



Doing Business in Lao PDR

Constraints to Productivity

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Key Findings

New available data suggests that the business environment in Lao PDR is not improving, and might be deteriorating. The main constraints to doing business named by firms surveyed in the 2016 Enterprise Survey are the practices of the informal sector, with 40 percent of respondents identifying this as a major issue, followed by tax rates at 33 percent and transportation at 23 percent. This represents a shift from 2012, when no issues were cited as major problems by more than 20 percent of firms, and the top issues were corruption, electricity, and worker education. In addition, analysis of firm productivity data indicates that labor productivity in Lao PDR remains low, with median levels of labor productivity lower than regional peers, around US \$4600. This has not shown statistically significant variation from the previous surveys. Of greater concern, the highest performing firms in Lao PDR, ranked at the 90th percentile domestically, lag drastically behind firms at the same percentile in neighboring countries.

Context

Lao PDR has demonstrated impressive economic growth for the past decade, with GDP growth averaging 7 percent, largely concentrated in the natural resource sector. However, this has been accompanied by a less than proportionate decline in poverty and rising inequality. The investment climate remains challenging due to high costs, and Lao PDR was ranked 139 out of 190 in the 2017 Doing Business report. In the Global Competitiveness index, Lao PDR was ranked 93 out of 138. Issues exacerbating these challenges include weak regulatory effectiveness, control of corruption and rule of law, and a largely “deals based approach,” which reduces predictability and transparency. This brief aims to analyze the perceptions of these challenges by firms doing business in the country, using data from the 2016 Enterprise Survey.

The Enterprise Survey is conducted by the World Bank Group and its partners across all geographic regions, and covers small, medium and large firms in the non-agricultural, formal, and private economy. This survey focuses on many aspects of the business environment that are relevant in determining whether an economy’s private sector will thrive or not. Lao PDR data collection was done from January-June 2016, and previous years’ surveys were completed in 2012 and 2009.

Constraints to Investment

The main identified constraint to investment was the practice of firms in the informal sector, with 40 percent of respondents citing this issue as a serious problem. Coming in second was tax rates, cited as a constraint by 33 percent of firms. Large percentages of firms also mentioned that transportation, electricity, and inadequately educated workers were major problems. Yet, there were some variations across different types of firms. Large firms were more likely to consider workers’ education a problem, while transportation was proportionally a bigger issue for medium firms, as was tax rates for smaller firms. Regionally, firms in the north and south of the country were more likely to identify key issues as major problems than firms located in the central region

or Vientiane. Firms in Vientiane were less concerned about infrastructure than the others.

Although corruption was only cited as a serious problem by 2 percent of firms (but 8 percent of exporters), the survey reflected a high actual incidence of corruption. The results could indicate an acceptance of the status quo, rather than the absence of corruption as a limiting factor. 49 percent of firms reported being requested or expected to give gifts or informal payments for construction permits, and 74 percent for government contracts, both of which are higher rates than the average for the region and for countries with similar incomes.

Differences by Firm Type

Exporters and foreign firms are also differentiated in the survey, as these types of businesses are a significant indicator of a country's ability to compete internationally. Exporters were more highly concerned about transportation and trade regulations than non-exporters. Transportation was the highest concern for exporters, at 34 percent, compared to 23 percent of non-exporters; trade regulations concerned 23 percent of exporters, in contrast with only 7 percent of non-exporters. For foreign firms, tax rates and access to land were of higher concern than for domestic firms. 53 percent of foreign firms stated that tax rates were a major issue, compared to only 32 percent of domestic firms. Access to land was an issue for 37 percent of foreign firms, but only 16 percent among domestic firms.

Women-owned firms have slightly different concerns, with female-owned firms reporting that they tend to be less concerned about competitors in the informal sector, or transportation. In fact, only 17 percent of women-owned firms stated that transportation was a serious problem, compared to 28 percent of firms with no female owners. However, 40 percent of female-owned firms said that tax rates were a serious issue, compared to 32 percent of non-female owned firms, and 23 percent of women-owned firms reported that access to land was a constraint, compared to only 16 percent for non-female-owned firms. Overall, Lao PDR performed higher than the rest of the East Asia and Pacific region for key gender indicators, with a higher percentage of firms with female top managers, majority female ownership, and full-time female workers.

Changes from Previous Surveys

Concerns about the business environment seem to have increased between 2012 and 2016. While the biggest constraints have remained consistent, priorities have somewhat changed. Firms were far more likely to indicate that many areas of the investment climate were serious problems in 2016 compared to 2012, although part of this increase could reflect an increased willingness to voice concerns. However, when asked to nominate only the biggest constraint, answers were more consistent over time: the informal sector, tax rates, and worker education remain as the biggest concerns.

For exporters, access to finance was no longer mentioned as a leading problem, and practices of the informal sector are now raised as a major issue. The inadequately educated workforce has remained a high concern for exporters. Additional analysis to better understand what companies refer to when complaining about the “practices of firms in the informal sector” is currently underway.

Firm Productivity and Competitiveness

Labor productivity remains low in Lao PDR. Using firm-level data, labor productivity is estimated by subtracting raw materials and intermediate inputs from sales, and dividing that amount by the number of full time permanent workers. The median level of labor productivity is around US \$4,600, which is about 10% lower than in Cambodia and less than half that of Vietnam. In the garment sector, Lao PDR performs similarly to the comparator countries at the median level, however it lags in the food processing sector. Retail and service firms also appear to be relatively unproductive in Lao PDR. There has been no statistically significant variation in overall productivity between 2009 and 2016.

While labor productivity at the median firm seems comparable to similar firms in neighboring countries, data suggests that the country's top firms are not competitive with top firms of neighboring countries. For example, firms in the top 10 percent productivity bracket in Lao PDR produce only around \$20,967 per worker, compared to the \$61,646 in Vietnam and \$93,378 in Cambodia. In fact, over three quarters of firms in Vietnam are more productive than the median firm in Lao PDR.

Capital Intensity

Firms appear not to be very capital intensive, although it is possible that capital is systematically underreported. Firms have little capital per worker, suggesting that they are instead more labor intensive. Wages are low, however relatively high when compared with production, suggesting that workers have low human capital (i.e. they are less educated or trained). This is confirmed by firms' concerns about availability of skilled labor and low workforce education. Only about 10 percent of the workforce in Lao PDR have completed upper secondary education and 5 percent have achieved vocational or tertiary degrees, as of 2013. Indications of low human capital are corroborated by data on the poor quality of schooling. Post-secondary graduates in Lao PDR performed almost on par with people with only primary schooling in Vietnam, (according to the 2011/2012 STEP Household survey, as reported in 2014 Lao PDR Development Report). Contributing causes to low labor productivity could include the use of old technologies, poor management practices, and a weak investment climate.

Summary

Overall, the investment climate seems to have deteriorated in Lao PDR between 2012 and 2016. In the 2012 survey, not one area of the investment climate was identified as a serious problem by more than 20 percent of firms. In the 2016 survey, there were six areas where more than 20 percent of firms identified areas of the investment climate as a serious problem. Although this could suggest a deteriorating investment climate, it might also reflect growing willingness to express opinions. Perceptions regarding the severity of main constraints also differ between various company types. For exporters, which are the companies that are best placed to expand and generate (job) growth in Lao PDR, informal practices of other firms (including other formal firms), ¹tax rates, transportation, electricity, worker education, and trade regulations, are the areas identified as serious problems. Addressing these issues will be critical to support export-led growth in Lao PDR.

¹ See Imboden and Hoppe (2017), "Formal informality: Informal Practices of Formal Firms as Key Business Constraint", World Bank, Vientiane, Lao PDR.

This report also analyzes firm level productivity based on the data available and finds that Lao PDR's enterprises are not productive compared to firms in neighboring countries. For example, the median level of labor productivity is lower in Lao PDR than in either Cambodia or Vietnam, and labor productivity in the most productive firms is significantly lower in Lao PDR compared to the other two countries; also, total factor productivity is generally higher in Vietnam than in Lao PDR. In addition, firms in Lao PDR also generally use significantly less capital than companies in Cambodia or Vietnam.

The available data indicate that low labor productivity reflects both low capital intensity and poorly educated or low-skilled workers. Unlike labor productivity, total factor productivity -- which controls for human and physical capital--is relatively high suggesting that the main drivers for low labor productivity are low human capital and low capital intensity. If other factors such as a poor investment climate or poor management were the main drivers of low labor productivity, we would expect total factor productivity—which does not control for either the investment climate or management quality—to be low as well. The fact that it is relatively high—both overall and in the garments and food processing sectors—suggests these factors play a relatively modest role in Lao PDR's low labor productivity. However, because capital is difficult to measure and might be consistently mis-measured², we consider labor productivity a better measure of overall performance.

² It is possible that firms tend to under-report capital in Lao PDR, for example because accounting standards are looser, which would lead to overestimated TFP estimates. This would be consistent with both low capital intensity and high total factor productivity. Unfortunately, there is no way to know whether this is the case; capital is difficult to measure and to compare across countries. For this reason, labor productivity might be a better measure of overall performance.

Areas of investment climate indicators	Practices of competitors in the informal sector, tax rates, inadequately educated workforce, electricity, access to finance, transport, customs and trade regulations, labor regulations, corruption, access to land, business licensing and permits, courts, tax administration, political instability, crime, theft and disorder.
Capital intensity	The value of the firm's machinery and equipment divided by the number of workers that the firm has.
Capital productivity	The ratio of value-added to the value of machinery and equipment, measures how productively firms use capital.
Comparator countries	Vietnam, Myanmar, Philippines, Cambodia, Malaysia, Thailand, and the BRIC countries (Brazil, China, India, Russia).
Constraints	If firms referred to an obstacle in the Enterprise Survey as 'major' or 'very severe', this paper refers to it as a 'serious problem or constraint'
Labor costs	Cost of wages, salaries, bonuses, other benefits, and social payments for workers at the firm divided by the number of workers.
Labor productivity	Calculated by subtracting raw materials (such as steel, milk, or cotton) and intermediate inputs (such as paper or computer chips) from sales, and dividing that amount by the number of full-time permanent workers
Median firms	The term 'median firm' is used to refer to the median firm on each particular measure of firm performance.
Panel Firms	Firms that were interviewed in both 2012 and 2016 Enterprise Surveys, or in the 2009 and 2012 Enterprise Surveys.
Total factor productivity (TFP)	A productivity measure that takes into account the firm's use of capital, the sector of operations, and the quality of the firm's labor. Although TFP does not have natural units, it can be roughly interpreted as the (weighted) average level of productivity in each country relative to the (weighted) average productivity across all firms in the countries where Enterprise Surveys have been conducted (i.e., across firms in all countries).
Unit labor costs	Allows us to assess the net impact of labor costs on competitiveness. Labor costs as a percent of value-added are an approximation of true unit labor costs.

Lao PDR has demonstrated impressive economic growth for the past decade, with GDP growth averaging 7 percent, largely concentrated in the natural resource sector. However, this has been accompanied by a less than proportionate decline in poverty and rising inequality. The investment climate remains challenging, with high costs, and Lao PDR was ranked 139 out of 190 in the 2017 Doing Business report. In the Global Competitiveness index, Lao PDR was ranked 93 out of 138. Issues exacerbating these challenges include weak regulatory effectiveness, control of corruption and rule of law, and a largely “deals based approach,” which reduces predictability and transparency.

Comparing Performance

This background paper summarizes information on firm performance from the 2016 Lao PDR Enterprise Survey, which is a study conducted by the World Bank Group and its partners across all regions. It aims to analyze the perceptions of the challenges faced by firms doing business in the country. It compares various measures of firm performance, including labor and total factor productivity of firms in Lao PDR with similar firms from several comparator countries in East Asia (Thailand, Myanmar, Cambodia, Malaysia, Philippines, Vietnam) and with the BRIC economies (Brazil, Russia, India, and China). It also compares performance across four geographical regions in Lao PDR and across different groups of firms (e.g., exporters and non-exporters) when enough data are available for firms in the different regions. In some cases, we also compare results from the earlier enterprise surveys for Lao PDR (2009 and 2012). Comparisons with the earlier surveys should, however, be treated cautiously because the questionnaire and sampling methodology were different in these earlier surveys.

Productivity Measures

For cross-country comparisons of productivity, productivity measures that are measured in monetary terms are converted from local currency at the time of the survey into 2010 US dollars³. Appendix 1 describes how this is done and how each specific productivity measure is calculated. All of the partial productivity measures (e.g., labor productivity) are weighted averages or weighted medians using the sample weights provided in the survey when weights are available.

Focus on Manufacturing

Although the Enterprise Surveys cover services, retail and wholesale trade as well as manufacturing, this background paper focuses on manufacturing. This is because the Enterprise Surveys collect the detailed financial data needed to calculate value-added and other performance measures only for manufacturing firms in most countries. To ensure comparability, the main cross-country comparisons are only for manufacturing

³ See appendix for a description of the methodology. We use the data computed by Cusulito and others (2016) for the raw data used to compute the partial productivity measures. In cases where the dataset computed by Cusulito and others (2016) does not cover the relevant surveys (e.g., for the earlier Laos surveys), we use the methodology described in that paper to calculate the relevant raw data.

firms. Although it is not possible to calculate most of the productivity measures for firms in the retail trade and service sectors, simple productivity measures for firms in these sectors are calculated. When this is done, it is specifically noted in the paper.

Median Firms

Most comparisons are for median⁴ firms in terms of the different measures of performance. Medians are preferred to means because means can be greatly affected by a few outliers—possibly due to misreported or miscoded information. For the purpose of brevity, the term ‘median firm’ is used to refer to the median firm on each particular measure of firm performance. For example, in the section on labor productivity, the ‘median firm in Lao PDR’ refers to the median firm in Lao PDR in terms of labor productivity. Similarly, in the section on capital productivity, ‘median firm’ refers to the median firm in terms of capital productivity.

⁴ Median refers to the midpoint value in a series, so that there are an equal number of values above and below.



What are the major problems facing firms in Lao PDR? A natural place to start any analysis of investment constraints is to look at what enterprise managers say are the biggest obstacles they face, since managers know more about the immediate problems facing their businesses than government officials, academic researchers, or other outside experts.

Issues with Perception-based Data

Although it is important to take managers' perceptions seriously, some have suggested that managers might be unaware about certain constraints, they might lie about them, or they might not answer these questions reliably for other reasons⁵. Although the concerns about using perception-based data are serious, it is important not to overemphasize these problems. Perception-based measures line up reasonably well with objective macro- and micro-economic indicators even on a cross-country basis⁶. That is, despite concerns about subjective measures, these measures seem to provide useful information. Moreover, some concepts are very difficult or costly to measure objectively—for example, how 'fair' or 'reliable' the court system is. In these cases, perceptions give valuable information on factors that would otherwise be very costly or difficult to measure⁷.

Rating of Perceived Constraints

The Enterprise Survey asks firms to rate each of 17 areas of the investment climate in terms of how large a constraint it is to the current operation of their business. They respond by rating each area on a five-point scale from 'no obstacle' to 'very severe obstacle'. Figure 1 shows the percent of each type of firm that rated each area as a 'major' or 'very severe obstacle'. **If firms referred to the obstacle as 'major' or 'very severe', this paper refers to it as a 'serious obstacle' or a 'constraint'.**

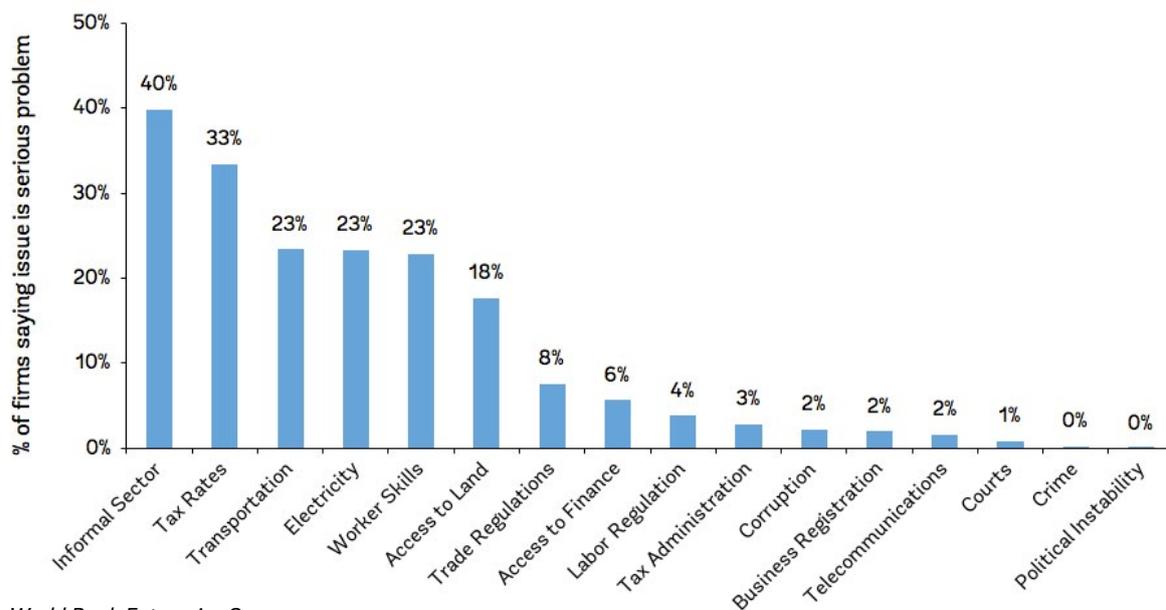
The most common complaint using this measure of perceptions is practices of firms in the informal sector (see Figure 1). About 40 percent of firms in Lao PDR said that practices of firms in the informal sector was a serious obstacle. The next most common concern mentioned as a serious obstacle was tax rates, with about one-third of firms raising this as an issue. This suggests broad concern about these two areas of the investment climate. No other constraints were rated as a serious obstacle by more than one-quarter of firms. About 23 percent

⁵ See, for example, Kaplan and Pathania (2010), Clarke (2011), and Rodrik (2007)

⁶ See, for example, Gelb and others (2006) for work using data from Africa, or Hellman and others (1999) for work using data from Eastern Europe and Central Asia.

⁷ It is also important to remember that there are concerns about objective data—particularly for sensitive and difficult questions. For example, some work has shown that managers in Africa appear to find it difficult to answer questions that involve calculating percentages. Clarke (2008) shows that managers that report bribes as a percentage of sales report bribe payments that are between four and fifteen times higher when they report them as a percent of sales than when they report them in monetary terms. This does not appear to be due to outliers, differences between firms that report bribes in monetary terms and firms that report them as a percent of sales, and the sensitivity of the corruption question. Lying is also a problem. Agfar and Murrell (2009) show that even broad questions about corruption, including questions about 'firm like yours', suffer from serious problems with lying and non-response that can lead to substantial underestimates of the extent of corruption

Figure 1: Rating: Practices of informal firms and tax rates were the two most common complaints among firms in Lao PDR



Source: World Bank Enterprise Surveys

said that transportation, electricity and worker skills were serious problems. In addition, about 18 percent of firms said that access to land was a serious problem. Very few firms expressed concern about any other constraints. Less than one in ten rated trade regulations and access to finance as serious problems, and less than one in twenty rated any other area as a serious problem. As this paper will show, no obstacles were considered serious by more than 20 percent of firms in the 2012 survey, indicating that the investment climate has likely deteriorated.

Ranking of Perceived Constraints

In addition to being asked about how great an obstacle each area of the investment climate was on a five-point scale, firms were also asked to rank the top three obstacles that they face. While the first measure (the rating) gives an idea about the breadth of concern—that is, it allows us to see how many firms saw that area of the investment climate as a serious problem—the second (the ranking) gives some idea about the depth of concern. That is, for the ranking, the firm must decide which constraint is the most binding for its operations. For the ratings, managers do not have to make the same decision—they can say that every problem, or none, was a ‘very serious’ constraint if they want to.

One difference between the two measures is that it takes a smaller number of firms to make an obstacle stand out on the ‘rankings’. Since firms can only rank one issue as their greatest concern, a small number of firms could give a single-issue prominence on this measure. Because firms can rate many problems as a “4” or a “5” in the ratings measure, these small group issues would be unlikely to stand out. For example, if there are only a few exporters but these exporters are particularly concerned about trade regulation or transportation, these areas might look like a minor problem on the first measure (i.e., only a small number of firms rated it as a major problem), but it could look like a major problem on the second. That is, even a small group can make an issue appear important using the second measure.

Ranking versus Rating of Constraints

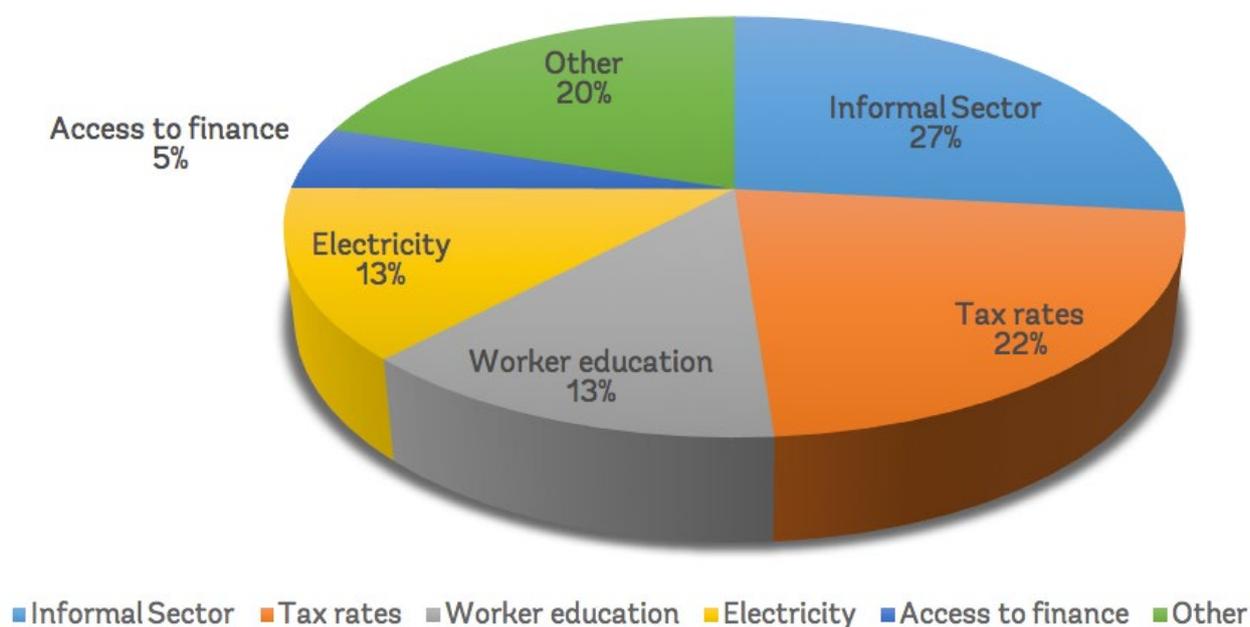
In practice, however, the main concerns were very similar when looking at the ranking versus the rating of constraints. The practices of informal firms and tax rates (see Figure 2), were ranked as the highest concern. About 27 percent of firms said that practices of firms in the informal sector was the biggest problem facing their firms, and about 22 percent said tax rates were the biggest problem.

Large numbers of firms also said that inadequately educated workers and electricity were the biggest constraints their firms faced. These also ranked among the top constraints based on the percent of firms that said they were serious obstacles. No other constraint was ranked as the biggest constraint by more than one in twenty firms.

There were, however, some differences between the two measures. Although about 23 percent of firms said transportation was a serious problem, only about 4 percent of firms said it was the biggest constraint they faced. Similarly, about 18 percent of firms said that access to land was a serious obstacle, but only about 3 percent of firms said that it was the biggest constraint they faced

In summary, four problems appear to stand out based on both the ratings and rankings measures. The biggest concern in both case was the practices of firms in the informal sector and the second biggest concern in both cases was tax rates. Many firms were also concerned about electricity and inadequately educated worked.

Figure 2: Ranking: Tax rates and practices of informal firms were also the areas of the investment climate that firms were most likely to say were the biggest problem they faced.

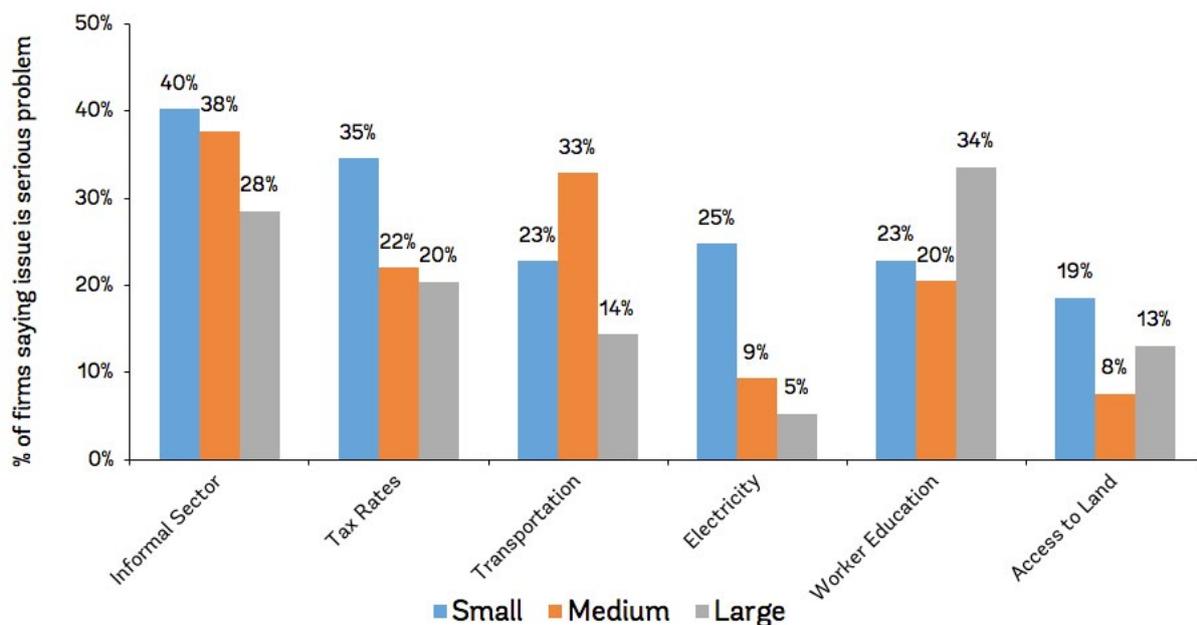


Source: World Bank Enterprise Surveys

Differences by Firm Size

Small, medium-sized and large firms generally had similar views about the investment climate (see Figure 3). In most cases, the same six constraints—practices of firms in the informal sector, tax rates, inadequately educated workers, electricity, and access to land—ranked as the biggest constraints based on the number of firms that said they were serious problems. The only exceptions were that access to land did not rank among the top 6 constraints for medium-sized firms and electricity did not rank among the top 6 constraints for large firms. No other constraint was rated as a serious constraint by more than 10 percent of firms in any size group.

Figure 3: Although large and small firms mostly shared the same concerns, there are some differences.



Source: World Bank Enterprise Surveys

There were, however, some differences. First, small firms were more likely to be concerned about electricity than medium-sized and large firms. Whereas about one-quarter of small firms said electricity was a serious problem, less than 10 percent of medium-sized and large firms said electricity was a serious problem. This might be because medium-sized and large firms are better able to deal with power outages than small firms are. Small and medium-sized firms were also more concerned about practice of informal competitors than large firms. This is not surprising—informal firms are often relatively small, meaning that they will more likely compete with small and medium-sized firms. Finally, small firms were more worried about taxes, and large firms were more worried about access to land than other firms.

Concerns of Exporters

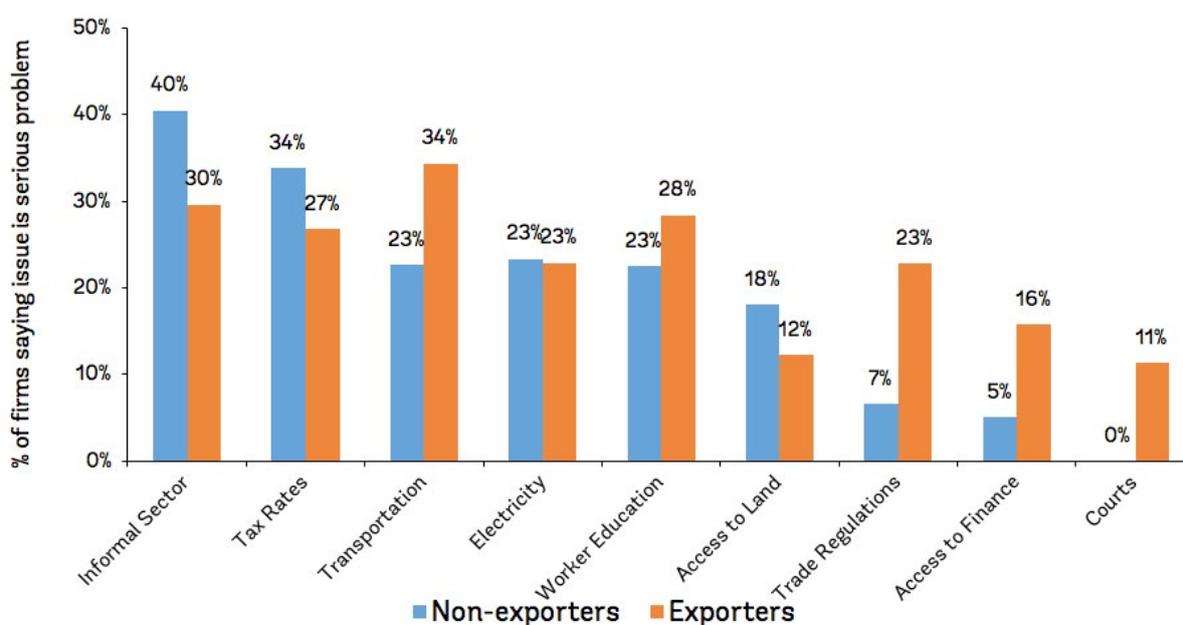
Few firms (only 8 percent) said that customs and trade regulations were a serious problem. Although this suggests that trade and customs regulations are only a minor concern, it is important to note that exporters were more seriously concerned about customs and trade regulations than other firms. About 23 percent said it was a serious problem—making it the fifth greatest concern for exporters (see Figure 4). In contrast, only 7 percent of non-exporters said the same.

Exporters were also more concerned about transportation than other firms. Although non-exporters were concerned about transportation—23 percent said it was a serious problem—about 34 percent of exporters said transportation was a serious problem—more than said the same about any of the other areas of the investment climate.

Exporters were also more likely to say that access to finance and courts were serious problems. About 11 percent of exporters said that courts were a serious problem compared with 0 percent of non-exporters, and 16 percent of exporters said that access to finance was a serious problem compared with only 5 percent of non-exporters.

Although exporters have some unique concerns, it is important to note that they also face many of the same challenges as non-exporters. Both exporters and non-exporters were concerned about practices of firms in the informal sector, tax rates, electricity, and access to land—although exporters were less likely to be concerned about all of these areas than non-exporters were. Similarly, few exporters or non-exporters—less than one in ten—ranked any of the other areas as serious problems.

Figure 4: Exporters were more concerned about transportation and trade regulations than non-exporters.



Source: World Bank Enterprise Surveys

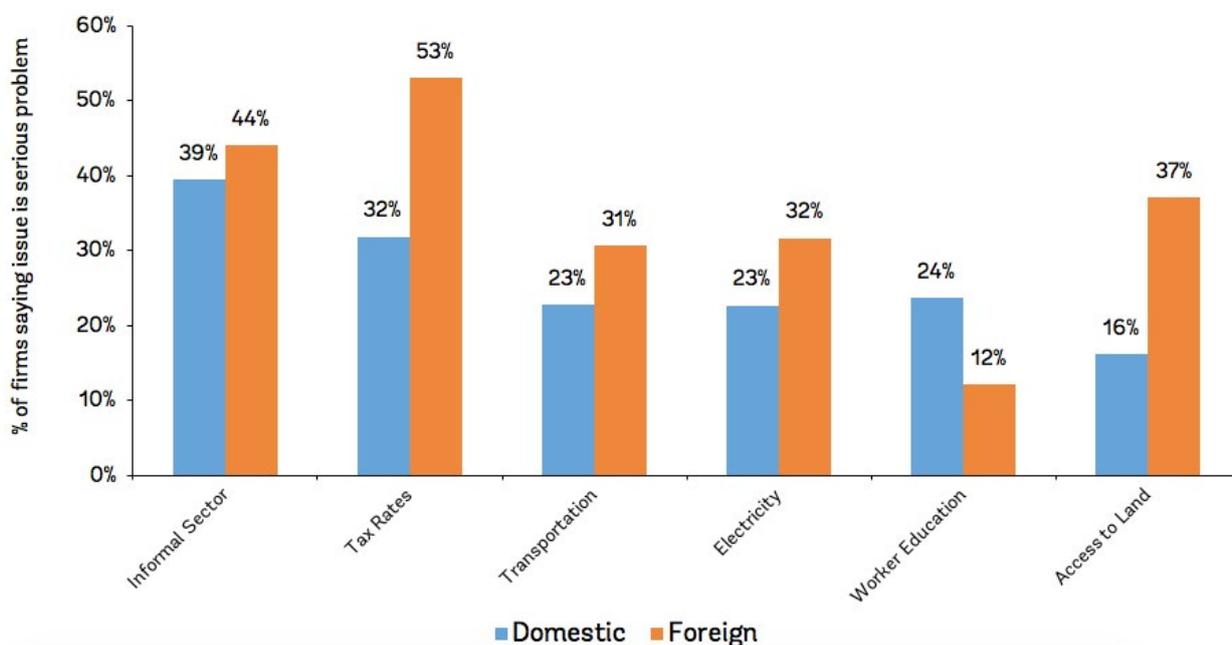
Differences by Ownership: Foreign and Women-owned

Foreign and domestic firms in Lao PDR generally have similar concerns. Practices of the informal sector, tax rates, transportation, electricity, and access to land ranked among the top 6 constraints for both types of firms. Other than access to finance, which was rated as a serious constraint for 11 percent of foreign-owned firms, no other obstacle was rated as a serious problem by more than 10 percent of either foreign or domestic firms⁸.

⁸ This result is slightly anomalous in that foreign-owned firms are generally less likely to say that access to finance is a serious problem than domestic firms (Clarke and others, 2006)

There were, however, some differences between foreign and domestic firms with respect to the 6 main constraints. First, foreign-owned firms were far more likely to say that tax rates were a serious problem—over half of foreign-owned firms said that tax rates were a problem compared with only one-third of domestic firms. Indeed, tax rates ranked as the greatest concern for foreign-owned firms, while practices of firms in the informal sector ranked as the greatest concern for domestic firms. Second, foreign-owned firms were far more concerned about access to land than domestic firms. About 37 percent of foreign-owned firms, but only 16 percent of domestic firms, said that access to land was a serious problem. Finally, foreign-owned firms were more concerned about the quality of infrastructure than domestic firms. Over 30 percent of foreign-owned firms said transportation and electricity were serious problems compared with only about 23 percent of domestic firms.

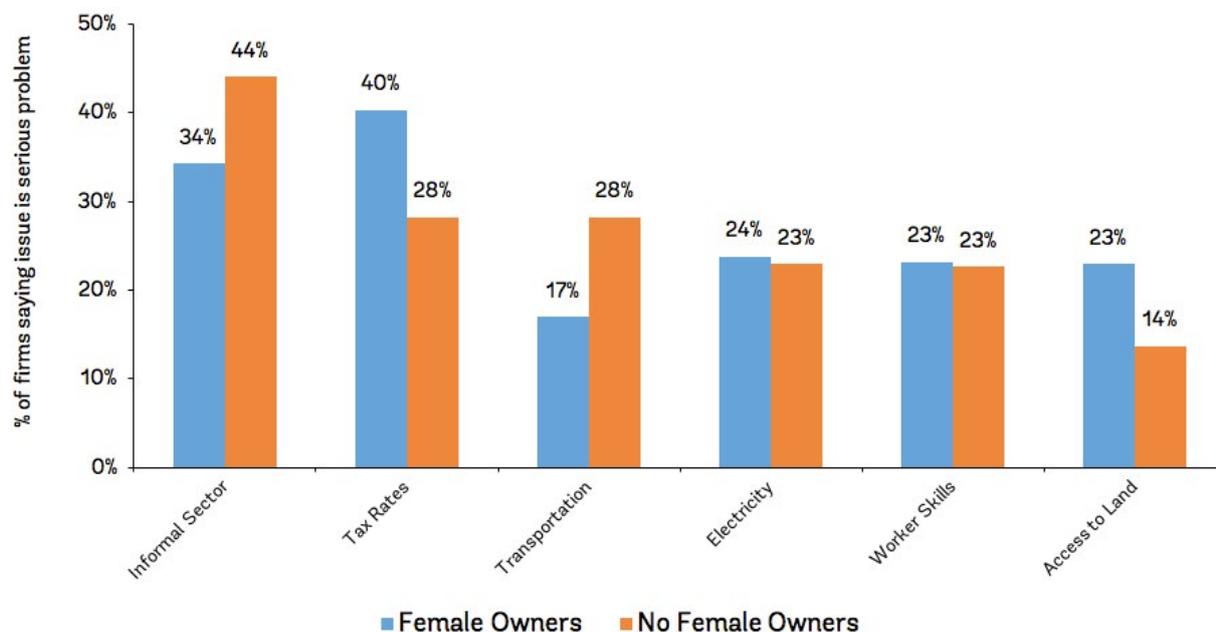
Figure 5: Foreign firms were particularly concerned about tax rates and access to land.



Source: World Bank Enterprise Surveys

Women-owned firms have slightly different concerns, with female-owned firms reporting that they tend to be less concerned about competitors in the informal sector, or transportation. In fact, only 17% of women-owned firms stated that transportation was a serious problem, compared to 28% of firms with no female owners. However, 40% of female-owned firms said that tax rates were a serious issue, compared to 32% of non-female owned firms, and 23% of women-owned firms reported that access to land was a constraint, compared to only 16% for non female-owned firms.

Figure 6: Firms with female owners tend to be more concerned about tax rates and access to land and less concerned about competitors in the informal sector or transportation.



Source: World Bank Enterprise Surveys

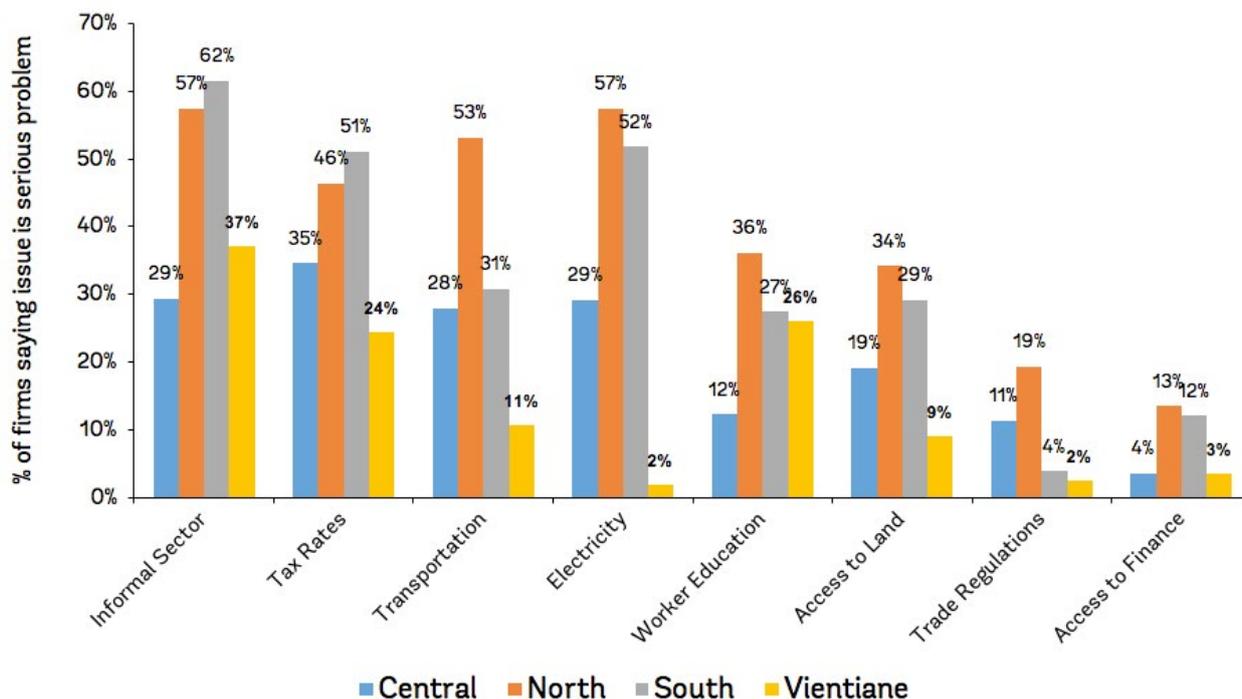
Differences by Region

There are some important similarities in perceptions across regions in Lao PDR. First, firms in all four regions rated most of the same six constraints as the biggest problems: practices of firms in the informal sector, tax rates, transportation, electricity, inadequately educated workers and access to land. The only exception to this was that very few firms in Vientiane reported that electricity was a serious problem. Similarly, fewer than 10 percent of firms rated any of the other constraints as serious problems in most cases. The only exceptions to this were that more than 10 percent of firms in the Central region and the South reported that customs and trade regulations were serious problems and more than 10 percent of firms in the South and North reported that access to finance was a serious problem. Neither access to finance nor customs and trade regulations, however, rated among the top 6 concerns in any region.

There were also some differences. One of the most noticeable differences is that firms in the North and South were more likely to say that each of the six main constraints were serious problems than firms in either the Central region or in Vientiane. This is especially noticeable for electricity and practices of firms in the informal sector, which were rated as serious problems by more than half of the firms in these two regions.

Another noticeable difference is that firms in Vientiane were less concerned about infrastructure than firms in other regions. Only 2 percent of firms in Vientiane rated electricity as a serious problem and only 11 percent rated transportation as a serious problem. These are far lower than in other regions—especially in the North.

Figure 7: Firms in Vientiane were less concerned about infrastructure than firms in other regions.



Source: World Bank Enterprise Surveys

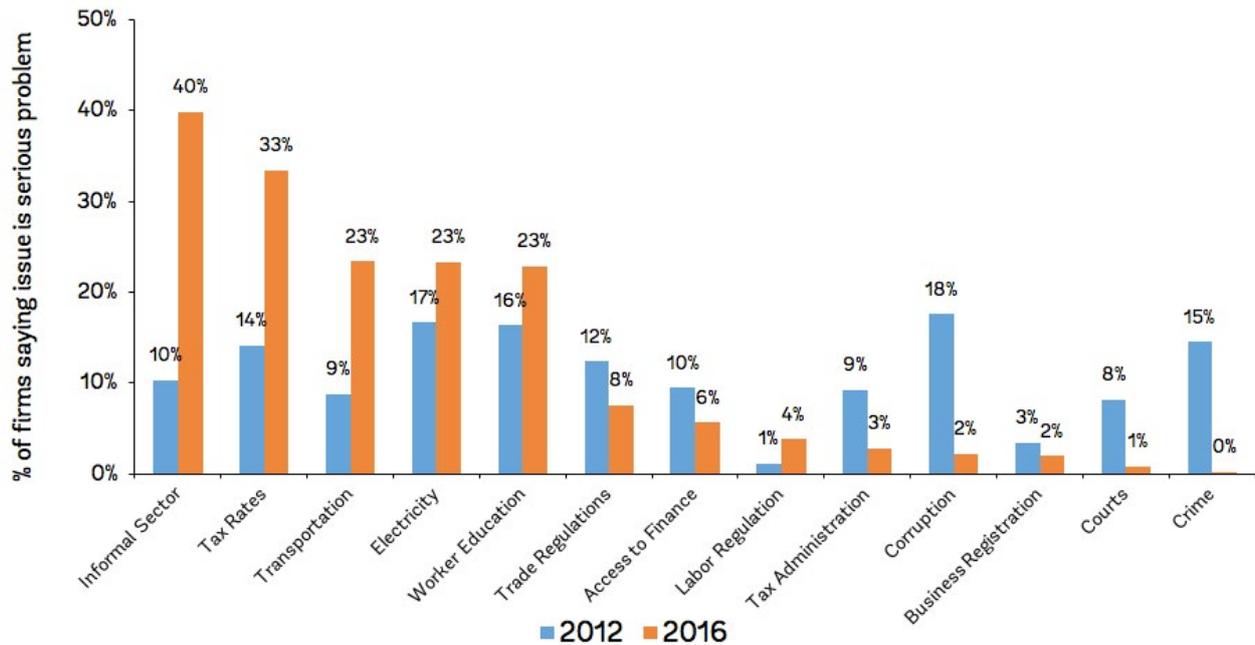
Changes in Perceptions Over Time

As discussed earlier, the 2016 Enterprise Survey was not the first survey conducted in Lao PDR. It is, therefore, interesting to compare perceptions in 2016 with perceptions in 2012 (see Figure 8). In this section, we look at the responses of all firms. In Appendix 4, we focus on the responses of the panel firms—firms that were interviewed in both 2012 and 2016.

There are several noticeable differences between the results of the two surveys. As noted in the Appendix, these differences are mostly statistically significant. First, firms were far more likely to say that areas of the investment climate were serious problems in the 2016 survey. In the 2012 survey, not one area of the investment climate was identified as a serious problem by more than 20 percent of firms. In the 2016 survey, there were six areas where more than 20 percent of firms identified areas of the investment climate as a serious problem. Although this could suggest a deteriorating investment climate, it could also reflect growing willingness to express opinions.

Second, firms generally had very different concerns. Firms in 2012 were most likely to say that corruption, electricity, inadequately educated workers, crime and tax rates were serious problems. In 2016, only three of these—electricity, inadequately educated workers, and tax rates—were among the most common concerns. Similarly, firms were far more likely to say that practices of informal competitors and transportation were serious problems in 2016. Neither of these concerns ranked among the top concerns in 2012.

Figure 8: Based on the percentage of firms that said areas were serious problems, firms had very different concerns in the 2012 Enterprise Survey.

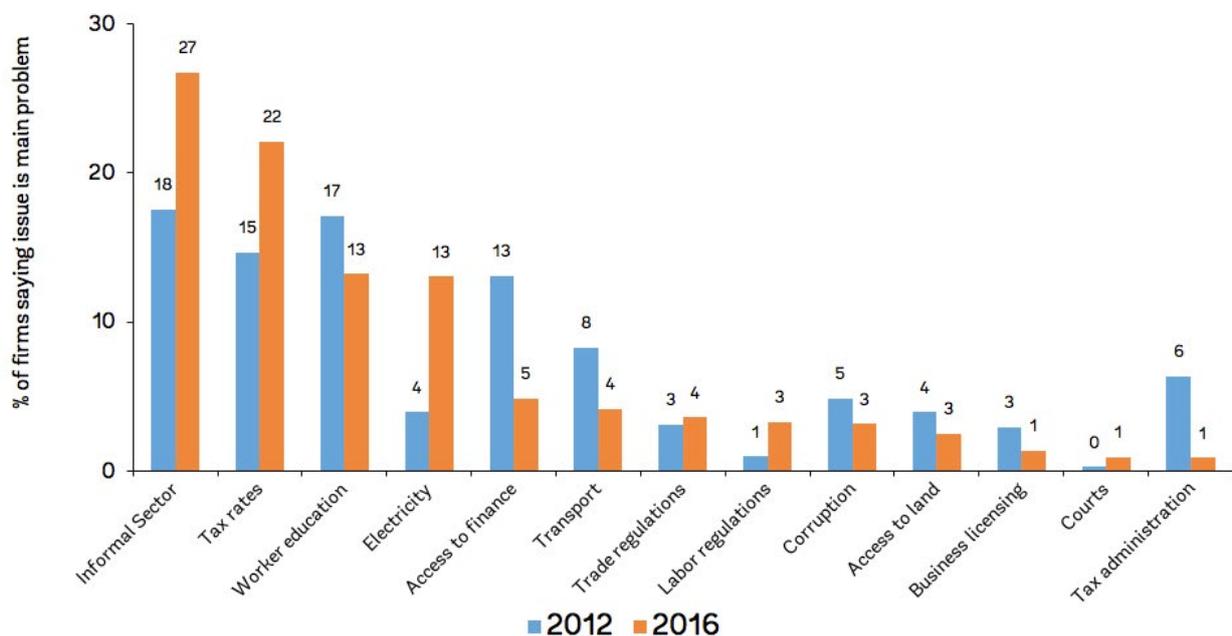


Source: World Bank Enterprise Surveys

Changes in Ranking of Perceptions

To check the robustness of results, it is interesting to compare perceptions of firms based on the ranking of areas identified as being serious problems (i.e. the second perception-based question). The results between the 2012 and 2016 surveys, based on this measure, are far more similar than those from the ratings question. When areas are ranked based on the percent of firms that reported each area as the main constraint facing their firm, the top three constraints were the same in the 2012 and 2016 surveys: practices of competitors in the informal sector, tax rates, and inadequately educated workers. The next most common concern in the 2012 survey was access to finance—something fewer firms said was the main problem in 2016. The next most common concern in the 2016 survey was electricity—something few firms said was the main problem in 2012.

Figure 9: There was, however, more consistency between rankings based on the main problem



Source: World Bank Enterprise Surveys

Differences in Rating and Ranking of Constraints

It is interesting to note that concerns across these two sets of questions—whether or not issues are a major problem, and which problem is the biggest—were generally similar in the 2016 survey, but this was not the case in the 2012 survey. In the 2012 survey, the areas firms were most likely to say were serious problems -- corruption and electricity -- were not the same as the issues chosen as the main concerns. It is possible that this is because firms in the 2012 survey were reluctant to state that issues were major or very severe problems in the first place. As a result, the first measure might not provide an accurate representation of the climate in the earlier survey.

Perceptions of Panel Firms Evolve Over Time

It is also interesting to see how perceptions evolved over time for panel firms interviewed in both periods. Table 1 shows what firms reported as the biggest constraints in 2016 based on what they reported as the biggest constraint in 2012. For example, about 30 percent of firms that said access to finance was the biggest constraint in 2012 reported that inadequately educated workers was the biggest constraint in 2016.

The table shows that perceptions are relatively fluid over time; only a modest number of firms reported the same problems in 2016 as they had reported in the earlier survey. For example, only 35 percent of firms that reported that inadequately educated workers were the biggest problem in 2012 reported the same in 2016. Further, none of the firms that reported access to finance was the biggest constraint in 2012 reported that access to finance was the biggest constraint in 2016.

Moreover, in some cases, firms that reported one area as the main constraint in 2012 reported a different area as the main constraint in 2016. For example, firms that reported competition from informal firms as the biggest constraint in 2012 were more likely to say inadequately educated workers and tax rates were the biggest constraint in 2016. Similar patterns hold for tax rates (which shifted to competition from informal firms in 2016), access to finance (which shifted to all other areas), transportation (which shifted to competition from informal firms) and other constraints in 2012 (which shifted to inadequately educated workers, competition from informal firms, and tax rates in 2016). The only constraint that this was not the case for was inadequately educated workers, which remained identified as a main constraint in 2016 by many firms who had already identified it as main constraint in 2012.

Finally, in some areas, firms were less likely to say that the area was a constraint in 2016 than in 2012. For example, only 17 percent of firms that said that competition from informal firms was the biggest constraint in 2012 said the same in 2016. In comparisons, about 40 percent of firms that said something else was the biggest constraint in 2012 said competition from informal firms was the biggest constraint in 2016. A similar pattern holds for tax rates.

Table 1: Changes in perceptions for individual panel firms over time.

	Biggest Constraint in 2016					
	Education	Informal Competitors	Tax Rates	Transport	Other	Total
Biggest Constraint in 2012						
Access to finance	30%	10%	20%	20%	20%	100%
Inadequately Educated Workers	35%	31%	12%	0%	23%	100%
Informal Competitors	33%	17%	25%	17%	8%	100%
Tax rates	8%	25%	17%	0%	50%	100%
Transport	11%	33%	22%	22%	11%	100%
Other	19%	40%	21%	5%	14%	100%
Total	24%	29%	20%	8%	18%	100%

Note: We omit access to finance in 2016 because so few panel firms reported access to finance as a constraint in the 2016 survey. None of the panel firms who reported access to finance as the biggest constraint in 2012 reported it as the biggest constraint in 2016.

Overall, the results suggest that perceptions differed significantly between the two surveys at both the aggregate level and at the level of individual firms. Knowing the challenges that an individual firm faced in 2012 is, in general, not a good predictor of the challenges it faced in 2016.



With knowledge about the perceived constraints of firms in Lao PDR, it is now relevant to examine these firms' productivity -- and how productivity has developed over the same time period -- to understand how these constraints may or may not be affecting actual outputs.

A. Labor Productivity

The most basic measure of firm performance that we use is labor productivity. Labor productivity is calculated by subtracting raw materials (such as steel, milk, or cotton) and intermediate inputs (such as paper or computer chips) from sales, and dividing that amount by the number of full-time permanent workers⁹. Labor productivity is a better measure of performance than the simple ratio of sales to workers because it takes the use of intermediate inputs into account. This makes it easier to compare the productivity of firms at different parts of the supply chain, and firms that are highly integrated into supply chains with those that are not.

Labor productivity is higher when firms produce more goods or services with less raw materials and fewer workers. Labor productivity will be higher when firms use more advanced technologies, have better organizational structures, and have highly skilled workers and managers.

Labor Productivity Versus Total Factor Productivity

Because labor productivity does not take the use of capital (i.e., machinery and equipment) into account, labor productivity will be higher when firms replace workers with machinery (i.e., when firms are capital intensive). Although this suggests that measures of productivity that take both labor and capital use into account, such as total factor productivity, might be inherently superior to partial productivity measures like labor productivity, this is not necessarily the case. Labor productivity has some advantages over measures such as total factor productivity. Most importantly, it is relatively easy to measure labor and value-added. In contrast, it is far harder to measure capital use even under the best of circumstances. And when firms misreport the value of their capital, total factor productivity will be mis-measured. This is an especially serious problem when dealing with small firms in developing countries that might not keep accurate financial accounts. Moreover, many firms in the Enterprise Surveys report labor and value-added but do not report capital. These firms are typically not included when calculating total factor productivity.¹⁰

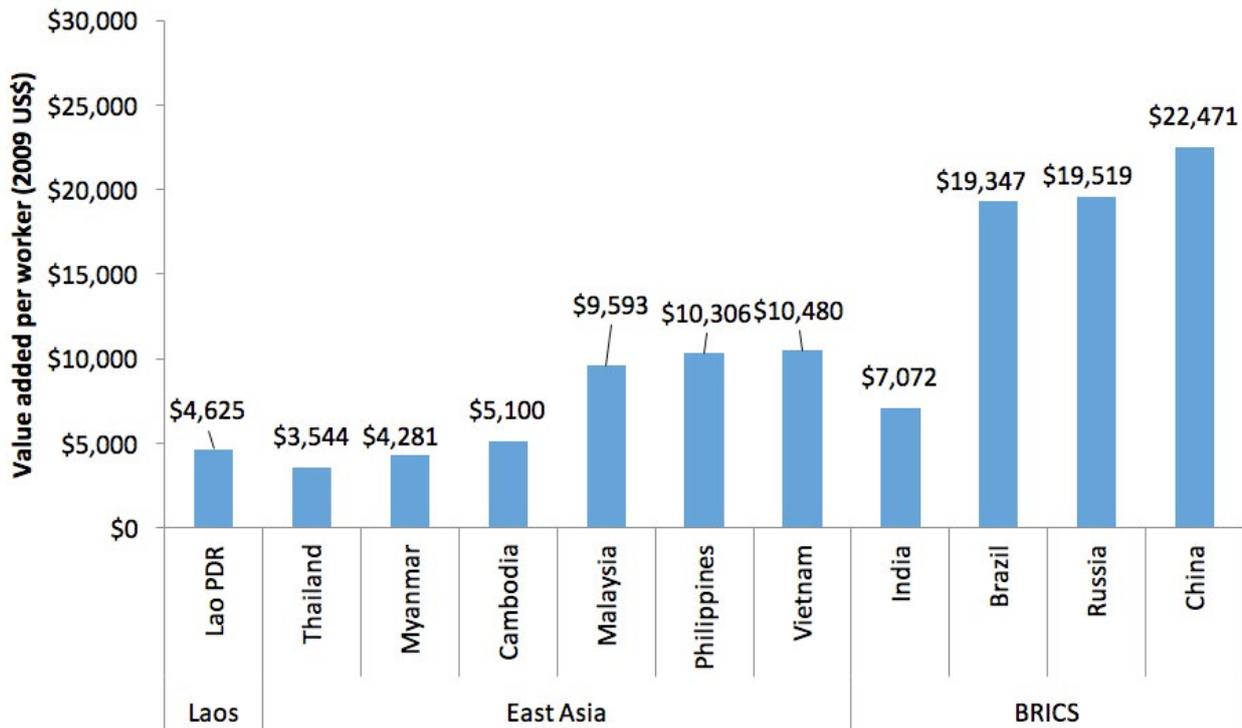
Labor Productivity Comparisons

The median firm in Lao PDR produces about \$4,625 of value-added per worker (see Figure 10). This is slightly more than in the least productive countries in East Asia and is close to the amount that the median firm in Cambodia produces. It is, however, significantly less than in Malaysia, the Philippines, and Vietnam, where the median firms produce more than twice as much per worker as the median firm in Lao PDR.

⁹ See appendix for a more detailed description

¹⁰ Although it would be possible to estimate missing values using robust estimation techniques than allow for missing data (Allison, 2001), this is not typically done. In particular, Cusulito and others (2016) do not use this approach

Figure 10: Labor productivity is slightly higher in Lao PDR than in the least productive comparator countries.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance

Labor productivity is also higher in the BRICS economies than in Lao PDR. Although the median Indian firm is only about 50 percent more productive than the median firm in Lao PDR, the median firms in Brazil, Russia and China are more than four times as productive as the median firm in Lao PDR.

Labor Productivity in the Garment and Food Processing Sectors

One concern about the previous results is that they might be due to differences in sectoral structure. Firms might be more productive in some countries because these countries have a comparative advantage in high productivity sectors. To see whether this is the case, we also look at labor productivity in the garment and food processing sectors. We choose these sectors because they are oversampled¹¹. This gives us larger samples than if we looked at other sectors such as the electronics or automobile parts sectors.

Despite this, these results should be treated with some caution. Although the samples are large in some large countries, in smaller countries such as Lao PDR and Cambodia, the samples are much smaller. In Lao PDR, for example, only 18 garment firms and 20 food processing firms were included in the survey. The smaller sample could lead to problems due to sampling error.

In the garment sector, Lao PDR compares similarly with the comparator countries, falling in between the best and worst performers in the sector. The median garment firm in Lao PDR is more productive than similar firms in Cambodia, Thailand and the Philippines, but lags behind Vietnam, Malaysia and China. Although it compares more favorably with some countries, such as Russia and the Philippines, productivity remains lower than in the best performing countries.

¹¹ These firms types were surveyed over proportionally compared to their representation in the economy.

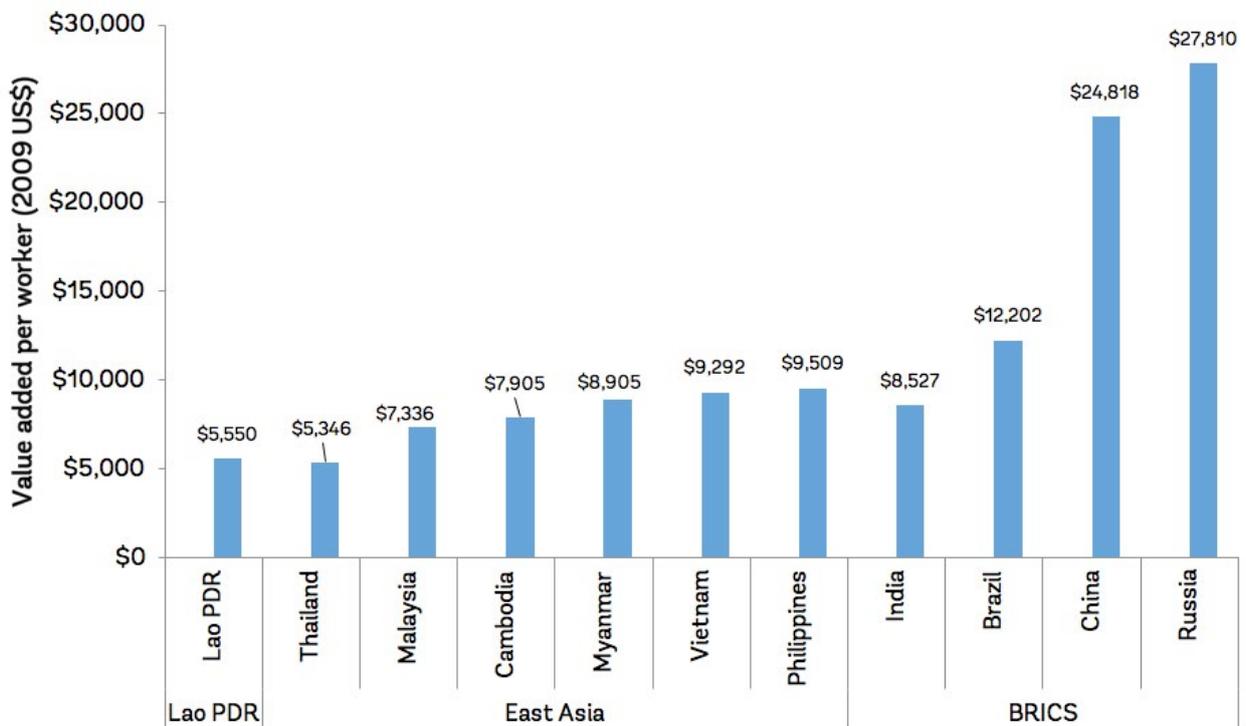
Figure 11: Lao PDR compares similarly with the comparator countries in the garment sector.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance. Countries with fewer than 10 observations in the sector are omitted.

Figure 12: Lao PDR compares less favorably with the comparator countries in the food processing sector.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance. Countries with fewer than 10 observations in the sector are omitted.

In the food processing sector, Lao PDR compares less favorably with the comparator countries. The median firm's labor productivity in Lao PDR is lower than in any other country except Thailand.

Reasons for Low Labor Productivity

The lower productivity in Lao PDR could reflect many different factors. It could be 1) because firms in Lao PDR use capital less intensively, or 2) it could be due to the low education and skills of workers, or 3) to differences in the investment climate. In the following sections of this paper, we will explore the first two hypotheses—differences in capital intensity and worker skills. The investment climate in Lao PDR has been examined in an earlier section.

B. Capital Intensity

As discussed above, labor productivity tends to be higher in countries where firms substitute capital for labor; when firms get more capital, value added will increase even if the number of workers stays fixed. It is, therefore, useful to see how Lao PDR compares with other countries in terms of capital intensity—the value of the firm's machinery and equipment divided by the number of workers that the firm has (see Appendix 1 for discussion).

Measuring Capital Intensity

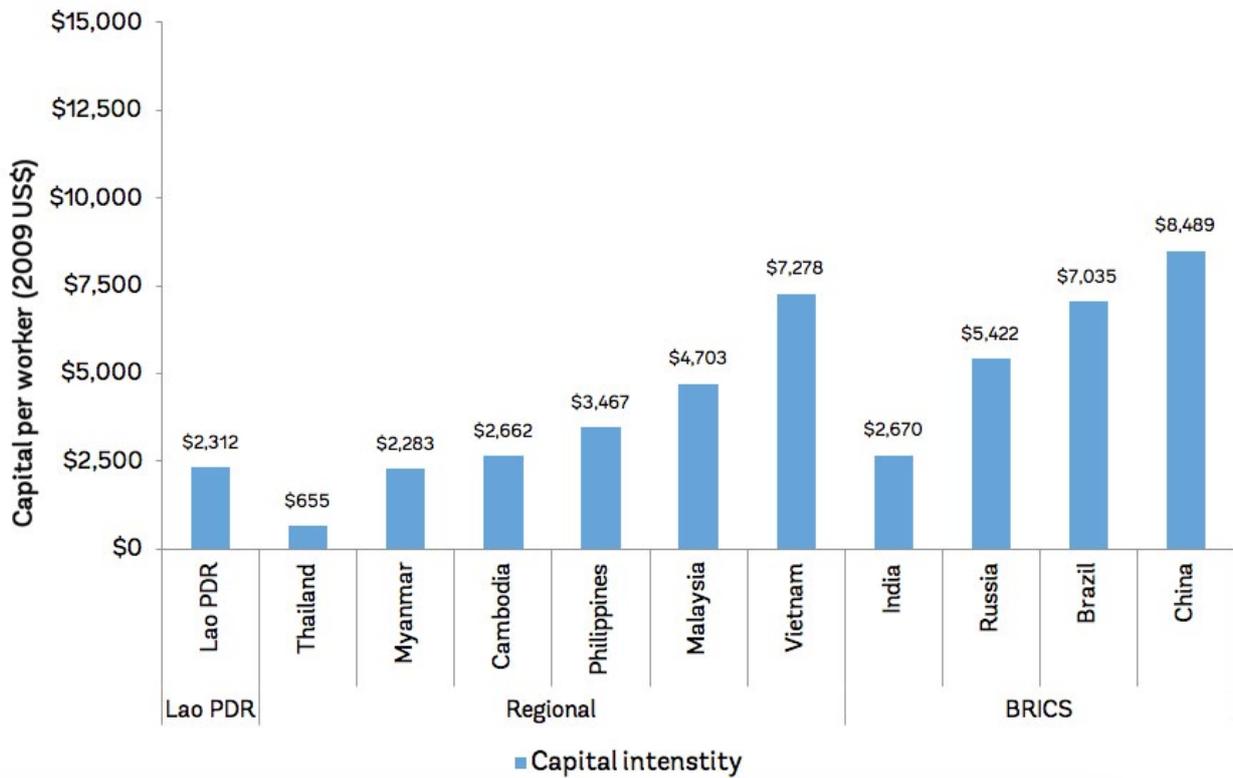
Although capital intensity can be informative, it is very difficult to measure capital accurately in developing countries. In addition to the standard problem of dealing with depreciation, few firms keep audited accounts and few managers report figures directly from their accounts. In addition, most firms will have purchased their machinery and equipment over a long period of time—and sometimes in the distant past—meaning that managers find it harder to estimate the value of their machinery and equipment than they do to estimate sales or expenditures over the past year. Finally, in most countries, fewer firms report capital than report sales or value-added. In Vietnam, for example, only 444 firms reported enough information to calculate capital intensity compared with 542 firms that reported enough information to calculate labor productivity. Although this is not the case for Lao PDR—109 firms reported enough information to calculate both labor productivity and capital intensity—it holds true for the comparator countries. Because of this, capital intensity is measured less accurately than measures of firm performance that do not depend on capital, such as labor productivity and unit labor costs.

Cross-country Comparison of Capital Intensity

Firms in Lao PDR are not very capital intensive (see Figure 13). The median firm reports that they have about \$2,312 of capital for each worker. This is higher than in Thailand¹² but lower than in most of the other comparator countries. In particular, firms are more capital intensive in Malaysia and Vietnam, where firms are more productive than in Lao PDR. Similarly, firms in Russia, Brazil and China are also more capital intensive than firms in Lao PDR. This suggests that one reason why firms in Lao PDR are less productive than firms in these other countries is that they are less capital intensive.

¹² For Thailand, some data issues seem to drive this figure as can also be seen by the extremely high capital productivity in the next section.

Figure 13: Firms in Lao PDR are not very capital intensive



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance

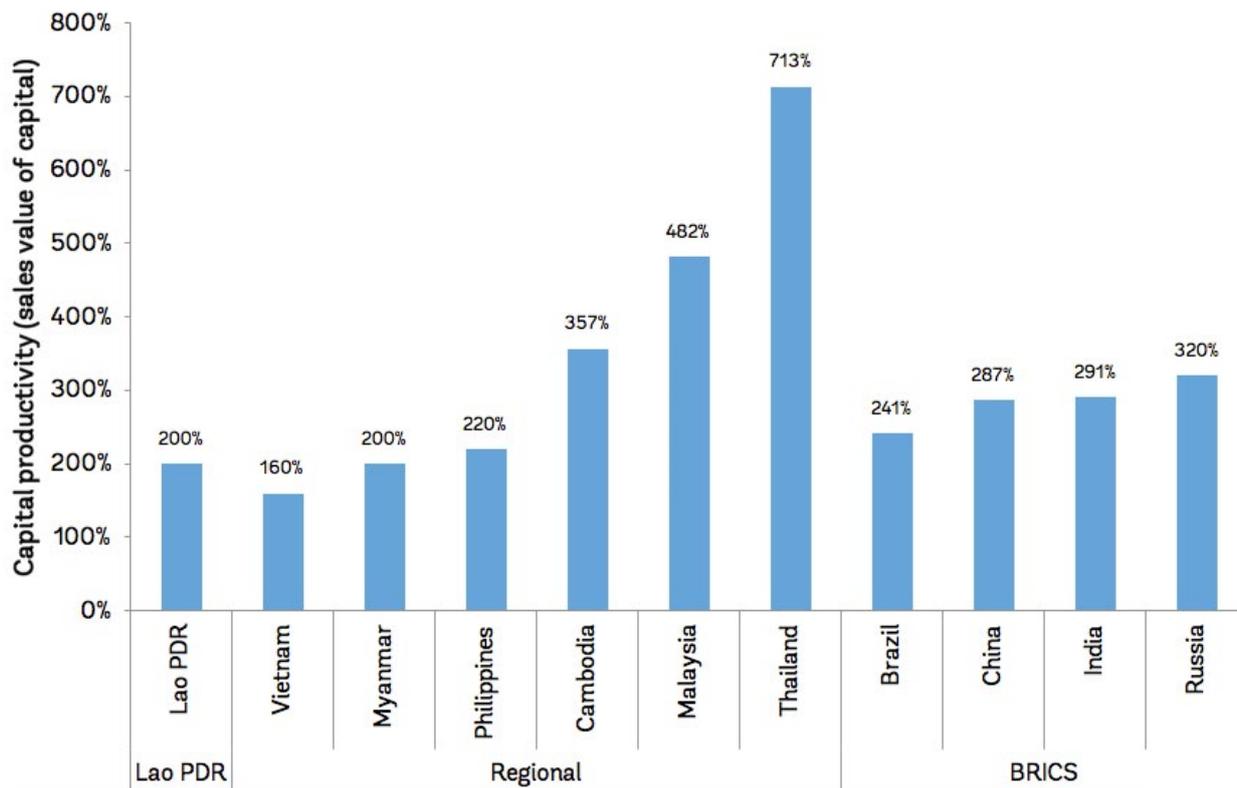
Capital Productivity

Although capital intensity gives an idea of how much capital firms use, it does not provide much information on how productively that capital is being used. Capital productivity, the ratio of value-added to the value of machinery and equipment, measures how productively firms use capital¹³. Capital productivity is higher when the firm produces more output (measured as value-added) with less capital. Because capital productivity does not take use of labor into account, capital productivity will generally be higher for firms that substitute workers for capital in their production process. Because both capital and value-added are measured in dollars, the ratio does not have natural units.

Because firms in Lao PDR do not appear to be very capital intensive, it seems plausible that capital productivity will be high. If firms cannot get enough capital—for example because access to finance is limited—capital productivity should be high because firms will under-invest in machinery and equipment. This, however, does not appear to be the case in Lao PDR (see Figure 14). The median firm reports that its capital productivity is 200 percent—lower than in any of the comparator countries other than Vietnam and Myanmar. This suggests that firms are not highly capital constrained in Lao PDR. If they were, we would expect capital productivity to be higher.

¹³ Although it can be measured using either the book value or the sales value of capital, we focus on the sales value in this section since this is closer to the economic concept we are interested in. See Appendix 2 for discussion.

Figure 14: Firms in Lao PDR are not highly capital intensive, yet capital productivity is not particularly high.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: See appendix for details. All data points are for the median firm on each measure of performance

C. Labor Costs

Although the earlier productivity measures provide information on how competitive firms in Lao PDR are relative to firms in other developing economies, they can be misleading when considered in isolation. Labor productivity, in particular, implicitly treats all full-time workers as if they are the same. That is, it does not distinguish between highly skilled workers and unskilled workers. For the most part, we would expect both productivity and wages to be higher when firms employ highly educated or highly skilled workers. But wages will also be higher when the supply of workers is low or demand for workers is high. That is, in the absence of free mobility for labor, high wages might be due to limited labor supply or differences in living costs across countries. That is, wages reflect both local labor market conditions and workforce composition.

Wages and Competitiveness

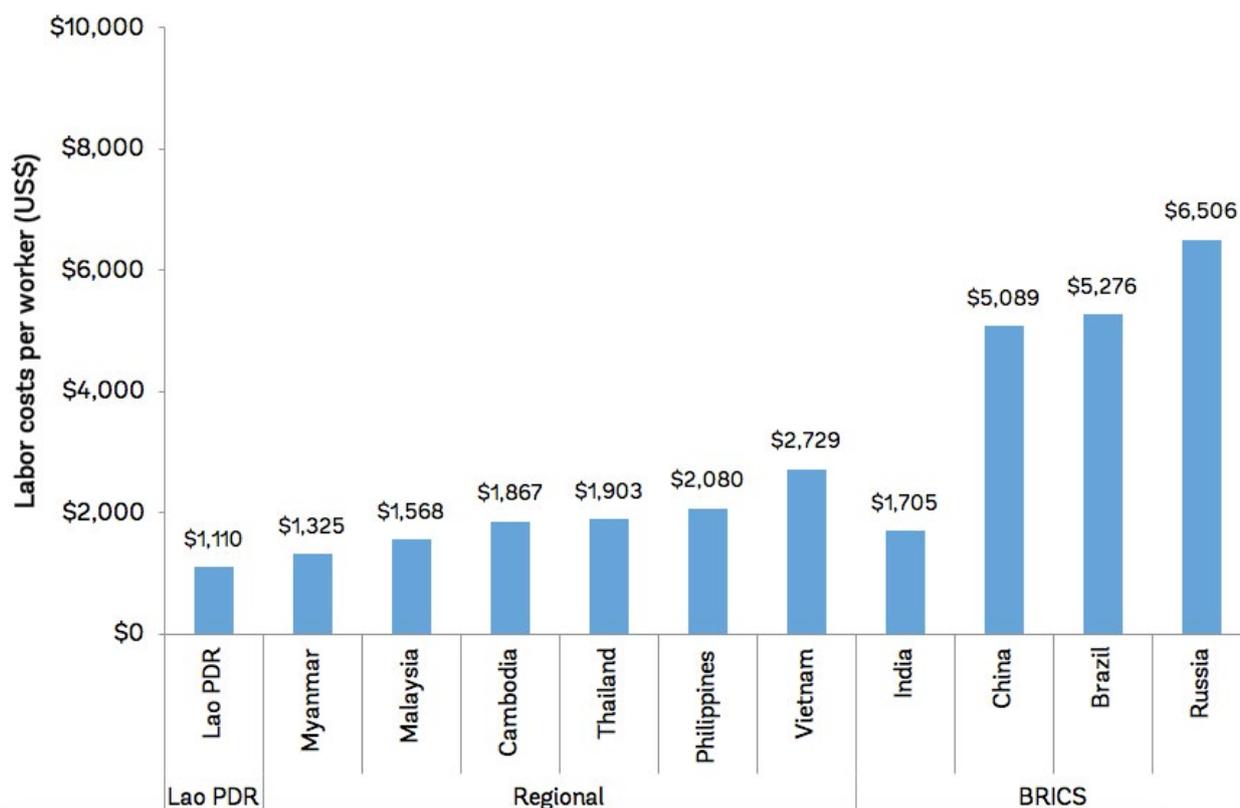
Wage levels are important because firms can remain competitive when productivity is low, if wages are comparatively lower. This might be the case if, for example, wages and productivity are both low due to low education and skills levels. Similarly, high wages might make firms uncompetitive even when productivity is relatively high. Because of this, it is useful to look at labor costs as well as labor and total factor productivity when assessing competitiveness.

The measure of labor costs that is used in this study is the cost of wages, salaries, bonuses, other benefits, and social payments for workers at the firm divided by the number of workers. The data are taken from the firms' accounts. It includes wages and salaries paid to all workers and managers—not just production workers.

Labor Costs Comparisons

Labor costs are lower in Lao PDR than in any of the regional comparator countries (see Figure 15). The median firm in Lao PDR reported that wages were about \$1,110 per worker. This is slightly lower than in Myanmar, Malaysia and India and about 70 to 150 percent lower than in Cambodia, Thailand, the Philippines or Vietnam. Wages are far lower than in the other BRICS economies.

Figure 15: Labor costs are lower in Lao PDR than in many of the regional comparator countries.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance

Low wages in Lao PDR suggest two things. First, they suggest that firms might be able to stay competitive despite low productivity. Second, although low wages might mostly reflect local labor market conditions, combined with low productivity they suggest that workers in Lao PDR might be less highly educated or skilled than in the comparator countries.

Unit Labor Costs

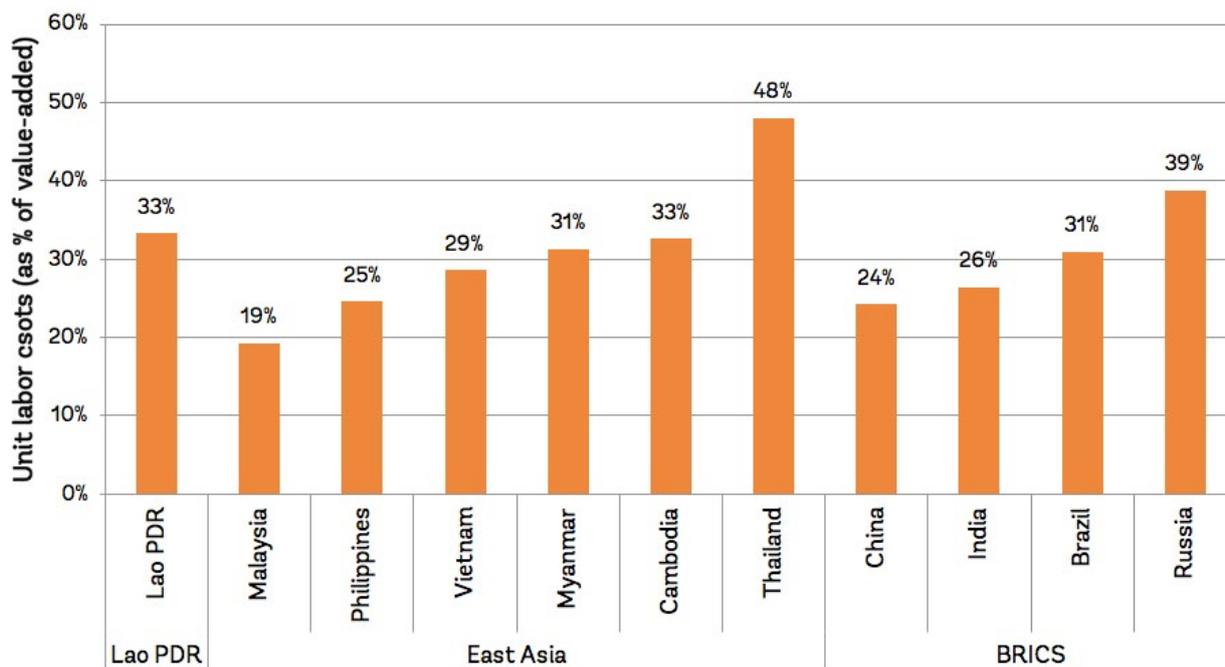
Unit labor costs allow us to assess the net impact of labor costs on competitiveness. The measure that we use, labor costs as a percent of value-added, is an approximation of true unit labor costs (i.e., true unit labor costs measure output in physical units of production rather than dollar values)¹⁴ Unit labor costs are higher when high labor costs are not fully reflected in high productivity. When this is the case, all else equal, firms will find it difficult to compete in international markets.

¹⁴ Because of limitations related to the data collected in the Enterprise Surveys and the broad coverage of the Enterprise Surveys across different sectors of the economic, we cannot calculate true unit labor costs

Unit labor costs have several attractive features for analytical purposes. One important feature is that unit labor costs are not measured in local currency and, therefore, are unaffected by exchange rate variations. They are not perfect, however, since they do not take capital use into account.

In contrast to labor productivity, capital intensity, total factor productivity (see discussion in next section), and labor costs, unit labor costs are not typically higher in higher income countries than in lower income countries (Clarke, 2012). Although labor costs are higher in monetary terms in higher income countries, productivity is also higher. That is, although workers in high income countries earn more, their productivity is also higher.

Figure 16: Unit labor costs are relatively high in Lao PDR



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance

Unit labor costs are relatively high in Lao PDR. The median firm reports that unit labor costs are about 33 percent of value-added. Although unit labor costs are higher in Russia and Thailand, and similar in Cambodia, they are lower in the other comparator countries than in Lao PDR. This suggests that low labor costs do not completely make up for low labor productivity in Lao PDR.

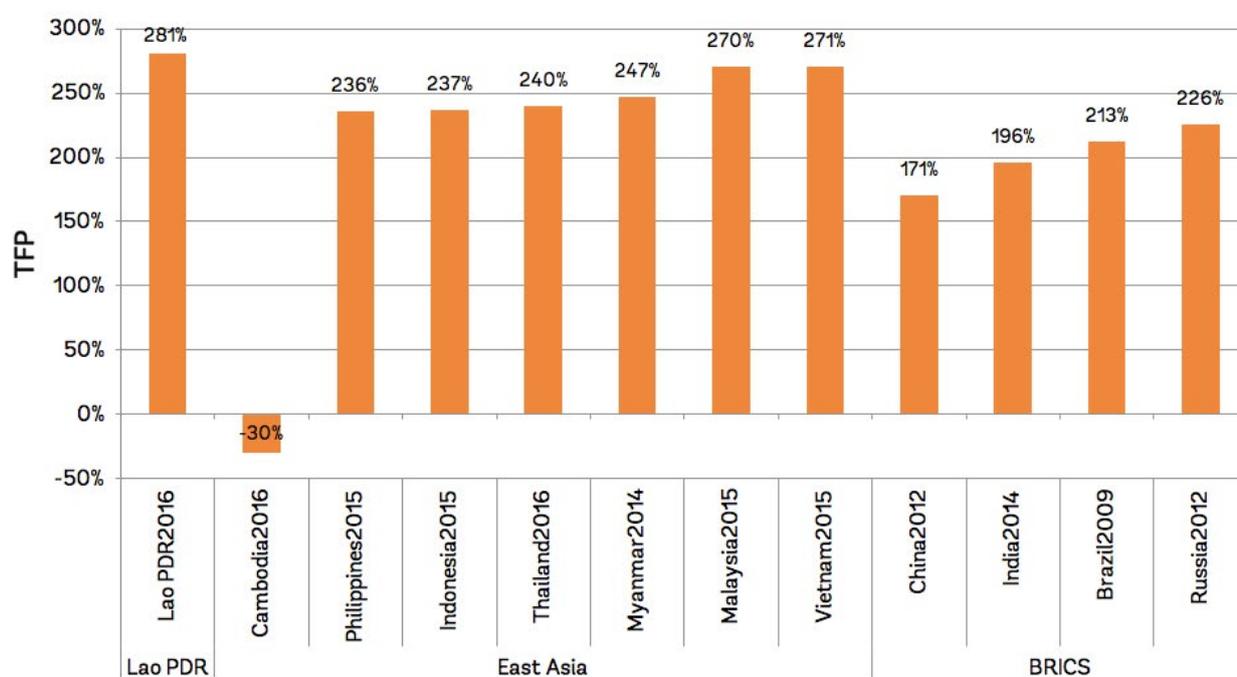
D. Total Factor Productivity

As a final exercise, we look at total factor productivity in Lao PDR. Total factor productivity (TFP) is a productivity measure that takes into account the firm's use of capital, the sector of operations, and the quality of the firm's labor. We use the methodology and data described in Cusulito and others (2016). Although TFP does not have natural units, it can be roughly interpreted as the (weighted) average level of productivity in each country relative to the (weighted) average productivity across all firms in the countries where Enterprise Surveys have been conducted (i.e., across firms in all countries).

TFP might seem to be an inherently better measure of productivity than labor productivity, which does not take into account all of these factors. In practice, however, it has some disadvantages over the previous measures. First, because it is highly data intensive, many observations with incomplete data are discarded. Second, as discussed in the section on capital intensity, capital is poorly measured in most cases.

In addition to problems due to accounting measures of capital not being perfect proxies for economic measures of capital, many small firms in the Enterprise Surveys do not keep detailed accounts. Finally, the measure that we use to capture the quality of labor -- labor costs -- is imperfect. Although labor costs will be high when the quality of labor is higher, they will also be affected by local labor market conditions. Because labor is not perfectly mobile, labor costs are only an approximation of labor quality. Moreover, as discussed in the appendix, small differences in the way that total factor productivity is measured appears to affect rankings noticeably.

Figure 17: Total factor productivity is relatively high in Lao PDR



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: See appendix for details. All data points are for the median firm on each measure of performance. They can be roughly interpreted as the (weighted) average level of productivity in each country relative to the (weighted) average productivity across all firms in the countries where Enterprise Surveys have been conducted, i.e. they can be negative.

Cross-country Comparison of Total Factor Productivity

Keeping these provisos in mind, TFP appears to be relatively high in Lao PDR (see Figure 17). Lao PDR compares with the comparator countries more favorably when looking at TFP than when looking at labor productivity. This suggests that low labor productivity is at least partly due to low capital intensity and low labor skills. This is consistent with the earlier results—capital intensity is lower in Lao PDR than in most of the comparator countries and labor costs are also lower. If labor costs are low because worker skills are commensurately low, this could explain Lao PDR's low labor productivity yet high total factor productivity. However, if low labor costs, are in part a reflection of local labor market conditions, we would overstate Lao PDR's TFP.

Total Factor Productivity at the Sector Level

A natural question is whether high TFP is due to firms operating in sectors where total factor productivity is relatively high. It is, therefore, useful to look at TFP at the sector level. In practice, this is difficult to do using Enterprise Survey data. That is, sub-sector samples are generally not large enough to precisely estimate TFP at the sector level. Two sub-sectors, however, are oversampled: garments and food processing. In most countries, it is therefore possible to calculate TFP in these two sub-sectors.

When we do this, we see similar patterns as in the broader sample (see Figure 18 and Figure 19). Lao PDR compares particularly favorably in the food processing sector—TFP is higher in only one country. In the garment sector, Lao PDR also compares favorably with the comparator countries—only Vietnam and Malaysia have higher TFP. This suggests that Lao PDR compares relatively favorably with other countries in multiple sectors.

E. Summary of Productivity Measures

The results in the previous sub-sections suggest the following empirical results

1. Labor productivity is low in Lao PDR—the average worker does not produce much.
2. Firms are not very capital intensive—firms have little capital per worker suggesting they are labor intensive
3. Wages are low—possibly suggesting that human capital is low
4. Total factor productivity is relatively high—suggesting that after controlling for sector, capital, and human capital, productivity is relatively high.

How can we explain these possibly contradictory results? The first observation is that low labor productivity could be explained in several ways. It might be due to firms using old technologies, having poor management practices, having relatively little capital, or having relatively poorly educated workers. It could also be due to a weak investment climate.

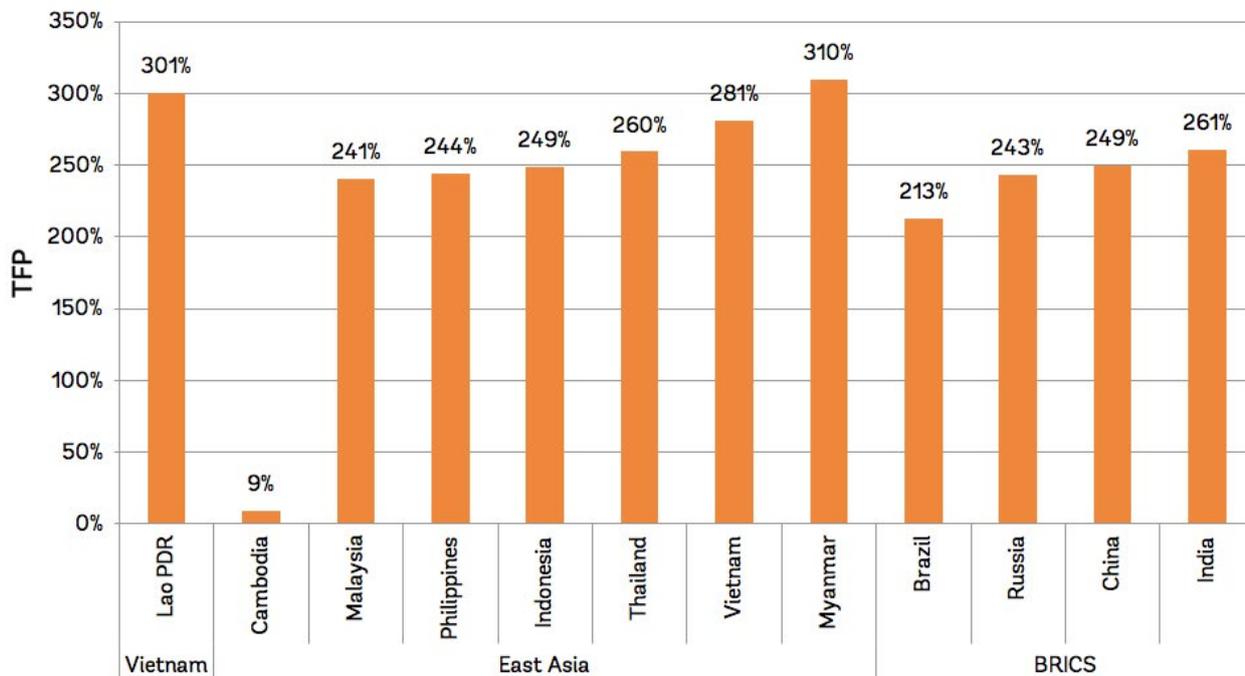
The second and third results suggest that, at least in part, low labor productivity reflects low capital intensity and poorly educated or low-skilled workers. The fact that firms remain highly labor intensive suggests that firms are not using capital very intensively. If this were the main problem driving low labor productivity, however, we would expect capital productivity to be higher. This suggests that low human capital also plays a role in Lao PDR's low labor productivity.

Finally, total factor productivity is relatively high. Unlike labor productivity, total factor productivity controls for human and physical capital. The fact that total factor productivity is relatively high suggests that the main drivers for low labor productivity are low human capital and low capital intensity. If other factors such as a poor investment climate or poor management were the main drivers of low labor productivity, we would expect total factor productivity—which does not control for either the investment climate or management quality—to be low as well. The fact that it is relatively high—both overall and in the garments and food processing sectors—suggests these factors play a relatively modest role in Lao PDR's low labor productivity.

It is possible that the difference between the results for labor productivity and total factor productivity are due to capital being consistently mis-measured in Lao PDR. This might be the case if accounting standards were looser in Lao PDR than in the comparator countries. That is, if firms tend to under-report capital, then

TFP estimates will be too high. This would be consistent with both low capital intensity and high total factor productivity. Unfortunately, there is no way to know whether this is the case. As discussed earlier, capital is difficult to measure and to compare across countries. For this reason, labor productivity might be a better measure of overall performance.

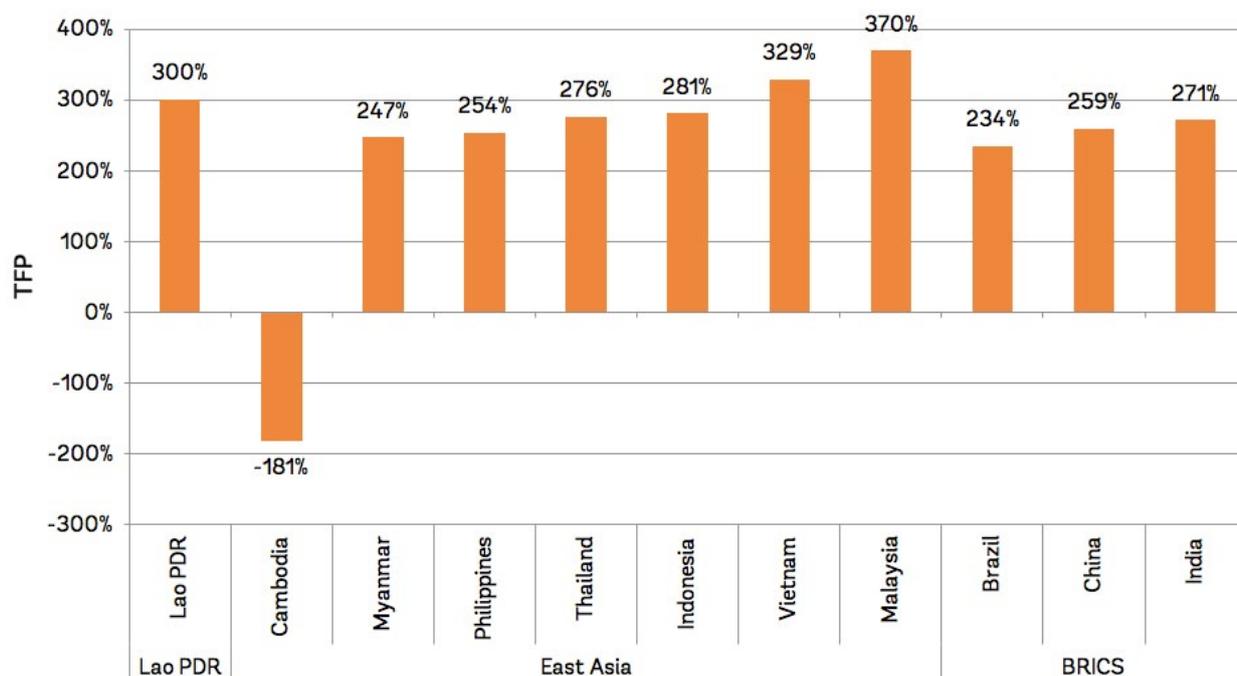
Figure 18: Total factor productivity is high in the food processing sector in Lao PDR



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: See appendix for details. All data points are for the median firm on each measure of performance.

Figure 19: Total factor productivity is also high in the garments sector in Lao PDR



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: See appendix for details. All data points are for the median firm on each measure of performance. They can be roughly interpreted as the (weighted) average level of productivity in each country relative to the (weighted) average productivity across all firms in the countries where Enterprise Surveys have been conducted, i.e. they can be negative.

In the previous section, we focused on manufacturing firms alone. We do this because information on the cost of intermediate inputs (needed to calculate labor productivity) and capital (needed to calculate total factor productivity) are only available for manufacturing firms. It is possible to calculate some simple productivity measures for other sectors. In particular, we can calculate sales per worker for firms in all sectors.

Sales Per Worker

Sales per worker is an inferior measure of productivity to labor productivity because it does not take the use of intermediate inputs into account. It is also important not to compare sales per worker across sectors. Retail trade firms, in particular, tend to have relatively high sales per worker because they mostly buy and sell finished goods even though their value-added is relatively low.

To ensure that retail trade firms do not make sales per worker appear high in countries with large retail sectors, we compare retail trade and service firms (e.g., hotels, business services, construction) across countries separately. In Appendix 6, we also present data for hotels and construction separately. Although it would be good to break out other sub-sectors, these generally have too few firms in small countries such as Lao PDR to make reasonable comparisons. We also present similar data for sales per worker for manufacturing firms in Appendix 6.

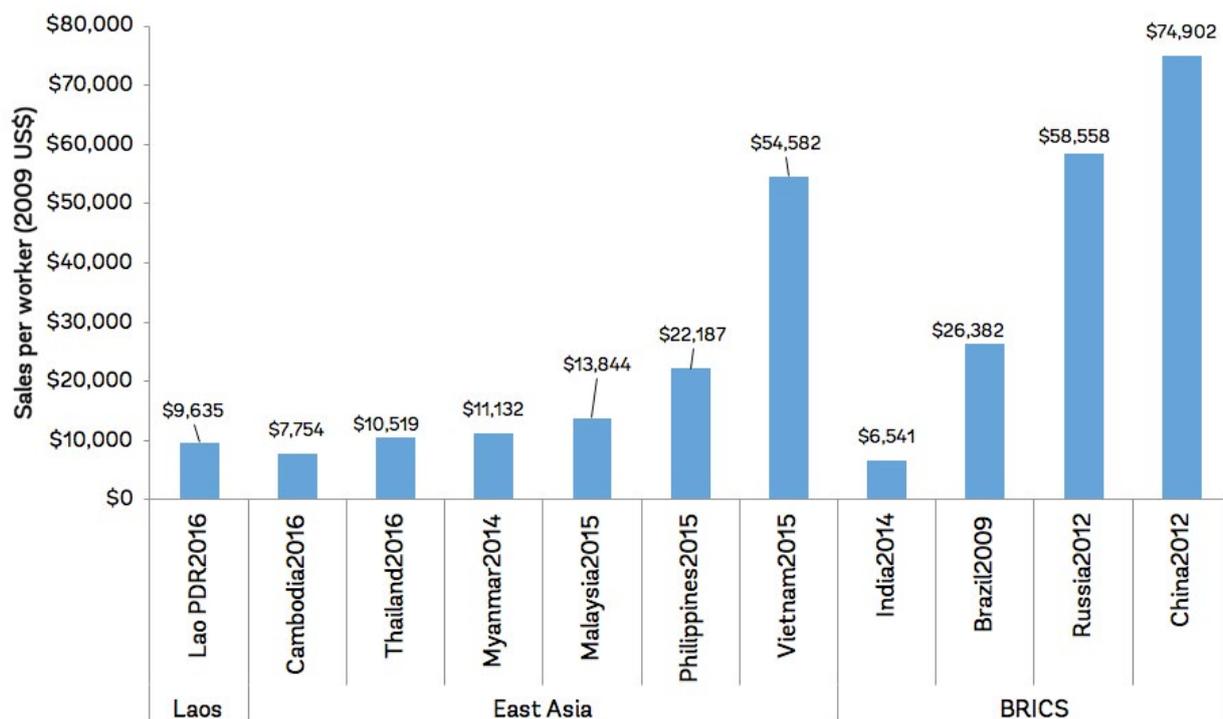
Retail and Service Sector Firms

Retail firms appear to be relatively unproductive in Lao PDR (see Figure 20). The median retail firm in Lao PDR reports that sales are about \$9,635 per worker. This is slightly higher than in Cambodia and slightly lower than in Thailand and Myanmar. It is, however, far lower than in the best performing countries in the region (e.g., Malaysia, the Philippines, and Vietnam) and the best performing BRICS (Brazil, Russia, and China).

A similar pattern also holds in other service sectors (see Figure 21)—the median firms in Lao PDR are less productive than median firms in the best performing countries in this sector as well. The median firm in Lao PDR sells about \$6,937 per worker. This is slightly higher than Thailand (\$6,740) and slightly lower than Myanmar (\$7,481). It is also lower than Cambodia (\$10,297)—although the difference is slightly larger than in other sectors. Once again, the median firm in Lao PDR lags far behind the median firms in the best performing countries in the region (e.g., Malaysia, Vietnam, and the Philippines) and among the BRIC economies.

In summary, the pattern observed in the manufacturing sector for labor productivity appears to also hold in retail trade and others services. That is, Lao PDR's productivity appears similar to some countries in the region such as Thailand, Myanmar, and Cambodia and to India. However, productivity, appears far lower than in the best performing BRIC economies and the best performing countries in East Asia.

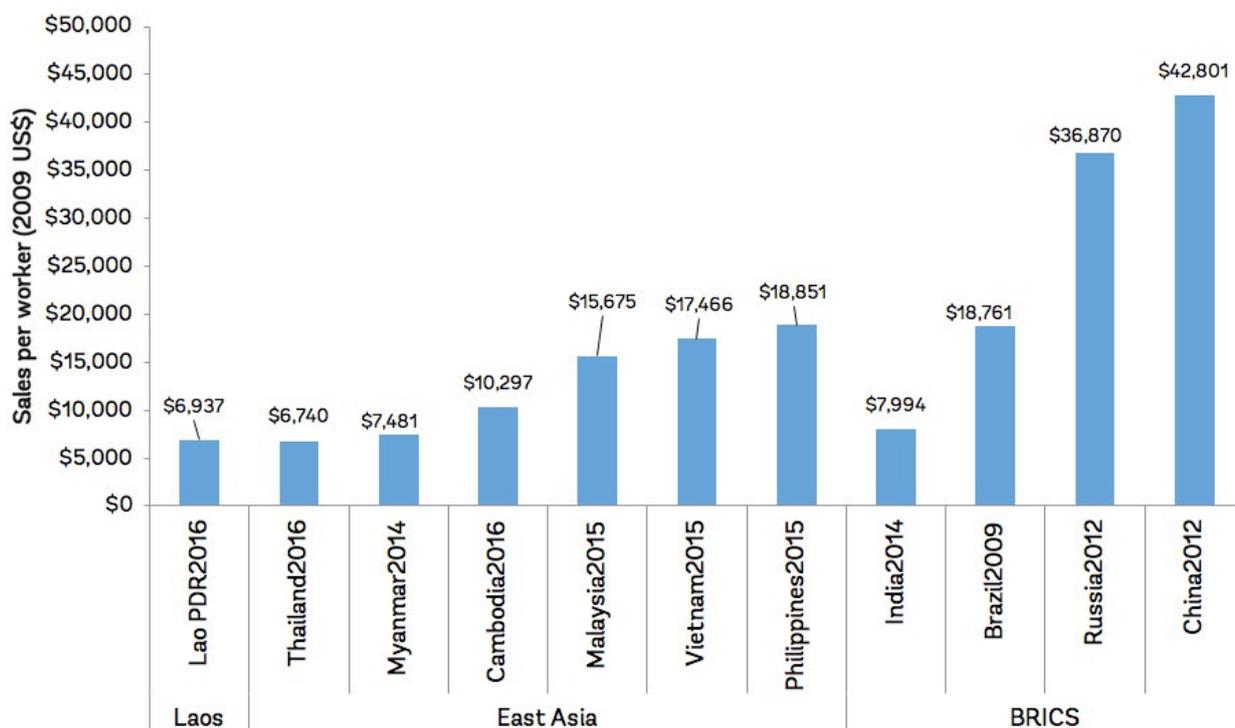
Figure 20: Retail firms also appear to be relatively unproductive in Lao PDR.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

Figure 21: Service firms in Lao PDR are also unproductive.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

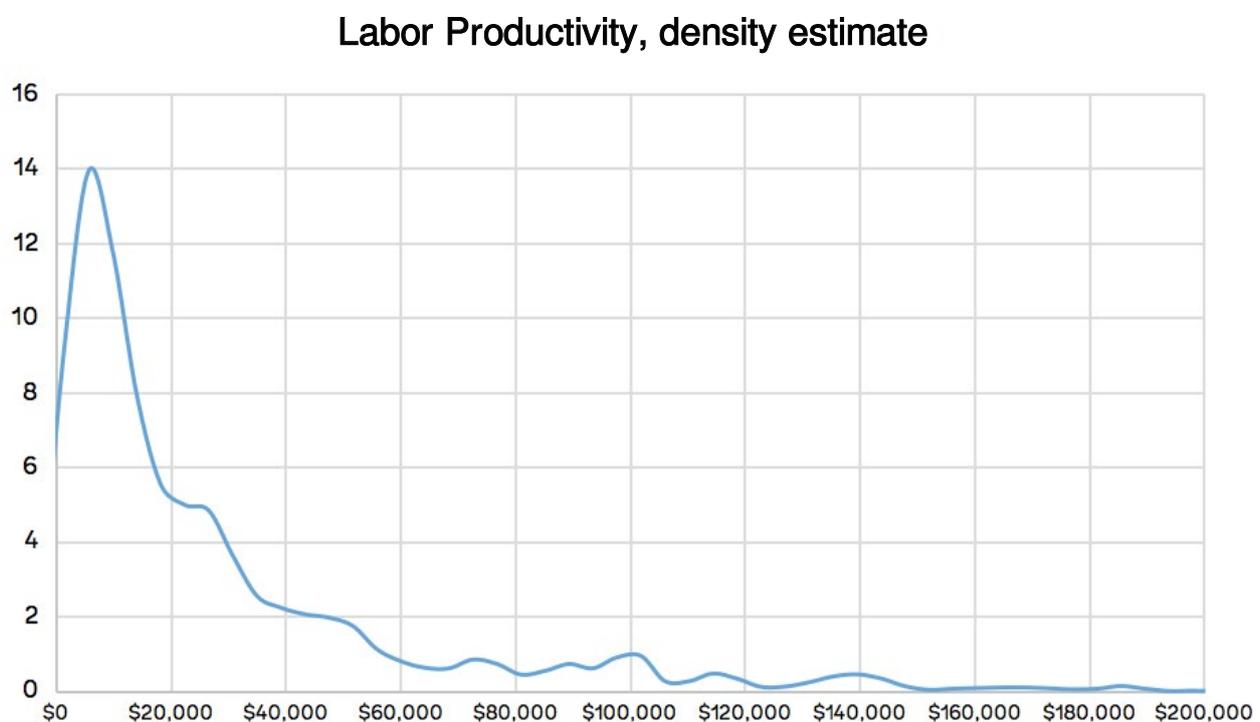
In the previous section, we focused on median productivity in Lao PDR and the comparator countries. It is useful to also look at the entire distribution of the productivity measures, which shows a more complete picture of how competitive manufacturing is. For example, in highly competitive economies, we would expect productivity improvements to disperse quickly and poorly performing firms to either improve their performance or exit.

As in the previous section, we focus on two measures—labor productivity and capital intensity. We also present some information on total factor productivity for comparisons. Finally, we compare productivity in Lao PDR with similar measures in Vietnam and Cambodia to give some context to the results. Table 2 shows the labor productivity and capital intensity at different percentiles and at the mean in the three countries.

Distribution of Labor Productivity

Figure 22 shows an estimate of the distribution of labor productivity in Lao PDR. The density peaks at about \$5,000 per worker—close to the median level of productivity. There is, however, a long tail in terms of high productivity. Many firms produce more than \$20,000 of value-added per worker and a significant number produce over \$40,000 per worker.

Figure 22: Estimate of the distribution of labor productivity in Lao PDR



Note: Kernel density estimates use an epanechnikov kernel with the optimal band width. Outliers with negative labor productivity or labor productivity were dropped when estimating the distribution.

As discussed above, the median level of labor productivity is lower in Lao PDR than in either Cambodia or Vietnam. The median firm in Cambodia is slightly more productive than the median firm in Lao PDR, and the median firm in Vietnam is about twice as productive as the median firm in Lao PDR. The best performing firms in Lao PDR, however, lag further behind the best performing firms in the other two countries than the median firms do. The firm at the 90th percentile in Lao PDR produces about \$20,967 of output per worker compared with \$61,646 in Vietnam and \$93,378 in Cambodia.

Firms in Lao PDR are consistently less productive and less capital intensive than firms in Vietnam at similar percentiles. In addition, firms in Lao PDR are often less productive than firms at lower percentiles in Vietnam. For example, over three-quarters of Vietnamese firms are more productive than the median firm in Lao PDR and more than 25 percent of Vietnamese firms are more productive than the firm at the 90th percentile in Lao PDR.

In contrast, although the difference between firms in Lao PDR and Cambodia is relatively modest at the 50th percentile, less productive firms in Lao PDR tend to be more productive than similar firms in Cambodia and the best performing firms tend to be less productive than similar firms in Cambodia. For example, at the 25th percentile, firms in Lao PDR are more productive than firms in Cambodia (\$2,035 compared with \$1,529). In contrast, at the 75th percentile, firms in Lao PDR produce about \$8,259 per worker, while firms in Cambodia produce about \$22,135 per worker.

Table 2: The distribution of productivity in Cambodia, Lao PDR and Vietnam.

	Obs.	Percentiles							Mean
		5th	10th	25th	50th	75th	90th	95th	
Labor Productivity									
Cambodia	129	\$221	\$583	\$1,529	\$5,100	\$22,135	\$92,378	\$287,632	\$44,047
Lao PDR	109	\$1,229	\$1,526	\$2,035	\$4,625	\$8,259	\$20,967	\$41,914	\$8,422
Vietnam	542	\$1,871	\$2,766	\$5,240	\$10,480	\$24,016	\$61,646	\$106,436	\$24,461
Capital Intensity									
Cambodia	128	\$116	\$256	\$705	\$2,662	\$6,646	\$18,324	\$64,799	\$14,226
Lao PDR	109	\$116	\$289	\$1,012	\$2,312	\$4,955	\$9,635	\$11,562	\$5,551
Vietnam	444	\$624	\$941	\$2,099	\$7,278	\$21,833	\$39,696	\$72,776	\$27,607
Total Factor Productivity									
Cambodia	75	-215%	-208%	-166%	-30%	35%	197%	235%	-35%
Lao PDR	61	-62%	-19%	57%	281%	301%	358%	383%	211%
Vietnam	307	112%	133%	194%	271%	324%	393%	445%	264%

Overall, the distribution of labor productivity is smaller in Lao PDR than in the other two countries. The interquartile range (i.e., the difference between the firm at the 25th percentile and the 75th percentile) in Lao PDR is about \$6,000. By comparison, the interquartile range is about \$19,000 in Vietnam and about \$21,000 in Cambodia. A similar pattern can be seen in terms of capital intensity. The interquartile range is about \$4,000 in Lao PDR compare with close to \$6,000 in Cambodia and \$19,000 in Vietnam. This could indicate that markets are relatively more competitive in Lao PDR than in the other two countries.

Distribution of Total Factor Productivity

The distribution of total factor productivity is also interesting. Median total factor productivity is higher in Lao PDR than in either Vietnam or Cambodia (see Figure 17). The results are similar when comparing Lao PDR with Cambodia at all levels of total factor productivity (See Table 2). Firms at all percentiles are more productive in Lao PDR than similar firms in Cambodia although the difference is narrowing for more productive firms. Indeed, firms at the 95th percentile in Cambodia are less productive than the median firm in Lao PDR.

The comparison with Vietnam is more interesting, showing that generally total factor productivity is higher in Vietnam than in Lao PDR. First, the least productive firms in Lao PDR are far less productive than the least productive firms in Vietnam in terms of total factor productivity. For example, firms in Vietnam at the 5th percentile of productivity are more productive than firms in Lao PDR at the 25th percentile. The same is also true for the most productive firms in the two countries. Due to differences in distribution, the level of productivity for the median firm is marginally higher in Lao PDR compared in Vietnam, but overall the mean of total factor productivity is higher in Vietnam than in Lao PDR.



The previous section presents comparisons between Lao PDR and other countries in terms of the partial productivity measures and labor costs. In this section, we compare the same measures for different types of firms within Lao PDR. That is, we look at the extent to which low productivity and capital intensity can be explained by characteristics of firms within the country. Although we mostly focus on capital intensity and labor productivity in this section, full results for all partial productivity measures are included in Appendix 3. In some cases, we make similar comparisons for Vietnam and Cambodia to highlight differences and similarities with Lao PDR.

It is important to note that the samples are often relatively small for these sub-groups of firms (see Table 3 in Appendix 3). The estimates are, therefore, often relatively imprecise. As a result, the differences are not consistently statistically significant (i.e., some differences might be due to sampling variation). We note in the text or in footnotes when the differences are not statistically significant.¹⁵

Differences by Size

In most countries, large firms are more productive than small firms. This does not appear to be the case in Lao PDR (see Figure 23). The median large firm produces about \$4,336 of output per worker. Although this is higher than the median medium-sized firm (\$2,628 per worker), it is lower than the median small firm (\$5,550 per worker). Although this pattern is peculiar, it is important to note the differences are not statistically significant at conventional significance levels. That is, the differences could be due to sampling variation rather than to actual difference in productivity.

In part, this might be because large firms are no more capital intensive than small firms—in most countries, large firms also have more capital per worker than large firms. This is also not the case in Lao PDR. The median large firm reports that it has about \$1,799 of capital per work compared with \$2,312 of capital per worker for the median small firm. Once again, medium-sized firms are less capital intensive (\$1,387) than either large or small firms.

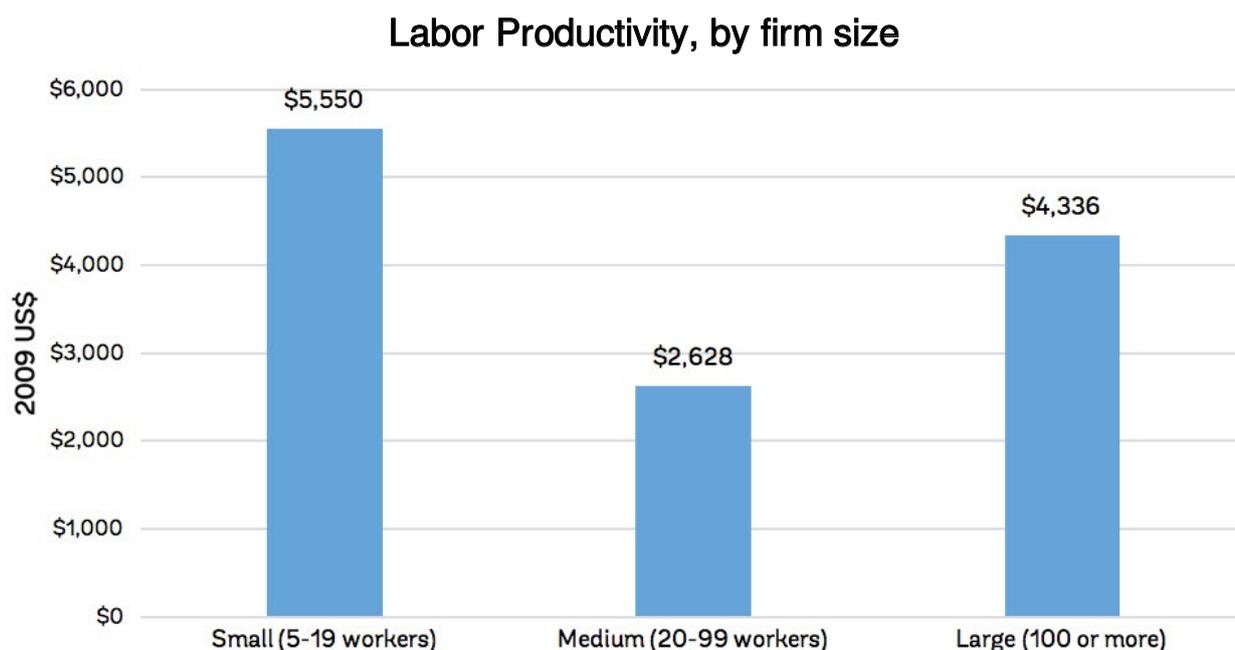
A similar pattern also holds for total factor productivity, suggesting that this is not the only factor driving the difference.¹⁶ That is, the median large and small firms are more productive than the median medium-sized firm in terms of total factor productivity (296% for small firms, 57% for medium-sized firms and 310% for large firms).¹⁷

¹⁵ We make these comparisons using signed rank tests using the Somer's D package in Stata (Newson, 2006)

¹⁶ These differences should, however, be treated with some caution since the TFP estimation does not impose constant return to scales. As a result, the TFP measures should be interpreted as TFP of firms in Lao PDR relative to firms of the same size in other countries.

¹⁷ The difference between medium-sized firms and other firms is statistically significant, but the difference between large firms and small firms is not statistically significant.

Figure 23: Large firms are no more productive than small firms in Lao PDR.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance. Firm size is based on number of workers.

Exporters and Non-Exporters

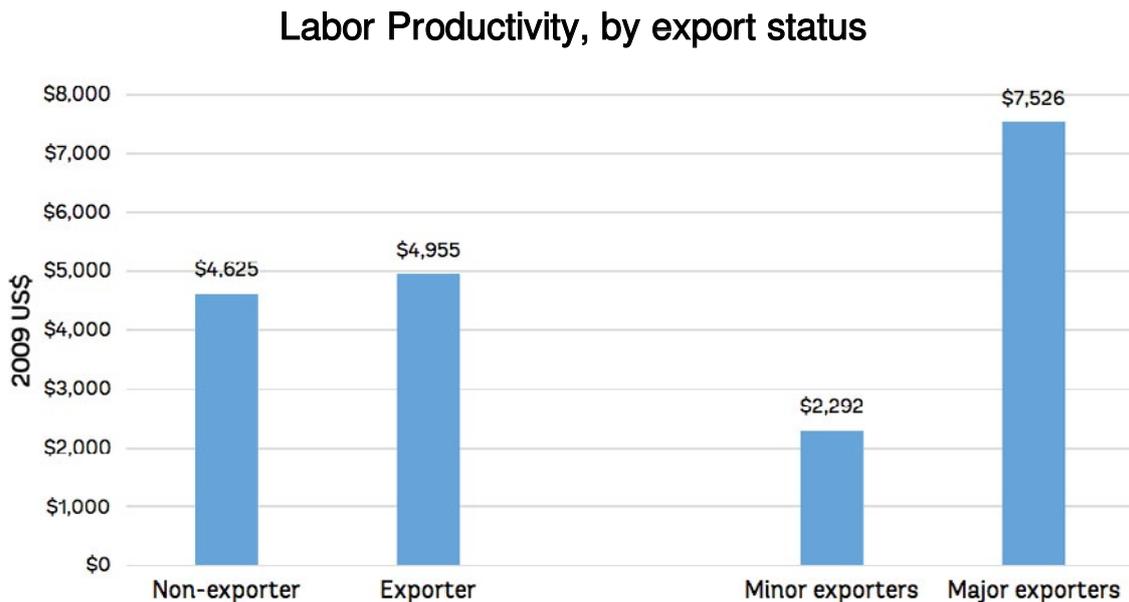
In most countries, exporters are more productive than similar non-exporters.¹⁸ This could be explained in two ways—although the reasons are not mutually exclusive. First, exporters might be more efficient than other enterprises because only the most productive enterprises are able to enter export markets (i.e., the self-selectivity hypothesis). Second, the discipline of exporting directly might improve efficiency (i.e., the learning-by-exporting hypothesis). Access to foreign markets might force firms to become more efficient, or they might benefit from technical advice from foreign buyers.¹⁹

Exporters are only slightly more productive than non-exporters in Lao PDR (see Figure 24). The median exporter reports about \$4,955 of value-added per worker compared with \$4,625 for the median non-exporter. Not surprisingly, given that there were only about 38 exporters in the sample, the small difference is not statistically significant at conventional significance levels.

¹⁸ For example, Chen and Tang (1987), using data from the electronics industry in Taiwan, China, find that export-oriented firms were between 6 and 11 percent closer to the production frontier than import-substituting firms. Using similar data from 1986, Aw and Hwang (1995) find that exporters are between 3 and 20 percent more efficient than non-exporters. Using US data from the mid-1980s through the early-1990s, Bernard and Jensen (1999) find that manufacturing enterprises that export are between 12 and 19 percent more productive than enterprises that do not. Clarke (2015a, 2015b) shows that this is also true, on average, for countries where Enterprise Surveys have been conducted.

¹⁹ Under the self-selectivity hypothesis, efficient enterprises are more likely to export either because their margins are higher or because the fixed costs associated with entering export markets make it difficult for inefficient enterprises to do so. In contrast, under the learning-by-exporting hypothesis, the discipline of competing in international markets forces the enterprise to improve technical efficiency after entering export markets. One possible way that this might occur is that enterprises might be able to improve efficiency by observing how their competitors in international markets operate (Lall, 1997) or by buyers passing on technical expertise and advice to the enterprise on how to meet international standards (Egan and Mody, 1992)

Figure 24: Exporters in Lao PDR are only slightly more productive than non-exporters.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

Most of the exporters export a significant portion of their output. The median exporter exports about 70 percent of its output and the average exporter exports about 80 percent of its output. Some firms, however, export relatively small amounts. If we divide the exporters into two groups—those that export more than half of their output ('major exporters') and those that export less than half of their output ('minor exporters'), the major exporters are more productive than either the non-exporters or the minor exporters. Low productivity among exporters might therefore reflect the relatively modest performance of minor exporters rather than the performance of the major exporters.²⁰

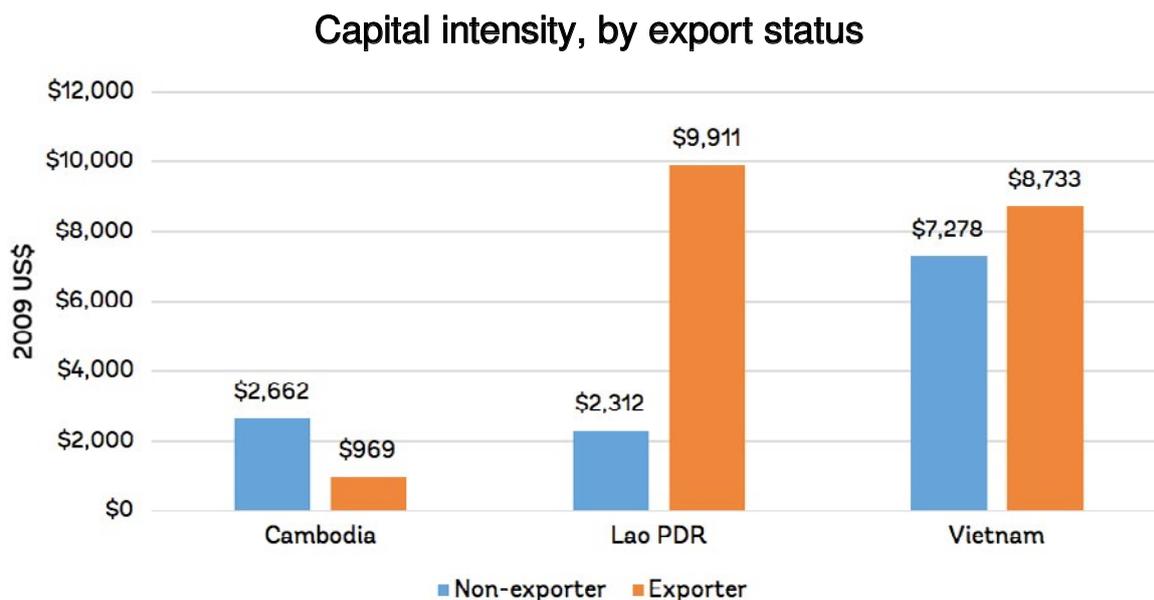
Although exporters are no more productive than non-exporters, they do appear to be more capital intensive (see Figure 25). The median exporter reports having about \$9,911 of capita per worker—more than four times as much as the median non-exporter (\$2,312). The difference, in this case, is statistically significant. The difference is much larger than in Vietnam, where exporters report slightly more capital per worker, and Cambodia where exporters report less capital per worker.

Foreign-Owned Firms

Foreign-owned firms are generally thought to be more productive than domestic firms in most developing countries. One possible reason for this is that foreign-owned firms have to be relatively productive to operate in developing countries. That is, salaries for ex-patriate managers and other similar things would make it hard for foreign-owned firms to compete unless they were relatively productive. Another possible reason for this is that foreign-owned firms might have better access to technology than other firms. Finally, they might have better access to finance through parent companies than domestic firms (Clarke and others, 2006).

²⁰ The differences between major and minor exporters are not statistically significant. However, this might be because the samples are relatively small—there are only 11 minor exporters in the sample.

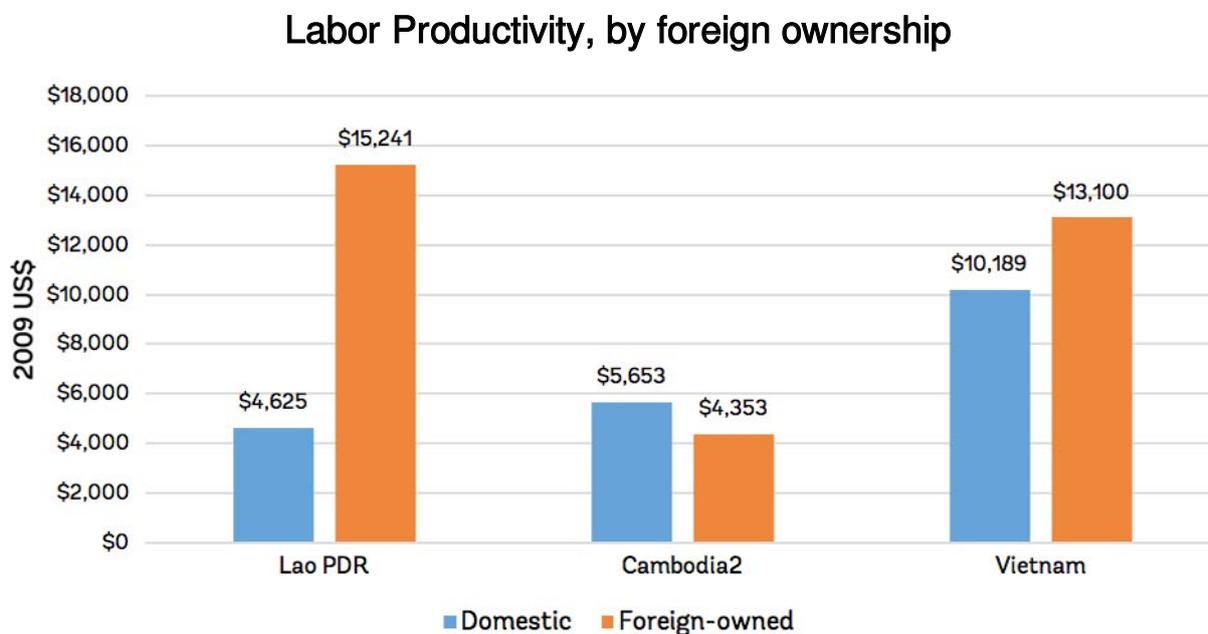
Figure 25: Exporters are more capital intensive than non-exporters in Lao PDR



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

Figure 26: Foreign-owned firms in Lao PDR are far more productive than domestic firms



Source: Authors' calculation based on data from World Bank Enterprise Surveys

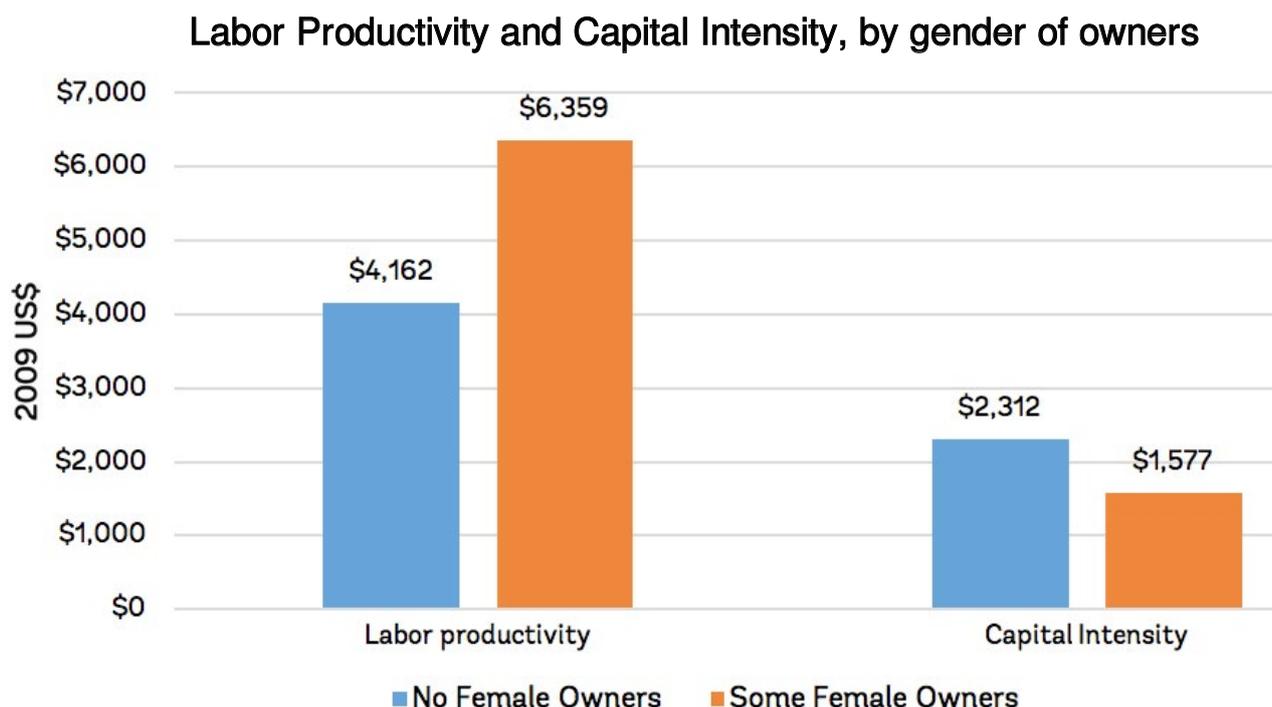
Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

As in other countries, foreign-owned firms in Lao PDR tend to be larger than domestic firms (20 employees compared with 8 employees for the respective median firms), more productive (\$15,241 compared with \$4,625), and more capital intensive (\$4,336 compared with \$2,312). Although the productivity difference is large in absolute terms, it is not statistically significant at conventional significance levels (see Figure 26). This might be because the sample of foreign-owned firms is small—only 23 foreign-owned firms provided enough information to calculate labor productivity. The difference is large, however, compared with Vietnam and Cambodia. The median foreign-owned firm in Vietnam is only slightly more productive than the median domestic firm, while the median foreign-owned firm in Cambodia is slightly less productive than the median domestic firm.

Women-Owned Firms

As shown in Figure 27, women-owned firms are more productive than those that don't have female owners. Labor productivity of firms with no female owners is \$4,162 compared to \$6,359 for firms that have some female owners. However, women-owned firms are less capital-intensive compared to firms that don't have female owners (\$1,577 compared to \$2,312 respectively).

Figure 27: Firms with female owners are more productive, but less capital intensive, than firms without any female owners



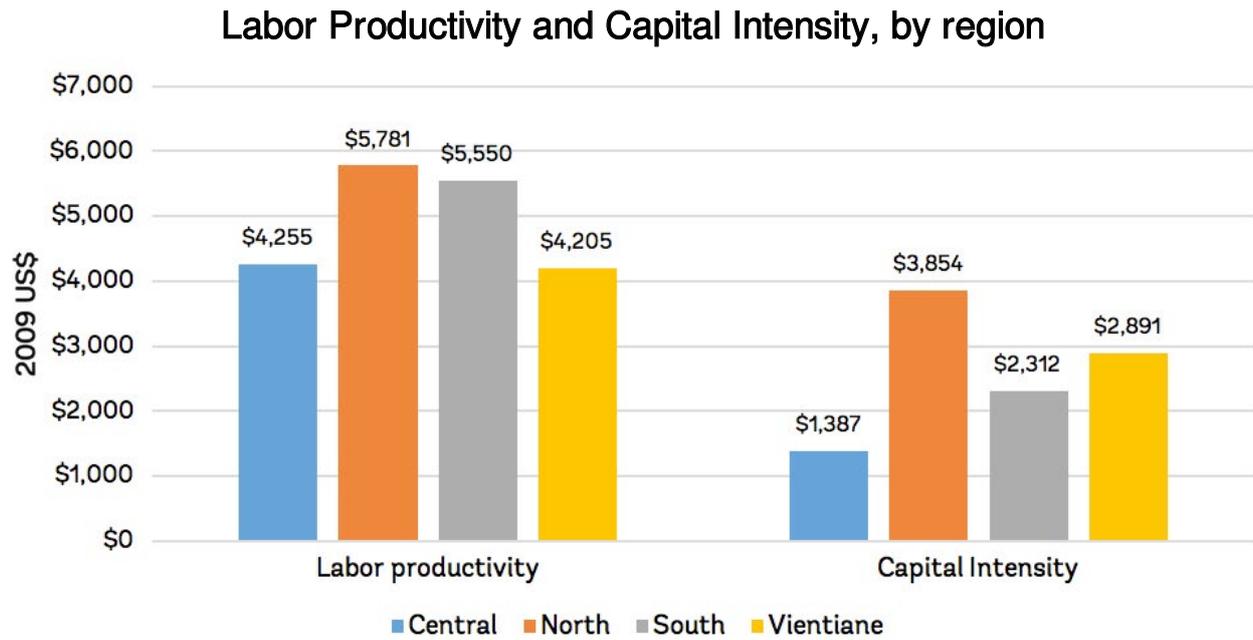
Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

Differences by Region

Productivity often differs across regions within countries. In practice, differences across regions appear to be relatively modest in Lao PDR. Median labor productivity varies between \$4,205 per worker in Vientiane and \$5,781 in the North, while capital intensity varies between \$1,387 in the Central region and \$3,854 in the North. Moreover, the differences are not statistically significant at even a 10 percent level.

Figure 28: Differences in labor productivity are relatively modest across regions



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.



Productivity will often change over time, due to national development or changes in technology, skills, or the business environment. Since many development indicators, including per capita GNI, have steadily improved in Lao PDR from 2009 to 2016, one might expect to see impacts of this development on firm productivity.

In this section, we look at whether productivity has changed over time in Lao PDR. Since we will not be making any cross-country comparisons in this section, we will keep all monetary amounts in local currency (000s Kip). This prevents us from attributing changes due to shifts in exchange rates to changes in productivity. As in the previous section, we will focus on labor productivity and capital intensity. Data for all productivity measures are shown in Appendix 3.

We will also make comparisons for the whole sample and for panel firms only (i.e., firms that appear in both surveys). The comparisons for the whole sample are useful because they will generally be more statistically robust than the comparisons for the small panels. The panel results are also useful, but might be biased due to survivor bias (i.e., better performing firms are more likely to survive) and suffer from small samples.

Changes in Labor Productivity and Capital—Whole Sample

Although the whole sample is larger than the sample of the panel firms, it remains small. In total, about 147 firms provided enough information to calculate labor productivity in 2009, about 68 did the same in 2012 and 109 in 2016. Slightly fewer firms provided enough information to calculate capital intensity. As a result, the estimates are imprecise and it is difficult to find statistically significant differences.

Labor productivity appears to have increased since 2012. The median firm in 2016 reported that it produced about ₭31,264,000 of value-added in 2016 compared with about ₭19,116,000 in 2012. The difference is statistically significant at conventional significance levels. Although the difference is large in absolute terms, it is important to note that the estimates are relatively imprecise.

In contrast, there is little evidence that labor productivity increased between 2009 and 2012. Although the median firm reported higher labor productivity in 2009 than in 2012, the difference is modest. Moreover, the difference is not statistically significant between these two years.

There is also little evidence that firms became more capital intensive over this period. The median firm reported slightly higher capital intensity in 2012 than in either 2009 or 2016. The difference between 2009 and 2012 is not statistically significant, whereas the difference between 2012 and 2016 is significant.

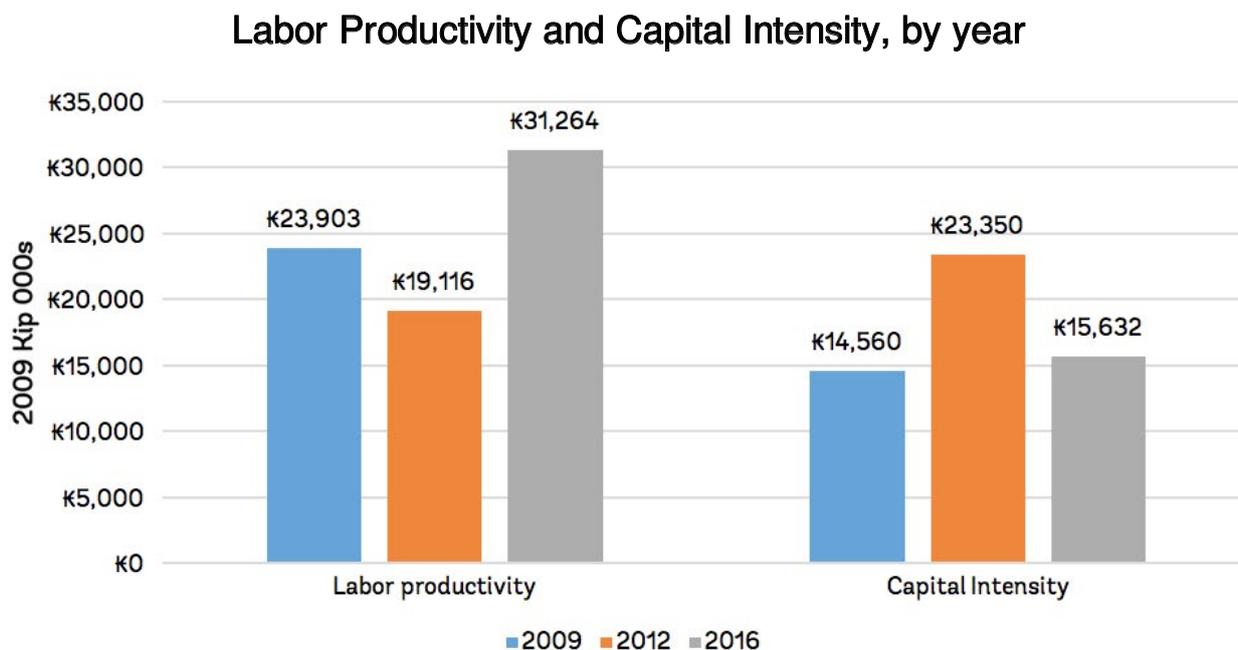
Changes in Labor Productivity and Capital Intensity—Panel Evidence

In this section, we make similar cross-time comparisons using only panel firms that were surveyed. Because the number of panel firms is small, we compare years for firms with data for 2009 and 2012 and firms with data for 2012 and 2016 separately. For example, the comparisons for 2012 and 2016 include all panel firms with data for 2012 and 2016, but not necessarily 2009. Similarly, the comparisons for 2009 and 2012 include

panel firms with data for 2009 and 2012, but not necessarily for 2016. As a result, the medians for 2012 will be different for the two comparisons. In Appendix 3, we present similar results for panel firms that provided enough data in all three years.

Because there are few panel firms, we present unweighted medians in this section. That is, the weights would not weight the panel firms up to the population medians in any case. Moreover, the weights for the different years will be different for the same firms (because the population changes over time), meaning that it is not clear what weights would be appropriate even in the absence of missing data.

Figure 29: Labor productivity was higher in 2016 than it was in 2012.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

Comparing 2012 to 2016 Data

As in the data for the full sample, panel firms reported higher labor productivity in 2016 than in 2012 (see Figure 28). The median panel firm with data for both years reported that labor productivity was about ₺29,037,000 in 2016 compared with ₺18,096,000 in 2012. Despite the large difference between the two years, the difference is not statistically significant—probably reflecting the small number of firms.

In contrast to the data for the whole sample, the median panel firm reported that capital intensity was slightly higher in 2016 than in 2012. Once again, the difference is not statistically significant.

We also use the data from panel firms to calculate sales and productivity growth and analyze how different obstacles reported in the 2012 survey impacted productivity growth of these firms over the subsequent period (Appendix 5 presents the analysis in greater detail). Five issues were raised by more than 10 firms as biggest constraint during the 2012 survey and we consequently focus on these in the analysis: access to finance; tax rates; practices of competitors in the informal sector; inadequately educated workforce; and transport.

Firms that rated transportation as the biggest obstacle had the slowest average productivity growth—about -12 percent per year (see Figure 30). Firms that said that inadequately educated workers as their main constraint also reported slow growth—about -9.0 percent per year on average. Firms that reported competition

from informal firms as the main constraint also reported negative productivity growth between 2012 and 2016. Firms that said access to finance, tax rates, and other areas of the investment climate reported faster growth—between 7 and 9 percent growth.

Econometric analysis further confirms that productivity of those firms that reported inadequately educated workers or transportation as the biggest constraint grew about 20 to 22 percent more slowly per year than firms that reported an obstacle other than the five specific obstacles as the biggest obstacle they faced. Productivity of firms reporting any of the other three obstacles as biggest constraint in 2012 also grew more slowly than firms in the omitted category—but these findings were not statistically significant. We further show that the impact of these constraints on sales growth is less clear.

Figure 30: Firms that said transportation and inadequately educated workers were the biggest constraints grew more slowly than other firms

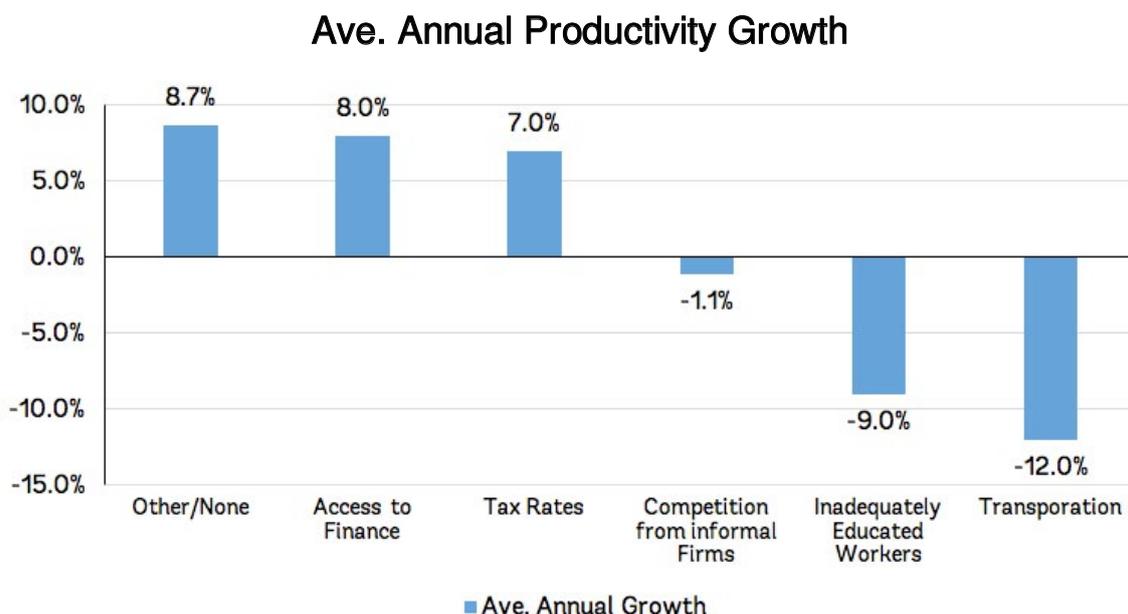
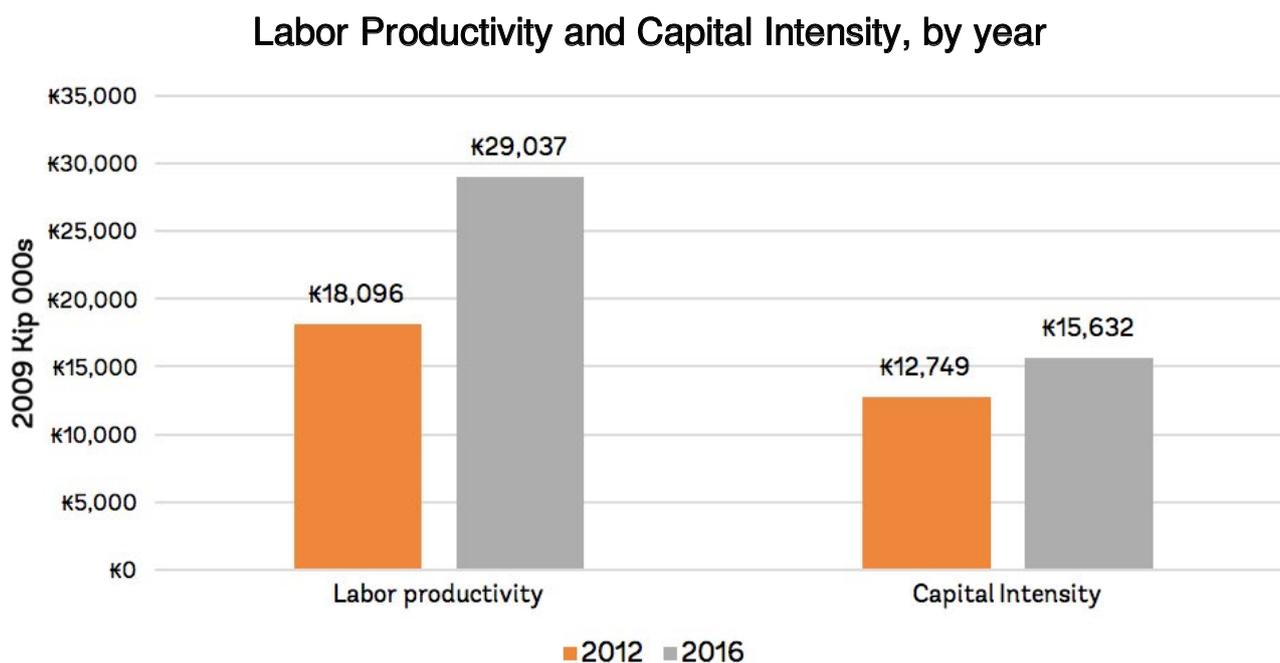


Figure 31: Labor productivity was higher for panel firms in 2016 than it was in 2012²¹



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

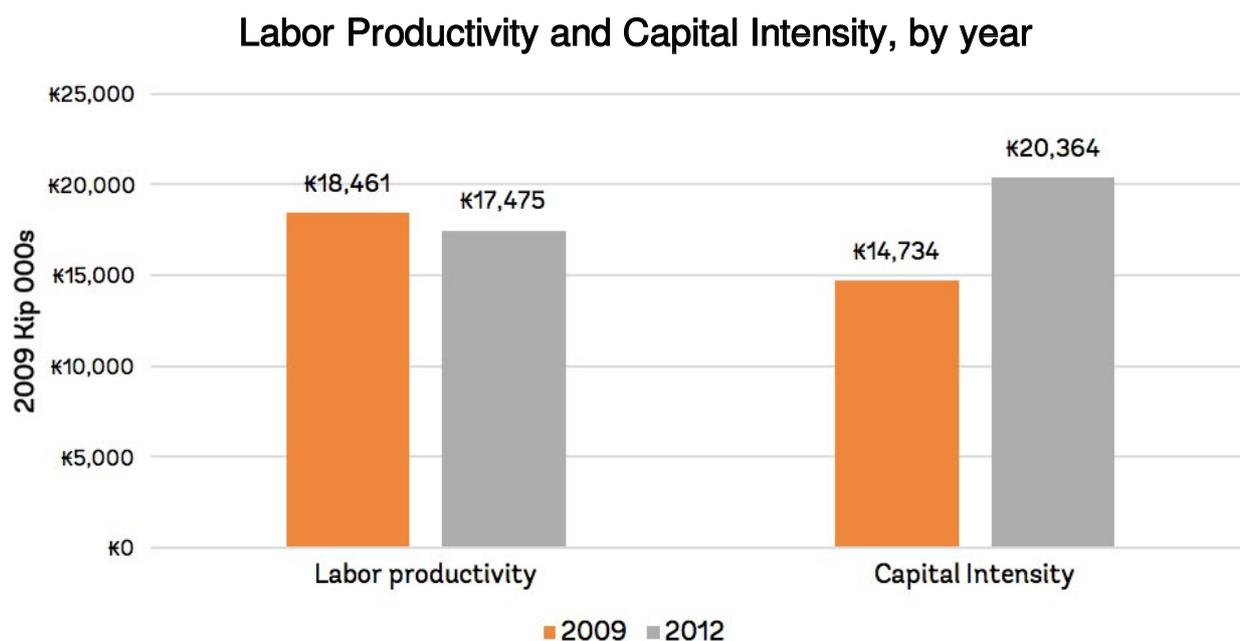
Comparing 2009 to 2012 Data

As in the data for the full sample, panel firms reported higher labor productivity in 2009 than in 2012 (see Figure 32). Moreover, as in the data for the whole sample, the difference is small--K18,461,000 in 2009 compared with K17,475,000 in 2012. As in the data for the whole sample, the difference is not statistically significant. As in the whole sample, the median panel firm reported that capital intensity was slightly higher in 2012 than in 2009. But, once again the difference is not statistically significant.

Statistical Signification of Results

In summary, labor productivity does appear to have increased slightly since the previous survey in 2012, when examining both the total sample of firms as well as panel firms, or those that were also surveyed about constraints in both years. However, the difference is not statistically significant, reflecting the small number of firms for which usable data was captured. When examining the total group of firms, capital intensity appears not to have increased, however there is a slight increase reflected when examining only panel firms.

Figure 32: Labor productivity was higher for panel firms in 2009 than it was in 2012.



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. All data points are for the median firm on each measure of performance.

²¹ Note that median for panel firms in 2012 will differ in the comparison to 2016 and 2012 so that it captures only firms surveyed in both years displayed.



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Appendix 1: Measures of Firm Performance

The study focuses on several measures of firm productivity. These are calculated in a uniform way in all countries with available Enterprise Survey data from 2006 to 2015. The accounting data is generally lagged one year from the year of the survey. So, for example, the accounting data for a 2016 survey, like Laos, will be for fiscal year 2015. As noted in the text, we use raw data from Cusulito and others (2016). If additional calculations are needed, we follow the methodology from Cusulito and others (2016).

The Enterprise Surveys collect financial data in the local currency in the country being surveyed. To compare firm performance across countries, when needed, Cusulito and others (2016) convert the financial data into a common currency in a single year to control for inflation and exchange rate differences. They do this by converting all values into 2009 US dollars (USD). For surveys conducted between 2006 and 2009 (that is, surveys with accounting data from between 2005 and 2008), data are converted into U.S. dollars at that year's exchange rate and are then inflated to 2009 values in local currency using the GDP deflator. For surveys conducted after 2010, the values are deflated in a similar way.

If the exchange rate in a given country is over- or under-valued in a given year, the comparisons will under- or overstate firm performance for that country in that year. Note that this proviso only applies to performance measures that are measured in U.S. dollars (e.g., labor productivity and capital intensity). Total factor productivity might also be partly affected by exchange rates. For measures that are ratios such as capital productivity or unit labor costs, the exchange rates will cancel out during the calculations. As a result, these ratios should be unaffected by exchange rate fluctuations.

The individual measures are constructed in the following way:

Value-added. Value-added is the value of the goods and services that the firm produces less the cost of the raw materials (such as iron or wood) and intermediate inputs (such as engine parts or textiles) used to produce the output. Output is measured in local currency, not in physical units. We subtract the cost of raw materials from output to get value-added.

Value-added would ideally be measured in terms of a physical measure of output (i.e., number of shirts, meters of fabric etc.). In practice, however, it is difficult to obtain physical measures of output that can be consistently compared across firms. Because of this, most analyses, including those using data from the Enterprise Surveys, calculate value-added using sales (i.e., output multiplied by unit price) rather than output.²² This can be a problem when firms produce heterogeneous products and, therefore, have market power. That is, when sales are used in place of physical output, a firm with market power that charges high prices (e.g., a monopolist) will appear more productive than a similar firm in a competitive market that has to charge lower prices.²³ This will be a problem for all of the productivity measures that we present—including labor and total factor productivity.

Number of workers. The number of workers is the number of permanent full-time workers.

²² See, for example, Pakes (2008).

²³ See, for example, the discussion by Levinsohn (2008) on the Escribano-Guasch methodology (Escribano and Guasch 2005; Escribano and others 2008; Escribano and others 2005).

Labor Productivity. Value-added per worker is the basic measure of labor productivity used in this paper. It is value-added divided by the number of full-time workers in the firm (see above). Firms that produce more output with less raw material and fewer workers have higher labor productivity.

Capital. There are two measures of capital in the Enterprise Survey. The first measure is the book value of capital. For firms that keep detailed financial accounts, this measure should be the value of capital taken from those accounts. For other firms, it will either be omitted or estimated by the manager. This variable is defined as follows in the ICA manual:

The net book value represents the actual cost of assets at the time they were acquired, including all costs incurred in making the assets usable (such as transportation and installation) minus depreciation accumulated since the date of purchase. (World Bank, 2007b)

The second measure is the sales value of capital. The manager is asked to estimate the value of the capital if sold in its current condition. Although this measure is probably closer to the true value of the capital, it has some shortcomings. In particular, when markets for capital equipment are thin, it might be difficult for the manager to give an accurate estimate. The implementation manual notes:

Ask the manager to estimate the market value if all of the equipment, land and buildings were sold on the open market. If the respondent states that there is no market, ask how much the respondent would be willing to pay for the capital, knowing what it can produce in its current condition. Estimate how much it would cost to buy machinery in the current market which is similar in terms of age and characteristics. (World Bank, 2007b)

In the empirical analysis, we focus on the sales value of capital. We do this because it is closer to the economic concept of capital.

Capital. Capital intensity is capital per worker. It can be interpreted as a measure of how much firms rely on capital in their production process. We calculate this by dividing capital by the number of workers. Firms that do not report these measures have to be dropped when calculating total factor productivity. We do this for both measures of capital but, as noted above, we focus on the sales value of capital in the analysis.

Capital productivity. This is the ratio of value-added to capital. When a firm produces a lot of output with little capital, capital productivity will be high. It is calculated by dividing value added by capital. It can be constructed either using the book value or sales value of capital. Firms that do not provide information on capital or enough information to calculate value-added are dropped.

Total factor productivity/Technical efficiency. This measure of productivity takes both labor and capital use into account. It is calculated as a residual from a regression of sales on intermediate inputs, salaries, and capital. The methodology is described in detail in Cusulito and others (2016).

As with labor productivity, the measure of output would ideally be a physical measure. In practice, because it is difficult to obtain physical measures of output, most TFP analyses, including those using Enterprise Survey data, use sales (i.e., output multiplied by unit price) as the dependent variable. Because production is affected by price as well as quantity, these functions are sometimes referred to as sales generating functions rather

than production functions.²⁴ As noted above, with firms producing heterogeneous products, this can be a problem if some have market power. Since the TFP analysis also uses expenditures on labor and capital rather than physical levels of these variables, these variables will also conflate quantities and prices.

Labor costs per worker. The cost of labor is the cost of wages, salaries, bonuses, other benefits, and social payments for workers at the firm divided by the number of workers. The data is taken from the firms' accounts. It includes wages and salaries paid to all workers and managers – not just production workers. We divide this by the number of workers to get labor costs per worker. Firms are only dropped from these averages when they do not report labor costs or workers.

Unit labor costs. This measure is labor costs divided by value-added. Although it is an approximation to true unit labor costs (i.e., it measures output in dollars rather than as physical measure of production), it can be calculated using information from the Enterprise Surveys. Unit labor costs are higher when higher labor costs are not fully reflected in higher productivity.

Employment and sales growth. Firms are asked about employment in the most recent fiscal year and two years earlier (e.g., for 2014 surveys, firms report 2011 and 2013 employment). Because the question for lagged employment only asks about full-time permanent employees, we use this as the measure of employment. That is, we do not include temporary or part-time workers for either the initial or final year.

The formula that we use is:

$$\text{Employment Growth} = \frac{1}{2} \times \frac{(\text{Employment}_t - \text{Employment}_{t-2})}{\frac{1}{2}(\text{Employment}_t + \text{Employment}_{t-2})} \quad (1)$$

Rather than using the initial value of employment as the denominator when calculating the growth rate, we use the approach used in Davis and Haltiwanger (1992). This measure is preferable to a measure that divides by initial employment because it does not become very large when initial sales or employment are small. We divide it by the growth rate by two to get an annual growth rate.

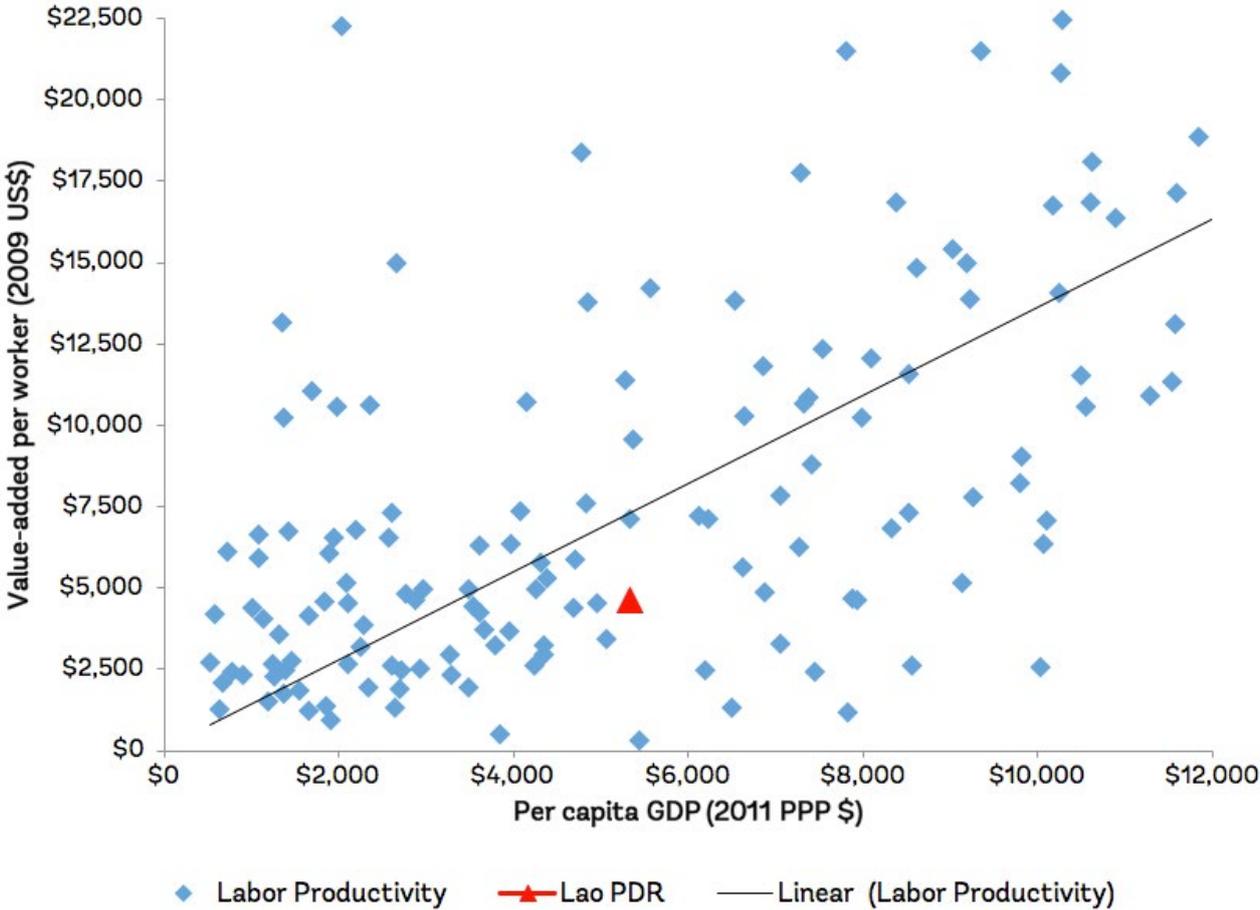
It is important to note that initial employment is reported retrospectively. So, for example, for a 2014 survey, the manager reports employment in both 2011 and 2013 during the same 2014 interview. That is, this calculation is based on recall data reported in 2014 not on data from separate surveys in 2012 and 2014.

We use an analogous measure for sales growth. Sales in both years are deflated into 2010 local currency units to get real, rather than nominal sales growth. See the description above for information on deflators.

²⁴ See, for example, the discussion in Pakes (2008).

Labor Productivity

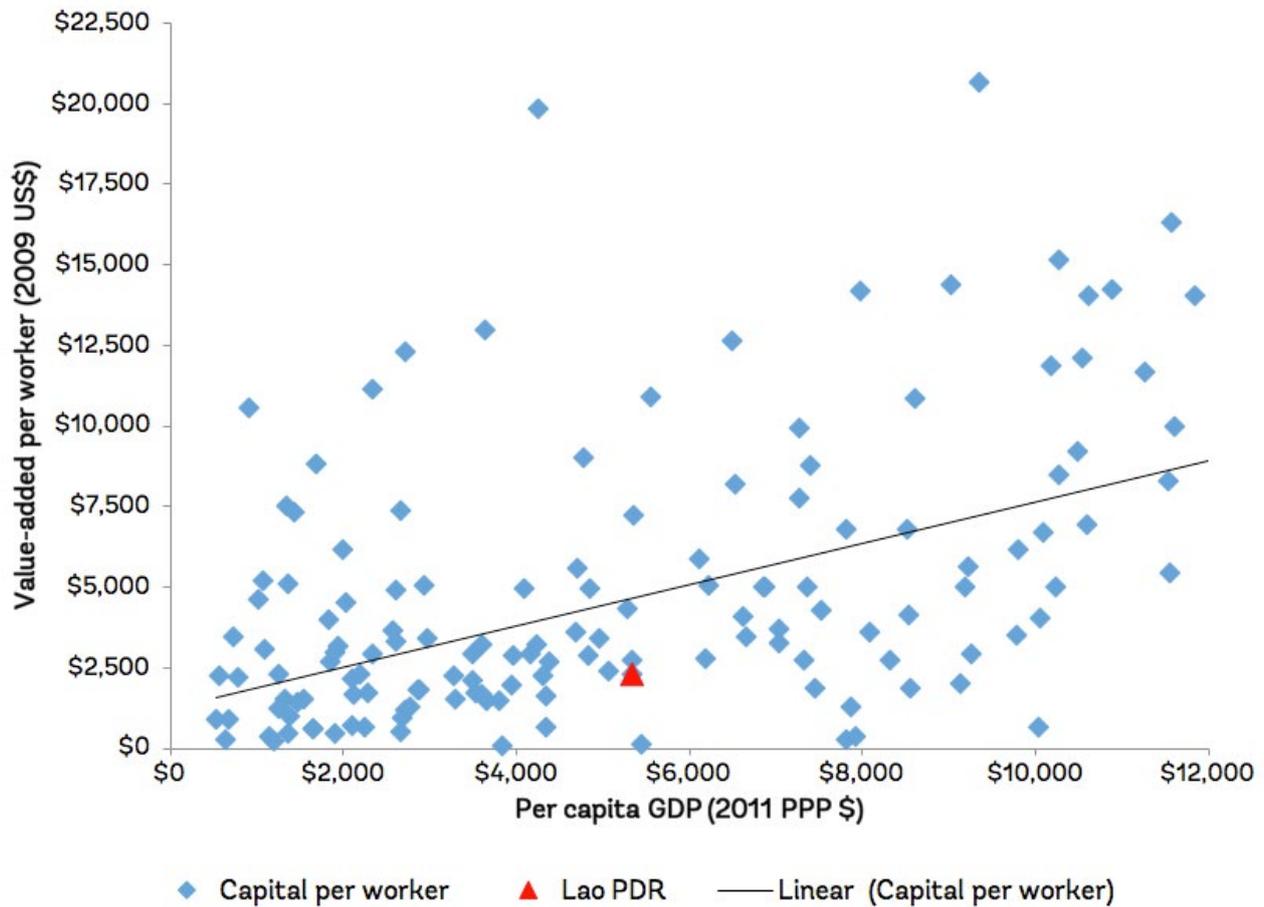
Figure 33: Labor productivity is lower in Laos than in other countries at similar levels of development.



Source: Authors' calculation based on data from World Bank Enterprise Surveys
 Note: All data points are for the median firm on each measure of performance. For presentational purposes the chart is shown only for countries with per capita GDP between \$0 and \$12,000. Countries with GDP per capita over this amount are, however, included when we calculate the linear projections. Results are similar for higher level polynomial projections.

Capital Intensity

Figure 34: Firms are less capital intensive than in countries at similar levels of development

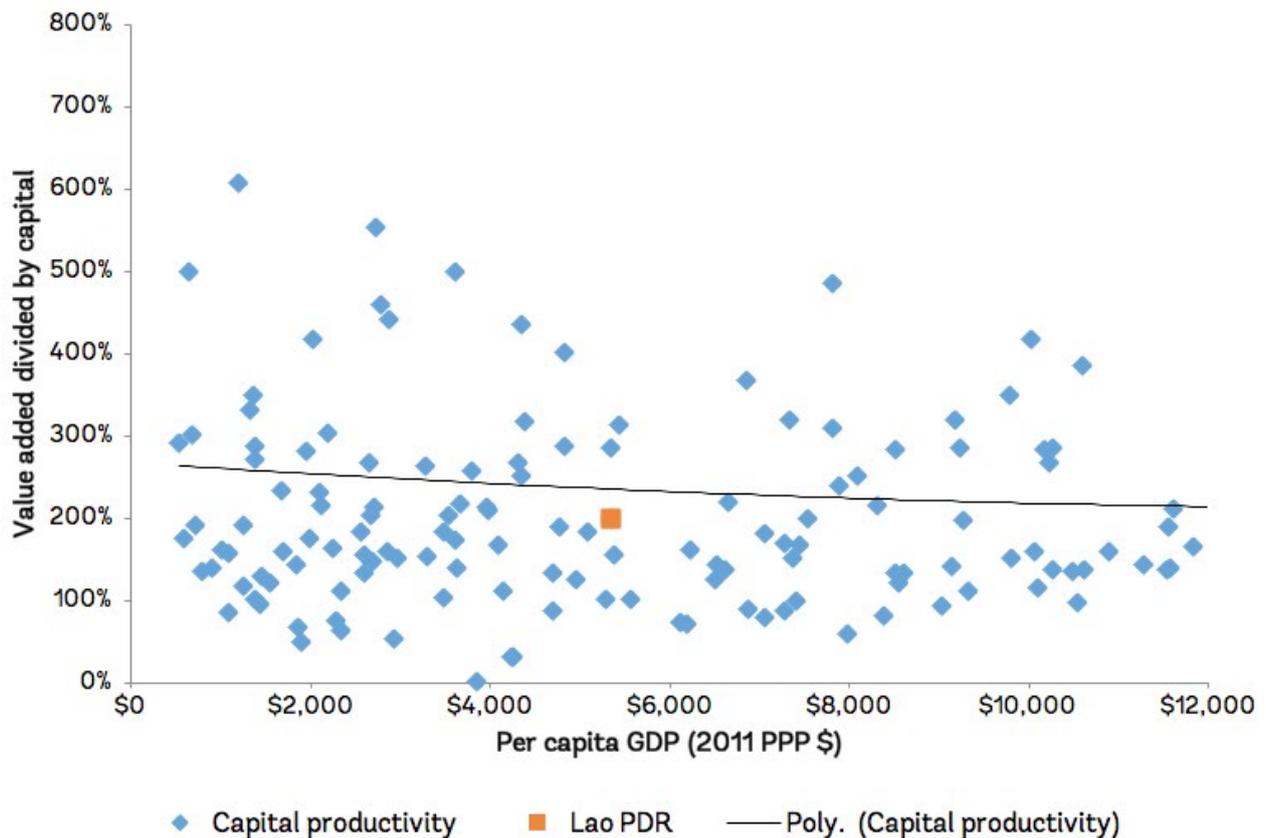


Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: All data points are for the median firm on each measure of performance. For presentational purposes the chart is shown only for countries with per capita GDP between \$0 and \$12,000. Countries with GDP per capita over this amount are, however, included when we calculate the linear projections. Results are similar for higher level polynomial projections.

Capital Productivity

Figure 35: Capital productivity is similar to other countries at similar levels of development.

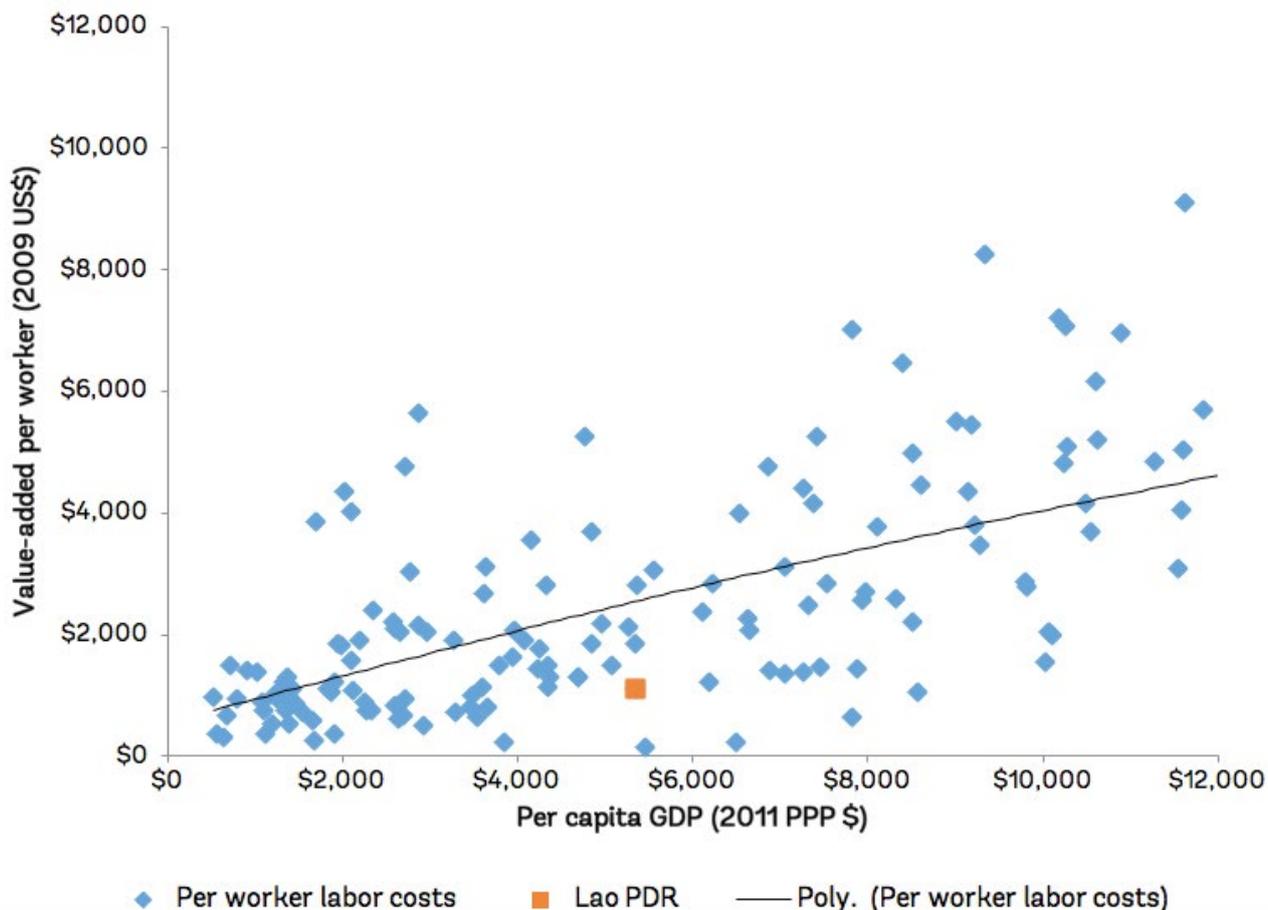


Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: All data points are for the median firm on each measure of performance. For presentational purposes the chart is shown only for countries with per capita GDP between \$0 and \$12,000. Countries with GDP per capita over this amount are, however, included when we calculate the linear projections. Results are similar for higher level polynomial projections.

Labor costs per worker

Figure 36: Per worker labor costs are lower in Lao PDR than in other countries at similar levels of development

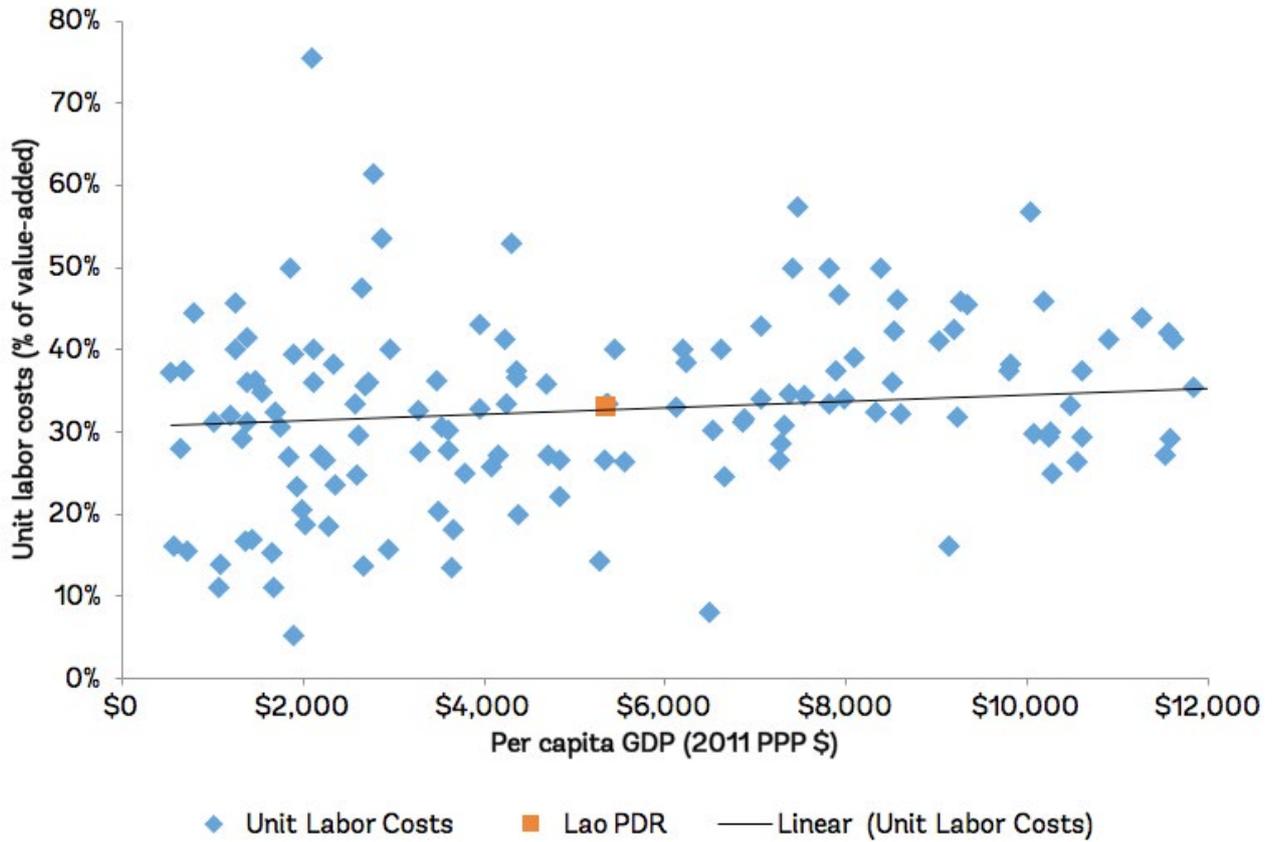


Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Partial productivity measures are measured in 2009 US\$. See appendix for details. GDP is measured in 2005 constant international dollars (PPP adjusted). All data points are for the median firm on each measure of performance. For presentational purposes the chart is shown only for countries with per capita GDP between \$0 and \$12,000. Countries with GDP per capita over this amount are included when we calculate the polynomial projection. A 4th degree polynomial is used because a linear projection suggests that labor costs should be negative or zero for countries with income levels below about \$2,500.

Unit Labor Costs

Figure 37: Unit labor costs are similar to unit labor costs in countries at similar levels of development



Source: Authors' calculation based on data from World Bank Enterprise Surveys

Note: Unit labor costs are the ratio of labor costs to value-added. See appendix for details. All data points are for the median firm on each measure of performance. For presentational purposes the chart is shown only for countries with per capita GDP between \$0 and \$12,000. Countries with GDP per capita over this amount are included when we calculate the linear projection. Allowing for a higher order polynomial projection gives similar results.

Appendix 3: Performance Indicators, by Firm Type and Year

Table 3: Firm performance in Laos, by firm type.

	Obs.	No. of workers	Labor Productivity	Unit labor cost	Per worker labor costs	Capital intensity	Capital productivity
All	109	8	\$4,625	33%	\$1,110	\$2,312	200%
Size							
Small(<20)	32	6	\$5,550	30%	\$1,110	\$2,312	220%
Medium(20-99)	50	25	\$2,628	40%	\$1,445	\$1,387	133%
Large(100 and over)	27	212	\$4,336	30%	\$1,349	\$1,799	296%
Region							
Central	22	6	\$4,255	30%	\$1,110	\$1,387	200%
North	21	10	\$5,781	40%	\$1,387	\$3,854	165%
South	16	7	\$5,550	21%	\$1,156	\$2,312	240%
Vientiane	50	9	\$4,205	39%	\$1,067	\$2,891	152%
Sector							
Clothing	18	5	\$5,781	34%	\$1,942	\$2,312	250%
Wood products	23	12	\$6,607	33%	\$1,665	\$4,955	162%
Food	20	8	\$5,550	21%	\$971	\$2,312	275%
Chemicals	10	9	\$3,777	45%	\$1,445	\$4,336	98%
Exports							
Non-exporter	71	8	\$4,625	30%	\$1,110	\$2,312	220%
Exporter	38	27	\$4,955	33%	\$2,081	\$9,911	90%
Foreign ownership							
Domestic	86	8	\$4,625	33%	\$1,110	\$2,312	200%
Foreign-owned	23	20	\$15,241	19%	\$1,445	\$4,336	967%
Training program							
No training program	90	8	\$4,625	30%	\$1,110	\$2,312	200%
Training program	18	20	\$4,162	40%	\$1,665	\$2,643	453%
Access to Finance							
Not credit constrained	70	8	\$5,319	30%	\$1,110	\$2,312	152%
Credit constrained	37	6	\$2,846	39%	\$1,156	\$1,156	450%

Note: Partial productivity measures are measured in 2009 US\$. Number of observations is the number of observations for labor productivity. See appendix for details. All data points are for the median firm of that type on each measure of performance. Sector and size are based on actual number of workers and reported ISIC codes rather than on information from the screener interview. All means and medians use sample weights. Groups with fewer than 10 observations are excluded (e.g. for sectors).

Table 4: Firm Performance by Gender

	Obs.	No. of workers	Labor Productivity	Unit labor cost	Per worker labor costs	Capital intensity	Capital productivity
No Female Owners	85	8	\$4,162	34%	\$1,110	\$2,312	200%
Some Female Owners	24	10	\$6,359	17%	\$1,387	\$1,577	275%

Note: Partial productivity measures are measured in 2009 US\$. Number of observations is the number of observations for labor productivity. See appendix for details. All data points are for the median firm of that type on each measure of performance. Sector and size are based on actual number of workers and reported ISIC codes rather than on information from the screener interview. All means and medians use sample weights. Groups with fewer than 10 observations are excluded (e.g. for sectors).

Table 5: Firm Performance, by year (000s Laotian Kip)

	Obs.	No. of workers	Labor Productivity	Unit labor cost	Per worker labor costs	Capital intensity	Capital productivity
2009	147	11	K23,903	31%	K5,662	K14,560	171%
2012	68	20	K19,116	37%	K10,182	K23,350	44%
2016	110	8	K31,264	33%	K7,503	K15,632	200%

Note: Partial productivity measures are measured in 000s of 2009 Laotian Kip. Number of observations is the number of observations for labor productivity. See appendix for details. All data points are for the median firm of that type on each measure of performance. All medians use sample weights.

Table 6: Firm Performance for panel firms, by year (000s Laotian Kip)

		2009	2012	2016
Panel Firms -- all years				
Labor Productivity	18	K16,780	K18,096	K29,037
Capital Intensity	13	K8,736	K10,398	K15,632
Panel Firms -- 2009&2012				
Labor Productivity	47	K18,461	K17,475	---
Capital Intensity	33	K14,734	K20,364	---
Panel Firms -- 2012&2016				
Labor Productivity	22	---	K18,096	K29,037
Capital Intensity	15	---	K12,749	K15,632

Note: Partial productivity measures are measured in 000s of 2009 Laotian Kip. Number of observations is the number of firms with data for either both years or for all three. For example, panel firms—all years are panel firms with productivity data for all three years. Panel firms—2009&2012 are the panel firms with data for 2009 and 2012. Panel firms—2012&2016 are panel firms with data for 2012 and 2016. Firms with missing data and non-panel firms are dropped. All data points are for the median firm of that type on each measure of performance. All medians are unweighted.

Appendix 4: Changes in Perceptions Between the 2012 and 2016 surveys: Evidence from Panel Firms

In this appendix, we look further at the robustness of the results concerning changes in perceptions between the 2012 and 2016 surveys. First, we show that the changes in perceptions between the two surveys are statistically significant. Second, we explore the changes in perceptions between the two surveys further, focusing on the firms that were interviewed in both 2012 and 2016.

There were several differences between the obstacles that firms in the 2012 survey identified and the obstacles that the firms in the 2016 survey identified (see Table 6). In particular, firms in the 2016 survey were far more likely to say that competition from informal firms, tax rates, transportation, electricity and inadequately educated workers were serious problems and were far less likely to say that the courts, crime, and corruption were serious problems. They were also slightly less likely to say that tax administration was a serious problem.

The differences do not appear to be due to changes in industrial structure or to the samples between the two surveys. In addition to holding for the entire weighted samples, the differences also appear to hold for panel firms—firms that were interviewed in both 2012 and 2016.²⁵ The panel firms were far more likely to say that competition from informal firms, tax rates, transportation, electricity and inadequately educated workers were serious problems in 2016 than they were in 2012, and they were less likely to say that tax administration, courts, crime, and corruption was a serious problem.

Table 7: Changes in perception over time in Laos -- panel firms and all firms

	Panel Firms			All Firms			Diff. between panel and all firms	
	2012	2016	Change	2012	2016	Change	2012	2016
Informal Sector	10%	46%	36%	10%	40%	29%	0%	6%
Tax Rates	15%	48%	33%	14%	33%	19%	1%	15%
Transportation	3%	30%	27%	9%	23%	15%	-5%	7%
Electricity	17%	30%	13%	17%	23%	7%	1%	7%
Worker Education	19%	34%	15%	16%	23%	7%	3%	11%
Trade Regulations	12%	9%	-3%	12%	8%	-5%	-1%	2%
Access to Finance	9%	6%	-3%	10%	6%	-4%	-1%	0%
Labor Regulation	2%	7%	5%	1%	4%	3%	1%	4%
Tax Administration	11%	3%	-8%	9%	3%	-6%	2%	1%
Corruption	21%	3%	-19%	18%	2%	-15%	4%	1%
Business Registration	6%	2%	-4%	3%	2%	-1%	2%	0%
Courts	12%	0%	-12%	8%	1%	-7%	3%	-1%
Crime	14%	0%	-14%	15%	0%	-14%	0%	0%

Source: Authors' calculations based on data from the World Bank Enterprise Surveys

Note: The results for panel firms are only for panel firms that answered the questions in both periods. If a firm manager refused to answer a question in one of the two periods, they are excluded from the comparisons.

²⁵ Because the weights will generally not apply for the panel sample, we calculate unweighted averages for the sample.

Although there were some notable similarities between the two sets of results, there were also some notable differences. Most prominently, although panel and non-panel firms tended to have similar perceptions in 2012, the panel firms tended to have less favorable perceptions of the investment climate in 2016. For 10 of 13 obstacles, the panel firms were more likely to rate the areas as obstacles in 2016. Moreover, some of the differences were large. In particular, panel firms were about 15 percentage points more likely to say tax rates were a problem than were non-panel firms, 11 percentage points more likely to say inadequately educated workers were a serious problem, seven percentage points more likely to say transportation and electricity were serious problems, and six percentage points more likely to say that competition with informal firms was a serious problem. Although these five obstacles ranked as the top five obstacles for both panel and non-panel firms, panel firms rated all five as greater obstacles than non-panel firms.

Changes in perceptions between the 2012 and 2016 surveys

A natural question is whether these differences are statistically significant. To see whether this is that case, we assume that firms' underlying perceptions about the investment climate are affected by the year of the survey (D_t) and possibly by firm characteristics.

$$y_{it}^* = \alpha_i + \gamma D_t + \beta X_{it} + \epsilon_{it}$$

We only observe, however, whether the firm said that the problem was a serious problem, which we assume is related to the firm's underlying perceptions, y_{it}^* in the following way:

$$y_{it} = \begin{cases} 1 & y_{it}^* > 0 \\ 0 & y_{it}^* < 0 \end{cases}$$

For the non-panel regressions, we cannot include individual effects (α_i) and so effectively assume that these effects are identical for all firms in the sample (i.e. $\alpha_i = \alpha, \forall i$). In the panel regressions in the next sub-section, we allow for individual fixed and random effects.

Although it would be possible to estimate an ordered logit or probit model using all five values of the perceptions variable (very severe, major, moderate, minor and no obstacle) in this section, this is not possible in the next section. When individual dummy variables are included in a fixed effect ordered logit model, the parameter estimates will not be consistent due to the incidental parameter problems.²⁶ When we use a simple dummy variable, it is possible to consistently estimate a fixed effect logit model (Chamberlain, 1980).

Differences in Perceptions – Panel Firms Only.

The three bottom rows of Table 8 and Table 9 show the results for the panel firms (i.e., firms that were in both the 2012 and 2016 surveys). The second row show results from a simple Logit regression that includes only panel firms. No individual effects are included in this regression (i.e. $\alpha_i = \alpha$ for all firms). The third row show

²⁶ Moreover, Greene (2004) shows that fixed effects estimators can be substantially biased in short panels such as this one.

results from a random effects panel regression. Although this approach allows for individual effects, it makes assumptions about their distribution and assumes they are uncorrelated with the regressors. The fourth row shows results from the fixed effects logit regressions.

Hypothesis tests favor the simple logit model over the more complicated models. In 10 of 12 cases where we can estimate the random effects model, we reject the null hypothesis that the random effects are equal (i.e., that the panel components do not explain any part of the total variance).²⁷ This favors the simple model over the random effects model. Similarly, a Hausman-type test favors the simple logit model over the fixed effects logit model in all 11 cases where we can estimate the fixed effects model.²⁸

The results for the simple model suggest that the observed differences in perceptions between the 2012 and 2016 surveys are statistically significant in most cases. For nine of the thirteen obstacles, we can reject the null hypothesis that perceptions did not change between 2012 and 2016 for the panel regressions. For three obstacles—customs and trade regulations, business registration and licensing, and courts—we cannot reject the null hypothesis that perceptions were the same in the two years in the simple logit model, the random effects model, or the fixed effects model. For the final obstacle—access to finance—we cannot reject the null hypothesis that perceptions did not change in the random and fixed effects models, but do reject the null hypothesis for the simple logit model at a 10 percent level.

Summary

In summary, the results from the full sample and panel sample suggest that the observed differences in perceptions between the 2012 and 2016 surveys are statistically significant in most cases. Most notably, firms appear to have become significantly more likely to say that competition from informal firms, tax rates, transportation, and inadequately educated workers in 2016 were serious problems than they were in 2012. Similarly, they were less likely to say that crime, the court system, and corruption were serious problems in 2016 than they were in 2012.

²⁷ The two exceptions are for the logit regressions for business registration ($\chi^2[1]=3.15$, p-value=0.03) and access to finance ($\chi^2[1]=2.46$, p-value=0.05).

²⁸ The coefficient estimates from the logit model are efficient and consistent when the fixed effects are equal, but are inconsistent when they are not. The coefficient estimates from the conditional fixed effects logit model are consistent in both cases, but are inefficient when the fixed effects are all equal. The null hypothesis that the simple model is consistent cannot be rejected at a 10 percent level for any of the perceptions regressions.

Table 8: Differences between perceptions in 2012 and 2016 -- logit regressions

All Firms - Logit	Worker Education	Business Registration	Access to Finance	Corruption	Crime	Informal Firms
Observations	633	633	620	597	634	629
2016 Dummy	0.556*** (2.75)	-0.624 (-1.39)	-0.570* (-1.94)	-1.733*** (-5.41)	-2.988*** (-4.93)	1.387*** (6.44)
Pseudo R-Squared	0.0117	0.0106	0.0107	0.0920	0.164	0.0660
Panel Firms - Logit	Worker Education	Business Registration	Access to Finance	Corruption	Crime	Informal Firms
Observations	320	320	309	295	198	315
2016 Dummy	0.805*** (3.03)	-1.275 (-1.64)	-0.755* (-1.67)	-2.414*** (-3.94)	---	1.799*** (6.35)
Pseudo R-Squared	0.0261	0.0318	0.0161	0.115	0	0.124
Panel Firms - Random Effects Logit	Worker Education	Business Registration	Access to Finance	Corruption	Crime	Informal Firms
Observations	320	320	309	295	198	315
Number of Panel Firms	199	199	195	187		196
2016 Dummy	0.812*** (2.93)	-1.743 (-1.57)	-0.845 (-1.64)	-2.564*** (-3.55)	---	2.025*** (4.85)
Panel Firms - Fixed Effects Logit	Worker Education	Business Registration	Access to Finance	Corruption	Crime	Informal Firms
Observations	96	14	26	48	34	106
Number of Panel Firms	48	7	13	24	17	53
2016 Dummy	0.788** (2.53)	-1.792* (-1.66)	-0.470 (-0.82)	-2.398*** (-3.25)	--	2.262*** (4.81)

Source: Authors' calculations based on data from the World Bank Enterprise Surveys

Note: Coefficients on constant terms are not shown for all regressions. Pseudo R-squared terms are not available for the panel regressions. The panel regressions for fixed effect logit regressions exclude firms whose opinions did not change across periods by construction.

Table 9: Differences between perceptions in 2012 and 2016 -- logit regressions

All Firms - Logit	Electricity	Transportation	Tax Rates	Tax Administration	Trade Regulations	Courts	Labor Regulations
Observations	635	618	635	633	631	442	632
2016 Dummy	0.333 (1.64)	1.258*** (4.95)	0.903*** (4.57)	-1.362*** (-3.89)	-0.436* (-1.72)	-2.074*** (-2.71)	1.029* (1.81)
Pseudo R-Squared	0.00424	0.0494	0.0306	0.0544	0.00668	0.0842	0.0226
Panel Firms - Logit	Electricity	Transportation	Tax Rates	Tax Administration	Trade Regulations	Courts	Labor Regulations
Observations	320	312	320	318	317	223	319
2016 Dummy	0.693*** (2.58)	1.779*** (5.11)	1.417*** (5.49)	-1.521*** (-2.76)	-0.541 (-1.44)	-1.521 (-1.44)	1.332** (2.18)
Pseudo R-Squared	0.0192	0.110	0.0811	0.0519	0.00923	0.0330	0.0481
Panel Firms - Random Effects Logit	Electricity	Transportation	Tax Rates	Tax Administration	Trade Regulations	Courts	Labor Regulations
Observations	320	312	320	318	317	223	319
Number of Panel Firms	198	196	199	198	198	171	198
2016 Dummy	0.717** (2.52)	2.091*** (3.53)	1.547*** (4.58)	-1.521*** (-2.76)	-0.560 (-1.42)	-1.521 (-1.44)	1.332** (2.18)
Panel Firms - Fixed Effects Logit	Electricity	Transportation	Tax Rates	Tax Administration	Trade Regulations	Courts	Labor Regulations
Observations	88	70	112	34	42	12	24
Number of Panel Firms	44	35	56	17	21	6	12
2016 Dummy	0.762** (2.35)	2.803*** (3.85)	1.792*** (4.69)	-1.179** (-2.06)	-0.288 (-0.65)	---	1.099* (1.65)

Source: Authors' calculations based on data from the World Bank Enterprise Surveys

Note: Coefficients on constant terms are not shown for all regressions. Pseudo R-squared terms are not available for the panel regressions. The panel regressions for fixed effect logit regressions exclude firms whose opinions did not change across periods by construction.

Appendix 5: The Effect of the Investment Climate on Productivity Growth in Lao PDR.

In this section, we look at productivity growth for panel firms between the 2012 and 2016 surveys. The measure of productivity that we use is sales per worker. This measure is imperfect in that it does not take use of capital or intermediate inputs into account. Although value-added per worker (labor productivity) or total factor productivity would be preferable, the information needed to calculate these productivity measures is unavailable for firms in the retail trade and services sectors. Using these measures would, therefore, cause a serious drop in sample size.²⁹

We calculate productivity growth for firm i (g_i) using the following formula:

$$g_i = \frac{\text{Sales per worker}_{i, 2015} - \text{Sales per worker}_{i, 2011}}{\frac{1}{2} \times (\text{Sales per worker}_{i, 2015} + \text{Sales per worker}_{i, 2011})}$$

We calculate the growth rate using the midpoint formula. This approach, which is often used in studies using Enterprise Survey data, bounds growth between -2 and 2 and reduces the influence of outliers.³⁰ Sales are converted to real values using the GDP deflator.

We perform a similar calculation to calculate sales growth, using sales rather than sales per worker. The formula for sales growth is:

$$g_i = \frac{\text{Sales}_{i, 2015} - \text{Sales}_{i, 2011}}{\frac{1}{2} \times (\text{Sales}_{i, 2015} + \text{Sales}_{i, 2011})}$$

We use data from the panel firms to calculate sales and productivity growth. This means that we can use sales and employment data from the 2012 survey to measure productivity in 2011 and data from the 2016 survey to measure productivity in 2015. We do this for two reasons. First, using contemporaneous data on sales and workers is preferable to using historical data reported in a single year. Second, we want to relate sales and productivity growth to reported obstacles from the 2012 survey. Because we measure the obstacles before the subsequent growth, we avoid problems related to endogeneity and reverse causation. That is, relating past growth to reported obstacles could be a problem if firms' growth experience affected managers' perceptions about the investment climate.

In addition to calculating growth, we want to ask whether growth differed for firms that reported different constraints. As part of the Enterprise Survey, firms were asked what was the biggest constraint they faced.

²⁹ This is made worse by the fact that many manufacturing firms also did not report enough information to calculate labor or total factor productivity. Using labor productivity instead of sales per worker reduces the sample from 113 firms (column 3 of Table 9) to 23 firms.

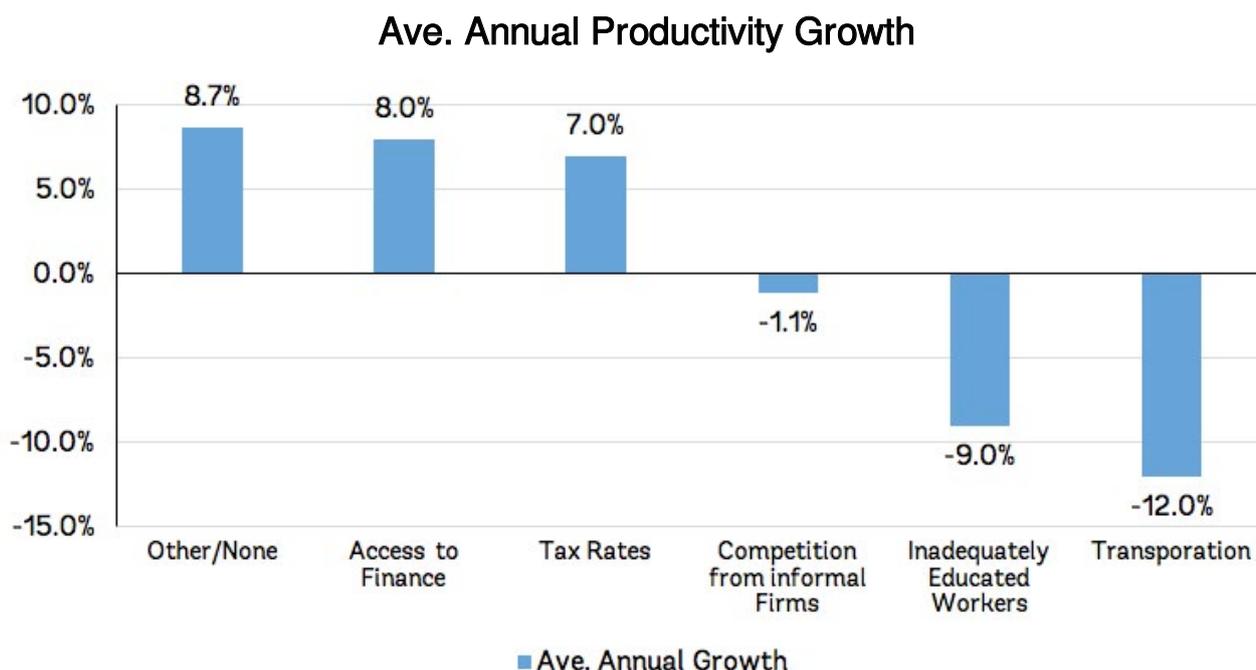
³⁰ This approach is common among studies looking at firm growth. See, for example, Davis and Haltiwanger (1999). Clarke and others (2016), Harrison and others (2014), and Aterido and others (2011) use similar approaches using Enterprise Survey data.

They were given 15 choices related to access to finance, taxes, regulations, infrastructure, and the quality of institutions.³¹ Of the 15 choices, only five were rated as the main problem by more than 10 firms: access to finance; tax rates; practices of competitors in the informal sector; inadequately educated workforce; and transport. We, therefore, focus on these five areas rather than the other areas that were rated as serious problems by fewer firms.

Firms that rated transportation as the biggest obstacle had the slowest average productivity growth—about -12 percent per year (see Figure 32). Firms that said that inadequately educated workers as their main constraint also reported slow growth—about -9.0 percent per year on average. Firms that reported competition from informal firms as the main constraint also reported negative productivity growth between 2012 and 2016. Firms that said access to finance, tax rates, and other areas of the investment climate reported faster growth—between 7 and 9 percent growth.

In the next section, we look at whether the slower growth for firms reporting inadequately educated workers, transportation, and competition from informal firms is due to other differences between firms that report these as the biggest obstacles and those that report other constraints as the biggest obstacles (e.g., sector of operations or firm size). We also look at whether these differences are statistically significant.

Figure 38: Firms that said transportation and inadequately educated workers were the biggest constraints grew more slowly than other firms



³¹ The obstacles are: access to finance; access to land; business licensing and permits; corruption; courts; crime, theft and disorder; customs and trade regulations; electricity; inadequately educated workforce; labor regulations; political instability; practices of competitors in the informal sector; tax administration; tax rates; and transport

Econometric Model

To see whether the differences are statistically significant, we estimate the following model:

$$Growth_i = \alpha + \beta Main\ Obstacle_i + \delta Sector_i + \gamma Firm\ Characteristics_i + \epsilon_i$$

The growth measure is either sales growth or productivity growth. Productivity growth is the growth of sales per worker between the 2012 and 2016 surveys (see above), while sales growth is growth of total sales (not sales per worker) between the two surveys. All of the control variables are measured in 2012. We do this to reduce the likelihood of reverse causation. It would, for example, be possible that productivity growth might affect either managers' perceptions about the investment climate or firm characteristics in the 2016 survey. Because of this, we only include firms that were interviewed in both 2012 and 2016. The model is estimated using ordinary least squares.³²

The main variables of interest are a set of dummies indicating what the manager said was the main obstacle facing the manager's firm. As in the previous section, we focus on those areas of the investment climate that at least 10 firms said was the most serious problem they faced (access to finance, tax rates, competition from informal firms, inadequately educated workers, and transportation). The omitted category is firms that reported any other constraint or no constraint. The coefficients on these variables can be interpreted as the difference in growth between firms that reported each of the five constraints noted above relative to growth for firms that reported other constraints or no constraints.

In addition to the dummies controlling for the biggest obstacle, the regressions include a set of firm-level controls. These include three dummies indicating sector of operations, the number of workers to control for firm size, a dummy indicating the firm is an exporter, and a dummy indicating the firm is foreign-owned.

Results for Productivity Growth

Table 10 shows results from the main regression. In the first column, the regression includes only the dummies indicating the biggest constraint the firm faced. As noted above, the omitted dummy is the one indicating that the firm reported some other constraint or no constraint. The coefficients on the included dummies, therefore, indicate the difference in productivity growth between firms that reported each specific constraint (e.g., access to finance) and firms that reported a constraint that has been omitted. In the second column, we add sector dummies indicating the firm is in the manufacturing or retail trade sectors. The omitted category is firms in other service sectors. In the third column, we add additional firm-level controls for firm size, export status and foreign ownership.

The coefficients on the dummy indicating the firm reported inadequately educated workers were the biggest constraint and the dummy indicating the firm reported transportation was the biggest constraint are negative and statistically significant. The negative coefficient indicate that these firms' productivity grew significantly more slowly than firms that reported some constraint other than the five indicated by the dummies. The results suggest these firms' productivity grew about 20 to 22 percent more slowly per year than firms that reported an obstacle other than the five specific obstacles as the biggest obstacle they faced.³³

³² Although productivity growth is bounded between -2 and 2, no observations are observed at the endpoints. Because of this, we do not need to use a limited dependent variable model.

³³ We divide the coefficient estimates by four to get the annual rate.

For the other three obstacles, the coefficients are negative—indicating that these firms also grow more slowly than firms in the omitted category—but are statistically insignificant. Although these firms might also grow more slowly than firms in the omitted category, we cannot reject the null hypothesis that they grow at the same rate as firms in the omitted category.

The coefficients on the control variables are mostly statistically insignificant. Including these variables, however, generally increases the size of the coefficients on the obstacle variables. That is, after controlling for differences between firms that report different constraints, we generally find that the obstacles have a more significant effect on firm performance.

Table 10: Productivity growth for firms facing different constraints

Dependent Variable	Productivity Growth		
Observations	116	116	113
Biggest obstacles^a			
Access to Finance	-0.037 (-0.09)	-0.008 (-0.02)	-0.076 (-0.18)
Inadequately Educated Workers	-0.716** (-2.33)	-0.719** (-2.28)	-0.791** (-2.44)
Competition from informal firms	-0.401 (-1.36)	-0.408 (-1.37)	-0.404 (-1.31)
Tax Rates	-0.075 (-0.20)	-0.101 (-0.26)	-0.257 (-0.66)
Transportation	-0.837** (-1.99)	-0.816* (-1.90)	-0.871* (-1.87)
Sector of Operations^b			
Manufacturing		-0.118 (-0.42)	-0.000 (-0.00)
Retail Trade		-0.031 (-0.12)	-0.125 (-0.42)
Firm-level Controls			
No of Workers (natural log)			-0.137 (-1.24)
Foreign owned (dummy)			-0.241 (-0.58)
Exporter (dummy)			0.396 (1.35)
Constant	0.356* (1.97)	0.405 (1.61)	0.748* (1.94)
R-squared	0.073	0.075	0.116

Source: Authors' calculation based upon data from the World Bank's Enterprise Surveys for Lao PDR.

***, **, * Statistically Significant at 1%, 5% and 10% significance levels. ^a The omitted category is firms that reported a different main constraint or who reported no main constraint. ^b The omitted sector is other services.

Note: T-statistics in parentheses.

Results for Sales Growth

In contrast to the results for productivity growth, the coefficients on the perceptions-based variables are all statistically insignificant (see Table 11). This suggests that sales growth was similar for all firms. For the two variables that had statistically significant coefficients in the productivity growth regression, perceptions about inadequately educated workers and transportation—the coefficients remain negative in the sales growth regressions but are smaller than in productivity growth regressions.

This suggests that the differences in productivity growth between firms that were most concerned about inadequately educated workers and transportation and other firms is not due to sales falling more quickly for these firms than for other firms. The negative coefficients on these variables in both the productivity and growth regressions suggests that sales declined relatively more quickly for these firms than employment did.

Table 11: Sales growth for firms facing different constraints

Dependent Variable	Sales Growth		
Observations	116	116	113
Biggest obstacles^a			
Access to Finance	0.036 (0.09)	0.166 (0.40)	0.176 (0.44)
Inadequately Educated Workers	-0.473 (-1.52)	-0.414 (-1.32)	-0.409 (-1.32)
Competition from informal firms	-0.190 (-0.64)	-0.202 (-0.68)	-0.094 (-0.32)
Tax Rates	0.209 (0.55)	0.152 (0.40)	-0.068 (-0.18)
Transportation	-0.655 (-1.54)	-0.644 (-1.50)	-0.560 (-1.26)
Sector of Operations^b			
Manufacturing		-0.271 (-0.97)	-0.013 (-0.04)
Retail Trade		0.215 (0.81)	-0.140 (-0.49)
Firm-level Controls			
No of Workers (natural log)			-0.371*** (-3.49)
Foreign owned (dummy)			0.078 (0.19)
Exporter (dummy)			0.558* (1.98)
Constant	0.233 (1.28)	0.223 (0.89)	1.168*** (3.17)
R-squared	0.048	0.076	0.187

Source: Authors' calculation based upon data from the World Bank's Enterprise Surveys for Lao PDR.

***, **, * Statistically Significant at 1%, 5% and 10% significance levels.

^a The omitted category is firms that reported a different main constraint or who reported no main constraint.

^b The omitted sector is other services.

Note: T-statistics in parentheses.

Appendix 6: Productivity in Sectors Outside of Manufacturing

Table 12: Sales per worker for firms in retail trade, other services and manufacturing

	Retail	Other Services	Hotels	Construction	Manufacturing
Lao PDR	\$9,635	\$6,937	\$6,937	\$7,708	\$5,781
Cambodia	\$7,754	\$10,297	\$9,703	--- ^a	\$8,021
Thailand	\$10,519	\$6,740	\$8,205	\$6,291	\$3,836
Myanmar	\$11,132	\$7,481	\$7,481	--- ^a	\$6,850
Malaysia	\$13,844	\$15,675	\$8,465	\$60,461	\$11,799
Philippines	\$22,187	\$18,851	\$17,516	\$8,736	\$18,124
Vietnam	\$54,582	\$17,466	\$13,646	\$17,466	\$22,706
India	\$6,541	\$7,994	\$7,994	\$8,807	\$17,108
Brazil	\$26,382	\$18,761	\$10,553	\$105,529	\$27,136
Russia	\$58,558	\$36,870	\$17,567	\$43,376	\$30,983
China	\$74,902	\$42,801	\$24,967	\$54,634	\$37,451

^a Countries with fewer than 10 observations in that sector are excluded.

Appendix 7: More Tables on Perceptions

Table 13: Percent of firms saying each area was the biggest problem they faced

	All firms
Practices of competitors in the informal sector	26.74
Tax rates	22.09
Inadequately educated workforce	13.22
Electricity	13.04
Access to finance	4.88
Transport	4.15
Customs and trade regulations	3.61
Labor regulations	3.31
Corruption	3.17
Access to land	2.53
Business licensing and permits	1.36
Courts	0.94
Tax administration	0.9
Political instability	0.04
Crime, theft and disorder	0.03

Table 14: Percent of firms saying each area was serious problem, by firm size

	All Firms	Small	Medium	Large
Informal Sector	40%	40%	38%	28%
Tax Rates	33%	35%	22%	20%
Transportation	23%	23%	33%	14%
Electricity	23%	25%	9%	5%
Inadequately educated workforce	23%	23%	20%	34%
Access to Land	18%	19%	8%	13%
Customs and trade regulations	8%	8%	9%	7%
Access to Finance	6%	6%	5%	1%
Labor Regulation	4%	4%	2%	8%
Tax Administration	3%	3%	3%	2%
Corruption	2%	2%	3%	3%
Business licensing and permits	2%	2%	2%	0%
Telecommunications	2%	1%	5%	0%
Courts	1%	1%	2%	0%
Crime, theft and disorder	0%	0%	0%	0%
Political Instability	0%	0%	0%	0%

Note: Small firms have fewer than 20 workers, medium firms have between 20 and 99 workers, large firms have 100 or more workers.

Table 15: Percent of firms saying each area was a serious problem, by exporting and ownership

	All	Non-exporters	Exporters	Domestic	Foreign
Informal Sector	40%	40%	30%	39%	44%
Tax Rates	33%	34%	27%	32%	53%
Transportation	23%	23%	34%	23%	31%
Electricity	23%	23%	23%	23%	32%
Inadequately educated workforce	23%	23%	28%	24%	12%
Access to Land	18%	18%	12%	16%	37%
Customs and trade regulations	8%	7%	23%	8%	6%
Access to Finance	6%	5%	16%	5%	11%
Labor Regulation	4%	4%	3%	4%	1%
Tax Administration	3%	3%	0%	3%	0%
Corruption	2%	2%	8%	2%	3%
Business licensing and permits	2%	1%	9%	2%	1%
Telecommunications	2%	1%	7%	2%	2%
Courts	1%	0%	11%	1%	0%
Crime, theft and disorder	0%	0%	0%	0%	0%
Political Instability	0%	0%	0%	0%	0%

Table 16: Percent of firms saying each area was a serious problem, by region

	All	Central	North	South	Vientiane
Informal Sector	40%	29%	57%	62%	37%
Tax Rates	33%	35%	46%	51%	24%
Transportation	23%	28%	53%	31%	11%
Electricity	23%	29%	57%	52%	2%
Inadequately educated workforce	23%	12%	36%	27%	26%
Access to Land	18%	19%	34%	29%	9%
Customs and trade regulations	8%	11%	19%	4%	2%
Access to Finance	6%	4%	13%	12%	3%
Labor Regulation	4%	1%	0%	5%	6%
Tax Administration	3%	7%	0%	0%	1%
Corruption	2%	3%	4%	2%	1%
Business licensing and permits	2%	2%	0%	9%	1%
Telecommunications	2%	2%	0%	0%	2%
Courts	1%	1%	0%	0%	2%
Crime, theft and disorder	0%	0%	2%	0%	0%
Political Instability	0%	0%	0%	0%	0%

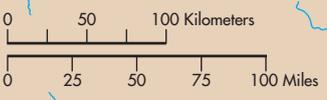
Table 17: Percent of firms saying each area was serious problem, by gender of owner

	All	Female Owners	No Female Owners
Informal Sector	40%	34%	44%
Tax Rates	33%	40%	28%
Transportation	23%	17%	28%
Electricity	23%	24%	23%
Worker Skills	23%	23%	23%
Access to Land	18%	23%	14%
Trade Regulations	8%	4%	10%
Access to Finance	6%	6%	5%
Labor Regulation	4%	4%	4%
Tax Administration	3%	5%	1%
Corruption	2%	1%	3%
Business Registration	2%	3%	1%
Telecommunications	2%	2%	1%
Courts	1%	2%	0%
Crime	0%	0%	0%
Political Instability	0%	0%	0%

100°E 102°E 104°E 106°E 108°E



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LAO PEOPLE'S DEMOCRATIC REPUBLIC

- CITIES AND TOWNS
- ⊙ PROVINCE CAPITALS
- ⊕ NATIONAL CAPITAL
- RIVERS
- MAIN ROADS
- RAILROADS
- PROVINCE BOUNDARIES
- - - INTERNATIONAL BOUNDARIES



104°E 106°E



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