

Firm Level Productivity and Exporting in the Uganda's Manufacturing Sector

by

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Abstract

The role of exports in helping attain and sustain high rates of growth especially in the context of developing countries cannot be overemphasized. Exports usually tend to be associated with both static gains (resulting for instance from access to larger outside markets) as well as dynamic gains (including learning from exporting and productivity gains). With regard to the dynamic gains from trade, two propositions have tended to dominate the literature. The first relates firm level productivity and exporting and its basic thesis is that more productive firms tend to "self select" themselves to compete in the global trading arena. The second line of argument dwells on the argument that in view of limited experience in the export business as well as the significant technological gaps faced by potential exporters from most of the developing world, there is a lot of scope to "learn by exporting". Once a firm succeeds in penetrating the export market, chances that it will sustain itself in the export business increase owing to interaction with (and learning from) other players along the export chain as well as the dictates of consumers' tastes and preferences in the importing countries. This paper tests the self-selection and learning by exporting hypotheses using data from Uganda's manufacturing firms. We employ proxies of self-selection and learning by exporting obtained from indices of path dependence to fit maximum likelihood estimates of export behaviour.

Our results provide support for both hypotheses suggesting a feedback relationship from productivity to exporting and vice versa. Thus the self-selection and learning by exporting hypotheses are not mutually exclusive possibilities, as high productivity firms afford the sunk costs of entry to export markets, and in principle, continue to improve their productivity as a result of their exposure to export markets. Also the results suggest that more experienced exporters reap more productivity gains from learning effects which is in line with the view that knowledge spillovers to exporting firms increase with the level of interaction in the global market place. Thus learning by exporting is not a "short term" occurrence which takes place only in the first few years of entry in export markets after which it would fizzle out as a firm's exporting experience increases but rather, it is a cumulative process.

Key words: Self-selection, learning-by-exporting, productivity and exporting.

1 Introduction

Industrialization and manufacturing have been important cornerstones for economic transformation and development in the developed and emerging economies. Manufactured products tend to be of high value and fetch higher prices in the domestic and export markets. There is little wonder then that many developing countries the world over are taking deliberate and purposive action to promote industrialization.

In Uganda, the government has put in place a number of policies to promote the growth of manufactured exports including; a stable macroeconomic environment, provision of incentives, and signing up to membership of regional trading agreements. However, in spite of these, the contribution of manufactured exports to total exports remains at a dismal 4 percent (Uganda Bureau of Statistics, 2006). This may perhaps mean that promoting rapid expansion of manufactured exports requires more than just a good macroeconomic policy environment. Understanding firm level productivity performance and the microeconomic environment in which manufactured export firms operate may thus play a cardinal role in promoting manufacturing export growth.

It is against this background that we analyzed firm-level interactions between productivity and exporting in the Uganda's manufacturing sector. We sought to provide a robust microeconomic evidence about any causality between productivity and exporting in order for policymakers to set appropriate export promotion policies from the point of view of targeting firm-level productivity. A good understanding of the drivers of productivity and competitiveness of manufacturing firms is crucial for ensuring growth in the private sector which is essential for fuelling overall economic growth. We conjecture that all other efforts to promote and expand manufacturing activity in the economy will yield very little if they are not matched by tremendous improvements in productivity.

We empirically tested two hypotheses; self-selection and learning-by-exporting hypotheses. For self-selection, we tested the hypothesis that more productive firms are more likely to become exporters in the subsequent period. We argued that if good firms become exporters then we should expect to find significant differences in performance measures/indicators between future export starters and future non-starters several years before some of them begin to export. For learning-by-exporting, we tested the hypothesis that exporting has a positive impact on growth rates of productivity at the enterprise level. This hypothesis suggests that breaking into the export market can make firms more productive due to the knowledge and technology spillovers from international

buyers and competitors to exporters. This is supported by some industry studies that document knowledge flows from foreign buyers to exporting firms and technology spillovers in international markets (Tybout (2000) and Bernard and Jensen (1997)). Empirically this view focuses on post-entry performance meaning that firms that enter and stay should enjoy faster productivity growth and higher productivity levels than their counterparts that sell on the domestic market only.

The earliest study analyzing the causal relationship between exporting and productivity at the firm-level in the recent literature was on the U.S. economy (Bernard et al. 1995, 1999). The authors find very little evidence of any learning-by-exporting effect. However, since the U.S. has the largest, most competitive and most technologically advanced economy, it is the least likely to be characterized by efficiency benefits of exporting. The ideal economy in which to find efficiency effects would have the opposite characteristics. It would be small, so that exporting would offer maximum scope for reaping economies of scale . It would have high trade restrictions which would enable even its potentially tradable sector to be uncompetitive, so that exporting would offer maximum scope for the increased discipline of competition. It would be technologically backward, so that contact with foreign customers and competitors would provide the maximum learning opportunities (Bigsten et al. 2000). Therefore, it became imperative to focus on a Sub-Saharan African economy such as Uganda that conforms to this pattern, and indeed the results show very strong evidence of learning-by-exporting effect.

Understanding the interactions between export behavior and firm productivity is important from a policy standpoint. Policy makers have long been convinced that export promotion is beneficial to economic growth. The evidence base for this has been largely from cross-country studies. However, without robust microeconomic evidence about any causality between exporting and productivity, it is difficult for policymakers to set appropriate export promotion policies targeted at boosting firm productivity (Greenaway et al.2004). It is this gap, for the case of Uganda, which this study sought to fill.

2 Data Type and Sources

The data came from a survey of registered enterprises in the Ugandan private sector conducted in November 2002 to April 2003 by the World Bank's Regional Program on Enterprise Development (RPED) in collaboration with the Uganda Manufacturers Association Consultancy and Information

Services (UMACIS). This survey covered 300 firms across four sectors (commercial agriculture, construction, manufacturing, and tourism) and three regions (central, northeast, and southwest). This was reinforced by a self-administered survey that had a major aim of covering the gaps that were found in the World Bank data set. Following Bernard and Jensen (1995, 1999), the analysis was carried out on a panel of 300 exporting and non-exporting firms within the Ugandan manufacturing sector for the sample period 2000-2002.

3 Basic Firm Characteristics in the Ugandan Manufacturing Sector

This section looks at firm status and characteristics, and documents various aspects of firm performance, focusing on capacity utilization, firm age, ownership, experience, human capital and ethnicity of the entrepreneur, export behavior and size. It critically analyzes the growth and productivity of Ugandan firms of different sizes and ownership types using survey data on manufacturing firms. A good understanding of what determines the competitiveness of manufacturing firms is crucial for ensuring growth in the private sector which is essential for fuelling overall economic growth. And policies to promote growth will bring high returns if they are targeted to the factors most important in determining the performance of private firms. The study results indicate that the human capital of entrepreneurs as reflected in education, capital stock, and experience in exporting are the most important factors determining the performance of firms in Uganda. Government policy directed toward augmenting these productivity enhancing channels would help improve the competitiveness of private firms in Uganda.

3.1 Characteristics of Enterprizes and Entrepreneurs

Around 78 per cent of firms in Uganda that are owned by indigenous Africans are defined as micro and small firms employing less than 50 workers (table 1). On the other hand foreign entrepreneurs; Asian, Middle Eastern and European entrepreneurs own most of the larger firms and thus control a large share of the business assets in Uganda. Most private firms in Uganda (around 75 per cent) established by entrepreneurs, rather than bought or inherited, are also defined as micro and small firms employing less than 50 workers (table 1). On the other hand, firms that are bought or inherited

are mostly large firms, and it is more likely for foreign entrepreneurs (especially Asians) than for African entrepreneurs that enjoy the benefits of inherited ownership.

| <i>Firms by ethnicity of the entrepreneur</i> | | | | | | |
|---|----------------------------|----------------------------------|---------------------------------|-----------------------|------------------------|-------------|
| | African | Asian | Middle Eastern | European/ American | | |
| Micro(< 10) | 34 | 11 | 0 | 15 | | |
| Small (10-49) | 44 | 42 | 10 | 5 | | |
| Medium (50-99) | 9 | 14 | 60 | 15 | | |
| Large (100+) | 13 | 34 | 30 | 65 | | |
| <i>Firms by form of acquisition</i> | | | | | | |
| | Established | Bought | Inherited | | | |
| Micro(< 10) | 31 | 9 | 0 | | | |
| Small (10-49) | 44 | 27 | 50 | | | |
| Medium (50-99) | 12 | 9 | 0 | | | |
| Large (100+) | 13 | 55 | 50 | | | |
| <i>Firms by export status</i> | | | | | | |
| | Exporters | Non-exporters | | | | |
| Micro(< 10) | 1 | 32 | | | | |
| Small (10-49) | 17 | 46 | | | | |
| Medium (50-99) | 15 | 10 | | | | |
| Large (100+) | 67 | 12 | | | | |
| <i>Firms by legal status</i> | | | | | | |
| | Publicly listed company | Publicly held limited company | Private held limited company | Partnership | sole proprietorship | cooperative |
| Micro(< 10) | 25 | 0 | 11 | 42 | 60 | 0 |
| Small (10-49) | 0 | 17 | 41 | 47 | 40 | 25 |
| Medium (50-99) | 0 | 33 | 15 | 11 | 0 | 33 |
| Large (100+) | 75 | 50 | 33 | 0 | 0 | 42 |
| <i>Firms by source of start-up finance</i> | | | | | | |
| | Own savings | Informal loans | Bank loans | | | |
| Uganda | 85.4 | 8.1 | 6.6 | | | |
| Kenya | 65.1 | 8.6 | 20.4 | | | |
| Mozambique | 78.5 | 6.0 | 9.2 | | | |
| Nigeria | 79.8 | 1.9 | 10.7 | | | |
| <i>Source: Author's calculations from RPED data set, 2003</i> | | | | | | |

Table 1: Characteristics of Private Manufacturing Firms, (Percent)

It is clear from table 1 that export behavior is highly correlated with the size of firms. Around 67 per cent of exporting firms are large, employing over 100 workers, and only 12 per cent of non-exporting firms are large. The percentage of exporting firms increases while that of non-exporting firms drastically drops as one runs from micro to large firms, most likely exporting makes firms more productive and hence grow larger in size. It is consistent with the predictions from recent models. Melitz (2003), Helpman, Melitz and Yeaple (2004) and Jean (2002) demonstrate that under monopolistic competition more efficient firms charge lower prices. Since gross output is decreasing in product price for individual firms, exporters should be larger than their domestic counterparts. Looking at the various sectors and considering firm size, it is clear that most firms in Uganda are micro and small and the percentage of firms keeps dropping as one runs from micro to large firms.

The furniture sector has the highest percentage of micro and small firms (94 per cent) and the chemicals and paints sector has the highest percentage of medium and large firms (54 per cent) (table 2). The small and micro firms lack the knowledge of the formal registration process required to become limited liability companies and therefore most of them are under sole proprietorship (table 1). The data show that obtaining financing to start a business in Uganda is difficult. Some 85 percent of firms were started with the savings of entrepreneurs (table 1). This large share, larger than in the other Sub-Saharan countries, probably reflects the poor development of the financial sector and the credit constraints facing firms.

| | Agro-industry | Chemicals | Construction | Furniture | Metals | Paper | Plastic | Textile | Wood |
|----------------|---------------|-----------|--------------|-----------|--------|-------|---------|---------|------|
| Micro(< 10) | 27 | 7 | 11 | 66 | 18 | 13 | 0 | 15 | 40 |
| Small (10-49) | 36 | 39 | 52 | 28 | 60 | 50 | 78 | 67 | 10 |
| Medium (50-99) | 10 | 18 | 16 | 4 | 7 | 13 | 22 | 11 | 30 |
| Large (100+) | 27 | 36 | 21 | 2 | 15 | 24 | 0 | 7 | 20 |

Source: Author's calculations from RPED data set, 2003

Table 2: Sector/Industry and Firm Size, (Percent)

3.2 Human Capital Endowments of Entrepreneurs

A comparison of human capital in the Ugandan private sector reveals interesting differences (table 3). Entrepreneurs with no education can not be found managing medium or large enterprise. A 100 percent of manufacturing entrepreneurs with no education manage only micro and small firms, while only 13 percent of manufacturing entrepreneurs with primary education manage medium and large firms. The percentage of manufacturing entrepreneurs managing micro and small firms falls drastically, while the percentage of manufacturing entrepreneurs managing medium and large firms drastically increases as one moves from no education to university post graduate degree (table 3). This means that entrepreneurs with at least a university degree are able to manage and run very large enterprises and that it may be partly due to their high level of education that their firms grow faster and bigger. Within Uganda there are differences between ethnic groups. On average, Asian entrepreneurs have more education and much more experience before starting their firms than African entrepreneurs (table 4). There is a very high percentage of African compared to Asian entrepreneurs at the lower end of the education level and the percentage for African entrepreneurs steadily declines, while that for Asian entrepreneurs steadily increases as one moves up the level of education. In addition, a much larger share of Asian entrepreneurs have experience in a foreign firm

| | None | Primary | Secondary | Vocational | Degree | Post graduate degree | Other university programme |
|---|------|---------|-----------|------------|--------|----------------------|----------------------------|
| Micro(< 10) | 79 | 57 | 49 | 27 | 10 | 2 | 0 |
| Small (10-49) | 21 | 30 | 41 | 54 | 39 | 27 | 25 |
| Medium (50-99) | 0 | 7 | 5 | 9 | 12 | 28 | 75 |
| Large (100+) | 0 | 6 | 5 | 10 | 39 | 43 | 0 |
| <i>Source: Author's calculations from RPED data set, 2003</i> | | | | | | | |

Table 3: Education of Manufacturing Entrepreneurs and firm size,(Percent)

before starting their own enterprise. The percentage of African entrepreneurs drastically declines while that of the Asian entrepreneurs drastically increases as one moves to a higher bracket of years of experience. And they are more likely than their African counterparts to buy a firm and to obtain external loans for start-up. For all these reasons Asian entrepreneurs start at a larger scale and their firms grow faster. On average, African-owned firms start with 14 employees and end up with 31 employees after almost 10 years, while Asian firms start with 39 employees and grow to 104 employees after a little more than 10 years.

Export status and education level also yield interesting differences (table 4). Exporting entrepreneurs have at least secondary education and the percentage grows as one moves up the level of education, while there is a very high percentage of non-exporting entrepreneurs at the lower level of education and the percentage steadily declines as one moves up the level of education. A 100 percent of manufacturing entrepreneurs with neither no education nor primary education can only be found managing/owning non-exporting firms. This may partly explain why exporting firms grow faster and bigger and are more productive once compared to the non-exporting firms.

3.3 Age of Capital Stock and Experience of the Manager

Uganda's capital stock is exceptionally young. For each category of firms (by size class), the highest percentage of firms is having capital stock within the range of 5-10 years old (table 5). It is not surprising though, that micro and small firms have the highest percentage of firms with capital stock averaging less than 5 years old (63 percent, micro and small combined, as compared to only 16 percent, medium and large firms combined). The percentage of firms drops drastically as one moves up the age bracket. This result is robust across all firm sizes and export status of manufacturing firms in Uganda, although micro, small and non-exporting firms are affected more than others.

| <i>Level of education of the entrepreneur</i> | | | | | | | |
|---|-----------------------------------|--------------------------|-------------------------------|------------|--------|----------------------|----------------------------|
| | None | Primary | Secondary | Vocational | Degree | Post graduate degree | Other university programme |
| African | 86 | 93 | 89 | 76 | 59 | 37 | 25 |
| Asian | 14 | 7 | 9 | 22 | 32 | 41 | 75 |
| Middle Eastern | 0 | 0 | 2 | 1 | 1 | 7 | 0 |
| European/American | 0 | 0 | 0 | 1 | 8 | 14 | 0 |
| <i>Level of education of the entrepreneur & export status</i> | | | | | | | |
| Exporter | 0 | 0 | 4 | 12 | 22 | 34 | 75 |
| Non-exporter | 100 | 100 | 96 | 88 | 78 | 66 | 25 |
| <i>Years of experience of the entrepreneur</i> | | | | | | | |
| | 0-9 | 10-19 | 20-29 | 30-39 | 40-49 | | |
| African | 78 | 51 | 25 | 29 | 0 | | |
| Asian | 18 | 40 | 50 | 71 | 0 | | |
| Middle Eastern | 1 | 3 | 7 | 0 | 0 | | |
| European/American | 3 | 6 | 18 | 0 | 0 | | |
| <i>Other characteristics</i> | | | | | | | |
| | Firm size at start-up (employees) | Average firm age (years) | Current firm size (employees) | | | | |
| African | 14 | 9.7 | 31 | | | | |
| Asian | 39 | 10.1 | 104 | | | | |
| Middle Eastern | - | - | - | | | | |
| European/American | - | - | - | | | | |
| <i>Source: Author's calculations from RPED data set, 2003</i> | | | | | | | |

Table 4: Education, Export status, Experience, and Ethnicity of Manufacturing Entrepreneurs, (percent)

| <i>Firm size class (employees)</i> | | | | |
|---|-------------|--------------|---------------|-------------|
| Age | Micro(< 10) | Small(10-49) | Medium(50-99) | Large(100+) |
| < 5 | 44 | 19 | 13 | 3 |
| 5-10 | 46 | 51 | 35 | 42 |
| 11-20 | 7 | 17 | 28 | 23 |
| > 20 | 3 | 13 | 23 | 32 |
| <i>Firm by export status</i> | | | | |
| | Exporter | Non-exporter | | |
| < 5 | 10 | 24 | | |
| 5-10 | 55 | 44 | | |
| 11-20 | 13 | 17 | | |
| > 20 | 22 | 15 | | |
| <i>Source: Author's calculations from RPED data set, 2003</i> | | | | |

Table 5: Manufacturing firms by Average Age of Equipment, (percent)

Uganda's young capital stock is due to two main factors, the higher rates of investment in the 1990s and the large inflows of foreign exchange that led to capital accumulation in the postwar period. The relatively young age of her capital stock may well indicate that the technology is more recent and of better quality and thus more productive. If other constraints to the private sector (such as poor business environment) are addressed, it is quite likely that firms could better utilize their capital and achieve faster growth.

Uganda's entrepreneurs have exceptionally few years of experience. For each category of firms (by size class), the highest percentage of entrepreneurs are having experience within the range of 0-9 years (table 6). The percentage of entrepreneurs drastically drops as one moves up the years of experience bracket, with micro and medium enterprises having no entrepreneur of at least 20 and 30 years of experience respectively. As expected, it is only the larger firms that have the highest percentage of entrepreneurs within the range of 20-29, 30-39 and 40-49 years of experience. Also, exporters have more experience compared to the non-exporters. Whereas the percentage for both categories declines as one moves up the years of experience bracket, the percentage of exporting firms is greater than that of non-exporting firms at the upper bracket.

| <i>Firm size class (employees)</i> | | | | |
|------------------------------------|-------------|--------------|---------------|--------------|
| Experience | Micro(< 10) | Small(10-49) | Medium(50-99) | Large (100+) |
| 0-9 | 91 | 77 | 82 | 70 |
| 10-19 | 9 | 16 | 15 | 12 |
| 20-29 | 0 | 6 | 3 | 12 |
| 30-39 | 0 | 1 | 0 | 4 |
| 40-49 | 0 | 0 | 0 | 2 |
| <i>Firms by export status</i> | | | | |
| | Exporter | Non-exporter | | |
| 0-9 | 61 | 84 | | |
| 10-19 | 22 | 11 | | |
| 20-29 | 12 | 4 | | |
| 30-39 | 5 | 1 | | |
| 40-49 | 0 | 0 | | |

Source: Author's calculations from RPED data set, 2003

Table 6: Manufacturing firms by Experience of the Manager, Firm Size and Export Status, (percent)

3.4 Capacity Utilization

Firms may have a young capital stock, but how efficiently they use it depends on factors driven by product demand or bottlenecks in raw material supply. How efficiently is Ugandan capital used? A comparison across firm size classes reveals interesting differences about capacity utilization in Uganda (table 7). Capacity utilization is the amount of output actually produced relative to the maximum amount that can be produced given the current capital stock and level of employment. A greater percentage of small firms in Uganda use a greater share of their capacity than large ones (except for exporting firms as shown in table 8) , presumably because large firms rely on imported equipment, raw materials and spare parts. They also require skilled and technical man power which is scarce, however small firms are not affected by all these constraints. There is also the strategic reason for keeping excess capacity for large firms; mainly to discourage potential entrants. There is also dispersion across manufacturing sectors, with plastic and paper and publishing firms having the highest capacity utilization (table 8).

| <i>Capacity utilization, percent</i> | | | | | |
|---|------|-------|-------|-------|-----|
| | 0-49 | 50-54 | 55-59 | 60-64 | 65+ |
| Micro(< 10) | 37 | 30 | 17 | 26 | 24 |
| Small(10-49) | 34 | 44 | 58 | 52 | 37 |
| Medium(50-99) | 10 | 8 | 8 | 9 | 16 |
| Large(100+) | 19 | 18 | 17 | 13 | 23 |
| <i>Source: Author's calculations from RPED data set, 2003</i> | | | | | |

Table 7: Capacity Utilization in Manufacturing and Firm Size, (percent)

| <i>Sectors</i> | | | | | | | | | |
|---|-------------------|-----------------------|---------------------------|-----------|--------|-----------------------|---------|----------------------|------|
| | Agro- industry | Chemicals & paints | Construction materials | Furniture | Metals | Paper & publishing | Plastic | Textile & leather | Wood |
| 0-49 | 29 | 25 | 23 | 30 | 32 | 23 | 0 | 41 | 50 |
| 50-54 | 19 | 14 | 11 | 23 | 8 | 3 | 0 | 18 | 20 |
| 55-59 | 14 | 25 | 22 | 14 | 17 | 17 | 33 | 11 | 20 |
| 60-64 | 3 | 4 | 3 | 3 | 8 | 10 | 11 | 4 | 10 |
| 65+ | 35 | 32 | 41 | 30 | 35 | 47 | 56 | 26 | 0 |
| <i>Capacity utilization & export status</i> | | | | | | | | | |
| | Exporter | Non-exporter | | | | | | | |
| 0-49 | 15 | 31 | | | | | | | |
| 50-54 | 19 | 15 | | | | | | | |
| 55-59 | 15 | 17 | | | | | | | |
| 60-64 | 2 | 5 | | | | | | | |
| 65+ | 49 | 32 | | | | | | | |
| <i>Source: Author's calculations from RPED data set, 2003</i> | | | | | | | | | |

Table 8: Capacity Utilization in Manufacturing and Industry/Sector, (percent)

4 Descriptive Statistics of Variables Used in the Study

The descriptive statistics in table 9 are presented by export status. Exporters are larger (by output and employment), pay higher wages, have older capital stock, have higher capacity utilization, and the share of manufacturing entrepreneurs with university education is higher for exporters once compared to non-exporters. Compared to non-exporters, there is a higher share of manufacturing firms who got their start-up finance by means of a bank loan, there is a higher share of exporters in agro-industry and chemicals and paints, yet, there is a higher share of non-exporters in paper and publishing. It is also noted that exporters have higher capital intensity than non-exporters, this is as expected, and is partly because exporters are larger and have greater access to loanable funds that facilitate quicker acquisition of capital goods.

| <i>Variable</i> | <i>Exporter</i> | <i>Non-Exporter</i> | <i>Full Sample</i> | | | |
|----------------------|-----------------|---------------------|--------------------|-----------------|------------|------------|
| | <i>Mean</i> | <i>Mean</i> | <i>Mean</i> | <i>Std.Dev.</i> | <i>Min</i> | <i>Max</i> |
| Output | 6.64e+09 | 7.71e+08 | 1.66e+09 | 5.02e+09 | 693000 | 4.46e+10 |
| Capital Intensity | 6.79e+07 | 3.10e+07 | 6.23e+07 | 5.10e+08 | 454.5454 | 8.33e+09 |
| Wage per worker | 1.39e+07 | 4416746 | 5855155 | 2.76e+07 | 2285.714 | 4.85e+08 |
| Employment | 97.2439 | 43.77778 | 51.8817 | 138.6175 | 1 | 2478 |
| Age | 14.86585 | 11.95604 | 12.40037 | 14.43093 | 1 | 92 |
| Capacity utilization | 66.4378 | 55.575 | 57.22149 | 22.7963 | 1 | 100 |
| Agro-industry | .5853659 | .3869565 | .4169742 | .493514 | 0 | 1 |
| Chemicals and paints | .1341463 | .0369565 | .0516605 | .2215452 | 0 | 1 |
| Paper and Publishing | .0487805 | .0565217 | .0553506 | .2288745 | 0 | 1 |
| University Educ | .4102564 | .2434783 | .267658 | .4431503 | 0 | 1 |
| Central Location | .695122 | .6195652 | .6309963 | .4829807 | 0 | 1 |
| Bank Loan | .1707317 | .073913 | .0885609 | .2843713 | 0 | 1 |
| <i>N=542</i> | | | | | | |

Table 9: Descriptive Statistics of the Variables Used in the Study

5 Self-selection hypothesis

5.1 Theoretical Framework

The main focus of our analysis in this section, was to identify those firm characteristics that make a firm more likely to export, thereby implementing the self-selection hypothesis. The central premise of this hypothesis is that, more productive firms before are more likely to become exporters in the

subsequent period. Therefore, we were interested in the dividing line between firms that sell only domestically and those that export to foreign markets. To motivate our empirical analysis, we draw upon the models of Bernard and Wagner (2001), Bugamelli and Infante (2003), and Tybout (2003). We start from a firm's static problem of export participation with no sunk costs. Denoting with (Y_{it}) a dummy variable equal to 1 if firm i exports in year t , and 0 otherwise. The foreign market participation problem of firm i at time t can be written as follows:

$$Max_{Y_{it} \in \{0,1\}} \{ \pi_{it}(X_{it}) + \nu_{it} \} Y_{it} \quad (1)$$

Where π_{it} denotes profits made by exporting, in excess of those made on the domestic market. π_{it} depends on the vector of firm and market characteristics (X_{it}) (which also determine the marginal production costs), and on serially uncorrelated error term (ν_{it}) . Firm i will decide to export at time t ($Y_{it} = 1$) if $\pi(X_{it}) + \nu_{it} > 0$ otherwise it will only serve the domestic market. Using a reduced-form approximation for the determinants of firm profits from exporting, this leads to the following static discrete choice of export market participation:

$$Y_{it} = \begin{cases} 1 : \text{if } \beta X_{it} + \nu_{it} > 0 \\ 0 : \text{Otherwise} \end{cases} \quad (2)$$

In this model, π_{it} is approximated as a reduced-form expression in exogenous firm and market characteristics. In particular, the vector X_{it} contains size, productivity, and other firm-level characteristics which typically determine the marginal production costs faced by the firm, and consequently the expected profits it is likely to generate by exporting.

In this scenario, the firm's payoff from exporting has not been adjusted for sunk costs of foreign market entry. Yet, it is reasonable to assume that the firm has to incur such costs. These include the establishment of distribution network, modification of products, advertising, as well as gathering information and dealing with the different legal and economic environment in the foreign country. We deal with sunk costs following the dynamic setting introduced in Bernard and Wagner (2001), Bugamelli and Infante (2003), and Tybout (2003). In this scenario, the decision to enter is made by a rational firm with the objective of maximizing expected profits over the expected period of participation in export markets, net of sunk costs. In other words, if there are sunk costs involved in taking up export activities, a dynamically maximizing firm will look beyond the present period when

deciding whether to export. The presence of sunk costs makes the decision rule dynamic, because exporting today carries an additional option value of being able to export tomorrow without paying the sunk costs of exporting. We denote with S the sunk costs and assume they are common to all firms and are time-invariant. The firm's payoffs from exporting take the following form:

$$\pi(X_{it}) + \nu_{it} \text{ if } Y_{it} = 1 \text{ and } Y_{it-1} = 1 \quad (3)$$

$$\pi(X_{it}) - S + \nu_{it} \text{ if } Y_{it} = 1 \text{ and } Y_{it-1} = 0 \quad (4)$$

$$0 \text{ if } Y_{it} = 0 \text{ and } Y_{it-1} = 0 \quad (5)$$

Denoting with δ the one-period discount rate, the optimal pattern of export market participation over time should satisfy the following Bellman equation:

$$V_{it} = \text{Max}_{Y_{it} \in \{0,1\}} \{ \pi_{it}(X_{it}) - (1 - Y_{it-1})S + \delta \cdot E_t(V_{it+1}) \} \quad (6)$$

Firms will find it optimal to export when:

$$Y_{it} = \begin{cases} 1 : \text{ if } \pi_{it}(X_{it}) - (1 - Y_{it-1})S + \delta \cdot [E_t(V_{it+1}|Y_{it} = 1) - E_t(V_{it+1}|Y_{it} = 0)] > 0 \\ 0 : \text{ Otherwise} \end{cases} \quad (7)$$

The expression in the square brackets can be interpreted as the expected current value of being able to export in period $t+1$ without having to pay the sunk costs. Its size depends on the expected profits the firm is likely to generate by exporting. Equation (7) can be rewritten as:

$$Y_{it} = \begin{cases} 1 : \text{ if } \pi_{it}(X_{it}) + \delta \cdot [E_t(V_{it+1}|Y_{it} = 1) - E_t(V_{it+1}|Y_{it} = 0)] > (1 - Y_{it-1})S \\ 0 : \text{ Otherwise} \end{cases} \quad (8)$$

and indicates that a firm will decide to export if the current and expected revenues from entering export markets are greater than the sunk entry costs.

5.2 Empirical Test for Self-selection Hypothesis: Probit/Logit Model

In order to estimate the export decision, we translate the theoretical model into an empirical probit model in which export behavior depends on a variety of observed, firm-specific characteristics:

$$Pr(Y_{it} = 1) = \Phi(Y_{it-1}, X_{it-1}) \quad (9)$$

where Φ is a cumulative normal density function, Y_{it-1} is previous export status, X_{it-1} is a vector of lagged control variables including productivity, size, education level of the manager, location of the firm, and source of finance among others. Finally, we also include dummy variables for the sector and the year of observation to capture time-and industry-specific effects not specific to an individual firm. For binary variables, the change in the predicted probability is presented when the variable changes from 0 to 1. For variables that are not binary, the change in predicted probability is examined for a unit change centered around the mean. This dynamic specification, which is close to that used in Bernard and Wagner (2001) and Bernard and Jensen (2004), takes into account sunk entry costs through persistence in the firm's export behavior. A positive and significant coefficient on the previous export status indicates that sunk costs are important during a firm's decision to take up export activities. To carry out robustness exercise, both probit and logit models are run and the results are given in table 10 below.

5.3 Discussion of the Main Findings

The estimation results for the whole sample identify several variables with significant explanatory power for the export decision. Labor productivity is a key determinant of the export decisions for firms in our sample. An increase in Labor productivity by one unit increases the probability of exporting by 0.03, holding other factors constant at their means. As expected, the influence of productivity on the decision to export seems to be strong and is statistically significant. This same result also holds under the logit model. Therefore our sample seems to strongly support the self-selection hypothesis in the Uganda's manufacturing sector. That is, firms that are more productive before, self-select themselves into export markets in the subsequent period. These results are in line with the findings by Roberts and Tybout (1998) and Bernard and Wagner (2001) whose data strongly supported the self-selection hypothesis. The policy implication is that, in order to promote

| Variable | Marginal effects (Probit) | Marginal effects (Logit) |
|---|---------------------------|--------------------------|
| Labor productivity | 0.03(2.69)*** | 0.03(2.03)* |
| Previous Export status | 0.2(2.99)*** | 0.19(3.05)*** |
| Capital Intensity | 0.016(2.24)** | 0.013(1.47) |
| Firm Size | 0.05(3.15)*** | 0.04(1.73)* |
| Firm age | -0.02(-0.95) | -0.01(-0.76) |
| Capacity utilization | 0.14(2.34)** | 0.13(3.12)*** |
| Experience of the manager | 0.06(2.40)** | 0.05(1.92)* |
| Agro-industry | 0.19(3.73)*** | 0.16(1.74)* |
| Chemicals and Paints | 0.02(0.31) | 0.03(0.44) |
| Paper and publishing | 0.05(0.78) | 0.03(0.53) |
| University education | 0.03(0.69) | 0.03(0.72) |
| Central location | 0.003(0.01) | 0.002(0.06) |
| Private held, ltd company | 0.09(2.41)** | 0.08(1.36) |
| Bank Loan | 0.17(1.53) | 0.15(0.99) |
| Pseudo R2 | 0.4955 | 0.4933 |
| Robust z statistics in parentheses,* significant at 10%; ** significant at 5% *** significant at 1%; All explanatory variables are lagged one year; N=542. | | |

Table 10: Probability of Exporting

exporting, maintaining a good macroeconomic environment alone is not enough, but it is imperative to address firm-level constraints and putting straight the general microeconomic environment that influence firm productivity.

Sunk costs are a key determinant of export decisions for firms in our sample. A discrete change from 0 to 1 in lagged export status increases the estimated probability of exporting by 0.2, at the means of all remaining variables. This technically implies that, being an exporter in the previous period, makes it more likely for firms to continue exporting in the subsequent period, meaning that sunk costs are quite significant in Uganda's export sector. This is in line with the findings of Bernard and Wagner (2001) and Bernard and Jensen (2004). The policy implication is that, the government should set up deliberate policies aimed at reducing the sunk costs for prospective exporters; for instance, providing them with free information and completely eliminating the red-tape in the export business. Another variable with significant positive influence on the export decision is firm size; an increase in firm size by 1 unit increases the probability of exporting by 0.05, holding other factors constant at their means. This implies that bigger firms before, are more likely to become exporters in the subsequent period. This still requires government effort that strongly addresses firm-level constraints.

Capital intensity is also a significant factor influencing the probability of exporting. An increase

in capital intensity by 1 unit increases the probability of exporting by 0.02 holding other factors constant at their means. However, Sub-Saharan African countries in general, and Uganda in particular, have an extreme disadvantage in the production of capital goods making capital intensity at firm-level abnormally low. This leaves only one option of importing capital goods from technologically advanced countries, which is in most cases very expensive given the foreign exchange shortage and trade restrictions. Therefore, the government of Uganda should purpose to make the importation of capital goods simpler for manufacturers and also attract foreign investors who in most cases come with own physical and human capital.

Capacity utilization is also a significant factor in influencing the decision to export. An increase in capacity utilization by 1 per cent increases the probability of exporting by 0.14, holding other factors constant at their means. Increasing capacity utilization can be achieved once firm-level constraints and the problem of high sunk costs are addressed. It should be noted, though, that large firms, which are more likely to be exporters, may operate below their capacity for strategic and other reasons. A firm whose manager has prior experience at the foreign firm, also significantly influences the probability of exporting. A one more year of experience, increases the probability of exporting by 0.06 holding other factors constant at their means. This issue concerns accumulation of human capital which can also be achieved through encouraging technical, practical and industry-based education, as well as offering entrepreneurship courses in the training institutions. A firm that belongs to the agro-industry sector has the probability of exporting of 0.2 higher than a firm that belongs to any other sector, other factors fixed at their means. The variables that remain robust across the probit and logit models are previous export status, agro-industry, capacity utilization, labor productivity, experience of the manager and firm size. This confirms that a firm under agro-industry, that is also more productive, larger and with previous export experience, is more likely to become an exporter in the subsequent period.

6 Learning-by-Exporting Hypothesis

6.1 Theoretical Framework

The theory of exporting and learning postulates that firms gain information when exporting and that such learning enhances their productivity. Consider the following quotes set out in Clerides,

Lach and Tybout (1998): *...a good deal of information needed to augment basic capabilities has come from the buyers of exports who freely provided product designs and offered technical assistance to improve process technology in the context of their sourcing activities. Some part of the efficiency of export-led development must therefore be attributed to externalities derived from exporting (Evenson and Westphal 1995).*

The important thing about foreign buyers, many of which have offices in Seoul, is that they do much more than buy and specify. . . . They come in, too, with models and patterns for Korean engineers to follow, and they even go out to the production line to teach workers how to do things (Rhee, Ross-Larson, and Pursell 1984, p.41).

When local goods are exported the foreign purchasing agents may suggest ways to improve the manufacturing process (Grossman and Helpman 1991, p.166).

Korean firms "benefit from their foreign buyers through the provision of blueprints and technical specifications of competing products, visits to the production plants by engineers from the importing countries, and constant feedback on the design, quality and technical performance of products." (Rhee, Ross-Larson and Pursell 1984).

In Indonesia "some firms have Japanese customers annually review their production methods to suggest improvements that would minimize costs, while others have their German customers advise on how to expand their production capacity." (Blalock and Gertler 2004).

Exporters, therefore, acquire from their foreign customers information on how to improve the manufacturing process, decrease production costs, improve product design, and upgrade product quality. This information, it is argued, gives exporters a performance edge. If learning occurs through the acquisition of knowledge of new production methods, inputs, and product designs abroad, an advanced country surely offers greater "learning potential"-there are simply more things to learn. An advanced country also sets higher standards with respect to product quality, timing of shipments, etc., and will challenge the exporter to meet these expectations. Hence, a market in an advanced country offers a much more rigorous "teach and discipline" experience than that in a less advanced country (Natalia Trofimenko, 2005).

More recently, policies of export-led growth have also been supported on the grounds that they improve the productivity of exporting firms. One often-cited reason for such improvement is that foreign buyers transfer technology to firms that introduce new export products. Additionally, as case study evidence from Taiwan suggests, the possibility of exploiting profitable opportunities

by selling in export markets may stimulate firms to improve their own technological capabilities (Westphal, 2002). Improvements in productivity associated with the access to export markets have been referred to by Clerides et al. (1998) and others as learning-by-exporting.

Theoretical models by Krugman (1979) and Jovanovic and Lach (1991) have shown that firms/plants can benefit from exporting activities because they can learn about and adopt international best practice production methods, receive feedback from international clients and competitors, and benefit from other knowledge spillovers or externalities. Also, plants can improve their product offerings because of their numerous interactions with, and the typically high standards of foreign clients.

In his classical work on learning-by-doing, Arrow (1962) suggests two main characteristics of learning. First, "learning is the product of experience. Learning can only take place through the attempt to solve a problem and therefore only takes place during activity" (p.155). Second, "learning associated with repetition of essentially the same problem is subject to sharply diminishing returns...To have steadily increasing performance, then implies that the stimulus situations must themselves be steadily evolving rather than merely repeating" (pp.155-6).

We believe that Arrow's general characterization of learning applies to domestic firms breaking into export markets. Those firms need to solve new problems such as adopting stringent technical standards to satisfy more sophisticated consumers. The production of export goods may require the introduction of new, more efficient equipment to which workers need to adjust. Export markets are likely to be more competitive than the domestic market, putting pressure on firms to meet orders in a timely fashion and ensure quality standards for their products. Meeting all these challenges may help firms improve their productivity. However, once-and provided that-firms succeed in meeting these challenges, the scope for further learning may be significantly diminished. This suggests that one is more likely to observe increases in productivity in new entrants into export markets than in established exporters. This implication has some support from the empirical literature. For example, Delgado et al. (2002) find strong effects of exporting on productivity growth for a sample of young plants in Spain, but not for established exporters. Similarly, Bernard and Jensen (2004b) find that continuing exporters in the US have virtually the same productivity growth as non-exporters, contrasting with the strong performance of entrants in the export market.

The mechanism behind the type of learning-by-exporting effect can be further conceptualized using Rosenberg's (1982) "learning-by-using" hypothesis. Rosenberg (1982) defines learning-by-using as knowledge that can only be acquired after a product/process has been used. In the

exporting context, this refers to learning acquired after being in the export market continuously over time. This differs from Arrow’s (1962) classical ”learning-by-doing” interpretation where the largest learning (and, consequently, productivity increases) only occurs as firms enter the export market. Arrow (1962) hypothesized that the rate of learning and rate of productivity improvement declines after entry since firms have learned the proverbial ropes of exporting. Rosenberg’s (1982) intuitively appealing learning-by-using effect, argues that, exporting firms continually learn over time through their interaction with the international competitors and consumers. In this framework, knowledge is freely borrowed or exchanged and the knowledge spillover to exporting firms increases with more interaction with the international firms and consumers.

We analyze the link between exporting and efficiency using a production function approach. Our baseline production function is taken to be dynamic Cobb-Douglas, modelling output as a function of capital, labor and efficiency.

$$Y_{it} = A_{it}K_{it}^{\alpha}L_{it}^{\beta} \quad (10)$$

Above, A_{it} is the productivity parameter, L_{it} and K_{it} are stocks of labor and capital respectively. Equation (10) can be written in per worker terms also called the intensive form (or the *AK* model in Barro and Sala-i-Martin, 2004).

$$y_{it} = A_{it}k_{it}^{\alpha} \quad (11)$$

where y_{it} is output per worker in each firm (our measure of productivity) and k_{it} is capital intensity (capital per worker).

Based on the learning-by-exporting idea, we hypothesize that the productivity parameter, A_{it} , depends on exporting and, since learning is unlikely to be instantaneous, this effect operates with a one-period lag.¹

$$A_{it} = f(X_{it-1}, Z_{it}) \quad (12)$$

where X_{it-1} is a dummy variable for previous export status; equal to one if firm i was an exporter in period $t - 1$ and zero else. Z_{it} is a vector of firm-specific characteristics (control variables) including ownership, location, industry, source of finance at start-up and capacity utilization among others. After imposing elasticities on the right hand side elements of equation (13), we can rewrite it as

¹Our sample, described above, consists of three waves of panel data and therefore, we can not allow for a longer lag structure than one period.

follows:

$$A_{it} = X_{it-1}^\lambda Z_{it}^\gamma \quad (13)$$

Substituting for the productivity parameter in equation(11) gives:

$$y_{it} = X_{it-1}^\lambda Z_{it}^\gamma k_{it}^\alpha \quad (14)$$

Taking natural logs on both sides of equation (14) gives an estimable linear function:

$$\ln y_{it} = \delta + \lambda \ln X_{it-1} + \gamma \ln Z_{it} + \alpha \ln k_{it} + \eta_i + \varepsilon_{it} \quad (15)$$

The compound disturbance term is composed of two terms. The first, η_i , is the firm-specific effect (unobserved firm heterogeneity) that reflects firm efficiency and managerial skills. The second, ε_{it} , is a random disturbance term assumed to be distributed identically and independently across firms. It represents factors such as luck, weather conditions and unpredicted variations in inputs. Equation (15) can be estimated by using either the fixed effects estimator or the Random effects estimator and the choice of either depends on the Hausman's (1978) test demonstrated later in this chapter.

6.2 Measure of Factor Productivity

Productivity is concerned with how companies use the resources (e.g. labor, equipment, machinery, materials) needed to produce goods and services. Technically, it is defined as a ratio of the output and quality of goods and services produced in relation to the inputs used in the production process in a given period. An increase in productivity is important to a country's competitiveness on the market. It is said to increase when the same amount of resources are used to produce more and a better quality of output; quality should create value. It should be noted that an increase in production does not necessarily mean an increase in productivity. There are two concepts of productivity. Firstly, single factor, or labor productivity which refers to the amount of output produced relative to the labor resources used, that is, labor hours or number of workers employed. Secondly, multi-factor or total productivity, which refers to the level of output of goods and services, produced relative to all the inputs used. The level of factor productivity has important implications for prices of final products and competitiveness and performance in general. Understanding the

drivers of productivity is thus important in shaping policy to ensure a competitive manufacturing sector, both domestically and internationally. It should be emphasized that all other efforts to promote and expand manufacturing activity in the economy will yield very little if they are not matched by tremendous improvements in productivity.

Single factor or labor productivity was used as a measure of factor productivity and two forms of the production function were possible. One seeks to explain value-added per worker while the second uses gross output per worker. There are advantages and disadvantages to both measures. The advantage of the gross output per worker measure is that it allows firms to have different efficiencies at transforming intermediate inputs (for example raw materials) into output. Its disadvantage is that the capital stock and raw materials tend to be highly correlated so that it can be difficult to know what the effect of capital stock is on output. In contrast the value-added per worker production function, in which value added is defined as gross output less intermediate inputs, does not allow for the different efficiencies with which firms convert intermediate inputs into output. Such a procedure allows the effect of capital on output to be more easily identified. However it comes at a cost. The cost is that the resulting estimates for the effects of various factors on underlying efficiency may be too high. It is therefore desirable to present both estimates and see which results are robust to moving from the value-added per worker measure to the general equation explaining gross output per worker.

6.3 Empirical Test for Learning-by-Exporting Hypothesis: Fixed Effects or Random Effects Estimator?

The random effects estimator is attractive when the unobserved effect is uncorrelated with all the explanatory variables. If we have good controls (comprehensive controls that capture all the relevant characteristics) in our equation, we believe that any leftover neglected heterogeneity only induces serial correlation in the composite error term, but it does not cause correlation between the composite errors and the explanatory variables (there will be no relevant unobserved characteristics). Estimation of random effects models by generalized least squares solves the serial correlation problem in the composite error term. The greatest advantage of the random effects estimator over the fixed effects estimator is that it allows for explanatory variables that are constant over time, yet the same get swept away under the fixed effects transformation. Thus, under the fixed effects estimator, we

would be able to say nothing about the relationship between time-invariant characteristics and the dependent variable under consideration. On the other hand, the major attraction of fixed effects estimator over the random effects estimator is that it tackles the unobserved heterogeneity bias and hence yielding more consistent estimates. An attempt was made to compare the two estimators using data and basing on the Hausman's test, we chose the most fitting estimator.

Equation(15) becomes a random effects model when we assume that the unobserved effect η_i is uncorrelated with each explanatory variable. If we define the composite error term as, $\nu_{it} = \eta_i + \varepsilon_{it}$, then (15) can be written as:

$$\ln y_{it} = \delta + \lambda \ln X_{it-1} + \gamma \ln Z_{it} + \alpha \ln k_{it} + \nu_{it} \quad (16)$$

Because η_i is in the composite error in each time period, the ν_{it} are serially correlated across time. In fact, under the random effects assumptions,

$$\text{Corr}(\nu_{it}, \nu_{is}) = \frac{\sigma_\eta^2}{(\sigma_\eta^2 + \sigma_\tau^2)} \quad \forall t \neq s \quad (17)$$

where

$$\sigma_\eta^2 = \text{Var}(\eta_i) \text{ and } \sigma_\tau^2 = \text{Var}(\varepsilon_{it}) \quad (18)$$

We can use the generalized least squares (GLS) to solve the serial correlation problem here. In order for the procedure to have good properties, it must have large N and relatively small T as is the case for the current study. Deriving the GLS transformation that eliminates serial correlation in the errors requires sophisticated matrix algebra. But the transformation itself is simple. Define:

$$\phi = 1 - \left[\frac{\sigma_\tau^2}{(\sigma_\tau^2 + T\sigma_\eta^2)} \right]^{1/2}, \quad (19)$$

which is between zero and one. Then, the transformed equation turns out to be:

$$y_{it} - \phi \bar{y}_i = \delta(1 - \phi) + \lambda(X_{it-1} - \phi \bar{X}_{it-1}) + \gamma(Z_{it} - \phi \bar{Z}_i) + \alpha(k_{it} - \phi \bar{k}_i) + (\nu_{it} - \phi \bar{\nu}_i) \quad (20)$$

Where the over-bar denotes the time averages. It should be noted that the random effects transformation subtracts a fraction of the time average, where the fraction depends on σ_τ^2 , σ_η^2 , and T , the

number of time periods, yet the fixed effects estimator subtracts the time averages from the corresponding variable. The following equation shows the fixed effects transformation that eliminates the unobserved heterogeneity.

$$y_{it} - \bar{y}_i = +\lambda(X_{it-1} - \bar{X}_{it-1}) + \gamma(Z_{it} - \bar{Z}_i) + \alpha(k_{it} - \bar{k}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i) \quad (21)$$

6.4 Hausman's Test (1978)

Comparing the fixed effects and random effects estimators can be a test for whether there is correlation between the unobserved effect and the explanatory variables, assuming that the idiosyncratic errors and the explanatory variables are uncorrelated across all time periods. Because of the properties of fixed effects estimator, only the time variant firm-specific drivers of productivity were included in the analysis. It can be shown from table 11 below that, the null hypothesis that differences in coefficients are not systematic can not be rejected even at 15 percent level of significance. This result favors the random effects estimator over the fixed effects estimator and is robust whether it is output per worker production function (column 1 and 2) or value added per worker production function (column 3 and 4) that is estimated. Therefore, for all the subsequent estimates, random effects estimator shall be employed instead of the fixed effects estimator. However, a comparison of the fixed effects and the random effects estimators reveals interesting relationships. For output per worker production function, the log of capital intensity and wage per worker are statistically significant and of the same magnitude for both fixed effects and random effects estimators. For value added per worker production function, it is only wages per worker that is statistically significant across the two estimators, but capital intensity is not statistically significant. Previous export status is statistically significant for the random effects estimator and across output per worker and value added per worker production functions. However, it is statistically insignificant under fixed effects estimator and across output per worker and value added per worker production functions. Table 11 below shows an empirical comparison of the fixed effects and random effects estimators using the Hausman's test.

| Variable | FE | RE | FE | RE |
|--|--|----------------|--|----------------|
| Log capital intensity | 0.274(0.14)* | 0.271(0.08)*** | 0.292(0.2) | 0.092(0.08) |
| Log wage per worker | 0.690(0.17)*** | 0.692(0.1)*** | 0.612(0.23)** | 0.841(0.12)*** |
| Log capacity | 0.687(1.3) | -0.366(0.6) | -0.141(1.7) | -0.578(0.6) |
| Bank loan | -0.179(0.7) | 0.051(0.41) | -0.848(0.94) | 0.608(0.43) |
| Previous Export Status | 0.074(0.07) | 0.61(0.3)** | 0.111(0.07) | 0.63(0.3)** |
| Constant | 0.933(5.6) | 3.540(2.6) | 4.565(8) | 3.386(2.6) |
| Hausman Test | chi2 (5)=6.07; <i>prob</i> > <i>chi2</i> = 0.3 | | chi2 (5)=7.24; <i>prob</i> > <i>chi2</i> = 0.2 | |
| R-squared | 0.7083 | 0.789 | 0.6082 | 0.7917 |
| Standard errors in parentheses,* significant at 10%; ** significant at 5%;*** significant at 1% the dependent variable for the first two columns is output per worker yet for the last two columns is value added per worker; FE=Fixed effects and RE=Random effects | | | | |

Table 11: Hausman's Test (1978)

6.5 Discussion of the Main Findings

Table 12 below shows the empirical test for the learning-by-exporting hypothesis using a panel data generalized least squares (GLS) technique (estimating model 16). This is a fuller specification where we control for even the time invariant firm-specific factors omitted in the first estimation due to fixed effects properties. The first model (1) examines the value added per worker production function specification and controls for export status, location, sector, capacity utilization, age, and education level of the entrepreneur. The coefficients on capital intensity and wages per worker are positive and significant, as expected, and so is the coefficient of previous export status. The estimated coefficient on wages per worker is equal to 0.85, and that on capital intensity is equal to 0.11, which implies that a one percentage increase in wages increases the level of value added per worker by 0.85 per cent whereas a one percentage increase in the capital intensity yields an increase in the level of value-added per worker by 0.11, on average. The coefficient on previous export status (the learning coefficient) is positive and significant, and therefore, as expected, exporting firms are significantly more productive than their counter parts that concentrate on the domestic market only. Being an exporter in the previous period increases firm-level productivity by 0.6 percentage points once compared to non-exporters. These results are robust even when output per work production function is estimated (model 2).

These results are similar to those reported by Girma, Greenaway and Kneller (2004). They supported the learning-by-exporting hypothesis by arguing that exporters are more productive, larger, and more efficient and pay higher wages. Exporters' superior labor productivity performance can

| Variable | Model 1 | Model 2 |
|--|---------------|--------------|
| Constant | 0.2(0.7) | 0.8(0.7) |
| Log Capital Intensity | 0.11(0.04)*** | 0.2(0.04)*** |
| Log wage per worker | 0.85(0.05)*** | 0.8(0.05)*** |
| Log age | 0.3(0.14)** | 0.2(0.16) |
| Age square | - 0.02(0.012) | -0.02(0.012) |
| Previous export status | 0.62(0.3)** | 0.6(0.3)** |
| Log Capacity Utilization | 0.2(0.16) | 0.25(0.14)* |
| Agro-industry | 0.23(0.22) | -0.07(0.22) |
| Chemicals and paints | - 0.5(0.46) | -0.6(0.43) |
| University education | 0.5(0.24)** | 0.33(0.23) |
| Central location | 0.11(0.22) | 0.09(0.2) |
| Bank loan | 0.4(0.33) | 0.23(0.3) |
| R-Square | 0.8728 | 0.8696 |
| Standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1% The dependent variable is value added per worker (column 1); and output per worker (column 2); The estimation method is GLS, N=542 | | |

Table 12: Testing Learning-by-Exporting Hypothesis

be partly explained by positive externalities due to exporting; such as knowledge and technology spillovers from foreign buyers and competitors and also by the higher capital-intensity in exporting firms once compared to the non-exporters. Technology and knowledge spillovers are key mechanisms which link international trade and endogenous growth. In their classic work, Grossman and Helpman (1991) show how international trade can boost a country's Research and Development sector (the sector which drives economic growth) by transmitting technological information, increasing competition and entrepreneurial effort and expanding the size of the market in which innovative firms operate.

The results also indicate that the education of entrepreneurs/managers is significant in determining a firm's productivity growth. A firm whose manager has a university education outperforms all others; an increase in education level of the manager by one year, increases firm-level productivity by 0.5 percentage points. The policy implication is that, the government should adopt deliberate policies aimed at human capital accumulation through relevant education especially the private sector-initiated training programmes (those that are targeted at covering firm-specific human capital gaps).

As already has been suggested the value-added per worker production function estimates may be too high, and for this reason it is necessary to establish how many of these results continue to hold if a gross output per worker function is estimated as in the second column of table 12. It

is clear that the differences in the determinants of productivity are just minor between the two production functions. Key variables such as capital intensity, wage per worker, and previous export status remain robust even when the gross output per worker production function is estimated. Location and source of finance at start-up do not significantly influence the level of productivity in both cases. However, the level of age of the firm and university education become insignificant, yet, capacity utilization becomes significant in influencing productivity under the gross output per worker production function.

These results raise the question of whether any learning effects depend on the firm's previous export experience, that is, does the magnitude and significance of β vary with past export experience? Girma, Greenaway and Kneller (2004) find that output and labor productivity growth rates of exporters are highest in the first year post entry and become smaller and insignificant in the second year. So if learning by exporting only occurs in the first few years after a firm breaks into the export market we should expect β to be positive and significant among new entrants but insignificant for earlier entrants with more export experience. To explore this, in line with Kraay (1999) we classify the firms into: established exporters, and export entrants. Since we are particularly interested in whether learning effects depend on firms' past exporting experience, we excluded exiters (stoppers) and switchers from the sample and separate entrants further into two types of firms for a given time point t : (a) New entrants: entrants which started exporting at $t - 1$. (b) Entrants with at least 2 years of exporting experience: entrants that start exporting prior to $t - 1$ (in our case we label such firms as established exporters since we only have three waves of panel data). Table 13 shows this classification. To investigate how any learning effect varies with the

| Type of firms | At and prior to $t - 3$ | At $t - 2$ | At t and $t - 1$ |
|-----------------------|-------------------------|------------|--------------------|
| New entrants | 0 | 0 | 1 |
| Established exporters | 0 or 1 | 1 | 1 |
| Non-exporters | 0 | 0 | 0 |

Table 13: Types of Firms According to Past Export Experience at time t

firms' previous exporting experience, equation (16) was re-run with the two export status dummy variables seeking to compare the new entrants and established exporters.

$$y_{it} = \delta + \lambda_1 \text{Established}_{it-1} + \lambda_2 \text{Starter}_{it-1} + \gamma Z_{it} + \alpha k_{it} + \nu_{it} \quad (22)$$

| Variable | Model 1 | Model 2 |
|--------------------------|---------------|----------------|
| Constant | 0.14(0.8) | 0.8(0.7) |
| Log capital Intensity | 0.1(0.04)** | 0.19(0.04)*** |
| Log wage per worker | 0.86(0.05)*** | 0.8(0.05)*** |
| Log age | 0.3(0.16)* | 0.2(0.16) |
| Age square | -0.013(0.013) | - 0.018(0.012) |
| Log Capacity Utilization | 0.2(0.17) | 0.3(0.14)* |
| Established Exporters | 0.7(0.3)** | 0.7(0.34)** |
| Starters | -0.6(0.6) | - 0.6(0.4) |
| Agro-industry | 0.23(0.23) | - 0.07(0.2) |
| Chemicals and paints | -0.4(0.5) | - 0.5(0.4) |
| University education | 0.5(0.24)* | 0.3(0.2) |
| Central location | 0.16(0.23) | 0.12(0.2) |
| Bank loan | 0.4(0.3) | 0.2(0.3) |
| R-Squared | 0.8736 | 0.8710 |

Standard errors in parentheses,* significant at 10%; ** significant at 5%;
*** significant at 1% The dependent variable is value added per worker (column 1)
; and output per worker (column 2); The estimation method is GLS, N=542

Table 14: Export Experience and the Learning-by-Exporting Hypothesis

The new entrants with only one year of export experience, have productivity in the following year of 0.6 percentage points lower than that of non-exporters and this learning coefficient is not statistically significant at any conventional level. On the other hand, established exporters with many years of export experience, have an increase in the level productivity of 0.7 percentage points higher than that of non-exporters and this learning coefficient is positive and statistically significant at five percent level. These results indicate that more experienced exporters reap more productivity gains from learning effects, which is in line with the finding in Kraay (1999). However, it is inconsistent with the intuition that learning-by-exporting is more likely a one-off effect which only occurs in the first few years post-entry and diminishes as the firm's exporting experience increases, rather than being a cumulative process. The results, therefore, differ from Arrow's (1962) classical "learning-by-doing" interpretation where the largest learning (and, consequently, productivity increases) only occurs as firms enter the export market. Arrow (1962) hypothesized that the rate of learning and rate of productivity improvement declines after entry since firms have learned the proverbial ropes of exporting. However, the results are in line with Rosenberg's (1982) intuitively appealing learning-by-using effect. Rosenberg argues that, exporting firms continually learn over time through their interaction with the international competitors and consumers. In this frame-

work, knowledge is freely borrowed or exchanged and the knowledge spillover to exporting firms increases with more interaction with the international firms and consumers.

Since established exporters are those firms which have successfully survived competition in export markets for many years, they may have already exhausted the benefits of learning. On the other hand, though, these findings may seem logical/applicable especially for firms in the less developing countries like Uganda. It may be the case that firms that are new entrants in the export market are over burdened by sunk costs of entry hence becoming less productive initially. However, after this strenuous period, firms are expected to stabilize and hence experience higher productivity levels once compared to the non-exporters. In addition, knowledge accumulation/learning is unlikely to be instantaneous and hence new entrants need some time over which they implement their new experiences.

It is also important to estimate the relationship between overall plant growth, both shipments and employment, and initial export status. If the high productivity exporters also grow faster, in terms of employment and output, one would expect rising industry productivity levels as economic activity (both output and employment) shifts to these high productivity exporting plants. This can be empirically analyzed by estimating regressions of the form:

$$Size_{it} = \delta + \lambda X_{it-1} + \gamma Z_{it} + \alpha k_{it} + \nu_{it} \quad (23)$$

$$Size_{it} = \delta + \lambda_1 Established_{it-1} + \lambda_2 Starter_{it-1} + \gamma Z_{it} + \alpha k_{it} + \nu_{it} \quad (24)$$

Table (15) below shows the relationship between previous export status and firm size; column 1 and 2 show the estimation of equations (3.6.14) and (3.6.15) respectively.

The results show that capital intensity, wage per worker, labor force, age of the firm, capacity utilization, education of the manager, previous export status and export experience (established versus new entrants/starters) play an important role in determining the rate at which firms grow. Being an exporter in the previous period, increases the level of sales of the firm in the current period by 1.2 percentage points once compared to the non-exporters. Established firms in the export business are more likely to grow faster and larger once compared to the non-exporters and vice versa for export starters. Being an established exporter in the previous period increases the levels of sales of the firm in the current period by 1.3 percentage points once compared to the

| Variable | Model 1 | Model 2 |
|---|---------------|---------------|
| Constant | 5(1.1)*** | 5(1.1)*** |
| Log Capital Intensity | 0.13(0.03)*** | 0.13(0.03)*** |
| Log wage per worker | 0.6(0.07)*** | 0.6(0.07)*** |
| Log Employment | 0.7(0.07)*** | 0.7(0.07)*** |
| Log age | 0.4(0.18)** | 0.4(0.2)** |
| Age Square | - 0.02(0.02) | -0.02(0.02)* |
| Log Capacity utilization | 0.3(0.14)** | 0.3(0.14)** |
| Previous Export status | 1.2(0.3)*** | - |
| Previous Export status (Established) | - | 1.3(0.4)*** |
| Previous export status (Starters) | - | - 0.5(0.7) |
| Agro-industry | 0.17(0.3) | - 0.18(0.3) |
| Chemicals and paints | -0.3(0.5) | - 0.3(0.5) |
| Central location | 0.4(0.3) | 0.4(0.3) |
| University education | 0.6(0.3)** | 0.6(0.3)* |
| Bank Loan | 0.17(0.2) | 0.16(0.2)* |
| R-Square | 0.8626 | 0.8640 |
| Standard errors in parentheses,* significant at 10%; ** significant at 5%; *** significant at 1% The dependent variable is the level of sales in both model 1 and 2; The estimation method is GLS; N=542. | | |

Table 15: Previous Export-status and Firm Size

non-exporters. Yet, being an export starter in the previous period reduces the level of sales of the firm in the current period by 0.5 percentage points once compared to the non-exporters. It may also be the case that established exporters have already covered the sunk/fixed costs of entry and therefore are able to enjoy full benefits from exporting once compared to the new entrants. The new entrants are expected to be just recovering from the strenuous period of paying the sunk costs and therefore, may not grow as large in size once compared to the established firms. Also a firm whose source of finance at start-up is through a bank loan is more likely to grow faster and bigger than other firms that access finance through informal sources. Thus it may be worthwhile for both the government and donors to revisit their priorities in such areas as making credit facilities readily and cheaply accessible to manufacturing firms especially those with a special bias towards exporting. However, the possibility of endogeneity problem of the size of the firm and export-status cannot be overemphasized.

7 Conclusion

It can be concluded, therefore, that the data from Uganda's manufacturing sector seems to provide support for both self-selection and learning by exporting hypotheses. This is in line with the findings by Roberts and Tybout (1998) and Bernard and Wagner (2001) whose data strongly supported the self-selection hypothesis and are also in line with Girma, Greenaway and Kneller (2004) whose findings strongly supported the learning-by-exporting hypothesis. As expected, the learning-by-exporting hypothesis has more explanatory power for countries like Uganda facing significant technological gaps *visa-á-vis* the foreign markets. At the same time, it is practically impossible for a firm operating below average to enter and survive in a distant market, where competition is obviously fierce, making the self-selection hypothesis also logical. The major conclusion from the study is that there appears to be a feed-back relationship, from productivity to exporting and vice versa. Therefore, self-selection and learning-by-exporting are not mutually exclusive possibilities, as high-productivity firms afford the sunk cost of entry to export markets and, in principle, continue to improve their productivity as a result of their exposure to exporting. This is as Rosenberg (1982) argues, that exporting firms continually learn over time through their interaction with the international competitors and consumers; that is, knowledge spillover to exporting firms increases with more interaction with the international firms and consumers. The policy implication is that, the government should strive to eliminate firm-level constraints and generally improve the microeconomic environment if productivity and subsequently exporting, and through a feed-back effect more productivity growth can be attained.

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