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**Contraction under Minimum Wages?  
Operational and Financial Advantages of Multinational Subsidiaries in China**

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**Abstract:** The advantages of multinational enterprises (MNEs) over domestic firms have been widely acknowledged in several streams of literature. However, a more refined analysis on the sources of their advantages is lacking. Exploiting minimum wage hikes in China as an exogenous shock, we theorize that, due to multinational advantages, the employment of multinational subsidiaries may be less affected by minimum wages than that of domestic firms, and that their multinational advantages arise from both operational and financial advantages. Using nation-wide longitudinal firm data from 1998 to 2007 and border discontinuity design (BDD) to estimate the causal effects, we find supportive evidence for our hypotheses. We contribute to the literature on multinational advantages and minimum wages.

**Key Words:** Multinational advantages; Minimum wages, employment; China; dual-purpose subsidiaries; operational flexibility; internal capital markets (ICMs).

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## Contraction under Minimum Wages?

### Operational and Financial Advantages of Multinational Subsidiaries in China

#### Introduction

The advantages of multinational enterprises (MNEs) over domestic firms<sup>1</sup> are widely acknowledged in several streams of the literature. For example, in international business (IB) literature, Hymer (1976) first raised the notion that MNEs must possess some competitive advantages to overcome the “liability of foreignness” to operate in a foreign country. MNEs may choose to “internalize” these advantages by exploiting them within the firm boundary to minimize transaction costs associated with the interfirm transfer of proprietary knowledge and capabilities, thereby explaining the “firm” as the institution chosen over the “market” for international production (e.g. Buckley and Casson, 1976; Rugman, 1980; Dunning and Rugman, 1985). Multinational advantages have also been embedded into international economics (IE) literature, where MNEs are found to be more productive than domestic firms (e.g. Helpman, Melitz and Yeaple, 2004); conduct higher investment in R&D, and have more innovative products (Qulton, 1998; Griffith, 1999; Wagner 2006).

Focusing more on operational aspects of MNEs, real options studies in international business (IB) literature establish that MNEs can use subsidiaries as interchangeable “options” to absorb or leverage external environmental uncertainties, such as exchange rate fluctuations or market uncertainties, thereby achieving greater agility and stronger financial performance (Reuer and Lriblein, 2000; Lee and Makhija, 2009; Fisch and Zschocke, 2012a, 2012b). Corporate finance literature, taking yet a different perspective, also ascertains that with their access to financial markets in multiple countries, MNEs accumulate financial resources into internal capital markets (ICMs), which can be distributed across the multinational networks to give them an edge over domestic firms in adverse situations such as poorly developed host capital markets, financial or currency crisis (Krugman, 1998; Baker, Foley and Wurgler, 2009; Desai, Foley and Hines, 2004, etc). However, none of these studies has explored the notion of multinational advantages in the context of minimum wages, and none has integrated the operational and multinational

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<sup>1</sup> When we refer to multinational firm, we use “firm” and “subsidiary” interchangeably since our observations are legal “firms” but with foreign ownership, from China’s perspective; they are also “subsidiaries” from foreign multinational enterprises’ perspective.

advantages discussed separately in real options studies and corporate finance literature. This is the focus of our study.

As a labor policy, minimum wage is adopted in many countries around the world, including developing ones. In the case of China, minimum wage is a notable government intervention that aims to protect workers' basic income. It also has contributed to the significant wage growth in China in the past two decades (Li et al., 2012). Therefore, it has wide-reaching implications for firms and millions of workers in China. However, to our knowledge, no research has evaluated how minimum wages affect multinational subsidiaries in China or anywhere else. This gap is particularly noteworthy in the case of China because China's low labor costs have played a significant role in attracting inward manufacturing FDI and promoting China as the "world factory" in the past decades. Therefore, the understanding of how growing minimum wages have affected and will continue to affect multinational subsidiaries in China carries significant empirical implications.

One of the contentions concerning minimum wages is that MNEs may not be affected by minimum wages since they are more productive, employ more skilled workers (Tatoglu et al., 2016), and tend to pay higher wages than domestic firms (Almeida, 2007; Chen et al 2011; Hale and Long, 2011). While some of the contention is likely true based on the empirical evidence that firms that are more productive tend to be less affected by minimum wages (Riley and Bondibene, 2017), there are at least two reasons to suggest that MNEs will still likely be affected by minimum wages, but possibly to a lesser extent, and that this question still warrants empirical investigations.

First, minimum wages tend to have a "ripple" effect on wage levels of workers far above minimum wages (Gramlich, 1976; Grossman, 1983; Katz and Krueger 1992; Lee, 1999; Neumark, Schweitzer and Wascher, 2004; Aaronson, Agarwal, and French, 2012; Autor, Manning and Smith, 2016). For example, Neumark, Schweitzer, and Wascher (2004) show that this wage spillover extends quite far into the wage distribution, up to individuals earning three times the minimum wage. One explanation of the wage spillover is due to *labor-labor* substitution, which stems from how minimum wages change skill premiums (Gramlich, 1976; Grossman, 1983; DiNardo, Fortin, and Lemieux, 1996; Neumark, Schweitzer, and Wascher 2004). Minimum wage hikes increase the relative price of low-skilled minimum wage workers compared with high-skilled workers. Thus, firms may optimally respond to minimum wage hikes by

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substituting away from less skilled minimum wage workers and hiring greater numbers of more skilled workers. This increase in demand for more skilled workers could bid up their wages and lead to a ripple effect. Another explanation rests on the internal wage structure argument, which indicates that when minimum wage grows, wage of workers above minimum wage grows as well to maintain relative wage (Grossman 1983; Card and Krueger, 1995).

Second, MNEs represent global mobile capital and they tend to prefer locations with lower wages. Previous studies of the distribution of aggregate FDI among Chinese regions all find that wages are statistically significant and negative determinants of FDI (Coughlin and Segev, 2000; Wei, et al., 1999; Cheng and Kwan 2000; Fung, Iizaka, and Parker 2002; Fung, Iizaka, and Siu, 2003). Similar evidence is also found outside China (Friedman, Gerlowski and Silberman, 1992; Wheeler and Mody 1992). Thus, aggregate studies strongly support the view that MNEs seek locations with low wages, *ceteris paribus*. However, there is surprisingly little support for the attraction of low wage to FDI from studies that use microdata. Liu, Lovely and Ondrich (2010, p.2) attribute it to estimation issues in micro studies, i.e. wage level in a region might be correlated with omitted variables, which are either observable or unobservable. Thus, to correctly estimate the effect of labor costs requires a methodology that can effectively mitigate omitted variable concern. Liu, Lovely and Ondrick (2010) provides one of the most rigorous estimations on the negative effect of wage on micro level FDI location choice in China by using a control function approach that mitigates omitted variable concern.

Thus, by exploiting minimum wage hikes as the exogenous shock, our study complements the extant literature on multinational advantages as well as the literature on the effect of labor costs of MNEs. More specifically, we examine whether firm employment is negatively affected and to what extent the effect is different on multinational subsidiaries. We focus on the employment effect of minimum wages rather than firm entry or exit decisions because multinational subsidiaries that either enter or exit a host market such as China are marginal compared to those operating in it. Post-entry employment dynamics of incumbent multinational is very important for us to understand because it is one of the key operational decisions multinational subsidiaries need to make as well as an important barometer of their commitment to the host country. IB literature has paid ample attention to entry and exit decisions (e.g. Head et al., 1995; Shaver and Flyer 2000; Chung and Alcacer, 2002; Fisch and Zschoche, 2012b; Li, 1995; Shaver, et

al., 1997; Fisch and Zschoche, 2012a). Much more is needed to understand how incumbent multinational subsidiaries respond to host country policy change as part of its evolving formal institutions.

Theoretically, we focus on the sources of multinational advantages by integrating both operational and financial perspectives discussed in the IB and corporate finance literature because higher operating costs from growing minimum wages exert both (direct) operational and (indirect) financial pressures on firms. Such an integrated focus can better reveal the constitutional parts of multinational advantages. MNEs' productivity advantage and its potential mitigating role is not our theoretical focus, we note, because minimum wages studies have established that firms with high productivity are less affected by minimum wage growth (Riley and Bondibene 2017). However, in our empirical analysis, we do control for this additional channel. We adopt a new methodology: border discontinuity design (BDD), to mitigate omitted variable concern and establish a causal inference of the effect of minimum wages. In this perspective, we re-direct the line of enquiry of minimum wages from labor economics to IB literature by providing the first theoretical and empirical analysis of the differential employment of minimum wage on multinational subsidiaries vs domestic firms.

In the next section, we outline the theoretical background of minimum wages and that of multinational advantages. We then integrate the related literature to motivate our hypotheses. Our empirical approach, i.e. BDD, is explained in greater details, followed by the sample construction and variables. Finally, we report empirical results, discuss policy and managerial implications, and conclude with the limitations of our study.

## **Theoretical Background**

### *Minimum wages and employment effect*

Theoretically, there are two views of how minimum wages may affect firm employment. One is based on the competitive model of labor market. In this view, a rise of minimum wages indicates an increase in the price of labor, which should reduce labor demand. Therefore, a general prediction of this view is that growing minimum wages will lead to reduced employment (Neumark and Wascher, 2007). The other view, however, argues that labor market can be non-competitive due to various frictions. Just like products can be differentiated (Salop, 1979), jobs can be differentiated, in many dimensions, such as

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location heterogeneity (Bunting, 1962), skills and working conditions (Helsley and Strange, 1990; Bhaskar and To, 1999; Hamilton, Thisse, and Zenou, 2000; Brueckner, Thissu, and Zenou 2002). Each of such differentiation will make labor market “thinner”, rendering employers more market power and diminishing the effect of minimum wages on their employment (Manning, 2003). Assuming away job heterogeneities, market frictions may still arise from search costs. It takes time and money for workers to find and change jobs. In the model of Burdett and Mortensen (1998), the extent of employer market power is determined by the rate at which job opportunities relative to that of destruction rate: the lower the arrival rate of job offers or higher destruction rate, or both, the more market power employers will have. With wage-setting power, firms may choose a wage rate lower than market wage and that can produce vacancies and high quit rates. In this scenario, minimum wage increase can cause a fall in vacancies or quit rates, or both, especially for high turnover jobs. Therefore, a minimum wage increase could even temporarily increase employment (Card and Krueger, 1994).

The volume of empirical investigations on the employment effect of minimum wages is vast. The literature has presented large negative, small negative, small positive, and non-significant results. For example, using payroll data, Neumark and Wascher (2000) found that the New Jersey minimum wage increase led to a 3.9 percent to 4.0 percent decrease in fast-food employment in New Jersey relative to Pennsylvania as the control group, which coefficients in the range of -0.10 to -0.25. Neumark and Wascher (2007) surveyed the minimum wage studies and concluded that majority of the studies gave a relatively consistent indication of negative employment effects of minimum wages, and studies that focus on the least-skilled groups provide overwhelming evidence of larger negative effects. However, their conclusions were met by oppositions such as Card and Krueger (1994) who found no evidence that the rise in New Jersey’s minimum wage reduced New Jersey’s employment compared to Pennsylvania’s using survey data. They further conducted a meta-analysis and concluded that earlier studies documenting negative employment effect might have been an outcome of specification-searching bias (Card and Krueger 1995, p.242).

Similarly, mixed results can be found in studies across many countries inside as well as outside US, including UK, Ireland, France, Spain, Netherland, Japan, South Korea, as well as China. Appendix 1 lists major studies on minimum wages by country distribution. In general, studies focusing on developing



countries remain far more limited than those on developed countries. More pertinent to our focus, no empirical studies have analysed the potentially differentiated response of multinational firms.

### *Multinational advantages*

The notion of multinational advantages originates in the seminar work of Hymer (1976), where MNEs are viewed as institutions for international production to achieve monopolistic power by using international operations to separate markets and remove competition. Hymer argues that MNEs must possess competitive advantages – manifested by technical advantages, well-recognized brands or superior organizational practices to coordinate transactions efficiently to overcome the “liability of foreignness” of doing business abroad. While the sources of multinational advantages mainly rest upon structural market imperfections in Hymer and other scholars such as Kindleberger (1969) and Caves (1971), what becomes inseparable is the theorizing of “internalization advantage”. Internalisation advantage applies to the case where the MNE prefers to exploit its multinational advantages *internally* to minimize transaction costs associated with the interfirm transfer of proprietary knowledge and capabilities (Buckley and Casson 1976; Rugman, 1980). Combined together, these discussions move away from previous macro based view and enlighten the micro foundations of international investment (Dunning and Rugman, 1985; Dunning, 1988; 1993).

These ideas have been embedded into formal theoretical models in international economics (IE) literature predicting that only the most productive firms become multinational firms because of the substantial sunk costs in undertaking FDI (e.g., Carr, Markusen and Maskus, 2001; Markusen, 2001; Helpmen, Melitz and Yeaple, 2004). “Multinational advantages” has thus become an integral part of explanations for the existence of the MNE. Empirical evidence largely confirms this view (Qulton, 1998; Griffith 1999; Wagner 2006). Scholars also find that multinational are more innovative than domestic firms are and generally invest more in R&D (Narula and Zanfei, 2005; Sadowski and Sadowski-Rasters, 2006) and that they may acquire foreign firms with valuable organizational routines to enhance their core competence (Ascani, 2018). These more recent work illustrates that MNEs can both exploit their existing competence as well as developing new ones with collaborations and acquisitions entailed by their internalization. What is apparent, for the purpose of our study, is that both productivity and innovation

advantages will give multinationals an edge over domestic firms in absorbing the cost shock of minimum wages because higher productivity indicates lower marginal costs; more innovative products tend to provide more market power and less sensitive prices; and in general, more productive and innovative firms employ more skilled workers, whose wages are less directly impacted by minimum wage shocks (Riley and Bondibene, 2017).

Taking a different route, real options studies focus on the operational advantage of MNEs. Operational flexibility, defined as the ability to reallocate productions and resources quickly and smoothly in response to external changes (Kogut and Kulatilaka, 1994; Buckley and Casson, 1998), is argued as one of the hallmarks of multinationality that reduces MNEs' operational exposure. The notion of operational flexibility is explored in the context of large exchange rates fluctuations and economic crisis (de Meza and Ploeg, 1987; Kogut and Kulatilaka, 1995; Trigeorgis, 1996; Chung, Lee, Beamish and Isobe, 2010; Dikova, Smeets, Garretsen and Ees, 2013). But this literature has not explored to what extent the operational flexibility will provide MNEs with advantages over domestic firms in the context of minimum wages. Also, this literature assumes that subsidiaries of MNEs are homogenous and therefore are interchangeable with each other, which gives rise to the corporate operational flexibility (de Meza and Ploeg, 1987; Kogut and Kulatilaka, 1995; Trigeorgis, 1996). We depart from this position and argue that subsidiaries can differ in terms of their market scopes, which may give rise to variations in their operational flexibility to cope with increased wage costs imposed by minimum wage policy. We will return to this in hypothesis development.

A third stream of literature: corporate finance, also discusses multinational advantages, but solely focuses on the financial advantages. Some studies in this literature provide interesting evidence of the existence and extent of multinational financial advantages. For example, Krugman (1998) provides anecdotal evidence that currency crises in Asian in the late 1990s allowed foreign firms with sufficient liquidity to buy Asian firms at discount price. He labels such investment "fire-sale FDI". Aguiar and Gopinathe (2005) study a large sample of cross-border mergers and acquisitions following currency crisis in Asia. They present evidence that liquidity-rich foreign firms purchase more assets at times when domestic firms are financially constrained. More interestingly, Baker, Foley and Wurgler (2008) test two alternative hypotheses: one is cheap-finance, and the other is cheap-assets. The former would support the

notion of ICMs, i.e. multinationals have cheaper access to finance. The latter would support the notion that FDI flows reflect the purchase of under-valued host country assets. Their evidence supports that FDI increases sharply with source-country stock market valuations. Their results are consistent with the cheap-finance hypothesis. However, to what extent minimum wages may have a lesser impact on multinational subsidiaries than on domestic firms due to their access to multinational finance is not examined in this literature. But we argue that it is intrinsically pertinent because the increased operational exposure due to growing minimum wages will lead to higher financial pressure on firms. To what extent the firm has access to necessary finance will affect their employment response.

In the next section, we develop our hypothesis motivated by these gaps identified in the literature.

### **Hypothesis development**

#### *1. The effect of minimum wages on firm employment: is there a multinational advantage?*

The literature on the effect of minimum wages on firm employment has two views, as we outlined earlier. One is based on the competitive model of labor market: when minimum wage increases, firm employment may decrease due to the higher costs. The other view considers the role of labor market frictions, which may to various extent make the negative association between minimum wage and employment less negative. Taking the stock of the extensive theoretical literature and the vast empirical findings on employment, we postulate that overall minimum wages will have a negative effect on firm employment. We adopt the view from Freeman (2010): “the evidence which shows that employment responses are often mixed across countries, regions and workers, does not mean that employers would not become more cautious in their employment decisions, especially hiring decisions, or that a higher minimum wage cannot reduce employment” (p.13). This view is shared by labor economists who suggest that an increase in minimum wage tends to increase the wage of workers above the minimum level, i.e. to shift the entire wage distribution, which could lead to long-term employment implications (Grossman, 1983; Falk, Fehr and Zehnder, 2006; Aarnson and French, 2007; Allergretto, Dube and Reich, 2011).

In addition, empirical studies that failed to find negative employment effect are often within specific sector, such as hospital or public school sector, where the employment decisions are less profit driven but

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more governed by state actors and public policy (Sullivan, 1989; Staiger, Spetz and Phibbs, 2010). In some instances, these sectors have a single “employer”, which resembles a “monopsony”. In such context, minimum wage growth may not only not depress employment, but could increase it because the monopsony employer wants to buffer future wage growth by over-hiring. By contrast, we focus on profit organizations in a nationwide labor market, where arguably labor has substantial mobility to compete for jobs and wages. Thus, the non-competitive view has less relevance to our context. Therefore, following this literature, our baseline expectation is that minimum wages have a negative effect on firm employment.

If the growth of minimum wage is analogous to a type of external changes, a rich stream of empirical studies have demonstrated that multinational subsidiaries have comparative advantages over domestic firms. The principal proposition of these studies is that access to internal resources, such as production flexibility, financial linkages, and internal capital markets, provides multinational subsidiaries with mitigating mechanisms, which are unavailable to domestic firms, to absorb external shocks.

Jorion (1990) studied multinationals’ exchange rate exposure. The unique ability of U.S. multinationals to shift production from one country to another was argued to lessen their exposure compared to domestic firms. Therefore, this study stressed the distinct internal operational flexibility as the mitigating mechanism to reduce exchange exposure risk. Focusing on host country currency depreciations, Desai, Foley and Forbes (2008) found that U.S. multinational subsidiaries increased employment, sales, assets, and investment significantly more than local firms during, and after, currency depreciations. They also demonstrated that the “multinational” advantages arose from the fact that the multinational parent allocated more financial resources to its subsidiaries experiencing severe depreciations. Similarly, Desai, Foley and Hines (2004) showed that multinational subsidiaries substitute internal borrowing from their parents for costly external finance stemming from adverse capital market turbulent in the host country. Using worldwide establishment panel dataset, Alfaro and Chen (2012) found that the sales performance of multinational subsidiaries was better than those domestic counterparts in the global financial crisis period and multinational subsidiaries sharing stronger vertical production and financial linkages with parents exhibited stronger resilience.

In labor studies, scholars also suggest that multinational subsidiaries have comparative advantage over domestic firms in dealing with stringent labor protections, although none has focused on minimum wages *per se*. For example, it is theorized that MNEs may find collective bargaining regime attractive because (host country) unions may choose to lower their wage demands to protect employment in less efficient domestic firms when these domestic firms compete with multinational subsidiaries in the same product market (Leahy and Montagna, 2000, p.85). Multinational subsidiaries have advantages over domestic firms in negotiating with local unions because production facilities in the multinational network improve their fallback profit in the case of disagreement with local unions (Echel and Egger, 2009).

These studies, from different perspectives, all suggest that multinational subsidiaries have an array of internal resources or internal markets that can mitigate the negative impact of business environment turbulent or external policy changes. Combining the insight from minimum wages research and that on multinational advantages, we conjecture that overall multinational subsidiaries have advantages over domestic firms in absorbing minimum wage increases, which help them protect their employment better than domestic firms. We state it as follows:

**Hypothesis 1 (H1):** The negative effect of minimum wages on firm employment is weaker (i.e. positively moderated) on multinational subsidiaries than that on domestic firms.

The advantages of multinational subsidiaries may arise from a variety of sources, as indicated in the rich empirical and theoretical studies that we have discussed. To provide a more refined analysis, we explore two distinctive sources of multinational advantages that could enable multinational subsidiaries to mitigate the negative effect of minimum wages. One arises from the different market scopes of subsidiaries and the other relates to the multinational financial advantage.

## 2. *Two sources of multinational advantages*

### 2.1 *Subsidiary type based on market scope: dual-purpose subsidiary vs. singular-purpose subsidiary*

The first concerns subsidiary type based on geographic scopes. Most IB studies either focus on market-seeking FDI (Li and Rugman, 2007, p.688; Brouthers, Brouthers and Werner, 2008; p.945) or categorize FDI into market-seeking and efficiency-seeking (Hakkala, Norback and Svaleryd, 2008; Brothers, Gao, and McNicol, 2008; Zhou and Guillen, 2016). Subsidiaries that serve both purposes are

much less studied. We draw on Chung, Lee, Beamish and Isobe (2010) and Chung, Lee and Lee (2013), and differentiate multinational subsidiaries into two. The first is those that sell products to both the host and overseas market, which we call Dual-purpose subsidiary (D-subsidiary). The second is those that sell products to either market only, which we call Singular-purpose subsidiary (S-subsidiary).

We argue that when facing minimum wage increase, D-subsidiaries may attain distinct advantages associated with either type of S-subsidiaries. For example, subsidiaries selling all products to the host market could be more resilient because when all firms are impacted by minimum wages, the relevant output demand is the market-level one, which tends to be less responsive. Firms may pass on the higher costs to consumers through higher prices (Stigler, 1946; Hamermesh, 1995; Aaronson and French, 2007). Two recent studies using country wide data in the US and Hungary find support that higher minimum wages feed into higher demand, which reduces the negative employment effect of minimum wages in their respective domestic market (MaCurdy, 2015; Harasztosi and Lindner, 2019). Considering that multinationals are usually more productive than the average firm active in the local market, a general raise in wage costs will raise the marginal cost more for low-productivity firms than for high-productivity firms. The wider wedge in marginal costs can translate into a greater strategic advantage for high productivity firms, which would allow them to be more aggressive in the product market (e.g. Leahy and Montagna, 2000; Norback, Skedinger and Duanmu, 2019). Subsidiaries selling exclusively to international markets enjoy substantial subsidies in China, such as rebate of value added tax, preferential access to soft loans, infrastructure and land and exemptions from industrial and commercial consolidated tax (Defever and Riano, 2012, 2017). Earlier research documented that these policy instruments helped boost China's export performance (Chen, Mai and Yu, 2006). More recent firm level studies corroborate this conclusion by revealing that these policy instruments help efficiency seeking subsidiaries alleviate financial constraint, maintain their investment activities and employment level (Zhang, 2019) and improve their profitability (Chandra and Long, 2013). With D-subsidiaries' access to the benefits of both, the employment effect of minimum wage can be more mitigated than that of S-subsidiaries.

We also suggest that D-subsidiary entails three additional advantages than S-subsidiaries: operational flexibility, financial resilience and corporate embeddedness, all of which can further mitigate the negative impact of minimum wages on their employment level. In contrast to the core thesis of real options

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theory, where operational flexibility of MNEs is attained by shifting factors of production *across* subsidiaries, which are presumably homogenous (Reuer and Lriblein, 2000; Lee and Makhija, 2009; Fisch and Zschoche, 2012a), we suggest that given D-subsidaries by mandate serve both the host and overseas market, their joint operation entails the flexibility of capacity utilization *across* their sub-operations. The embedded dual-purpose also means that the factors that often hamper operational flexibility across subsidiaries are less pronounced within D-subsidaries. For instance, for subsidiaries solely serving a host market with substantial product localization, the assumed operational flexibility across various host markets could be severely hampered (Rangan, 1998). The challenges of increased transaction costs and information processing loads (Jones and Hill, 1988; Kogut and Kulatilaka, 1994) and regulatory rigidities across borders (Fisch and Zschoche, 2012b) that often confront the realization of operational flexibility across subsidiaries are less relevant to D-subsidaries. By contrast, the necessary coordination between sub-operations within D-subsidaries is an integral competence, which requires extra time and resources to build but also entails fewer frictions in execution.

D-subsidaries are likely to relish financial resilience because of diversification. When their revenues from either market are adversely affected by minimum wages, they can adjust the quantities and prices serving either markets to stabilize their revenues. This is similar to the logic that MNEs can stabilize their revenue streams through diversification (Caves 1996; Qian, 1996), and that they have the ability to cross-subsidize their operations by flexibly allocating profits of subsidiaries to support others experiencing environmental turbulent (Hamel and Prahalad, 1995). It is also consistent with the notion that multinational subsidiaries can access internal cash flows or capital reserves in the multinational corporation (Desai, Foley and Forbes, 2008). We highlight that such benefit is more attainable within D-subsidaries.

Thirdly, D-subsidaries, by designation, would entail more interactions and complementary with the geographically dispersed multinational networks. Despite enormous theoretical contribution, the focus of extant IB literature largely assumes that subsidiaries are homogenous and the combined value of a collection of subsidiaries could be less than the sum because of redundancies among them (de Meza and Ploeg, 1987; Kogut and Kulatilaka, 1995; Trigeorgis, 1996). However, it is plausible that subsidiaries may have heterogeneous roles, and they may interact with each other, making their joint value larger than the

sum of their stand-alone values (Trigeorgis, 1993, p.207; Vassolo, Anand, and Folta, 2004; Fisch and Zschoche, 2012a, p.1543). D-subsidaries in this perspective, we argue, are more likely to have such potentials. For example, potential externalities can arise if D-subsidaries share their product market knowledge, local suppliers and distribution information, regulatory compliance competence and government relations with those subsidiaries focusing on the host market or those on overseas market. The knowledge flow and information sharing can also occur in the reverse direction to develop their dual competence. Both can make D-subsidaries particularly valuable to the multinational network. Previous study finds that in financially crisis period, dual-role subsidiaries are less likely to exit the market than their singular counterparts because of their more important roles within MNEs (Chung, Lee, Beamish and Isobe, 2010). In a similar vein, we suggest that D-subsidaries are less likely to reduce their employment level than their singular counterparts when facing growing minimum wages due to their more important roles and operational externalities within their network. Taking these multiple perspectives together, we suggest:

**Hypothesis 2 (H2):** Among multinational subsidiaries, the negative effect of minimum wages on employment is weaker (i.e. positively moderated) on D-subsidaries than on S-subsidaries.

## 2.2 *Multinational finance advantage*

Another source of multinational advantage pertains multinational subsidiaries' access to internal capital markets (ICMs). We also call it multinational finance advantage<sup>2</sup>. Although received less attention in IB literature, capital market frictions are one of the core themes of corporate finance (Bekaert and Harvey, 1995; Bekaert, Harvey, Lundblad and Siegel, 2011). This literature has long challenged the notion that firms are unconstrained in their ability to raise capital to fund investment. The fact that firms require external finance to fund investment and that finance market is incomplete makes it important to understand how access to finance shapes firms' decisions. Relating to MNEs, it indicates that local

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<sup>2</sup> Rugman (1980) is among the first in IB area to raise the notion of internal capital market within MNEs, which effectively redistributes financial resources within their hierarchy. Unfortunately, this work has been somewhat ignored. Nguyen and Rugman (2015) is the only empirical study that we identify that explicitly argues the internal capital market of MNEs in IB literature. But their focus is different from ours. They focus on the benefits of internal equity financing on subsidiary performance based on cross-sectional survey data.



financial institutions might impede domestic firms, giving comparative advantage of MNEs because they are better positioned to tap into international sources of finance with ICMs.

Empirical evidence of multinational finance advantage is abundant. In addition to Desai, Foley and Hines (2004) and Desai, Foley and Forbes (2008), which demonstrate that U.S. multinational subsidiaries use internal capital to substitute external finance in host countries with poor capital markets and that the access to ICMs help U.S. multinational subsidiaries to sustain their performance better than domestic firms during host country currency depreciations, Alfaro and Chen (2012) find similar evidence in their world-wide sample. In a similar vein, Blalock, Gertlet and Levin (2008) find that as a response to the large currency devaluation in 1997 in Indonesia, foreign-owned exporters substantially increased their investment and employment while limited access to capital prevented domestic exporters from taking the advantage of improved terms of trade.

From minimum wage perspective, we argue that the binding financial pressure from growing minimum wages may indirectly depress firms' commitment in other areas, which in turn could further dampen their employment indirectly (Tobin, 1969; Lucas and Prescott, 1971). For example, higher labor protections have long been found to depress corporate financial leverage to mitigate the human costs of bankruptcy (Besley and Burgess, 2004; Berk, Stanton and Zechner, 2010; Agrawal and Matsa, 2013; Simitzi, Vig, and Volpih, 2014). Reduced financial leverage in turn depresses fixed and variable investment critical for long-term growth. They may include investment in R&D, market research, advertising, fixed capital equipment, employee training and land fees, etc. Minimum wages are found to reduce corporate investment, reduce capital expenditure and lead to contraction in corporate assets and employment among US firms (Gustafson and Kotter, 2018; Cho, 2018), and reduce firm human capital investment among Chinese firms (Haepf and Lin, 2016). The reduced investment in these areas will indirectly stifle employment growth in the long run (Hirsch, Kaufman, and Zelenska, 2015; Freeman, 2010).

While it is often difficult to directly observe individual firms' financial vulnerability because firms use different technologies, operate in different markets, and may have different strategic goals, corporate finance literature assesses financial vulnerability at the industry level. Two key determinants of industry's financial vulnerability are highlighted. One is the requirement for external finance arising from upfront long-term investments and short-term working capital needs (Rajan and Zingales, 1998) and the other is

the ability to raise external finance by pledging the available assets as collateral (Clessens and Laeven, 2003). The argument is that for firms operating in financially vulnerable industries due to either or both reasons, the financial pressure from minimum wages could be aggravated.

Being part of an MNE will mitigate the financial vulnerability in general, and in specific, the benefit of multinational finance advantage becomes more pronounced with the extent of industry's financial vulnerability. For example, while in general exporters need more finance to support their longer transaction process and financial settlements with international clients, exporters in more financially vulnerable industries need access to finance even more than those in financially invulnerable industries. Thus, the exporting performance of multinational firms is better than that of domestic firms in general, and their performance edge over domestic firms is even greater in financially vulnerable industries than those financially neutral industries (Manova, Wei and Zhang, 2015, p.577). In a similar vein, the share of full foreign acquisitions in emerging markets is found to be higher in industries more reliant on external finance (Alquist, Berman, Mukherjee, and Tesar, 2019), indicating the higher the financial vulnerability of an industries is, the stronger the multinational financial advantage. We relate this discussion to minimum wages and develop the following hypothesis:

**Hypothesis 3 (H3):** Among multinational subsidiaries, the negative effect of minimum wages on employment is weaker (i.e. positively moderated) in more financially vulnerable industries.

## Method

### *Border discontinuity design (BDD)*

Our goal is to assess the impact of minimum wages on firm employment<sup>3</sup>. While minimum wages are straightforward to quantify, the main estimation challenge is omitted variable concern: i.e. cities having different minimum wages may also differ in other important but unobservable ways. Previous studies rely on difference-in-differences (DID) estimator by comparing employment outcomes between two neighbouring states, where one had minimum wage increase and the other did not. This gives rise to issues such as non-representative samples, inability to control for regional observable and unobservable

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<sup>3</sup> For the interest of space, the institutional background of minimum wage policy in China is provided in Appendix 2.

confounds, inability to estimate the coefficient of the level of minimum wages because minimum wage increase is measured as a binary, and lower power to detect plausibly sized true impacts. A separate stream of studies based on countries with a national minimum wage also use DID but compare those individuals/firms with wages lower than minimum wages and those higher ignores the fact that an individual/firm may have unobservable characteristics that are correlated with other individuals/firms of the same group or may be affected by common group shocks (Brewer, Crossley and Zilio, 2019).

These methodological issues have led to new improvement in identification strategy. The most influential papers are Dube, Lester and Reich (2010; 2016). Their 2010 study was built upon a key methodological innovation, which essentially generalized previous one-off minimum wage increase to make it nationally representative. More specifically, their border discontinuity design (BDD) consists of a series of *localized* comparison within continuous county pairs that straddle states in the U.S. that had differing minimum wages. This approach extenuates the omitted variable concern for both observable and unobservable regional confounds. This approach is well suited to China as China has large, if not larger, regional disparities than the U.S. Therefore, we apply it to exploit minimum wage policy *discontinuities* at province borders by comparing firm employment in Chinese cities on *either* side of a province border with differing minimum wages to mitigate omitted variable concern<sup>4</sup>. More formally, consider the following equation:

$$y_{fit} = \alpha + \beta \ln(MW_{s(i)t}) + \Gamma X_{fit} + \epsilon_{it} \quad (I)$$

Here  $y_{fit}$  refers to the dependent variable: log employee for firm  $f$ , in city  $i$ , at time  $t$ . The minimum wage variable  $\ln(MW_{s(i)t})$  in a given city  $i$  is set at the level of the province  $s$ , and  $\beta$  is the primary coefficient of interest. In addition, there is a vector of time-varying controls  $X_{fit}$ , which include city and firm controls. Estimation of equation (I) is complicated due to heterogeneity across time and place that is not captured by observables, which makes it likely that  $E(\ln(MW_{s(i)t}), \epsilon_{it}) \neq 0$ . A conventional approach to estimating  $\beta$  in equation (I) is to include two-way fixed effects as controls to account for such unobserved heterogeneity. A regression with such two-way fixed effects is identical to a regression using demeaned data. The model with a firm and time fixed effect can be estimated represented as follows:

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<sup>4</sup> Province is the first administrative division in China, followed by prefectures, which we call cities. Administratively, province in China is equivalent to state in the U.S.

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$$\tilde{y}_{fit} = \alpha + \beta \ln(\tilde{M\tilde{W}}_{s(i)t}) + \Gamma \tilde{X}_{fit} + \eta_{ij} + d_t + \tilde{\epsilon}_{it} \quad (\text{II})$$

The identifying assumption behind the consistency of the two-way fixed effects estimate is that purging the data of firm-specific and common time-specific fixed effects is sufficient for removing regional confounds, ruling out time-varying heterogeneity. However, minimum wage policies may exhibit strong geographical clustering and there are a myriad of factors affecting the labor market other than minimum wages that vary across regions. By ignoring such spatial confounds, the two-way fixed effects estimator may be subject to an omitted variable bias. Existing research shows that, indeed, the two-way fixed effects model often attributes to minimum wage policies the effects of regional differences in the growth of low-wage employment that are independent of minimum wage policies (Dube, Lester and Reich, 2016, p.673). An alternative and much less restrictive strategy restricts identifying variation to geographically *proximate* units that are more likely to share common economic trends. The border discontinuity estimating equation can then be written as follows:

$$\tilde{y}_{fijt} = \alpha + \beta \ln(\tilde{M\tilde{W}}_{s(ij)t}) + \Gamma \tilde{X}_{fijt} + \eta_{ij} + c_{ijt} + g_f + \tilde{\epsilon}_{ijt} \quad (\text{III})$$

In contrast to the regression in equation (II), the preferred border discontinuity equation (III) consists of a series of *localized* comparisons within contiguous city pairs  $i$  and  $j$ , since the differencing in equation (III) washes out all the variations within city pairs. Hence, this strategy uses the within-pair variation across all pairs and effectively pools the estimates. This is achieved by including city pair fixed effects:  $\eta_{ij}$ , as well as city pair time specific effects:  $c_{ijt}$ . Hence, the identifying assumption for the border-discontinuity specification is that, conditional on covariates, city pair fixed effects and city pair time specific effects, minimum wages are *uncorrelated* with the residual outcome within a city pair. This approach automatically accounts for unbalanced panels and degrees of freedom corrections for estimating group means. Since minimum wage policy is set at the province level, we cluster our standard errors at the province level. Note that the contiguous city pair sample stacks all pairs, so that a particular city and firms in that city will be in the sample as many times as it is paired with a neighbour city across the province border. Province level clustering automatically accounts for the presence of city duplicates in the estimation of the standard errors. However, the presence of a single city in multiple pairs along a border segment may also induce a mechanical correlation in the error term across city pairs and potentially along an entire border segment. To account for this induced spatial autocorrelation, we additionally cluster the

standard errors on city pairs (Dube, Lester and Reich, 2016). To consider that our firms are longitudinally presented in the data, we also include firm fixed effects to capture the within effect of minimum wage differences on their employment.

#### *Firm Level Data*

The firm level data comes from Annual Survey of Industrial Firms (ASIF) in China in 1998-2007. This dataset has been widely used in current literature of Chinese economy (e.g., Brandt et al., 2017) and IB studies (Buckley, Clegg, and Wang, 2002; Zhou and Li, 2008; Li and Li, 2010). These surveys cover all state-owned enterprises as well as large and medium sized non-state-owned enterprises with annual sales above five million yuan. The dataset contains rich firm-level information, including firm identification, ownership structure, employment, gross output, and complete information on the three major accounting statements (i.e. balance sheet, profit and loss account, and cash flow statement). We follow Fan, Li and Yeaple (2015) to delete problematic observations resulting from misreporting in this dataset: i.e. ASIF.

Our 10-year longitudinal firm level data have attractive features for estimating the employment effect of minimum wages. One is that we can detect a long-term employment effect of minimum wages. Firms may be less likely to reduce existing employment, but over long-term, the negative employment may be picked up by their reduced growth in employment (Hirsch, Kaufman and Zelenska, 2015; Freeman, 2010). In addition, employment effect could be more or less likely to be observed in long panel data because firms could make a variety of adjustments to cope with the impact of growing minimum wages. Depending on the nature of the adjustments, some of them may make it more likely while others may make it less likely to observe the employment effect. For example, while labor-capital substitution is theoretically appealing, capital deepening is difficult to implement in the short term, but could take place through long-term planning (Belenzon and Tsolmon, 2016). If this takes place, it is more likely to observe a negative employment effect of minimum wages. We will consider these factors by including a range of control variables in our estimations.

Our data also has disadvantages. For example, one of the disadvantages is that it is not feasible to accurately capture firm “entry” or “exit” because the threshold of being included in the data is annual turnover of 5 million yuan. This means that on the one hand, some multinational subsidiaries may have

entered the Chinese market but are not included in the data (i.e. truncation issue); on the other hand, dropping out of the data is not equivalent to exit since it may be simply caused by the lowering of annual turnover or other reasons such as the firm ceased to participate in the survey. Therefore, the data is more apt for investigating the operational adjustment of incumbent multinational subsidiaries (and domestic firms), but not entry or exit.

#### *Firm Level Sample Construction for Border Discontinuity Design (BDD) estimation*

We begin the sample construction for BDD by identifying the *city* where the firm is located. We use various information in the dataset for this identification: firm identification code, province code, city name, county name, postcode, and detailed address. The reason for using various pieces of information to ascertain the city location is that all of them contain missing values. After establishing the city where the firms are located in the dataset, we manually collected city level minimum wage data from a variety of sources, including city government websites and provincial statistics yearbooks<sup>5</sup>. We then identify adjacent cities for each of the cities (i.e. focal cities). With the minimum wage data collected for both the focal and adjacent cities, we differentiate *focal-adjacent pairs* that span different provinces from those pairs that do not span different provinces. The former constitutes the backbone of “border discontinuity” design. Then, we identify *focal-adjacent city pairs* that had *differing* minimum wages between 1998 and 2007 and keep firm observations that are within these focal-adjacent city pairs in this period. This gives us 1,172,101 firm-year observations, which represents 53% of the full original firm data.

The third step is to stark firms based on the focal-adjacent city pairing. To do this, we segment the firm level data into smaller files; each only contains firm observations in one city. This way, we can merge the city-based files based on the *focal-adjacent city pairs* we identified. More crucially, this merging allows us to generate a new and crucial variable: pair identification code. For example, for the focal-adjacent pair: Suzhou (in Jiangsu Province) and Jiaxing (in Zhejiang Province), firms in Suzhou and Jiaxing will enter the final dataset with the creation of a unique pair identification code. Firms in a focal city that is paired

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<sup>5</sup> We recruited 14 postgraduate Chinese students in the data collection process. We split them into two groups, each with 7 students. Each student collected around 40-45 cities’ minimum wage information in the first group. Once the data collection was completed by the first group, we replicated the data collection process in the second group to verify the data quality.

more than once need to enter the dataset the number of times that the focal city is paired, but will be given a different pair identification code each time. It is also noted that we did this process year by year to avoid the potential errors because some focal-adjacent pairs had different minimum wages in some years but same minimum wages in others (i.e. the latter are not included in the estimation sample). This sample construction process returns us 1,735,837 firm-year observations.

We then focus on firms with foreign equity equal to or larger than 50 percent, and those equal to or larger than 25 percent, which leaves us with 132,574 and 199,705 observations, respectively. To be encompassing, foreign equity includes the equity held by all foreign investors including those from Hong Kong, Taiwan and Macao (HTM). We are aware that it could be controversial to include HTM. For one, Hong Kong and Macao are part of China. The tradition of recording equity by Hong Kong and Macao investors started far earlier and no longer fits the definition of FDI. Investment by Taiwan investors fits the definition, but we cannot isolate it from the HTM ownership, which is reported as an aggregate in our data. Second, there is a great deal of round tripping FDI in these firms. However, investors from HTM do generally receive same treatment as foreign investors. Therefore, we perform our regressions analysis by including HTM and then excluding it.

### *Variables*

#### (1) Dependent variable:

Our dependent variable is firm employment, measured as the natural logarithm of the number of employees. This is consistent with minimum wage studies in labor research (Card and Krueger, 1995; Neumark and Wascher, 2000; Mayneris, Poncet and Zhang, 2018) and IB studies that focus on the expansion or contraction of foreign subsidiaries (Belderbos and Zou, 2007; Blonigen and Tomlin, 2001; Tan, 2003).

#### (2) Independent variables:

The first independent variable is city level monthly minimum wages, measured as natural logarithm of monthly minimum wage at city level in 1998 to 2007. The second is foreign dummy. We code it with the value of “1” if the ratio of foreign capital to total capital is equal to or large than 50 percent; “0”

otherwise. Alternatively, we use 25% as the threshold. We interact foreign dummy with log minimum wage to evaluate H1. A positive and significant coefficient will support H1.

The third is D-subsidary. We code it as “1” if the subsidiary has sales to both the Chinese and overseas markets; “0” otherwise. Although our D-subsidaries are similar to the “dual options” in Chung, Lee, Beamish and Isobe (2010) and Chung, Lee and Lee (2013), our measurement differs. In their study, it is measured as the ratio of subsidiary export to local sales. We do not use the ratio based measure for a few reasons. First, the ratio measure will exclude subsidiaries without local sales, i.e. the denominator is zero. Over forty percent subsidiaries are this type in our sample. Second, using ratio measure also alludes that multinational subsidiaries have full flexibility to adjust sales to either markets, whilst in reality opening up each market involves substantial planning and investments. As such, the adjustment flexibility is more available to subsidiaries that have established sales in both markets, which makes it more suitable to measure D-subsidaries as a discrete category. Therefore, in the absence of export composition data, we take a more literal measure, treating the host market, i.e. China, and overseas market as two discrete components (markets) of total sales. In our regressions analysis, we interact D-subsidary with minimum wage in a sample that includes all multinational subsidiaries to test H2. A positive and significant coefficient will support H2.

The next key variable is financial vulnerability. The extent to which firms operations are dependent on external finance is an outcome of both the supply and the demand of capital. Our goal is to disentangle how the “supply” side may mitigate the negative effect of minimum wages on employment, which means that we need to eliminate confounds from the “demand” side. Firm level proxy is subject to endogeneity because it is a joint outcome of demand and supply. Therefore, we follow the extant finance literature and use two industry level proxies that are less subject to potential endogeneity. One is external finance dependence, defined as the share of capital expenditures not financed with cash flows from operations. It identifies the outside funding for long-term investment and this relates mostly to fixed costs (Rajan and Zingales, 1998; Manova, Wei and Zhang, 2015). The other is industry level asset intangibility, which is derived from industry level asset tangibility. Asset tangibility recognises that the asset structure optimal for production varies across sectors. The availability of tangible assets determines to what extent firms can pledge as collateral to raise external finance with the share of fixed assets, e.g. plant, property and



equipment (Clessens and Laeven, 2003). To ease interpretation, we then use the value of 1 to subtract the value of industry asset tangibility to obtain asset intangibility. In our regression analysis, we interact each of the alternative proxies with minimum wage to test H3. A positive and significant coefficient will lend support to H3. For the interest of space, the results using external finance dependence are presented in Table 2 and 3. Those using asset intangibility are presented in Appendix 10.

### (3) Control variables:

Our control variables are at the city, firm and industry level. We include log population as the city level control. We include five firm level controls because firm characteristics can be important for their employment decisions. They are total debt indicates the financial leverage of the firm. Total sales indicate the overall revenue of the firm. Both age and age squared are included to consider that age may have non-linear effect on firms' employment level. We also include fixed assets. Because of its quasi-fixed nature, fixed assets could give rise to labor hoarding which may reduce firm employment adjustment (Abel and Eberly, 1998). In addition, while capital intensity can be an important factor in affecting firm employment, especially in the view that firms may substitute labor with capital, including capital intensity would mean including our dependent variable on the right side of our regression. This could cause simultaneity. Therefore, we include fixed assets as a better alternative. We include the interaction of fixed assets and minimum wage to consider potentially mitigated effects of scale.

Given productivity is an important factor affecting the extent to which a firm responds to a cost shock, we control for total factor productivity (TFP). TFP provides a broader gauge of firm level performance than some of the more conventional measures, such as labour productivity or firm profitability. For example, profitability captures only the part of the value added; an inefficient firm can achieve high profitability merely because it has access to low cost labour, capital or materials. TFP is advantageous because it is estimated based on multiple input measures of firm performance. TFP is usually measured as the Solow residual, defined as the difference between the observed output and its fitted value calculated via OLS. However, this method suffers from two biases: simultaneity bias and selection bias. The first bias results from potential correlation between productivity and input choices. The second bias is a 'survival' bias meaning that low productive firms are absent in the sample because they shut down and

exit the market. Therefore, firms covered in the sample are not randomly selected. There are two methods addressing these concerns. One is developed by Olley-Pakes (1996) and the other Levinsohn-Petrin method (2003). We opt for the latter because of data-driven benefit that it offers. To correctly estimate TFP using Olley-Pakes method, one needs to use investment as a proxy. However, it is not uncommon that a large proportion of firms report zero investment because generally investment is lumpy (Petrin, Poi and Levinsohn, 2004). Therefore, we opt to use Levinsohn-Petrin which relies on value added measured by gross-output net of immediate inputs to estimate the production function. TFP is estimated in three stages with this method. First, we estimate the coefficient of labor and combined coefficient of material and capital by substituting a third-order polynomial approximation in capital and material. Second, we isolate the coefficient of capital and labor. Third, we insert the estimated coefficient of labor and capital to the data to estimate individual firm's TFP. We also include the interaction between TFP and minimum wage to control for potential mitigating effects (Riley and Bondibene, 2017).

Our last control variable is industry Herfindahl-Hirschman index (HHI). We measure it using employee number with the industry boundary defined at four-digit level and the regional boundary defined as city. We include this control and its interaction with minimum wage to consider the discussion in labor studies that employers in more concentrated industries may have monopsony power. Thus, they may respond to minimum wages differently from what a standard competitive model would suggest (e.g. Boal and Ransom, 1997). But the measurement of “monopolistic” power is in debate. One of the difficulties is associated with a proper definition of “market”: some scholars advocate to use HHI based on employee information as a proxy (Azar, Marinescu, Steinbaum, and Taska, 2018); others argue that it could be misleading (Manning, 2009).

The descriptive statistics of our main variables are detailed in Appendix 3 and the correlation matrix is presented in Appendix 4.

## Results

### *Table 1: H1*

We first report results concerning H1 in Table 1. In column (1), the coefficient of log minimum wage is -0.065 and significant at 5 percent, supporting our baseline expectation that minimum wage has an

overall negative effect on firm employment. To illustrate the importance of our estimated coefficient for firm employment, we consider a hypothetical minimum wage *difference* of 20 percent across a pair of cities, which is typical difference between city pairs, this will translate into 1.3 percent lower employment. The magnitude is small but significant. We then test H1: whether foreign ownership mitigates the impact of minimum wages in column (2). We find that on the one hand, the coefficient of log minimum wage is -0.107, and significant at one percent. This means approximately two percent lower employment for twenty percent minimum wage difference between a pair of cities. On the other, the interactive term of foreign dummy and log minimum wage attain a positive coefficient 0.043, also significant at zero point one percent, indicating the mitigated negative effect on foreign subsidiaries. We graph the interactive results in Appendix 5, which illustrates that the coefficients are negative for both domestic and multinational firms but the latter is less negative. We use 25 percent as alternative foreign ownership threshold in column (3) and find consistent results.

How will the results fare if we exclude foreign equity held by investors from Hong Kong, Taiwan and Macao? This is what we test in column (4). It shows that minimum wage still attains a negative coefficient (-0.105) that is significant at zero point one percent. This translates into two percent of lower employment for a twenty percent minimum wage difference between a pair of cities. The coefficient of the interactive term of minimum wage and foreign dummy remain positive: 0.040, and it is significant at one percent. These results support H1 that the impact of minimum wages on foreign firm employment is much lower than on domestic firms. In column (5), we use 25 percent as the foreign ownership threshold and the results remain largely unchanged.

We conduct two robustness checks to substantiate results concerning H1. Earlier studies based on countries with a universal minimum wage compare employment between high-wage firms vs. low-wage firms to establish the effect of minimum wages based on the argument that the main effect should concentrate in low-wage firms. Although this method, i.e. DID estimation, has been criticized for a variety of issues, we nevertheless test this idea in our BDD estimation by adding an interactive term of log minimum wage and log firm wage to detect potential differential effect. The results are presented in Appendix 6, which confirm the idea that the effect of minimum wages on firm employment is weaker (stronger) among high (low) wage firms. Meanwhile, our main results concerning H1 remain unchanged.

In the second robustness check, we exclude firms from city pairs that contain four mega cities: Beijing, Tianjin, Shanghai, and Chongqing. These cities might be systematically different from other cities in terms of access to market, skilled labor, infrastructure, supply chain, and government policies, which may bias our results. Following Fan, Lin and Tang (2018), we removed observations from these city-pairs. The results are shown in Appendix 7. Our main results are still unchanged and the value of the coefficient of minimum wages remains similar to those in previous estimations, suggesting the robustness of BDD in mitigating regional heterogeneity.

{Insert Table 1 about here}

*Table 2: H2 and H3*

Results of H2 and H3 are reported in Table 2. In column (1) of Table 2, we find that the coefficient of minimum wage is -0.240, significant at zero point one percent. The interaction between log minimum wage and D-subsiary receives a coefficient of 0.105 with p-value of zero point one percent, which lends strong support to H2. In column (2), we add the interactive terms of minimum wage and external finance dependence concerning H3. The coefficient of the interaction term of minimum wage and external finance dependence is 0.096, significant at zero point one percent, which lends support to H3. However, the triple term of minimum wage, external finance dependence and WOS is not significant, providing no support to H3b. The coefficients of minimum wage and the interactive term of minimum wage and dual-subsiary attain similar results as those in column (1).

We then use 25 percent as alternative foreign ownership threshold. In Column (3), we focus on H2. We find that minimum wage attains a negative coefficient: -0.227, significant at zero one point. This is closely in line with the result in Column (1). The interactive term of minimum wage and dual subsidiary has a positive coefficient: 0.165, significant at zero one point. This is also consistent with that in Column (1). In Column (4) we focus on H3. The interactive term of minimum wage and external finance has a positive coefficient: 0.069, which is significant at zero one point. This result is in line with that in Column (2). Therefore, the results in Table 2 lend support to H2 and H3. The result of the interaction between minimum wage and D-subsiary is illustrated in Appendix 8. In a similar fashion, we graph the result of the interaction between minimum wage and external finance dependence in Appendix 9. We then

replicate the analysis by using industry level asset intangibility as the proxy of financial vulnerability. These results are reported in Appendix 10. Overall, the results remain consistent with those in Table 2.

{Insert Table 2 about here}

*Table 3: H2 and H3, excluding HTM*

Table 3 presents results based on the sample excluding HTM. Overall, the results are highly consistent with those in Table 2. One main difference is that the significant levels concerning H3 are usually at 5 percent in Table 3, whereas in Table 2, the significant levels are at zero point one percent. Nevertheless, the magnitudes of coefficients are very close.

{Insert Table 3 about here}

### **Discussions and Conclusions**

By employing a large Chinese manufacturing firm sample, we find that although minimum wages on average have a negative and statistically significant effect on firm employment, the magnitude is reassuringly modest on average. In addition, we find consistent results that multinational subsidiaries are less affected than domestic firms. These results are robust after controlling for city, firm and industry level controls, and in several alternative specifications. We also find that multinational advantages stem from both the operational flexibility of dual-market scopes and access to ICMs.

From multinational subsidiary perspective, growing minimum wages may make it more attractive to expand their market scopes to cover both national, i.e. the host, and international markets. Given the irreversibly high wage growth trajectories in China, and the possibility that the dual competences may require more time and investment to develop, multinational subsidiary managers may consider expanding their market sooner than later. In general, the financial markets in China are still under-developed, giving multinational subsidiaries significant advantages, particularly in industries that require deeper finance. Operating in these industries will provide multinational subsidiaries an upper hand over domestic firms. With the substantial financial advantages of MNEs over domestic firms, substituting labor with capital might also be a long-term strategy that MNEs can or continue to consider. Making the production more capital intensive and automated seems to be the trend of manufacturing sector with the growing wage

costs and more protective labor policies. The key is to be able to hire sufficient skilled workers to complement more capital-intensive and automated operations.

From a minimum wage policy perspective, the relatively weak employment response of multinational subsidiaries is reassuring, and in the long term, the presence of MNEs may indeed bring more and better jobs in the host market. But the stronger negative impact on employment in domestic firms constitutes a potential risk of a crowding out effect on domestic firms. This concern is particularly related to the multinational financial advantages because domestic private firms in China are the most financially constrained among their peers in developing countries, at least in our sample period (Firth, Lin, Liu, and Wong, 2009). Therefore, if reforming the financial market is hard to achieve in the short term, the central and local government may provide appropriate financial support to help domestic firms maintain their operations and mitigate the potential crowding out effect that they may have to face from multinational subsidiaries. It also points to the complementary role of government policies: for policies such as minimum wages to be effective for the benefit of millions of workers, other relevant policy infrastructure, including a functioning financial market, needs to be in place to support domestic firms. Growing minimum wages can be beneficial from a productivity perspective, if higher minimum wages lead to exits of the least productive domestic firms. This could introduce positive structural dynamics, whereby better-paid jobs in more productive firms are sustained at the expense of lower-paid jobs in least productive firms.

Our study has several limitations. For example, it does not build on the essential logics of real options theory although we adopt some of its theoretical views. Real options theory emphasizes how multinational parent benefits from the asymmetrical exposure by deploying a network of subsidiaries that can fully exploit the upside potential but mitigate the downside risk across borders (Chi et al., 2019). That is essentially a parent-centred analytical framework. Our focus, by contrast, is individual subsidiaries and their heterogeneities in terms of market scopes, financial vulnerability, and ownership structure. Although striving to study subsidiary types, our data on subsidiaries remain limited. For example, many large MNEs have R&D, financial, and customer service subsidiaries handling distinct corporate functions. They also infuse these functions into regional headquarters to streamline coordination with global headquarters. These subsidiaries can be different from traditional manufacturing subsidiaries but play a pivotal role in

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assisting traditional subsidiaries. Therefore, their response to host country institutional change may be different from traditional manufacturing subsidiaries. Subsidiary heterogeneity, we suggest, remains staggeringly under-studied and the different configurations of a portfolio of subsidiaries within MNEs is even more under-studied due to the paucity of large quantitative data. Future research may use qualitative approach to provide in-depth understandings of the characteristics and networks dynamics of MNEs multinational in a response to host country regulations.

We also note that China is unique in terms of inward FDI due to its fast-growing domestic market and its relatively low costs, in our study period, which makes it likely that China hosts a larger proportion of D-subsidiaries than most countries in the world. High-income and low-income countries may conversely host higher proportion of S-subsidiaries, which could lead to different regularities of employment decisions among their multinational subsidiaries as a response to minimum wage changes. Additionally, our data do not contain the nationality data of MNEs, which prevents us from investigating to what extent MNEs from different home countries may respond to minimum wages differently, and apart from economic reasons, whether there are cultural related factors that may drive their different response.

We also reflect on the validity of our methodology. From internal validity perspective, we have a nationally representative sample that meet the BDD criteria, thus our results are generalizable to the whole sample. BDD design is superior to a sample which pools all observations since it is not possible to control for all omitted variable concern. In terms of external validity, it is much harder to ascertain for two reasons. First, we use a 10-year longitudinal data of manufacturing firms in China, the largest developing country in the world. Second, China has a particularly active minimum wage policy, where minimum wages are adjusted every one or two years. Thus, we have reasons to believe that our results may be more applicable to manufacturing firms in other developing countries that also have active minimum wage policy. To what extent our results may apply to service sector and developed countries is less certain. We are also aware that the minimum wage policy sustained well beyond 2007 and results from our 10-year longitudinal data may be less informative about how firms are affected outside this period. Among recent publications, Fan, Lin and Tang (2018) use firm level data in 2001-2012 to examine the impact of minimum wage on Chinese firms' tendency to invest abroad and find that the impact is stronger after 2008 because of the introduction of a Labour Contract Law, which increased the stringency

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of worker protection. But not all latest publications use data with such long time span<sup>6</sup>. This suggests that our findings could be replicated in data beyond 2007 because of more stringent labor protections and policy enforcement. On the other hand, such simplistic extrapolation needs to be taken with caution for various reasons. First, longer time span introduces more confounds, policy ones as well as firms' strategic learning and adaptations. Second, more complexities may arise from changes beyond China's border because multinationals respond to host policies as well as regional and global dynamics. Thus, longer data may enable analysis of additional theoretical interests and policy changes in which multinational subsidiaries operate. This is not what our study can shed light on but is a great avenue for future research.

Finally, we acknowledge that, in IB literature, it is new to use minimum wage as the empirical setting and explore various sources of multinational advantages from an employment perspective, but we advocate that more studies are needed in this perspective because one of the key motives of attracting FDI is to create jobs. Future studies can use other empirical contexts, such as the Covid-19 pandemic, to understand whether or not multinational subsidiaries are more able to retain jobs than domestic firms and if so, what are the sources of their resilience. We hope that this paper may promote more interest in IB community in terms of understanding the employment implications of multinational subsidiaries for the host economy. This is particularly worthy in the light of more turbulent business and political environment that we are facing.

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<sup>6</sup> Hau, Huang and Wang (2020) use the same firm level data from 1998 to 2007 to examine the productivity effects of minimum wages.



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Table 1: the effect of minimum wage on employment of multinational subsidiaries: H1

	(1)	(2)	(3)	(4)	(5)
		Foreign dummy $\geq$ 50%	Foreign dummy $\geq$ 25%	Foreign dummy $\geq$ 50%	Foreign dummy $\geq$ 25%
	Coeff.	Coeff.	Coeff.	Excluding HTM Coeff.	Excluding HTM Coeff.
<b>Log minimum wage</b>	<b>-0.065*</b> <b>(0.03)</b>	<b>-0.107**</b> <b>(0.04)</b>	<b>-0.103**</b> <b>(0.04)</b>	<b>-0.105***</b> <b>(0.03)</b>	<b>-0.108**</b> <b>(0.04)</b>
Log population	-0.013 (0.05)	-0.014 (0.05)	-0.011 (0.05)	-0.015 (0.05)	-0.014 (0.05)
log total debts	0.027*** (0.00)	0.027*** (0.00)	0.027*** (0.00)	0.028*** (0.00)	0.028*** (0.00)
Log sales	0.220*** (0.00)	0.220*** (0.00)	0.217*** (0.00)	0.217*** (0.00)	0.217*** (0.00)
Age	0.016*** (0.00)	0.015*** (0.00)	0.015*** (0.00)	0.015*** (0.00)	0.015*** (0.00)
Age squared	-0.000*** (0.00)	-0.000*** (0.00)	-0.000*** (0.00)	-0.000*** (0.00)	-0.000*** (0.00)
Log fixed assets	0.046*** (0.00)	0.046*** (0.00)	0.047*** (0.00)	0.046*** (0.00)	0.046*** (0.00)
Log minimum wage*Log fixed assets	0.005** (0.00)	0.008** (0.00)	0.011** (0.00)	0.012** (0.00)	0.010** (0.00)
TFP	0.121*** (0.03)	0.138*** (0.03)	0.177*** (0.03)	0.169*** (0.03)	0.185*** (0.03)
Log minimum wage*TFP	0.013** (0.00)	0.024*** (0.00)	0.042*** (0.00)	0.033** (0.00)	0.036*** (0.00)
HHI	3.368*** (0.56)	3.573*** (0.54)	3.675*** (0.60)	3.575*** (0.54)	3.681*** (0.59)
Log minimum wage* HHI	-0.560*** (0.08)	-0.600*** (0.08)	-0.615*** (0.09)	-0.608*** (0.08)	-0.617*** (0.09)
Foreign dummy		-1.370*** (0.24)	-1.279*** (0.24)	-1.479*** (0.28)	-1.344*** (0.26)
<b>H1: Log minimum wage* Foreign dummy</b>		<b>0.043***</b> <b>(0.01)</b>	<b>0.046***</b> <b>(0.01)</b>	<b>0.040***</b> <b>(0.01)</b>	<b>0.041***</b> <b>(0.01)</b>
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
City-pair specific time effects	Yes	Yes	Yes	Yes	Yes
N	1,709,139	1,709,139	1,709,139	1,709,139	1,709,139
R2	0.938	0.938	0.945	0.938	0.945

Notes: This table reports coefficients associated with log minimum wage on log employment. The dependent variable is log employment. All regressions include firm fixed effects and city-pair specific time effects. Robust standard errors are corrected by two-way clustering at the province and city-pair levels. Robust standard errors are in parentheses. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

Table 2: the effect of minimum wage on employment: H2 and H3

	(1)	(2)	(3)	(4)
	Foreign ownership>=50%	Foreign ownership>=50%	Foreign ownership>=25%	Foreign ownership>=25%
	Coeff.	Coeff.	Coeff.	Coeff.
<b>Log minimum wage</b>	<b>-0.240***</b> (0.06)	<b>-0.200***</b> (0.05)	<b>-0.235***</b> (0.05)	<b>-0.238***</b> (0.04)
<b>H2: Log minimum wage*D-subsiary</b>	<b>0.105***</b> (0.01)	<b>0.129***</b> (0.01)	<b>0.146***</b> (0.01)	<b>0.169***</b> (0.01)
<b>H3: Log minimum wage*External finance dependence</b>		<b>0.096***</b> (0.02)		<b>0.069***</b> (0.01)
D-subsiary	0.104 (0.07)	0.112 (0.07)	-0.076 (0.05)	-0.079 (0.05)
External finance dependence		-0.611*** (0.16)		-0.238** (0.09)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
City-pair specific time effects	Yes	Yes	Yes	Yes
N	132,485	132,485	199,631	199,631
R2	0.939	0.939	0.937	0.937

Notes: This table reports coefficients associated with log minimum wage on log employment. The dependent variable is log employment. All regressions include firm fixed effects and city-pair specific time effects. Control variables are the same as in Table 1. Control variables are included but not reported.

Robust standard errors are corrected by two-way clustering at the province and city-pair levels. Robust standard errors are in parentheses. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

Table 3: the effect of minimum wage on employment: H2 and H3, excluding HTM

	(1)	(2)	(3)	(4)
	Foreign ownership>=50%	Foreign ownership>=50%	Foreign ownership>=25%	Foreign ownership>=25%
	Coeff.	Coeff.	Coeff.	Coeff.
<b>Log minimum wage</b>	<b>-0.254***</b> (0.07)	<b>-0.217***</b> (0.05)	<b>-0.239***</b> (0.06)	<b>-0.246***</b> (0.05)
<b>H2: Log minimum wage*D-subsiary</b>	<b>0.104***</b> (0.01)	<b>0.116***</b> (0.01)	<b>0.108***</b> (0.02)	<b>0.118***</b> (0.02)
<b>H3a: Log minimum wage*External finance dependence</b>		<b>0.089*</b> (0.04)		<b>0.053*</b> (0.02)
D-subsiary	0.133 (0.08)	0.136 (0.08)	-0.010 (0.09)	-0.007 (0.09)
External finance dependence		-0.496* (0.23)		-0.298** (0.12)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
City-pair specific time effects	Yes	Yes	Yes	Yes
N	84,061	84,061	120,379	120,379
R2	0.943	0.943	0.943	0.943

Notes: This table reports coefficients associated with log minimum wage on log employment. The dependent variable is log employment. All regressions include firm fixed effects and city-pair specific time effects. Control variables are the same as in Table 1. Control variables are included but not reported.

Robust standard errors are corrected by two-way clustering at the province and city-pair levels. Robust standard errors are in parentheses. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.