating in those countries.

The estimated coefficients of [*Territorial*] on geographic diversification are negative and significant in only Panel A, where we use foreign sales with both OLS and WLS estimations. This result indicates that the impact of geographic diversification on cash holdings is more negative in countries with a territorial tax system relative to a worldwide tax system. Because this finding disappears with other proxies of multinationality, we interpret this finding as weaker evidence for the role of tax systems in explaining the cash holdings of MNCs.

4.2. Legal protections of investors

Agency problems have been considered one of the major issues in both cash holdings and diversification strategies in the literature. Because of the possibility that managers can easily convert cash to their private benefits, strong country legal protection of investors plays a role in reducing agency problems by restricting the amount of cash holdings in comparison to the scenario with weak legal protection (Dittmar et al., 2003; Kalcheva and Lins, 2007). Kurnadi and Wei (2011) demonstrate that the relationship between changes in cash holding and increasing cash flow is significantly negative in countries with strong legal protection of investors. Chen and Chen (2012) show that the efficiency of diversification strategies in allocation of investments increases with strong governance and shareholder rights.

We use three different proxies to measure the country level of legal protection: 1) the revised *anti*-director rights index by Djankov et al. (2008); 2) the World Bank Governance Index (*WBGovIndex*) as a broad definition of country governance measured by the World Bank; 3) political stability and absence of violence, also from the World Bank. On the basis of the existence of evidence for the disciplinary role of strong investor protection leading to a lower level of cash and efficiency of diversification strategies, we would expect to see that the negative associations between cash holdings and the two diversification strategies are stronger in countries with better legal protection of investors. If this were the case, we would also expect to see that legal protection also affects the trade-off between geographic and industrial diversification.

The results in Table 4 are in line with our expectation. The estimated coefficients of [*WBGovIndex*] are negative and significant when we use foreign sales (Panel A) and the inverse Herfindahl index (Panel F). This finding shows that the impact of geographic diversification on cash holdings becomes more negative with stronger legal protection of investors. We observe the same outcome for the impact of industrial diversification on cash holdings (Panel B). This evidence shows that the diversification strategies of firms are more efficient at reducing cash holdings in countries with better investor protection and institutional development. Then, we would expect to see a trade-off between the two diversification strategies in those countries. The results in Panels C, E, and G show that this is indeed the case, with positive and significant coefficients of [*WBGovIndex*] with WLS estimates.

4.3. Stock market development

Financial market development ensures the adequate availability of less costly external funds (Love, 2003; Khurana et al., 2006), enabling financial constraints to be relaxed. This implies that firms in countries with higher financial market development do not need to hold such high levels of precautionary cash.

We use the stock-market-capitalization-to-GDP ratio to measure the level of access to equity financing. We expect the negative associations between cash holdings and the two diversification strategies to become more negative in countries with higher stock market development. We only observe a negative and significant association at the 1% level between [*StockMktCap*] and the effect of industrial diversification on cash holdings (Panel B). These results indicate that in countries with high access to equity financing, industrial diversification reduces the need for precautionary cash holdings.

4.4. Economic activity

Fauver et al. (2004) compare the value of both international and industrial strategies across US, UK, and German firms, to test the idea that diversification strategies have a similar effect for different developed countries. Similarly, we consider the fact that international differences for the effects of diversification strategies would be related to the degree of countries' development, which would also affect the level of cash holdings. We measure economic growth by the current GDP growth and predict that MNCs from high-growth countries will prefer to have large cash holdings in order to avoid missing growth opportunities.

We find that, using all three proxies of multinationality, higher [*GDP growth*] significantly increases (makes less negative) the impact of geographic diversification on cash holdings (Panels A, D, and G). This strong result implies that MNCs in countries with higher economic growth increase their cash holdings to finance their multinational expansion.

4.5. National culture: individualism and uncertainty avoidance

Recent evidence shows that some national culture dimensions explain the variation in cash holdings. Chen et al. (2015) argue that there would be a negative relationship between cash holdings and individualism because managers spend cash by becoming overly optimistic about future earnings creation. They also predict a positive relationship with uncertainty avoidance because managers prefer to hold more cash when they fear more uncertainty regarding future cash flows. We use Hofstede's cultural dimension to measure individualism and uncertainty avoidance. We do not have any prior expectation for the role of these two cultural dimensions on the effects of geographic and industrial diversification on cash holdings and the trade-off between the two. However, on the basis of the recent findings, we expect individualism also to support the negative relationship between

diversification dimensions and cash holdings and the trade-off between the two. On the other hand, uncertainty avoidance also prevent managers from participating in diversification activities, thus leading to higher cash holdings and a decrease in the importance of the trade-off.

[*UncerAvoidance*] has positive and significant coefficients on multinationality (panels A and F). On the other hand, our results indicate the importance of national culture for the trade-off between the two diversification strategies and cash holdings. We find that higher [*Individualism*] increases the importance of the trade-off effect, whereas [*UncerAvoidance*] has a negative impact on the trade-off effect.

5. Additional analyses

5.1. Firm-level weighted least squares regressions

Our firm-level analysis in Table 3 gives equal weights to each firm, which raises a concern that the results are mainly attributable to countries with a higher number of observations. In this section, we perform firm-level tests by running WLS regressions to show that our results in Table 3 are not affected by the bigger representation of some countries in our sample.

In Table 5, we perform pooled time-series cross-sectional regressions by using WLS estimation with firm and year fixed effects. The weight we use is the inverse of the square root of the total number of firm-year observations for each country. We again report the results with three proxies of multinationality in two models. In addition to our previous estimation by clustering

Table 5

Firm-level WLS regressions. This table reports pooled WLS regression results, where the weight is the inverse of the squared root of total number of firm-year observations from each country, with firm and year fixed. The definitions of variables are given in Table 2. Variables of Multinationality and Ind.Diversification are centralized by country in each year to prevent potential multicollinearity. The sample period is from 1990 to 2011. Robust standard errors are provided in brackets and clustered at the firm level (Model 1) and at country-year (Model 2).

	Foreign Sales		# of Geo Regions		Inverse Herfindahl Index	
	(1)	(2)	(1)	(2)	(1)	(2)
Multinationality	−0.008** [0.003]	−0.008*** [0.002]	−0.003** [0.001]	−0.003*** [0.001]	−0.004*** [0.001]	−0.004*** [0.001]
Ind.Diversification	−0.001 [0.001]	−0.001** [0.001]	−0.001 [0.001]	−0.001** [0.001]	−0.001 [0.001]	−0.001** [0.001]
Multinationality * Ind.Diversification	0.010*** [0.003]	0.010*** [0.002]	0.002** [0.001]	0.002*** [0.001]	0.003*** [0.001]	0.003*** [0.001]
Tobinq	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]
Size	−0.005*** [0.001]	−0.005*** [0.001]	−0.005*** [0.001]	−0.005*** [0.001]	−0.005*** [0.001]	−0.005*** [0.001]
NWC	−0.208*** [0.006]	−0.208*** [0.006]	−0.207*** [0.006]	−0.207*** [0.006]	−0.207*** [0.006]	−0.207*** [0.006]
R&D	−0.114*** [0.013]	−0.114*** [0.011]	−0.115*** [0.013]	−0.115*** [0.011]	−0.114*** [0.013]	−0.114*** [0.011]
Leverage	−0.121*** [0.004]	−0.121*** [0.004]	−0.122*** [0.004]	−0.122*** [0.004]	−0.122*** [0.004]	−0.122*** [0.004]
CashFlow	0.052*** [0.005]	0.052*** [0.005]	0.052*** [0.005]	0.052*** [0.005]	0.051*** [0.005]	0.051*** [0.005]
Capexp	−0.102*** [0.008]	−0.102*** [0.008]	−0.102*** [0.008]	−0.102*** [0.008]	−0.102*** [0.008]	−0.102*** [0.008]
Payer	0.008*** [0.001]	0.008*** [0.001]	0.008*** [0.001]	0.008*** [0.001]	0.008*** [0.001]	0.008*** [0.001]
Acquisitions	−0.277*** [0.008]	−0.277*** [0.009]	−0.276*** [0.008]	−0.276*** [0.009]	−0.276*** [0.008]	−0.276*** [0.009]
NetEquityIssues	0.196*** [0.005]	0.196*** [0.007]	0.195*** [0.005]	0.195*** [0.007]	0.195*** [0.005]	0.195*** [0.007]
NetDebtIssues	0.124*** [0.006]	0.124*** [0.006]	0.124*** [0.006]	0.124*** [0.006]	0.124*** [0.006]	0.124*** [0.006]
Tangibility	−0.292*** [0.007]	−0.292*** [0.006]	−0.291*** [0.007]	−0.291*** [0.006]	−0.291*** [0.007]	−0.291*** [0.006]
CloselyHeldShares	−0.003* [0.002]	−0.003* [0.002]	−0.003* [0.002]	−0.003* [0.002]	−0.003* [0.002]	−0.003* [0.002]
Constant	0.343*** [0.016]	0.343*** [0.012]	0.343*** [0.016]	0.343*** [0.013]	0.342*** [0.016]	0.342*** [0.013]
Adjusted R-sq	0.742	0.742	0.742	0.742	0.742	0.742
Observations	203,139	203,139	202,426	202,426	202,497	202,497
Year	x	x	x	x	x	x
Firm	x	x	x	x	x	x

*** Denotes statistical significance at 1% level.

** Denotes statistical significance at 5% level.

* Denotes statistical significance at 10% level.

Table 6

Firm-level regressions excluding firms from United States, United Kingdom, and Japan. This table reports pooled OLS regression results with firm and year fixed effects. The definitions of variables are given in Table 2. Variables of Multinationality and Ind.Diversification are centralized by country in each year to prevent potential multicollinearity. The sample period is from 1990 to 2011. Robust standard errors are provided in brackets and clustered at the country-year.

	Foreign Sales	# of Geo Regions	Inverse Herfindahl Index
Multinationality	−0.008*** [0.002]	−0.003*** [0.001]	−0.003*** [0.001]
Ind.Diversification	−0.002*** [0.001]	−0.002*** [0.001]	−0.002*** [0.001]
Multinationality * Ind.Diversification	0.012*** [0.002]	0.002*** [0.001]	0.002*** [0.001]
Tobinq	0.006*** [0.001]	0.006*** [0.001]	0.006*** [0.001]
Size	−0.009*** [0.001]	−0.009*** [0.001]	−0.009*** [0.001]
NWC	−0.209*** [0.006]	−0.210*** [0.006]	−0.210*** [0.006]
R&D	−0.103*** [0.023]	−0.104*** [0.024]	−0.104*** [0.024]
Leverage	−0.129*** [0.004]	−0.130*** [0.004]	−0.129*** [0.004]
CashFlow	0.043*** [0.006]	0.043*** [0.006]	0.043*** [0.006]
Capexp	−0.095*** [0.009]	−0.094*** [0.009]	−0.094*** [0.009]
Payer	0.008*** [0.001]	0.008*** [0.001]	0.008*** [0.001]
Acquisitions	−0.269*** [0.012]	−0.269*** [0.012]	−0.269*** [0.012]
NetEquityIssues	0.197*** [0.008]	0.197*** [0.008]	0.197*** [0.008]
NetDebtIssues	0.128*** [0.007]	0.128*** [0.006]	0.128*** [0.006]
Tangibility	−0.283*** [0.006]	−0.282*** [0.006]	−0.282*** [0.006]
CloselyHeldShares	−0.006*** [0.002]	−0.006*** [0.002]	−0.006*** [0.002]
Constant	0.376*** [0.016]	0.377*** [0.016]	0.375*** [0.016]
Adjusted R-sq	0.714	0.714	0.714
Observations	101,602	101,125	101,174
Year	x	x	x
Firm	x	x	x

*** Denotes statistical significance at 1% level.

standard errors at the firm level [Model (1)], we estimate robust standard errors clustered at the country-year levels [Model (2)]. The results for all proxies are consistent with the results in Table 3.

In Table 6, we run the same regressions in Table 5, but excluding three countries with extreme numbers for firm-year observations: the United States, the United Kingdom, and Japan. The results are unchanged.

This evidence confirms our results for the negative effects of both geographic and industrial diversification and the positive joint effect, which is the trade-off between the two dimensions of diversification.

5.2. Causality and panel vector-autoregression methodology

So far, our approach to analyzing the relationship between diversification strategies and cash holdings has been to examine if cash holdings in a given period are determined by the levels of geographical and industrial diversification activities during that period. Holtz-Eakin et al. (1988) offer vector-autoregression estimation with panel data to analyze possible dynamic relationships among variables that would be interdependent (causality). It is possible that the current level of cash; a measure of international diversification, such as foreign sales; and industrial diversification are affected by their own level, as well as the level of other variables in the previous year(s). Furthermore, the use of debt is another potential candidate to create causality in this dynamic relationship. Jensen (1986) argues that leverage can reduce agency costs by forcing managers to use a higher level of cash, which can be used to extract private benefits, instead of using the extra cash to pay off debt. Thus, performing vector autoregressions with our large panel data would be an appropriate technique to disentangle possible causality effects.

To capture dynamic relationships between cash holdings and the two dimensions of diversification and leverage, we perform Panel Vector Autoregressive (PVAR) with one lag and GMM estimation, which captures firm-specific effects that are consistent

with our earlier specification. We use variables [Cash Ratio], [Multinationality], [Ind.Diversification], and [Leverage] as endogenous variables, and one lag of all other control variables are included as exogenous variables to obtain the effects of geographic and industrial diversification on Cash Ratio. To save space, we report the results with only foreign sales in Table 7. We observe from the equation of [Cash Ratio] that our main results – the negative and significant effects of multinationality and industrial diversification – hold. We also find that past level of foreign sales increases the level of industrial diversification, whereas past industrial diversification reduces the level of foreign sales.

6. Conclusion

We study the relation between both geographic and industrial diversification and cash holdings for a large worldwide sample of firms for the period 1990–2011. We find a negative relation between both dimensions of diversification (the level of multinationality and industrial diversification) and cash holdings at the firm level. These results with our different proxies for internationalization suggest that there are economies of scale in cash management in MNCs, and as they globalize into different markets, they can reduce their average cash holdings. We also find a negative impact of industrial diversification on cash holdings.

When we examine the interrelationship between global expansion and industrial expansion, we find that geographic diversification and industrial diversification are not independent, and a significant trade-off exists. MNCs selling multiple products in multiple geographic regions hold more cash than focused MNCs. This supports the idea that the effect of industrial diversification on the firm's cash holdings in globally diversified firms is significantly reduced and, according to some measures, it has no additional impact.

We also provide evidence that multinationality and industry diversification play different roles in countries with different characteristics. The results suggest that when firms from different environments globalize, their cash needs differ. MNCs from countries with stronger legal protection of investors or better access to financing efficiently utilize any diversification benefits. In addition, MNCs in countries with higher GDP growth prefer to have larger cash holdings (in order to avoid missing growth opportunities) regardless of their diversification perspectives. In nations with less individualism and high uncertainty avoidance, the

Table 7

Panel vector autoregressive (VAR) estimation results. This table reports Panel Vector Autoregressive (PVAR) GMM estimation using variables Cash Ratio, Multinationality, Ind.Diversification, and Leverage as endogenous variables, and one lag of all other variables are included as exogenous variables to obtain the effects of geographic and industrial diversification on Cash Ratio. The definitions of variables are given in Table 2. The sample period is from 1990 to 2011. Robust standard errors are provided in brackets, and clustered at the firm level.

	Cash Ratio	Foreign Sales	Ind.Diversification	Leverage
Cash Ratio (t – 1)	1.240*** [0.051]	–0.009 [0.021]	–0.240*** [0.065]	–0.415*** [0.046]
Multinationality (t – 1)	–0.052*** [0.020]	0.533*** [0.030]	0.068** [0.027]	0.01 [0.017]
Ind.Diversification (t – 1)	–0.019*** [0.007]	–0.009*** [0.003]	0.769*** [0.022]	0.004 [0.004]
Leverage (t – 1)	–0.239*** [0.028]	–0.013 [0.013]	0.232*** [0.083]	1.263*** [0.216]
Tobinq (t – 1)	–0.010*** [0.001]	0.001 [0.002]	0.018*** [0.005]	0.025*** [0.003]
Size (t – 1)	–0.009 [0.009]	0.035*** [0.004]	–0.033*** [0.011]	0.061*** [0.014]
NWC (t – 1)	0.235*** [0.017]	–0.004 [0.013]	0.101* [0.053]	0.801*** [0.098]
R&D (t – 1)	0.284*** [0.026]	0.086*** [0.027]	–0.095*** [0.022]	0.353*** [0.046]
CashFlow (t – 1)	–0.158*** [0.034]	–0.028*** [0.009]	0.140*** [0.046]	0.159* [0.094]
Capexp (t – 1)	–0.234*** [0.077]	–0.091*** [0.024]	0.181*** [0.064]	0.558*** [0.039]
Payer (t – 1)	0.02 [0.027]	0.007 [0.007]	–0.009 [0.027]	0.032 [0.031]
Acquisitions (t – 1)	0.762*** [0.053]	–0.039* [0.022]	–0.184** [0.076]	–0.408*** [0.038]
NetEquityIssues (t – 1)	–0.494*** [0.030]	–0.034*** [0.012]	0.127*** [0.039]	0.413*** [0.061]
NetDebtIssues (t – 1)	0.047* [0.026]	–0.026 [0.019]	–0.142** [0.069]	–1.325*** [0.189]
Tangibility (t – 1)	1.041*** [0.103]	0.027 [0.034]	–0.319*** [0.073]	–0.526*** [0.051]
CloselyHeldShares (t – 1)	0.004 [0.005]	0.004 [0.004]	0.006 [0.008]	0.006 [0.009]
Observations	137,937	137,937	137,937	137,937

*** Denotes statistical significance at 1% level.

** Denotes statistical significance at 5% level.

* Denotes statistical significance at 10% level.

trade-off between two dimensions of diversification is significant. These results confirm the fact that the relationships between cash holdings and geographic and industrial diversification depend also some country-level characteristics.

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