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## Chapter 1 : The Measurement of Productive Efficiency and Productivity Growth

*The Measurement of Productive Efficiency and Productivity Growth Edited by Harold O. Fried, C. A. Knox Lovell, and Shelton S. Schmidt This book is an accessible update to the widely-hailed collection by the current editors, The Measurement of Productive Efficiency: Techniques and Applications (OUP, ).*

Lexicon Productivity Growth Productivity is a measurement of how efficient a production process is. It is calculated as a ratio of output to input. Within the same organization, in a given period of time, productivity may not be the same. Depending on so many factors, productivity can increase or decrease. A rise in productivity is what is referred to as productivity growth. What is Productivity Growth? Productivity growth simply refers to an improvement or increase in the efficiency of work or production. Generally, productivity growth is depicted by an increase in total output or production. However, an increase in total output or sales does not automatically mean there is growth in productivity. Since managers know that an increase in output does not necessarily mean there is an increase in efficiency, they find it very important to analyze and calculate the real productivity growth. It is however important to effectively calculate productivity growth in order to make strategic and proactive business decisions. Instances where Productivity growth occurs The most common way a growth in productivity occurs is when there is an increase in output. Even when output increases, one of these conditions must be present before productivity growth will occur: If there is an increase in output whiles input remains constant An increase in output with whiles input declines A higher proportional increase in output coupled with a lower proportional increase in input. Two common factors that drive Productivity Growth Technology Technology is one factor that leads to productivity growth. A company, after purchasing new technological devices, computers and equipment, may have no more need of some employees. This new machine may help increase output and this affects productivity growth positively. Likewise, the cost of operating the equipment may be less expensive than the combined annual wages of the former employees which means a decrease in input â€" which is also a positive to productivity growth. Jointly, they could assemble 20 cars per month. This means there is a growth in productivity or efficiency â€" they are spending less to get the same output. Labor Force Another driver of productivity growth is improvement in the labor force. When workers acquire more skills, they become more efficient and their contributions to total output increases. Sometimes, certain incentive schemes like bonuses and overtime can help increase their overall output whiles increased morale at the workplace also yields similar results. Managers who consider the various components of their inputs and take the necessary proactive steps to improve or change them experience productivity growth within their organizations.

## Chapter 2 : [P.D.F] The Measurement of Productive Efficiency and Productivity Growth by amadamus - Iss

*When Harold Fried, et al. published The Measurement of Productive Efficiency: Techniques and Applications with OUP in , the book received a great deal of professional interest for its accessible treatment of the rapidly growing field of efficiency and productivity analysis.*

This is an open access article distributed under the Creative Commons Attribution License , which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. Abstract Business incubators can play a major role in helping to turn a business idea into a technology-based organization that is economically efficient. However, there is a shortage in the literature regarding the efficiency evaluation and productivity evolution of the new technology-based firms NTBFs in the incubation scope. This study develops a model based on the data envelopment analysis DEA methodology, which allows the incubated NTBFs to evaluate and improve the efficiency of their management. Moreover, the Malmquist index is used to examine productivity change. The index is decomposed into multiple components to give insights into the root sources of productivity change. The proposed model was applied in a case study with 13 NTBFs incubated. Introduction The highly competitive environment of new technologies forces firms to seek mechanisms that enable them to achieve sustainable growth. Recent years have seen the emergence of business incubators all over the world. Incubators can play a key role in supporting new technology-based firms NTBFs by betting on innovation as a way to help the creation and development of these firms. However, it is still unclear whether the mission of the incubators to encourage the growth of NTBFs has been successful [ 1 ]. Since NTBFs are the general typology of incubated firms, it is important to ensure efficient management of the available resources. This situation forces firms to minimize their costs while continuing to provide quality and diversity products. Therefore, performance evaluation and benchmarking could help the NTBFs to become more productive and efficient by avoiding their untimely death. Data envelopment analysis DEA has been highlighted as an assessment tool of technical efficiency in organizations. The DEA allows evaluating the relative efficiency of a combination of units that convert multiple inputs into multiple outputs. For a given set of input and output variables, DEA produces a single comprehensive measure of performance efficiency score for each unit [ 2 ]. To measure the productivity change over time, this paper suggests a DEA-based Malmquist productivity index methodology [ 3 ]. However, there is a shortage of research into the subject in the context of incubated firms. The aim of this paper is to create a model for estimating the technical efficiency and productivity growth of NTBFs located in a business incubator during the period â€” Based on these comparisons, both across companies and over a period of time, it will be possible for firms with more specific sources on how to address improvements in terms of management in a macroperspective. The paper is organized as follows. Section 2 presents the state of art regarding the main characteristics for business incubators and some of their challenges regarding the evaluation of performance. Section 3 describes the concepts and models related to DEA, along with the Malmquist index. The proposed model to evaluate efficiency and productivity growth of NTBFs is presented in Section 4 along with the description, analysis and discussion of the results of the case study of Madan Parque, an incubator in Portugal. In Section 5 conclusions are presented. National and regional governments have launched several political programs and policies over the years seeking to develop a nurturing environment for NTBFs. These political measures are often a way to revitalize European regions that have been in economic decline and where there is a belief that NTBF can reverse that downwards trend [ 12 ]. Despite NTBFs performance and contribution to the economy, there are factors that may jeopardize their economic potential, for example, the management capacity and the sales ability of their marketing drive, as entrepreneurs often have mainly technological skills and competences. NTBF entrepreneurs are more likely to start and grow their companies in SCT business incubators than outside them [ 15 ]. According to Monck et al. To measure the internal efficiency, the authors propose the ratio of sales per employee. The authors used a combined approach of hierarchical balanced scorecard HBSC

and nonadditive fuzzy. The aim was therefore to develop a tool for improving performance measures through HBSC in complex environments and high competitiveness. The HBSC serves as a bridge between financial and nonfinancial perspectives and is an integrated system of performance measurement, combining the objectives of the organizations and other traditional functional areas of corporate strategy. Their study demonstrates the limitations that may exist in an HBSC survey of performance measures and thus contributes to the improvement of the effectiveness and efficiency of management. Measuring Efficiency and Productivity Growth 3. Data Envelopment Analysis Data envelopment analysis DEA measures the relative efficiency of decision-making units DMUs with multiple inputs and multiple outputs using a linear programming based model. The technique is nonparametric because it requires no assumption about the weights of the underlying production function [ 19 ]. Furthermore, DEA does not require prescribing the functional forms of the relationships between inputs and outputs that are needed in statistical regression approaches, and the variables can be measured in different units [ 20 ]. The set of efficient DMUs that form the efficient frontier can be identified. Thus, DEA is also a powerful benchmarking technique since it allows measuring the level of efficiency of nonfrontier units and identifying benchmarks against which such inefficient units can be compared [ 21 ]. In the literature, two DEA models are commonly used. The initial basic frontier model, known as the Charnes, Cooper, and Rhodes CCR model [ 22 ], is built on the assumption of constant returns to the scale CRS of activities. One is input-oriented and the other output-oriented [ 24 ]. The output-oriented score will be greater than or equal to 1, and that is the proportional increase in outputs that could be achieved by the unit under evaluation, with input quantities held constant. It is noted that defines a technical efficiency score that varies between 0 and 1 [ 25 ]. The existence of input and output slacks shows that additional input reduction or output production is needed in order to make the DMU efficient [ 2 ]. Scale efficiency evaluates the capacity of a unit being produced in CCR. If the scores of the two models are equal, then the DMU is operating under CCR, that is, in the most efficient scale of production. SE is always lower than 1. Expression 1 is equivalent to. This decomposition describes the sources of inefficiency, which may be caused by an inefficient operation from the DMU PTE , by disadvantageous conditions under which the DMU is operating SE , or both [ 20 ]. DEA has also been widely applied to different industries, and a number of different DEA models have been developed and improved based on the original DEA model see [ 2 , 21 , 24 , 27 â€” 31 ]. Compared to other indices, the Malmquist productivity index presents some important characteristics and properties. The Malmquist productivity index can be useful in situations in which the objectives of managers differ, are unknown, or are difficult to implement, since it does not require any assumption regarding the cost minimization or profit maximization [ 33 ]. Moreover, an assumption associated with application of MI is the existence of a competitive market, which encourages businesses to implement effective strategies [ 25 ]. The calculation of the MI requires measurements of two different time periods and two grouped periods. Consider The above measure is actually the geometric mean of two Malmquist productivity indices [ 1 ]. When , it indicates productivity gain; when , it signifies productivity loss; and means no change in productivity from and [ 5 ]. The MI can be decomposed into two components: Consider The ratio outside the brackets measures the change in relative efficiency; that is, it is also a measure of how close the DMU is to the frontier in period compared with period. The bracketed term is the index of change in technology between two periods. In relation to the returns to scale assumption, the MI must be calculated in a first step on the basis of CRS, since, if measured according to VRS, the measurement obtained is inaccurate [ 35 ]. SEC quantifies the productivity gain or loss associated with a production unit, evaluating whether movements inside the frontier are in the right direction to attain the CRS point, where changes in outputs result in proportional changes in inputs [ 37 ]. In this case, MI would comprise three components [ 34 ]: While the TEC refers to the changes in technical efficiency calculated under CRS, the PTEC corresponds to changes in technical efficiency with regard to VRS and represents the changes resulting from efficiency improvements in operations and management activities. This decomposition allows us to contemplate situations in which a DMU may be technically effective, since the volume of production uses the least amount of resources, but not operating at the optimal scale production.

SEC shows the movements inside the boundary that are in the right direction to reach the CRS point at which the output changes result in proportional changes in inputs [ 36 ]. It appears, therefore, that greater emphasis has been given to evaluation activities within the NTBF on the whole, leaving aside the assessment of the efficiency of NTBF. With regard to outputs, the authors considered number of patents, export volume, return on investment, and sales volume. With regard to the outputs, annual sales, and the number of patents were used. The authors concluded that the performances differed significantly between the various companies, although the vast majority of firms are technically efficient. These authors used four inputs: Two outputs were considered: In addition to studying the efficiency of the six industries each year individually through the CCR and BCC models, the authors used the MI to examine their growth over time. Despite its drawbacks, the number of patents filed by a company continues to be widely used as a way to measure the level of technology diffusion. The author states that, for the growth of companies in some industries associated with designing new products, patents have no effect on sales growth. DEA can help managers to identify NTBF sources of inefficiency, and the best ways to improve performance based on best practices of reference units. DEA does not provide specific information on corrective actions needed to improve business performance, but focuses, rather, on analyzing the reasons why a DMU is inefficient. Thus, managers have the task of evaluating the feasibility of the practical application of the proposed targets for the inputs and outputs [ 41 ]. The Case Study of Madan Parque 4. To collect data, questionnaires were applied to firms incubated in Madan Parque, a business incubator located in Almada, Portugal. The main service of Madan Parque is business incubation. The Parque provides modular office spaces equipped with telephone, electricity, air conditioning, and internet access, as well as access to common spaces, services, and joint activities. By , there were 55 incubated companies that generated jobs. As it was intended to analyze the data available not only from the most recent year, but also from the two previous years, it was decided to restrict the analysis to firms operating in Madan Parque between the years and , ignoring the companies that started or ended activity in this period. This condition restricted the sample to 21 companies. It is important that the DMUs included in the analysis are homogeneous. Discarding firms with incomplete data resulted in a final sample of 13 firms. Tables 1 , 2 , and 3 report the data collected for the years , , and , respectively. Data for each DMU for the year  The data for the year Table 3 were analyzed in order to obtain the coefficients of correlation between variables, thus eliminating redundant information. We chose to analyze only the data from the year because it was the most recent year of the sample. Table 4 shows the matrix of correlations between inputs and outputs. Correlation coefficients of inputs and outputs. If two possible inputs present a high correlation, this may indicate that the inclusion of both is useless. The analysis of Table 4 shows that space costs are strongly correlated with the total number of employees, so the space costs variable was excluded from the analysis. The space costs are an indicator of firm size with respect to the occupied office area, so it is natural that the higher the amount of space costs, the greater the number of employees.

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## Chapter 3 : EconPapers: The Measurement of Productive Efficiency and Productivity Growth

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Abstract When Harold Fried, et al. Techniques and Applications with OUP in , the book received a great deal of professional interest for its accessible treatment of the rapidly growing field of efficiency and productivity analysis. The first several chapters, providing the background, motivation, and theoretical foundations for this topic, were the most widely recognized. In this tight, direct update, these same editors have compiled over ten years of the most recent research in this changing field, and expanded on those seminal chapters. The book will guide readers from the basic models to the latest, cutting-edge extensions, and will be reinforced by references to classic and current theoretical and applied research. It is intended for professors and graduate students in a variety of fields, ranging from economics to agricultural economics, business administration, management science, and public administration. It should also appeal to public servants and policy makers engaged in business performance analysis or regulation. Suggested Citation Fried, Harold O. To find whether it is available, there are three options: Check below whether another version of this item is available online. Perform a search for a similarly titled item that would be available. More about this item Access and download statistics Corrections All material on this site has been provided by the respective publishers and authors. You can help correct errors and omissions. See general information about how to correct material in RePEc. For technical questions regarding this item, or to correct its authors, title, abstract, bibliographic or download information, contact: General contact details of provider: If you have authored this item and are not yet registered with RePEc, we encourage you to do it here. This allows to link your profile to this item. It also allows you to accept potential citations to this item that we are uncertain about. We have no references for this item. You can help adding them by using this form. If you know of missing items citing this one, you can help us creating those links by adding the relevant references in the same way as above, for each refering item. If you are a registered author of this item, you may also want to check the "citations" tab in your RePEc Author Service profile, as there may be some citations waiting for confirmation. Please note that corrections may take a couple of weeks to filter through the various RePEc services. More services and features.

## Chapter 4 : Economic Growth: What are the Best Measurements? | Investopedia

*1 THE MEASUREMENT OF PRODUCTIVE EFFICIENCY AND PRODUCTIVITY GROWTH Edited by HAROLD O. FRIED Union College C. A. KNOX LOVELL University of Georgia.*

This is done in order to avoid double-counting when an output of one firm is used as an input by another in the same measurement. Increases in it are widely used as a measure of the economic growth of nations and industries. GDP is the income available for paying capital costs, labor compensation, taxes and profits. Freeman ,5 The measure of input use reflects the time, effort and skills of the workforce. Denominator of the ratio of labour productivity, the input measure is the most important factor that influences the measure of labour productivity. Labour input is measured either by the total number of hours worked of all persons employed or total employment head count. Freeman ,5 There are both advantages and disadvantages associated with the different input measures that are used in the calculation of labour productivity. It is generally accepted that the total number of hours worked is the most appropriate measure of labour input because a simple headcount of employed persons can hide changes in average hours worked and has difficulties accounting for variations in work such as a part-time contract , leave of absence , overtime , or shifts in normal hours. However, the quality of hours-worked estimates is not always clear. In particular, statistical establishment and household surveys are difficult to use because of their varying quality of hours-worked estimates and their varying degree of international comparability. GDP per capita is a rough measure of average living standards or economic well-being and is one of the core indicators of economic performance. Maximizing GDP, in principle, also allows maximizing capital usage. For this reason GDP is systematically biased in favour of capital intensive production at the expense of knowledge and labour-intensive production. Saari ,10,16 Another labour productivity measure, output per worker, is often seen as a proper measure of labour productivity, as here: Total factor productivity Trends in U. When multiple inputs are considered, the measure is called multi-factor productivity or MFP. If the inputs specifically are labor and capital, and the outputs are value added intermediate outputs, the measure is called total factor productivity or TFP. TFP measures the residual growth that cannot be explained by the rate of change in the services of labour and capital. MFP replaced the term TFP used in the earlier literature, and both terms continue in use usually interchangeably Hulten ,7. TFP is often interpreted as a rough average measure of productivity, more specifically the contribution to economic growth made by factors such as technical and organisational innovation. The original MFP model Solow involves several assumptions: In practice, TFP is "a measure of our ignorance", as Abramovitz put it, precisely because it is a residual. This ignorance covers many components, some wanted like the effects of technical and organizational innovation , others unwanted measurement error, omitted variables, aggregation bias, model misspecification Hulten , Hence the relationship between TFP and productivity remains unclear. Accounting procedure[ edit ] Accounting procedure of MFP Saari The MFP measure can be compactly introduced with an accounting procedure in the following calculation. We can use the fixed price values of the real process in the production model to show the accounting procedure. Fixed price values of the real process depict commensurate volumes of the outputs and inputs. When we subtract from the output the intermediate inputs we obtain the value-added. Value-added is used as an output in MFP measure. The principle is to compare the growth of the value-added to the growth of labour and capital input. The formula of the MFP growth is as follows Schreyer ,7: The residual problem of Multi Factor Productivity was solved by many authors who developed production income formation models where productivity was an integrated factor. For this purpose was needed Total Productivity concept. Production economics When all outputs and inputs are included in the productivity measure it is called total productivity. A valid measurement of total productivity necessitates considering all production inputs. If we omit an input in productivity or income accounting this means that the omitted input can be used unlimitedly in production without any impact on accounting results. Because total productivity includes all production

inputs it is used as an integrated variable when we want to explain income formation of production process. Davis has considered [5] the phenomenon of productivity, measurement of productivity, distribution of productivity gains, and how to measure such gains. According to Davis, the price system is a mechanism through which productivity gains are distributed, and besides the business enterprise, receiving parties may consist of its customers, staff and the suppliers of production inputs. In the main article is presented the role of total productivity as a variable when explaining how income formation of production is always a balance between income generation and income distribution. The income change created by production function is always distributed to the stakeholders as economic values within the review period. Benefits of productivity growth[ edit ] Labour productivity growth in Australia since , measured by GDP per hour worked indexed Productivity growth is a crucial source of growth in living standards. Productivity growth means more value is added in production and this means more income is available to be distributed. At a firm or industry level, the benefits of productivity growth can be distributed in a number of different ways: Productivity growth is important to the firm because it means that it can meet its perhaps growing obligations to workers, shareholders, and governments taxes and regulation , and still remain competitive or even improve its competitiveness in the market place. Adding more inputs will not increase the income earned per unit of input unless there are increasing returns to scale. In fact, it is likely to mean lower average wages and lower rates of profit. But, when there is productivity growth, even the existing commitment of resources generates more output and income. Income generated per unit of input increases. Additional resources are also attracted into production and can be profitably employed. Drivers of productivity growth[ edit ] See also: Productivity improving technologies In the most immediate sense, productivity is determined by the available technology or know-how for converting resources into outputs, and the way in which resources are organized to produce goods and services. Historically, productivity has improved through evolution as processes with poor productivity performance are abandoned and newer forms are exploited. Process improvements may include organizational structures e. A famous example is the assembly line and the process of mass production that appeared in the decade following commercial introduction of the automobile. A similar pattern was observed with electrification , which saw the highest productivity gains in the early decades after introduction. Many other industries show similar patterns. The pattern was again followed by the computer, information and communications industries in the late s when much of the national productivity gains occurred in these industries. Certain factors are critical for determining productivity growth. The Office for National Statistics UK identifies five drivers that interact to underlie long-term productivity performance: The more capital workers have at their disposal, generally the better they are able to do their jobs, producing more and better quality output. Innovation is the successful exploitation of new ideas. New ideas can take the form of new technologies, new products or new corporate structures and ways of working. Speeding up the diffusion of innovations can boost productivity. Skills are defined as the quantity and quality of labour of different types available in an economy. Skills complement physical capital, and are needed to take advantage of investment in new technologies and organisational structures. Enterprise is defined as the seizing of new business opportunities by both start-ups and existing firms. New enterprises compete with existing firms by new ideas and technologies increasing competition. Entrepreneurs are able to combine factors of production and new technologies forcing existing firms to adapt or exit the market. Competition improves productivity by creating incentives to innovate and ensures that resources are allocated to the most efficient firms. It also forces existing firms to organise work more effectively through imitations of organisational structures and technology. Individual and team productivity[ edit ] See also: Programming productivity Technology has enabled massive personal productivity gainsâ€”computers, spreadsheets, email, and other advances have made it possible for a knowledge worker to seemingly produce more in a day then was previously possible in a year. Having an effective or knowledgeable supervisor for example a supervisor who uses the Management by objectives method has an easier time motivating their employees to produce more in quantity and quality. An employee who has an effective supervisor, motivating them to be more productive is likely to experience a

new level of job satisfaction thereby becoming a driver of productivity itself. Companies that have these hierarchy removed and have their employees work more in teams are called Liberated companies or "Freedom inc. The Toyota Way Business productivity[ edit ] Productivity is one of the main concerns of business management and engineering. Many companies have formal programs for continuously improving productivity, such as a production assurance program. Whether they have a formal program or not, companies are constantly looking for ways to improve quality, reduce downtime and inputs of labor, materials, energy and purchased services. Often simple changes to operating methods or processes increase productivity, but the biggest gains are normally from adopting new technologies, which may require capital expenditures for new equipment, computers or software. Modern productivity science owes much to formal investigations that are associated with scientific management. In truth, proper planning and procedures are more likely to help than anything else. Productivity paradox Overall productivity growth was relatively slow from the s through the early s. The matter is subject to a continuing debate that has grown beyond questioning whether just computers can significantly increase productivity to whether the potential to increase productivity is becoming exhausted. The calculations of productivity of a nation or an industry are based on the time series of the SNA, System of National Accounts. National accounting is a system based on the recommendations of the UN SNA 93 to measure total production and total income of a nation and how they are used. Saari , 9 International or national productivity growth stems from a complex interaction of factors. Some of the most important immediate factors include technological change, organizational change, industry restructuring and resource reallocation, as well as economies of scale and scope. Over time, other factors such as research and development and innovative effort, the development of human capital through education, and incentives from stronger competition promote the search for productivity improvements and the ability to achieve them. The OECD [33] publishes an annual Compendium of Productivity Indicators [34] that includes both labor and multi-factor measures of productivity. Several statistical offices publish productivity accounting handbooks and manuals with detailed accounting instructions and definitions. For example, the following:

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## Chapter 5 : Productivity - Wikipedia

*When Harold Fried, et al. published The Measurement of Productive Efficiency: Techniques and Applications with OUP in , the book received a great deal of professional interest for its accessible treatment of the rapidly growing field of efficiency and productivity analysis. The first several.*

By Sean Ross Updated June 4, â€" Economists and statisticians use several different methods to track economic growth. The most well-known and frequently tracked metric is gross domestic product GDP. Over time, however, some economists have highlighted limitations and biases in GDP calculation. Some suggest measuring economic growth through increases in the standard of living, although this can be tricky to quantify. Gross Domestic Product Gross domestic product is the logical extension of measuring economic growth in terms of monetary expenditures. If a statistician wants to understand the productive output of the steel industry, for example, he needs only to track the dollar value of all of the steel that entered the market during a specific period. Combine the outputs of all industries, measured in terms of dollars spent or invested, and you get total production. At least that was the theory. Unfortunately, the tautology that expenditures equal sold-production does not actually measure relative productivity. In other words, economic growth needs to somehow measure the relationship between total resource inputs and total economic outputs. Its solution was to use GDP to measure aggregate expenditures , which theoretically approximates the contributions of labor and output, and to use multi-factor productivity MFP to show the contribution of technical and organizational innovation. Gross National Product Those of a certain age may remember learning about gross national product GNP as an economic indicator. GNP measures the total income accruing to the population over a specified amount of time. In , the BEA began using GDP, which was already being used by the majority of other countries; the BEA cited easier comparison of the United States with other economies as a primary reason for the change. The income of the factories would be included in GDP, as it is produced within domestic borders, but not in GNP, since it accrues to non-residents. Comparing GDP and GNP is a useful way of comparing income produced in the country and income flowing to its residents. Most economists agree that total spending, adjusted for inflation , is a byproduct of productive output. They disagree, however, if increased spending is in itself an indication of growth. Consider the following scenario: In , the average American works 44 hours a week being productive. Suppose there is no change in the number of workers or average productivity for  However, Congress passes a law requiring all workers to work for 50 hours a week instead that year. Does this constitute real economic growth? Some would certainly say yes. After all, total output is what matters to those who focus on expenditures. For those who care about productive efficiency and the standard of living , this question does not have a clear answer. With an unlimited demand for war supplies and government financing, the standard metrics of economic health would show progress. But would anyone be better off?

## Chapter 6 : Citations of The Measurement of Productive Efficiency and Productivity Growth

*This book is an update of the publication of The Measurement of Productive Efficiency: Techniques and Applications. The same editors have here compiled over ten years of the most recent.*

## Chapter 7 : Measurement of Productive Efficiency and Productivity Change - Oxford Scholarship

*This book is an update of the publication of The Measurement of Productive Efficiency: Techniques and Applications. The same editors have here compiled over ten years of the most recent research in this changing field, and expanded on those seminal chapters and written this new edition.*

## Chapter 8 : What is Productivity Growth (and how to calculate it)

*Productivity growth simply refers to an improvement or increase in the efficiency of work or production. Generally, productivity growth is depicted by an increase in total output or production. However, an increase in total output or sales does not automatically mean there is growth in productivity.*