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Manufacturing productivity and firm ownership in a transition economy: Analytical issues and evidence from Vietnam

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Manufacturing productivity and firm ownership in a transition economy: Analytical issues and evidence from Vietnam

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Abstract

This paper contributes to the fledgling literature on firm ownership and manufacturing productivity in transition economies by drawing on the experience of Vietnam. The empirical analysis uses a new a new establishment-level panel dataset over the period 2006-2017. The findings indicate that the transformation of the ownership structure under trade and investment policy reforms has contributed significantly to improving the productivity of the manufacturing sector, with both fully owned subsidiaries of multinational enterprises (MNEs) and MNE joint ventures with domestic private sector firms playing a pivotal role. Productivity of fully-owned MNE subsidiaries is significantly higher than that of MNE joint ventures, supporting the view that relaxing ownership restrictions on foreign direct investment have been instrumental in improving manufacturing productivity. Both state-owned enterprises (SOEs) and MNE-SOE joint ventures are at the bottom of the productivity ranking, suggesting that the MNE-SOE joint ventures are not immune to productivity-retarding factors affecting SOEs.

Keywords: transition economies, Vietnam, manufacturing, multinational enterprises (MNEs), State owned enterprises (SOEs)

JEL Codes: F23, O14, P24, P23

1. Introduction

The role of firm ownership in industrial performance is a subject of interest in many areas of economics and business studies. The subject has gained added impetus in recent years in the context of economic transition in the former socialist countries (Brown, Earle and Telegdy, 2006). Unshackling the private sector from state dominance is central to the move from plan to market in many transition economies (Havrylyshyn and McGettigan, 1999). However, reflecting socio-political resistance and vested interests, not only the timing and sequencing of these reforms but also the choice of ownership modes in the divesture of state-owned enterprises (SOEs) have varied significantly among these countries. In most transition economies, SOEs and private domestic enterprises (PDEs) operate side by side with fully-owned subsidiaries of multinational enterprises (MNEs) (which we denote here as fully-owned foreign firms, FOFs), and MNEs' joint ventures with SOEs and PDEs, with different degrees of foreign ownership among them. Understanding differences in performance among these diverse ownership groups is vital for analyzing the overall performance of the manufacturing sector and informing the debate on further reforms.

Early literature on the ownership–productivity nexus has focused mainly on the differences among SOEs, PDEs, and subsidiaries of multinational enterprises (MNEs), without distinguishing among fully owned MNE subsidiaries and MNE's joint venture with SOEs and PDEs (Ehrlich *et al.*, 1994; Griliches and Regevc, 1995; Görg and Greenaway, 2004; Haskel, Pereira and Slaughter, 2007). The advent of transition economies calls for extending the analysis to account for the hybrid nature of ownership patterns. However, the lack of good-quality firm and plant-level data has been a serious impediment for researchers to meet this quest for knowledge (Konings, 1997; Jefferson *et al.*, 2000; Asaftei, Kumbhakar and Mantescu, 2008; Jindra, Giroud and Scott-kennel, 2009; Chang, Chung and Moon, 2013).

The purpose of this paper is to contribute to the fledgling literature on firm ownership and industrial productivity in transition economies drawing on the experience of Vietnam. The gradual transition from plan to market, commencing with the renovation reforms (*doi moi)* announced in 1986, has dramatically transformed the ownership structure of Vietnamese manufacturing over the past three decades. On the one hand, Vietnam has actively opened the economy to foreign direct investment (FDI), resulting in an expansion of foreign-invested enterprises (FIEs). The relaxation of ownership restrictions on FDI, in which FIEs have not been forced into joint ventures (JVs) with the state sector, has contributed to a diversity of foreign ownership structures. On the other hand, Vietnam has removed most restrictions on establishing PDEs and accelerated privatization since 2006, leading to a significant increase in the share of PDEs among all ownership forms. Vietnam has also committed to preserving the dominant role of SOEs in the economy. As a result, similar to other transition economies, the emerging market economy of Vietnam has been characterized by a hybrid ownership structure.

The notable ownership transition, coupled with the availability of establishment-level data from a comprehensive annual manufacturing survey covering a period of sufficient length, makes Vietnam an ideal case study of this subject. Two previous studied, Ramstetter and Phan (2013) and Le, Pieri and Znomotto (2019), have examined the Vietnamese experience with ownership transition and industrial productivity. Ramstetter and Phan (2013), using the establishment-level data from 2000 to 2006, show that the level of total factor productivity (TFP) of both FIEs and SOEs is higher than that of PDEs. Le et al. (2019) examine the role of ownership on firms' TFP from 2001 to 2011, showing that both FIEs and SOEs have performed better than PDEs in terms of TFP levels. The former study has, however, lumped together SOEs and JV-SOEs as a single ownership category of SOEs, while the latter has group both FOFs and JVs with SOEs and PDEs as FIEs. These ways of grouping may lead to biased effects of ownership structure on industrial productivity, given the hybrid nature of the ownership structure of Vietnam's manufacturing. Moreover, the time coverage of these studies predates the structural changes resulted from the ownership resourcing phase in Vietnamese manufacturing that commenced in the second half of the 2000s.

The novelty of this paper lies in the following aspects. First, the analysis is based on a newly constructed data set covering more recent years (2006-2017). Second, specific emphasis is placed on capturing the hybrid nature of the ownership structure by distinguish between fully SOEs and JV-SOEs as well as between FOFs and JVs with local firms. Thirdly, there are several methodological improvements. For calculating real value added (output), we use the double deflator method, which takes into the impact of on-going market-oriented reforms on relative pries of final goods and intermediate inputs. The double deflator method use separate price indices to deflate output and material inputs instead of directly converting nominal value-added into real-term using the readily available producer (wholesale price index), based on the restrictive assumption of fixed relative prices. We use generalized moments methods of Ackerberg, Caves and Frazer (2015) to estimate TFP. This method has the advantage of addressing identification issues involved in the methodology commonly used in previous studies. In estimating firm-level TFP biased on production functions estimated separately at the 2-digit level of the Vietnamese Standard Industrial Classification (VSIC). This approach allow for inter-industry differences in technology, in contrast to the standard practice of estimating firm-level productivity based on a production function estimated by pooling all firms

To preview the key findings, there is strong empirical evidence that the transformation of the ownership structure brought about by reforms over the past three decades has significantly improved productivity of Vietnamese manufacturing, with both FOFs and JV-PDEs playing a pivotal role. However, the productivity of FOFs is higher than their JV-PDEs. These results support the hypothesis that relaxing ownership restrictions on FDI have been instrumental in improving manufacturing productivity. Both SOEs and JV-SOEs have been recorded at the bottom of the productivity ranking by ownership mode. This comparison suggests that the choice between the state and private entrepreneurs is essential in determining the productivity implications of joint venture operation of MNEs because joint ventures with SOEs are not immune from various productivity-retarding factors affecting SOEs.

The paper proceeds as follows: Section 2 succinctly discusses the analytics underpinning the ensuing enquiry into productivity differentials by ownership. Section 3 provides information on policy reforms and the transformation of the ownership structure of Vietnamese manufacturing. Section 4 analyses the patterns and trends of productivity performance of Vietnamese manufacturing enterprises. An econometric analysis of the determinants of TFP growth of manufacturing enterprises is undertaken in Section 5. The concluding section summarises the main findings and makes suggestions for further research.

2. Ownership and productivity

What could explain possible differences in productivity performance of firms belonging to different ownership categories? To the extent that enterprises of different ownership face the same production possibilities and similar market conditions, systematic differences in productivity growth among them must be interpreted through some firm-specific factors/assets that are endogenous to the performance of each ownership mode. In other words, persistent productivity differences among ownership types should prevail after controlling for variables commonly applicable to the conduct and performance of all firms (Hart and Moore, 1990; Ehrlich *et al.*, 1994; Shleifer and Vishny, 1994).

There is a sizeable literature on the performance of MNE subsidiaries (FIEs) compared to the local firms in the host countries.[1] MNEs possess intangible assets such as patents and other fruits of R&D, management know-how, and marketing resources that determine their efficiency in global operation. Thus, in the process of global reach, MNEs bring not only new investment to the host countries but also these intangible proprietary assets. Therefore, MNE subsidiaries (FIEs) tend to be relatively more efficient compared to other firms in a given host country (Blomström and Kokko, 1997). Better management practices, specialized knowledge about production, and access to better technology provide them with a cost advantage over domestic firms. Moreover, MNE subsidiaries probably have the potential to avoid inefficiencies of small-scale operations more often than their rivals because parents' supply of internally generated funds frees offspring of the bondage of capital rationing' (Caves, 1974).

The dominant model of the effect of public ownership on firm performance is the public choice or property right model (Boardman and Vining, 1989; Toninelli, 2000). According to this model, the property rights structures have significant effects on patterns of incentives. The owners of PDEs have the right to alter the form, place, or use of their property and hence they have incentives to monitor managerial behaviour to ensure efficiency. By contrast, SOEs' ownership rights, which belong to the state, are non-transferable. Limits to transferability of ownership inhibit capitalization of the firm's perspective performance into its current property rights and thus reduces the owner's incentives to monitor managerial behaviour.

Another important theory of the firm related to public ownership's effects on firm performance is the agency theory (Jensen and Meckling, 1976). According to this theory, there are conflicts of interest between principal (the state) and agents (SOE managers and employees working for the state). While the agents have little incentive to strive for higher economic efficiency, the principal is likely to intervene in the enterprise's decision-making process. The intervention, rooted in nonmarket objectives, hinders SOEs' profitable operation. Partial divesture of the state-owned industries in the process of economic transition by forming joint ventures does not necessarily eliminate thie 'agency problem' (Schaffer, 1998; Kornai, Maskin and Roland, 2003). In other words, partial divesture of public enterprises is not synonymous

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[1] For surveys of this literature, see Caves (2007), Dunning (1998), Görg and Greenaway (2004), and Helpman (2006).

with the elimination of state intervention in enterprise decision making, which is a *sine qua non* for productivity improvement.

The performance of SOEs can also be shared by the well-known phenomenon of 'soft budget constraint', which cushions SOEs, perhaps to a lesser extent, SOE joint ventures, from competitive pressure created by natural maker forces (Kornai, 1986).[2] Presumably efficiency is not a major concerns for SOEs in a context where the government supports them through various channels, such as financing from state-owned banks and subsidies from different government agencies. Under the soft budget constraint, enterprises can not only survive but also even engage in anti-competitive behaviour. The problem of the SOEs' chronic soft budget constraint occurs in central planning and persists during the period of market transition (Kornai, Maskin and Roland, 2003).

The performances of SOEs and their joint-ventures are also subject to 'state capture', which refers to the phenomenon of private agents using illicit and non-transparent methods to shape the development and implementation of reform programs for their private gains (Hellman and Schankerman, 2000). If the privatization process is unduly influenced by the power of concentrated vested interests, it may impose severe impacts on subsequent institutional and regulatory developments. Privatization and other institutional reforms will effectively improve the performance of firms if the reforms process is cushioned from 'state capture' by private interests (Hellman and Schankerman, 2000).

The performance comparison between JVs and FOFs is also highly developed in the literature. The ownership mode of JV is likely to receive the most leading technology from their parent company because the latter has a greater incentive to transfer advanced technology to FOFs (Dimelis and Louri, 2002). By contrast, the possibility of technological leakage discourages the parent company from transferring technology to its JVs. Performance of a JV also depends on the congruence of the partners' goals, which is not an issue in the case of a FOF so that joint venture subsidiaries could be less productive compared to wholly owned subsidiaries, *ceteris paribus* (Brouthers and Hennart, 2007).

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[2] The 'softening' of the budget constraint appears when the strict relationship between the expenditure and the earnings of an economic unit has been relaxed because excess expenditure will be paid by some other institution, typically by the paternalistic state (Kronai 1986).

The performance difference between JV-SOEs and JV-PDEs in a given country is an empirical issue. Compared to JV-PDEs, JV-SOEs could have some advantages of accessing state-owned financial institutions and flexibility in meeting regulatory obligations (Hoskisson *et al.*, 2000). However, JV-SOEs' performance is susceptible to productivity-reading factors common to pure SOEs, such as agency problem, soft budget constraint, and state capture. This could make joint ventures with the state sector less productive compared to their private-sector counterparts.

3. Reforms and ownership transition

Reforms

Vietnam, unlike the transition economies in Central and Eastern Europe and somewhat similar to the Chinese reforms, adopted a gradual approach to unshackling the economy (Riedel and Comer, 1997; Vu-Thanh, 2019). The reform process, which was introduced under the slogan of *doi moi* (*renovation*) in 1986 and implemented gradually during the ensuing three decades, set the stage for the development of a market economy characterized by a mix of state and private ownership.

The first Foreign Investment Law passed in 1987 specified three modes of foreign investor participation: (i) business cooperation contracts (BCCs), (ii) joint-ventures, and (iii) fully foreign-owned ventures. Foreign participation in the fields of oil exploration and communication was strictly limited to BCCs. In some key sectors such as transportation, port construction, airport terminals, forestry plantation, tourism, and cultural activities, a joint venture with domestic SOEs was specified as the sole mode of foreign entry. Fully foreign-owned ventures in other sectors were permitted only under special considerations according to policy priorities of domestic industrial development. The duration of foreign ownership of approved projects was limited to a maximum of 20 years, unless under exceptional circumstances. The Law on Private Enterprises promulgated in 1990 legally recognized sole proprietorships and became a legal basis for opening up limited liability and joint-stock companies.

The initial opening of the economy to foreign investment led to growing resentment against FDI within certain circles of the Communist Party, resulting in the adoption of a number of restrictive policy measures in 1995-96. These included establishing Communist Party cells in FIEs, doubling commercial and residential rents for foreign enterprises and expatriate staff, imposing a maximum time limit of three years on work permits issued to foreigners employed in FDI projects, restricting foreign capital participation in labour-intensive industries, and imposition a domestic-content and export-performance requirements on FIEs in a number of key industries. There was also a renewed emphasis on strengthening the state sector in the economy. In the mid-1990s, 18 large SOEs (referred to as state general corporations, SGCs) were established, inspired by the role of large conglomerates (*Keiretsu* and *chaebols*) in the industrialization success of Japan and South Korea (Vu-Thanh, 2019).

Policy reforms gathered momentum following the economic downturn during 1997-99, supporting the adage that ‘bad times lead to good reforms’. A new Law on Enterprises that came into force in 2000 introduced a simplified procedure for setting up new enterprises and permitted conversion of joint-venture FIEs (including joint ventures formed under BCCs) into fully-owned subsidiaries of parent companies. In December 2005, a new unified Law on Investment was promulgated in place of the Law on Foreign Investment and the Law on Domestic Investment Promotion. The key features of this landmark legislation included treating foreign and domestic investors equally with regard to investment approval and incentives, providing investors with complete freedom in the choice of the mode of business entry, abolishing local-content and export-performance requirements, and introducing a decentralized three-tier system of investment approval. There have been further revisions to foreign investment and enterprise laws in 2014 and 2016 to make these more consistent with international standards and practices.

A noteworthy future of the ownership reforms over the past three decades has been its dualistic nature. Significant opening up of the economy to FDI and relaxing restriction on PDEs has taken side by side with the government commitment to preserving the ‘leading role of the state sector’ in the economy (Vu-Thanh, 2019, p. 20). Interestingly, following the country’s WTO accession in 2007, restructuring the state sector with a view to preparing it to face new competitive market conditions because declared government policy. As part of this new policy emphasis, some SGCs were restructured, with new capital injection and privileged access to bank financing.

Manufacturing performance and ownership structure

The manufacturing sector has played a significant role in the Vietnamese economy since the ‘renovation reforms’ initiated in the late 1980s, particularly, following significant trade liberalization and enterprise reforms in the early 2000s. Real manufacturing output had grown at an average annual rate of nearly 10% during 1990-2017, except for 2010, when there was an overall contraction in economic growth in the country. The direct contribution of manufacturing to GDP growth increased from 12.3% in 1990 to around 20% during 2000-2009. After significant contraction during the global financial crisis (2008-2009), the contribution gradually increased to 15.3% in 2017. The manufacturing sector directly generated 4.3 million jobs between 2005 and 2017. The share of manufacturing in total formal sector employment in the economy increased continuously from 11.8% in 2005 to 17.3% in 2017.[3]

Manufacturing growth has been underpinned by a notable shift in the ownership structure. The share of SOEs in manufacturing output (value-added) declined from 56.5% in 2000-2001 to 4.2% in 2016-2017. Their sharing in manufacturing employment was 3.1% in 2016-2017, down from 55.5% in 2000-2001 (Table 1). Output and employment shares of FIEs increased from 20.2% and 12.5% in 2000-2001 to 66.6% and 58.2%, respectively in 2016-2017. Within FIEs, the role of JVs decreased gradually over the years due to the relaxation of ownership restrictions that permitted MNEs to form FOFs. FOFs accounted for 58.7% of output and 55.1% of employment in manufacturing compared to JVs' shares of 7.9% and 3.1%, respectively. In sum, there has been a notable shift in the ownership structure of Vietnamese manufacturing from public ownership to private ownership, with FIEs, particularly FOFs, playing a pivotal role in this structural change.

[3] Data used in this paper, unless otherwise stated, are from *The Statistical Yearbook*, Hanoi: General Statistical Office (GSO) (various issues).

Table 1: Ownership Structure of Manufacturing Output and Employment in Vietnam, 2000-2017 (to-year averages)

	2000-2001	2006-2007	2010-2011	2016-2017
	% Output (value added)			
State-owned enterprises (SOEs)	56.5	19.4	11.0	4.2
Private domestic enterprises (PDEs)	23.3	33.3	37.5	29.3
Foreign-invested enterprises (FIEs)	20.2	47.4	51.5	66.6
Fully owned foreign firms (FOFs)	*14.5*	32.6	41.8	58.7
Joint-ventures (JVs)	*5.7*	14.8	9.7	7.9
JV-SOEs	---	12.6	7.2	5.5
JV-PDEs	---	2.2	2.5	2.5
	% Employment			
State-owned enterprises (SOEs)	55.5	14.1	6.8	3.1
Private domestic enterprises (PDEs)	32	46.2	46.6	38.8
Foreign-invested enterprises (FIEs)	12.5	39.8	46.7	58.2
Fully owned foreign firms (FOFs)	---	35.2	43.1	55.1
Joint-ventures (JVs)	---	4.7	3.7	3.1
JV-SOEs	---	2.4	1.7	0.8
JV-PDEs	---	2.3	2.0	2.4

Note: ---: Data not available

Source: Data for 2000-2001 are from Ramstetter and Phan (2013); for other years compiled from the VES 2006-2017

4. Productivity: measurement and patterns

Measurement of productivity

Labour productivity (LP) is the most commonly used measure of productivity, measured as production per unit of labour input. The problem with this measure is that it spuriously capture capital deepening as a part of measured productivity. In reality, workers may produce more not because of an increase in efficiency but because they have better machines to work with. Total factor productivity (TFP), the measure of productivity used in this paper, avoids this limitation. It is the level of output after accounting for factors of production used in the production process.

We use the production function estimator developed by Ackerberg, Caves and Frazer (2015) for estimating firm (establishment) level TFP.

Let us begin with the standard production function:

$$\boldsymbol{y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \omega_{it} + \varepsilon_{it}} \qquad \textbf{(1)}$$

where, y_{it} is the log of output (value added), k_{it} is the log of capital input, and l_{it} is the log of labour input, both of which are observed, ω_{it} represents mostly unobservable "productivity" shocks, and ε_{it} *iid* error term for firm i at period t. The productivity shocks are associated with innate technology or managerial ability of a firm, expected production disruption due to machine breakdown, and expected defect rates in a manufacturing process. If the econometrically unobservable ω_{it} is observed at least partially by the firm prior to choosing k_{it} and l_{it}, then (k_{it}, l_{it}) and ω_{it} are correlated, rendering OLS estimates of β_k and β_l inconsistent.

To address the correlation between unobservable productivity shocks and k and L levels, Olley and Pakes (OP) (1996) suggest using a firm's investment as a proxy variable for the firm's productivity. Since investment may not fully respond to changes in productivity, Levinsohn and Petrin (LP) (2003) propose using intermediate inputs rather than investments in the control function. According to OP and LP, inputs are assumed to be of two types: variable inputs such (v_{it}) such as labour[4], the choice of which in the current period does not have an impact on their cost of use in the future periods and 'state' variables (s_{it}) such as capital input (k_{it}) whose choice have an impact on the future cost of input. Thus, equation (2) is rewritten as:

$$\boldsymbol{y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + \omega_{it} + \varepsilon_{it}} \qquad \textbf{(2)}$$

where β_v and β_s are parameter vectors of the appropriate dimension. Firms' investment and intermediate inputs decisions are given by the demand function, which is a function of productivity shocks ω_{it} and the state variables s_{it}: $d_{it} = (s_{\text{it}}, \omega_{it})$. Assuming this function can be inverted, $\omega_{it} = d_t^{-1}(s_{\text{it}}, d_{it}) = h_t(s_{\text{it}}, d_{it})$, the estimation of the production function can be taken in two steps as follow:

Stage 1: Insert the inverse of the demand function for the proxy variable 9in (2):

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[4] In the case where y_{it} is gross output, variable inputs also include intermediate inputs. However, for simple illustration, this section focuses on the case in which y_{it} is value added.

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + h_t(s_{it}, d_{it}) + \varepsilon_{it} \quad (3)$$

to obtain the estimate of the labour coefficient β_v and the composite term $P_t(s_{it}, d_{it}) = \beta_0 + \beta_s s_{it} + h_t(s_{it}, d_{it})$

Stage 2: Insert the estimate of $\widehat{\beta_v}$ and $\widehat{P}_t(s_{it}, d_{it})$ to estimate β_s using the equation:

$$y_{it} = \beta_0 + \widehat{\beta_v} v_{it} + \beta_s s_{it} + \tilde{g}\left(\widehat{P_{t-1}} - \beta_0 - \beta_s s_{i,t-1}\right) + \xi_{it} + \varepsilon_{it} \quad (4)$$

Ackerberg, Caves and Frazer (ACF) (2015) argue that the approaches of OP and LP suffer from an identification issue because of treating labour as a state variable: choice of labour potentially impact on the future cost of inputs because of hiring and/or firing costs. ACF, therefore, allow labour input to have a dynamic effect and include it in the input demand function $d_{it} = (s_{\text{it}}, \omega_{it}, l_{it})$, thus, $\omega_{it} = d_t^{-1}(s_{\text{it}}, d_{it}, l_{it}) = h_t(s_{\text{it}}, d_{it}, l_{it})$. They propose modifying the two-step procedure for estimation the production function as follows:

Stage 1: Insert the inverse of the demand function for the proxy variable:

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + h_t(s_{it}, d_{it}, l_{it}) + \varepsilon_{it} \quad (5)$$

To obtain the estimate of the composite term: $\theta_t(v_{it}, s_{it}, d_{it}) = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + h_t(s_{it}, d_{it}, l_{it})$

Stage 2: Insert the estimate of $\widehat{\theta}_t(v_{it}, s_{it}, d_{it})$ using the equation:

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + \tilde{g}\left(\widehat{\theta_{t-1}} - \beta_0 - \beta_v v_{i,t-1} - \beta_s s_{i,t-1}\right) + \xi_{it} + \varepsilon_{it} \quad (6)$$

to identify labour coefficient, along with all other input coefficients.

After obtaining consistent estimators for β_v and β_s, the level of productivity is estimated as[5]:

$$\widehat{TFP}_{it} = exp(\widehat{y}_{it} - \widehat{\beta}_v v_{it} - \widehat{\beta}_s s_{it}) \quad (7)$$

Data

The data were compiled for the period 2006-2017 from the unpublished returns to the Vietnamese Enterprise Surveys (VES) conducted annually by the General Statistics Office (GSO) of Vietnam. This is one of the most disaggregated establishment-level data sources available for a transition economy. It enabled us to group establishments under five ownership categories: SOEs, PDEs, FOFs, JV-SOEs, and JV-PDEs. This separation permits for better capturing the hybrid nature of different ownership structures.

[5] We use the Stata subroutine *acfest* developed by Manjón and Mañez (2016).

In the dataset, the annual returns for each establishment have been linked across years so that an annual panel dataset can be constructed. We extracted data for establishments operating in manufacturing industries VSIC 10 to VSIC 31, excluding petroleum and gas (VSIC 19) and Tobacco (VSIC 12). The petroleum and gas industry is excluded for two reasons: most of the production is exported in semi-processed forms, and, unlike other products, petroleum is subject to world market price fluctuations. Tobacco industry is excluded because it has too few firms.

The VES has been conducted annually since 2000. However, we limit the time coverage of the analysis to 2006-2017 because precise concording of firms and the relevant performance variables is not possible for the entire period because of changes in industry codes with effect from the 2006 survey. Also, the related information for transforming variables into real terms is only available from 2006. In any case, we believe that focusing on this period rather than the entire period from 2000 is more appropriate given the significant structural break in ownership patterns resulting from the policy reforms undertaken during 2005-2006 in preparation for obtaining membership of the World Trade Organization.

The VES data presumably has an inherent 'large firm bias' because of the 'size' cut-off point used in selecting firms (which varies across years) and probable poor response to the survey by relatively smaller firms. However, we believe this does not pose a major problem in the inter-industry analysis of productivity patterns. By inspecting firm (establishment)-level data from the 2006 manufacturing census, we found that firms that employ more than ten workers account for over 96% of gross manufacturing output and 89% of manufacturing employment.

Output (value-added) and capital stock are measured in real terms (at 2010 prices). Real output is computed using the 'double deflator' method, which involves using separate deflators for gross output and intermediate inputs constructed from data provided by the GSO. There is evidence that reforms have significantly altered the relative prices of gross manufacturing output and material inputs. Therefore, it is important to use separate price indices to deflate output and material inputs instead of directly converting nominal value-added into real-term based on the mistaken assumption of fixed relative prices (Jefferson *et al.*, 2000). Wholesale price indices at the 2-digit level of the Vietnam Standard Industry Classification (VSIC) are used as gross output deflators. Deflators of intermediate inputs are constructed by combining wholesale price indices with data on the input stature of production from the 2012 Input-Output constructed by the GSO. Data series for real capital stock are derived using implicit price deflators compiled from data on current and real (2010 = 100) gross fixed capital formation (at the 2-digit level).[6]

The number of workers employed is used to measure labour input. This is presumably a good proxy for the number of labour hours involved in manifesting production because there have not been any changes in the length of the working week and incidences of major employment disruption during the period under study. Unfortunately, the available data do not permit us to adjust the employment series for change in labour quality.

Previous plant/firm-level studies have mostly estimated firm-level TFP based on a production function estimated for the entire manufacturing sector based on the implicit assumption of homogeneity in technology among all firms. In order to minimize possible estimation bias resulting from using this restrictive assumption, we estimate establishment-level productivity based on production functions estimated for each 2-digit manufacturing industry.[7] Tobacco industry (VSIC 12) is excluded from estimation because it has too few firms.

Trend and pattern of TFP

TFP estimates for total manufacturing and the five ownership groups are plotted in Figure 1. The estimates are plotted as indices (2006 = 100) to facilitate comparison. The index of TFP in total manufacturing increased from 100 to 126 during 2006-2017, with an average annual growth rate of 2.1%. Within manufacturing, all ownership groups recorded an increase in productivity during this period. However, both SOEs and JV-SOEs have recorded slower TFP growth (1.0% and 2.1%, respectively) compared to the other three ownership groups (FOFs: 5.2%, PDEs: 4.7%, JV-PDEs: 4.6%).

Overalls, this first look at data shows an interesting pattern of PDEs closely following (or even performing slightly better than) the productivity patterns of FOFs and JV-PDEs. This has occurred in the context of a significant increase in the role of foreign firms (both JVs and FOFs) in Vietnamese manufacturing (Table 1). At first blush, these patterns seem to suggest

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[6] Price indices used for deflating current gross output, inputs, and capital stocks together with a methodological note are available from the authors on request.

[7] In this, we follow Newman, Rand, Talbot, and Tarp (2015).

that ‘superior technology or productivity imported by the subsidiaries progressively spills into their domestic rivals’ (Caves, 2007, p. 214).

TFP estimates by ownership mode estimated at the 2-digit level of VSIC are summarized in Table 3. All industries, except printing (VSIC 18) and pharmaceuticals (VSIC 21), have shown productivity growth, though at varying degrees. Productivity growth is relatively higher in industries in which Vietnamese manufacturing has been rapidly integrating within global production networks (e.g., electronics (VSIC 26), electrical goods (VSIC 27), motor vehicles (VSIC 29)). These are also the industries with a heavy concentration of FIEs (Athukorala and Nguyen, 2020).

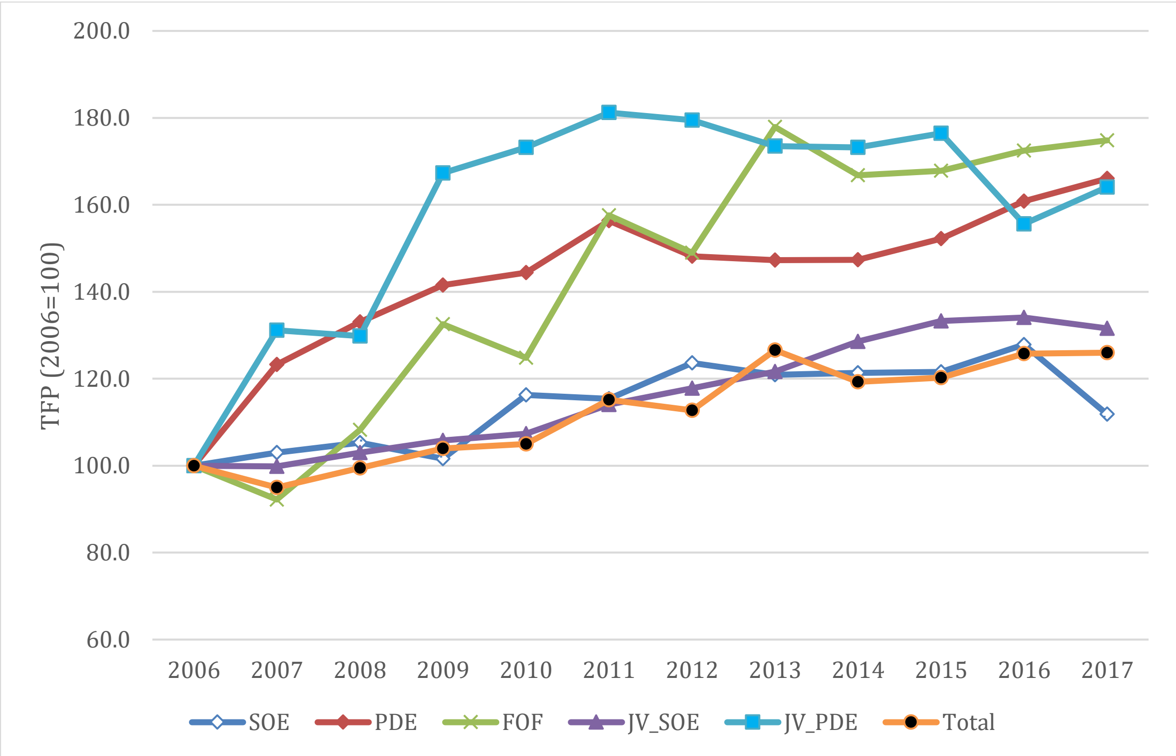

Figure 1: Manufacturing TFP Growth by Ownership

Note: (1) Average annual TFP growth rates: state-owned enterprises (SOEs): 1.0%; private domestic enterprises (PDEs): 4.7%; fully owned foreign firms (FOFs): 5.2%; SOE-MNE joint ventures (JV-SOEs): 2.5%; PDE-MNE joint ventures (JV-PDEs): 4.6%; total manufacturing: 2.1%

Source: Data compiled from the VES 2006-2017

Table 2: Vietnamese Manufacturing: Output (Value-Added) Share and TFP Growth by Ownership Types, 2006-2017 (%)

VSIC	Manufacturing industries	Output (value-added) share 2006–2017						TFP growth 2006–2017					
		Total	SOE	PDE	FOF	JV-SOE	JV-PDE	Total	SOE	PDE	FOF	JV-SOE	JV-PDE
10	Food products	15.8	6.9	51.8	27.4	8.2	5.7	1.9	0.3	4.0	1.3	0.8	2.5
11	Beverages	4.1	37.0	17.0	13.7	31.8	0.5	0.5	-0.3	4.3	1.4	-0.9	8.1
13	Textiles	3.5	13.2	30.7	48.8	5.4	2.0	3.7	3.7	3.2	4.0	-2.6	6.7
14	Wearing apparel	11.6	6.9	38.7	52.3	0.8	1.3	2.5	0.6	2.5	2.6	-0.1	3.7
15	Leather and related products	9.5	1.4	19.5	73.0	0.4	5.6	1.1	1.5	1.7	1.3	-1.0	-1.5
16	Wood and products of wood	1.3	8.9	70.0	14.7	3.3	3.0	1.4	1.0	2.2	0.2	0.3	2.1
17	Paper and paper products	1.8	9.6	49.0	37.9	0.9	2.5	0.5	-0.1	0.0	0.3	-2.2	2.9
18	Printing and recorded media	1.0	40.9	38.1	20.3	---	---	-1.4	-0.9	-1.0	-0.8	---	---
20	Chemical and chemical products	5.0	28.9	21.1	43.3	5.4	1.4	0.9	0.7	1.8	1.9	-0.6	0.5
21	Pharmaceuticals and related chemical	1.9	9.0	74.1	11.3	---	2.1	-0.5	1.7	-0.1	-2.4	-3.3	-0.8
22	Rubber and plastic products	4.4	8.5	36.4	51.4	1.2	2.6	3.1	3.0	1.2	4.1	6.8	7.8
23	Other non-metallic mineral products	5.1	20.8	52.3	13.3	12.1	1.4	3.3	4.6	3.7	3.0	2.6	6.7
24	Basic metal	1.3	33.0	44.5	18.6	---	3.0	1.8	0.9	5.6	-0.2	---	5.5
25	Fabricated metal products	4.3	6.4	37.5	47.1	5.8	3.2	3.1	3.4	3.8	2.5	2.8	4.9
26	Computers, electronics, and optical products	12.2	4.1	3.0	83.9	8.7	0.5	5.2	2.9	2.3	6.1	0.1	5.8
27	Electrical equipment	4.1	9.3	19.1	68.0	1.3	2.3	1.8	1.4	2.2	1.7	3.4	2.6
28	Unclassified machines, equipment	1.9	3.9	31.3	63.5	---	1.1	1.2	0.1	1.5	0.8	---	3.5

29	Motor vehicles and trailers/semi-trailers	2.8	13.3	15.5	52.2	---	---	7.2	3.8	12.1	8.1	---	---
30	Other transport equipment	4.7	8.6	4.2	26.8	57.5	---	2.9	2.1	4.4	1.5	2.4	3.0
31	Furniture	3.6	2.9	39.7	55.0	---	2.2	5.3	6.0	5.4	4.6	---	20.7
		100	13.7	34.7	41.1	10.2	2.4	2.1	1.0	4.7	5.2	2.5	4.6

Note: --- Data not available

Source: Data compiled from the VES 2006-2017

5. Ownership and Productivity

Model Specifications

In this section, we examine the effect of ownership types on TFP. For this purpose, the estimation equation is specified as follows:

$$TFP_{ijt} = \alpha + \beta_1 Own_{ijt} + \beta_2 X_{ijt} + \gamma_i + \mu_j + \lambda_t + \varepsilon_{ijt} \quad (1)$$

where TFP is total factor productivity, $i = 1, 2, \ldots, n$ is the firm, $j = 1, 2, \ldots, m$ is the 2-digit sector and $t = 1, 2, \ldots, t$ is the time unit in years. γ: Firms' fixed effects; µ: 2-digit sector dummy variables; λ: Year dummy variables; ε: Error term assumed to be independent of explanatory variables.

The main variable of interest, ownership (Own), is captured by ownership dummies: state-owned enterprises (SOE), private domestic enterprises (PDE), fully-owned foreign enterprises (FOF), joint-ventures with state-owned enterprises ($JV{-}SOE$) and joint-ventures with private domestic enterprises ($JV{-}PDE$), private domestic firms (PDE) as the reference group (base dummy). The control variables (X_{ij}) are listed below with the expected sign of the regression coefficients in brackets:

$SIZE$ (+ or -)	Firm-size dummy variables: $Micro$: 0-9 employees, $Small$: 10-49 employees (base dummy), $Medium$: 50-299 employees, and $Large$: more than 300 employees
AGE (+ or -)	Number of years of operation based on the year of entry
GLD (+ or -)	Geographical location dummies: Northeast and Mountainous region - NTM (base dummy), Red River Delta - RRD, North Central - NC, South Central and Highland - SCH, Southeast - ST, and Mekong Delta - MKD
EOR (+)	Export orientations (export-output ratio at 2-digit industry level)
MDR (+ or -)	Import dependence (import-output ratio at 2-digit industry level)
HHI (+ or -)	Herfindahl-Hirschman Index of industry concentration measured at 2-digit industry level

Among the control variables, firm size ($SIZE$) is included to capture the impact of scale on firms' productivity.[8] Key features of a large firm, including its diverse capabilities, the ability to exploit economies of scale and scope, and the formalization of procedures, allow it to generate superior performance relative to smaller firms (Penrose, 1959). In contrast, small firms may have higher productivity due to their lean organizational structure (Williamson, 1967; Utterback, 1994).

Firm age (AGE) is included to capture the vintage effect on productivity. Older firms, which are more experienced and can enjoy the benefits of learning, may perform better than younger firms (Stinchcombe, 2000). However, younger and more agile firms can outperformm older firms because the latter are unlikely to have the flexibility to make rapid adjustments to changing circumstances due to inertia and the bureaucratic ossification that goes along with age (Marshall, 1920).

Geographical location dummies (GLD) are included in the model by dividing the firms by six main regions of Vietnam: Northeast and Mountainous (base dummy), Red River Delta, North Central, South Central and Highland, Southeast and Mekong Delta. Given the significant historical, institutional, and economic differences that persist over time, firms' productivity is expected to differ across these regions. Of these six regions, South Vietnam was under central planning for a much shorter period than North. Presumably, this can have a significant impact on establishment-level productivity differences (Riedel and Comer, 1997).

Export orientations (EOR) is incorporated to capture an export impact on a firm's productivity. On the one hand, the self-selection hypothesis indicates that firms that enter the export market should have sufficient profits to cover a significant sunk cost involved in exporting, so it is the more productive firms that self-select into exporting (Roberts and Tybout, 1997). On the other hand, the learning-by-exporting hypothesis emphasizes the productivity improvement of firms following their entry into international markets thanks to accessing the information on the

[8] In experimental runs, we used employment (number of workers) and real output as alternative measures of the firm size, but was not possible to retain in the final estimates because of high multicellularity.

best managerial and marketing practices, new technologies, and exposure to competition (Clerides, Lach and Tybout, 1998).

Import dependence (MDR) is included to capture the effects of import penetration on firm productivity. On the one hand, rising imports may lead to firms losing scale efficiency because of crowding out effects – firms lose market shares to imported goods (Edwards and Jenkins, 2015). On the other hand, rising import penetration encourages firms to cut costs and use inputs more efficiently in order to survive (Holmes and Schmitz, 2010). The intensifying import competition also forces firms to invest more in innovation to improve existing products or generate new products to escape competition from rivals (Aghion *et al.*, 2005).

A common measure of market concentration, the Herfindahl-Hirschman Index (HHI),[9] is included to capture the effects of market competitiveness on firms' productivity. Greater competition will pressure firms into adopting new technologies and operating more efficiently (Nickel, 1996). Also, endogenous growth theory postulates that monopoly rent coming from the low level of competition are invested in R&D, which in turn leads to innovation and improvements in TFP (Dixit and Stiglitz, 1977; Grossman and Helpman, 1991). However, under some conditions, increased competition can lower the expected income of managers and, therefore, their effort, which in turn reduces firm efficiency levels.

Data for all variables other than the two trade exposure variables (MDR and EOR) are compiled from the VES database. Data series for MDR and EOR are constructed at the VSIC 2-digit level by combining trade data from the UN COMTRADE database and gross manufacturing output data from the VES database. In estimating the TFP equation, TFP, $AGE\ HHI$, EOR, and MDR are measured in natural logarithms.

Estimation method

We use the correlated random effects (CRE) method for estimating the TFP equation (Wooldridge, 2010 and 2019; Schunck and Perales, 2017). Fixed-effects (FE) and random-effects (RE) estimators are the common methods applied to panel data. Unlike the standards OLS estimators,

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[9] $HHI_{jt} = \sum_{i=1}^{n} os_{ijt}^2$, where os_{ijt}^2 is the gross output share of firm i in sector j at time t. The lower the value of HHI_{jt}, the higher the level of a sector's competition.

both these estimators take account of unobservable individual heterogeneity. The FE estimator offers consistent estimators but does not estimate time-invariant variables since it is based on the within operator. On the other hand, the RE estimator increases the efficiency of estimations but imposes a strong assumption that individual effects are not correlated with explanatory variables. However, it can yield biased and inconsistent coefficient estimates if one or more explanatory variables are endogenous (i.e., if they are jointly determined together).

The CRE approach is a mid-way house between the FE and RE estimators, that combines strengths of both these models. It provides within estimates analogous to FE by subtracting the cluster mean of time-variant variables in a RE model. Moreover, it allows for the statistical disentangling of effects of time-variant within-firm determinant factors and time-variant between-firm determinant factors, taking the panel data design into account (Schunck and Perales, 2017). For time-variant variables, such as ownership and age, both within- and between- effects are estimated, although the latter is indirectly estimated through the difference- effects (the difference between the between- and within- effects). While within-effects assess how on average, a within-cluster change in an explanatory variable x_{it} is associated with a within-cluster change in an outcome variable y_{it}, the between-cluster effects assess how a change in x_i is associated with a change in y_i. Our interest lies chiefly in the within-cluster effects since we intend to capture productivity level differences due to chnage in ownership within firms.

An additional advantage of CRE is that it has the capability to estimate the effects of time-invariant variables like RE without restrictive assumptions of the absence of correlation between the unobserved heterogeneity term and other explanatory variables. The coefficients on the time-invariant variables, such as geographical location, are estimated like those in a standard RE regression.

One potential econometric issue is the reverse causality between ownership and domestic firms' productivity. In the productivity–ownership nexus, arguably, causality may not necessarily go from the latter to the former. For instance, private firms with low productivity may be more likely to come under state ownership for political reasons. Alternatively, the more efficient SOEs are privatized first to make the privatization strategy more active to the private sectors. Accounting for this potential endogeneity, we include the ownership variables with one-year lag.

Results

Table 3 presents CRE estimates of the productivity equation. Alterative RE and FE estimates are given in the Appendix Table A-1 for comparison.

Table 3: Total Factor Productivity in Vietnamese Manufacturing: CRE Estimates

(Dependent variable = Log TFP)

	(1)	**(2)**	**(3)**
Ownership (with PDE as the base dummy)			
L.SOE	0.091 (0.028)**	0.038 (0.028)	0.014 (0.033)
L.FOF	0.179 (0.048)***	0.156 (0.048)**	0.140 (0.048)**
L.JV-SOE	0.126 (0.062)*	0.068 (0.061)	0.080 (0.061)
L.JV-PDE	0.154 (0.050)**	0.124 (0.047)**	0.127 (0.050)*
Log AGE		0.182 (0.012)***	0.182 (0.012)***
Size (with Small as the base dummy)			
Micro		-0.179 (0.008)***	-0.179 (0.008)***
Medium		0.093 (0.008)***	0.094 (0.008)***
Large		0.101 (0.015)***	0.102 (0.016)***
Geographic location (with NTM as the base dummy)			
RRD		0.155 (0.019)***	0.142 (0.019)***
NC		-0.058 (0.026)*	-0.063 (0.026)*
SCH		0.028 (0.022)	0.014 (0.023)
ST		0.406 (0.019)***	0.387 (0.019)***
MKD		0.154 (0.022)***	0.147 (0.021)***
Log EOR		0.352 (0.012)***	0.360 (0.012) ***
Log MDR		0.176 (0.013)***	0.175 (0.013)***
Log HHI		-0.035 (0.004)***	-0.032 (0.005)***
FOF*EOR			-0.055 (0.018) **
SOE*AGE			0.014 (0.012)
Constant	4.840 (0.021)***	5.888 (0.077)***	5.889 (0.076)***

Observations (N)	154317	154317	154317
AIC[2]	360395	346597	345639
BIC[2]	361081	347472	346554

Notes: Heteroscedasticity-robust standard errors are given in given in parentheses with the statistical significance of the regression coefficients denoted as * p<0.05, ** p<0.01, *** p<0.001; All regressions include sector fixed effects and year fixed effects; AIC: Akaike information criterion; BIC: Bayesian information criterion

The 'base' model, in which only the four ownership variables enter as the explanatory variables, is reported in column (1). In this equation, the coefficients of all four variables are positive and statically significant at the five percent level or better. The results suggest that the productivity level in all four ownership groups is higher on average compared to purely locally owned firms. However, the magnitude ('economic' significance) of SOE ad JV-SOE coefficients is much smaller than the other two ownership categories. This result is consistent with the relatively poor productivity performance of SOEs and JV-SOEs we noted by eyeballing the productivity estimates (Section 3).

Interestingly, the statistical significance of the coefficients of SOEs and JV-SOE disappears in the full model as reported in column (2). The results suggest that, when appropriately controlled for factors that commonly affect productivity performance across all firms regardless of the particular ownership mode, the productivity of both types of firms is not significantly different from that of PDEs. By contrast, both FOFs and JV-PDEs stand out for higher productivity performance. The coefficient of the former (0.156) is more significant than that of the latter (0.124) (and the two coefficients fall well beyond two standard error bands), supporting the hypotheses that FOFs are characterized by higher manufacturing productivity compared to their joint-venture counterparts.[10]A comparison of the results for JV-SOE and JV-PDE (statistically insignificant

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[10] Le et al. (2019, p. 693), using data from the same source for period 2000-2011, have come up with the inference: 'on average, both foreign-owned enterprises (FOEs) and state-owned enterprises (SOEs) have performed better than privately-owned enterprises (POEs) in terms of their TFP levels'. Their findings are not sickly comparable with ours because the difference in the

coefficient of JV-SOE compared to significant and much larger coefficient of JV-PDE) suggests that the choice between the state and private entrepreneurs as joint-venture partners is important in determining productivity implications of joint venture operation of MNEs in Vietnam. This result is consistent with our analytical prior that JV-SOEs are not immune from various productivity-retarding factors affecting SOEs in general.

The model estimated after adding two interaction terms, $SOE * AGE$ and$FOF * EOR$, is reported in column (3). SOEs, on average, are much older compared to the firms belonging to the other ownership groups. The interaction variable $SOE * AGE$ is included to capture this vintage effect on productivity performance. In recent years, there has been a significant increase in the entry of MNEs to set up fully owned subsidies in Vietnam manufacturing for export processing within global production networks (Athukorala and Nguyen, 2020). The integration variable $FOF * EOR$ is included to test whether this structural shift has impacted the association between FOF and productivity.

The coefficient of $SOE * AGE$ is not statistically different from zero, suggesting that the productivity of SOEs is not susceptible to the vintage effect. The coefficient of $FOF * EOR$ is statistically sufficient with the negative sign. The results could reflect lower productivity gains at the formative stage of engagement in simple assembly processes within global production networks. This is an interesting issue that deserves further investigation.

To comment briefly on the results for the control variables, coefficient estimates of the SIZE variables support the hypothesis that firms are more productive when they have the ability

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time coverage of the data used. However, there are important methodological issues that we need to take into account in probing the sharp contrast between the inferences. First, they have lumped together both SOEs and JV-SOEs under their coverage of SOEs. Second, real output (value-added) used in their calculation of TFP is based on the restrictive assumption of fixed relative prices between final (gross) output and intermediate inputs. Finally, presumably, there could have been inconsistencies in the data series between the periods 2000-2005 and 2006-2011, resulting from significant revisions to the VSIC classification system introduced with effect from 2006. There is no mention of this important data concordance issue in the discussion on data compilation in the paper.

to exploit economies of scale. In particular, the coefficient of the micro firm dummy variable is statistically significant but with a negative sign. The AGE coefficient is positive and statistically significant, suggesting that firms getting mature operate more productively. There is evidence from the regional dummy variable that, on average, the productivity of firms located in the Southeast (ST) is much higher than those located in other regions. Both export orientation and import penetration seem to promote productivity, with the former having a much more significant effect than the latter. Finally, industrial concentration appears to have a mild negative impact on manufacturing productivity.

Robustness Checks

In the benchmark model, unobserved time-invariant factors (including firm- and sector-specific time-invariant variables) have been controlled by CRE using within estimates. Furthermore, various macroeconomic environment changes have been captured by the year dummy. However, some unobserved firm- and industry-specific variables that vary over time may lead to endogeneity problems. Reverse causality also cannot be fixed entirely by lag explanatory variables. It is challenging to find suitable external instruments that meet the criterion of highly correlated with the ownership variables but not correlated with productivity in this type of econometric analysis.

We, therefore, checked the robustness of the results using different estimators. First, we estimated the model using the Hausman-Taylor instrumental variable estimator (HT) (Hausman and Taylor, 1981), which aims to minimize endogeneity by using instruments derived within the model. Second, we estimated the model using the difference-GMM estimator developed by Arellano and Bond (1991). This approach employs within-firm differencing to control for unobserved and time-invariant firm heterogeneity, together with internal instruments (lag levels) for all endogenous explanatory variables. Thus, the estimator offers a powerful toolbox to tackle endogeneity problems caused by unobserved heterogeneity and reverse causality.[11]

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[11] We employed difference-GMM instead of system-GMM because the coefficients for the lag dependent variable (L.Log TFP) lie well within the OLS upper bounds and FE lower bounds in all three models (Bond, Hoeffler, & Temple, 2001)

In addition, we reestimated the model after excluding micro-sized firms from the data set and truncating the time coverage to 2010-2017. As already discussed, there have been significant changes from time to time in the coverage of these firms in the VES dataset. There are also concerns about the quality of data reported by these firms. We also undertook alternative estimation after truncating the time coverage to 2010-2017 to allow for production disruptions during the global financial crisis (2008-2009). Finally, we tested in alternative regressions runs four-firm concentration ratio as an alternative to HHI and the square of AGE in addition to AGE (to test possible non-linearity of the vintage effect).

The alternative estimates are reported in Tables A-3 to A-7 in the Appendid. As one would expect, the magnitude of the regression coefficent for most variables is notably different among alternative estimates. However, interms of the sings of regression coefficnents and differences in the magnitutude of the coeffinces of the dummy variables for the four ownership groups, our inferences are robust to all these tests.

6. Conclusions

We have examined the role of ownership in manufacturing productivity in Vietnam in the context of policy reforms undertaken over the past three decades. The ownership structure of Vietnamese manufacturing has undergone a dramatic transformation thanks to the significant opening up of the economy to foreign direct investment and relaxing restrictions on domestic private enterprises, notwithstanding the government's commitment to preserving the role of SOEs in the economy.

The results of our analysis undertaken using a new establishment-level panel dataset over the period 2006-2017 indicate that transformation of the ownership structure has contributed to significantly improving the productivity of the manufacturing sector, with both fully owned MNE subsidiaries and MNE joint ventures in the domestic private sector playing a key role. However, the productivity of fully-owned MNE is significantly higher than that of private-sector joint ventures. These results support the hypothesis that relaxing ownership restrictions on foreign direct investment have been instrumental in improving manufacturing productivity. Both SOEs and SOE joint ventures with MNEs have at the bottom of the productivity ranking by ownership mode. This comparison suggests that the choice between the state and private entrepreneurs is important in determining productivity implications of joint venture operation of MNEs: state sector joint ventures are not immune from various productivity-retarding factors affecting SOEs.

Superior productivity performance of MNE subsidiaries naturally directly reflects in the measured productivity performance of domestic manufacturing. However, in assessing national gains from MNE presence in the economy, a crucial issue is the extent to which the quasi rent generated by MNEs from their proprietary assets spill over to the domestic private sector. This is an important subject for further research.

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Appendix

Table A-1: Total Factor Productivity in Vietnamese Manufacturing:
Fixed Effects and Random Effects Estimates (Dependent variable: Log TFP)

	FE	**RE**
L.SOE	0.036 (0.028)	0.399 (0.023)***
L.FOF	0.164 (0.048)***	0.627 (0.014)***
L.JV-SOE	0.081 (0.061)	0.872 (0.044)***
L.JV-PDE	0.132 (0.050)**	0.612*** (0.031)
Micro	-0.179 (0.008)***	-0.378 (0.007)***
Medium	0.094 (0.008)***	0.348 (0.007)***
Large	0.102 (0.0154)***	0.516 (0.012)***
Log AGE	0.183 (0.012)***	0.134 (0.005)***
RRD	0.193 (0.077)*	0.157 (0.020)***
NC		-0.102 (0.027)***
SCH		0.008 (0.024)
ST		0.367 (0.020)***
MKD		0.110 (0.023)***
Log EOR	0.351 (0.012)***	0.420 (0.011)***
Log MDR	0.176 (0.013)***	0.167 (0.013)***
Log HHI	-0.032 (0.005)***	-0.036 (0.004)***
Constant	5.077 (0.071)***	5.049 (0.036)***
Number of obs.	154317	154317
Number of firms	38953	38953
R^2	0.733	0.590

Notes: Heteroscedasticity robust standard errors are given in given in parentheses with the statistical significance of the regression coefficients denoted as * $p<0.05$, ** $p<0.01$, ***$p<0.001$

Table A-3: Total Factor Productivity in Vietnamese Manufacturing: CRE Estimates with 4-firm Concentration Ratio and Age/Age Squared

(Dependent variable: Log TFP)

	(1)	**(2)**
L.SOE	0.035 (0.028)	0.008 (0.028)
L.FOF	0.166 (0.048)***	0.170 (0.048)***
L.JV-SOE	0.085 (0.061)	0.098 (0.061)
L.JV-PDE	0.135 (0.050)**	0.139 (0.050)**
Log AGE	0.182 (0.0025) ***	
Micro	-0.179 (0.009)***	-0.180 (0.009)***
Medium	0.092 (0.008)***	0.095 (0.008)***
Large	0.100 (0.016) ***	0.102 (0.016)***
RRD	0.155 (0.019)***	0.155 (0.019)***
NC	-0.061 (0.026)*	-0.062 (0.026)*
SCH	0.024 (0.023)	0.030 (0.023)
ST	0.404 (0.019)***	0.406 (0.019)***
MKD	0.149 (0.022)***	0.152 (0.022)***
Log EOR	0.352 (0.012) ***	0.344 (0.012)***
Log MDR	0.148 (0.014)***	0.159 (0.013)***
Log HHI		-0.030 (0.005)***
Log top4	-0.089 (0.008)***	
AGE		-0.019 (0.031)
AGE2		-0.001 (0.000)***
Constant	6.226 (0.084)***	5.905 (0.077)***
Observations (N)	154317	
AIC	346774.5	346839
BIC	347649.8	347724.3

Notes: Heteroscedasticity robust standard errors are given in given in parentheses with the statistical significance of the regression coefficients denoted as * p<0.05, ** p<0.01, *** p<0.001;

All regressions include sector fixed effects and year fixed effects; AIC: Akaike information criterion; BIC: Bayesian information criterion.

Table A-4: Total Factor Productivity in Vietnamese Manufacturing:

HT Estimates (Dependent variable: Log TFP)

	(1)	**(2)**	**(3)**
L.SOE	0.075 (0.026)**	0.074 (0.026)**	0.045 (0.026)
L.FOF	0.896 (0.038)***	0.897 (0.038)***	0.869 (0.038)***
L.JV-SOE	0.617 (0.055)***	0.618 (0.055) ***	0.608 (0.054)***
L.JV-PDE	0.667 (0.043)***	0.669 (0.043)***	0.651 (0.043)***
Log AGE	0.173 (0.008)***	0.173 (0.008)***	
Micro	-0.218 (0.008)***	-0.218 (0.008)***	-0.218 (0.008)***
Medium	0.131 (0.008)***	0.130 (0.008)***	0.131 (0.008)***
Large	0.172 (0.014)***	0.170 (0.014)***	0.169 (0.014)***
RRD	0.188 (0.033) ***	0.191 (0.033)***	0.230 (0.035) ***
NC	-0.087 (0.044)*	-0.087 (0.044)*	-0.050 (0.046)
SCH	0.040 (0.039)	0.038 (0039)	0.070 (0.041)
ST	0.357 (0.033)***	0.359 (0.033)***	0.390 (0.035)***
MKD	0.104 (0.037)**	0.102 (0.037)**	0.139 (0.040)***
Log EOR	0.348 (0.011)***	0.358 (0.011)***	0.358 (0.011)***
Log MDR	0.155 (0.013)***	0.140 (0.013)***	0.137 (0.012)***
Log HHI	-0.030 (0.005)***		
Log top4		-0.086 (0.008)***	-0.085 (0.008)***
AGE			0.033 (0.002)***
AGE2			-0.001 (0.000)***
Constant	4.223 (0.046)***	4.615 (0.052)***	4.689 (0.053)***
Observations (N)	154317	154317	154317
Number of firms	38953	38953	38953
R square	0.808	0.809	0.828

Notes: Heteroscedasticity robust standard errors are given in given in parentheses with the statistical significance of the regression coefficients denoted as * p<0.05, ** p<0.01, *** p<0.001;

Table A-5: Total Factor Productivity in Vietnamese Manufacturing:

CRE Estimates Excluding Micro Firms (Dependent variable: Log TFP)

	(1)	**(2)**	**(3)**
L.SOE	0.039 (0.026)	0.037 (0.026)	0.012 (0.027)
L.FOF	0.162 0.047)***	0.163 (0.046)***	0.169 (0.047)***
L.JV-SOE	0.082 (0.059)	0.083 (0.059)	0.100
L.JV-PDE	0.135 (0.048)**	0.137 (0.048) **	0.142 (0.048)**
LogAGE	0.219 (0.013)***	0.217 (0.013)***	
Medium	0.113 (0.008)***	0.112 (0.008) ***	0.116 (0.008)***
Large	0.137 (0.015)***	0.136 (0.015)***	0.139 (0.015)***
RRD	0.144 (0.020)***	0.145 (0.020)***	0.146 (0.020) ***
NC	-0.088 (0.028)**	-0.088 (0.028)**	-0.089 (0.028)**
SCH	0.041 (0.025)	0.040 (0.025)	0.046 (0.025)
ST	0.362 (0020)***	0.362 (0.020)***	0.365 (0.020)***
MKD	0.114 (0.023)***	0.112 (0.023) ***	0.116 (0.023)***
Log EOR	0.353 (0.012)***	0.365 (0.012)***	0.354 (0.012)***
Log MDR	0.078 (0.014)***	0.061 (0.014)***	0.074 (0.014)***
Log HHI	-0.031 (0.005)***		-0.031 (0.005)***
Log top4		-0.103 (0.009)***	
AGE			0.090 (0.007)***
AGE2			-0.001 (0.000)***
Constant	5.761 (0.089)***	5.911 (0.095)***	5.832 (0.089)***
Observations (N)	122342	122342	122342
AIC	260378.8	260272.2	260393.7
BIC	261214.2	261107.7	261238.9

Notes: Hteroscedasticity robust standard errors are given in given in parentheses with the statistical significance of the regression coefficients denoted as * p<0.05, ** p<0.01, *** p<0.001; All regressions include sector fixed effects and year fixed effects; AIC: Akaike information criterion; BIC: Bayesian information criterion

Table A-6: Total Factor Productivity in Vietnamese Manufacturing:

CRE Estimates For Subsample 2010-2017 (Dependent variable: Log TFP)

	(1)	**(2)**	**(3)**
L.SOE	0.048 (0.035)	(0.035)	0.029 (0.035)
L.FOF	0.188 (0.051) ***	0.190 (0.051) ***	0.195 (0.051)***
L.JV-SOE	0.098 (0.070)	0.098 (0.070)	0.108 (0.070)
L.JV-PDE	0.139 (0.054) **	0.141 (0.053) **	0.146 (0.054)**
Log AGE	0.181 (0.014)***	0.181 (0.014)***	
Micro	-0.150 (0.009)***	-0.150 (0.009)***	-0.151 (0.009)***
Medium	0.066 (0.009)***	0.066 (0.009)***	0.068 (0.009)***
Large	0.077 (0.077)***	0.075 (0.017)***	0.076 (0.017)***
RRD	0.157 (0.020)***	0.158 (0.020)***	0.159 (0.020)***
NC	-0.068 (0.027)*	-0.068 (0.027)*	-0.069 (0.027)*
SCH	0.023 (o.024)	0.022 (0.024)	0.026 (0.024)
ST	0.397 (0.020)***	0.398 (0.020) ***	0.400 (0.020)***
MKD	0.159 (0.023)***	0.157 (0.023)***	0.159 (0.023)***
Log EOR	0.305 (0.016)***	0.314 (0.016)***	0.314 (0.016)***
Log MDR	0.289 (0.015)***	0.276 (0.015)***	0.272 (0.015)***
Log HHI	0.000 (0.005)		
Log top4		-0.074 (0.009)***	-0.073 (0.009)***
AGE			-0.023 (0.030)
AGE2			-0.001(0.000)***
Constant	5.612 (0.091***	5.828 (0.097)***	5.889 (0.097) ***
Observations (N)	129943	129943	129943
AIC	281569.6	281491.5	281516.6

BIC	282371.1	282293.0	282327.9

Notes: Heteroscedasticity robust standard errors are given in given in parentheses with the statistical significance of the regression coefficients denoted as * p<0.05, ** p<0.01, *** p<0.001; All regressions include sector fixed effects and year fixed effects; AIC: Akaike information criterion; BIC: Bayesian information criterion

Table A-7: Total Factor Productivity in Vietnamese Manufacturing:

Two-Step Difference GMM estimates (Dependent variable: Log TFP)

	(1)	**(2)**	**(3)**
L.Log TFP	0.167 (0.011)***	0.168 (0.012)***	0.165 (0.012)***
L.SOE	-0.045 (0.038)	-0.028 (0.037)	-0.039 (0.037)
L.FOF	0.133 (0.063)*	0.124 (0.059)*	0.133 (0.064)*
L.JV-SOE	0.134 (0.083)	0.126 (0.078)	0.139 (0.085)
L.JV-PDE	0.140 (0.073)$^{+}$	0.124 (0.068)$^{+}$	0.141 (0.074)$^{+}$
Log AGE	0.203 (0.108)	0.1141 (0.102)	
Micro	-0.159 (0.017)***	-0.154 (0.017)***	-0.162 (0.017)***
Medium	0.053 (0.015) ***	0.055 (0.014)***	0.058 (0.015)***
Large	0.034 (0.030)	0.029 (0.029)	0.045 (0.028)
Log EOR	1.711 (0.264)***	1.298 (0.262)***	1.858 (0.249)***
Log MDR	-0.733 (0.290)*	0.196 (0.341)	-0.903 (0.258)***
LogHHI	0.029 (0.039)		0.023 (0.039)
Log top4		-0.088 (0.029)**	
AGE			0.045 (0.007)***
AGE2			-0.000 (0.000)***
Number of obs.	68462	68462	68462
Number of firms	16123	16123	16123
No. of instruments	55	55	56
AR1 (p-value)	0.000	0.000	0.000
AR2 (p-value)	0.461	0.292	0.468
Hansen-J (p-value)	0.130	0.058	0.114

Notes

(1) Hteroscedasticity robust standard errors are in parentheses: + $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$
(2) AR1 is a test for first-order serial correlation. The null hypothesis of no first-order serial autocorrelation is rejected at order one
(3) AR2 is a test for second-order serial correlation. As the p-value>0.05, we confirm that no serial correlation exists at order two and that the model is well specified
(4) Hansen-J is a test of the over-identifying restrictions for the GMM estimators. As the p-value>0.05, we confirm the validity of instruments