



## **An empirical analysis of the interactions between economic freedom, management & productivity.**

We use cross-sectional data from over 11.000 firms in 34 countries on firm-level management practices, country-level economic freedom and country-level total factor productivity to analyze their interactions and ultimately attempt to answer the following question: *“Does the effect of economic freedom on total factor productivity run through management practices?”*. Through a variety of linear multiple regression models, we find a significant, positive association between economic freedom and management practices. We also find a significant, positive association between economic freedom and total factor productivity, in which average management practices acts as a partial mediator for two-thirds of the relationship. When we substitute economic freedom for one of its sub-factors, business freedom, we find similar results across the board although with a slightly smaller effect size. However, given the lack of panel data with regards to management practices, we are unable to establish a causal effect. This is a point which future research could improve upon.

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The views stated in this thesis are those of the author and not necessarily those of the Erasmus School of Economics or Erasmus University Rotterdam.

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## 1.0 Introduction

The impact of management on the heterogeneity of productivity has left economists wondering for over 100 years. The founder of the American Economic Association, Francis Walker, stated that “*no driver of productivity has seen a higher ratio of speculation to research*” (Walker, 1887). An argument can even be made that the pin factory discussed in *A Wealth of Nations* by Adam Smith (1776) is a preliminary for this topic.

This heterogeneity of productivity can occur both across countries, as well as within countries, and doesn't have a single, clear cause. Across countries, it was long believed that the difference in output per worker was the result of differences in physical capital or education. Hall & Jones (1999) find, upon taking a closer look, that differences in capital accumulation, productivity, and output per worker across countries also depend on differences in social infrastructure, such as institutions or government policies.

Within countries, and between firms, the heterogeneity of productivity has been even more omnipresent. Empirical economists have discovered vast differences in productivity between firms, even between those within the same industry. Syverson (2011) provides a substantial overview of the various factors that influence differences in productivity across firms. Within firms, several factors play a key role, such as managerial practices, quality of labor and capital inputs, IT, R&D, experience of the firm, product innovation and firm structure decisions. Externally, there are also a few factors that play an important role: productivity spillovers, competition, as well as intra-market and trade competition, regulation, and flexibility of the input markets. Clearly, the heterogeneity of productivity is a multi-headed beast, which has proven to be challenging to tackle.

Over the last decade, economists have made great steps towards answering the question that was once posed by Francis Walker (1887). One of those efforts is the World Management Survey of Bloom et al. (“World Management Survey,” 2019), which is a measure for the quality of management in a firm and enables us to observe differences in management both within firms and across countries.

To construct this measure, they hire MBA students to interview managers of randomly selected SME manufacturing firms and ask them open-ended questions about and score them on the management practices at their firm. Within firms they find indications of a positive association between the quality of management and productivity level of a firm. Meanwhile, across countries the average quality of all firms in a country is positively associated with total factor productivity. Proof of a causal relationship, however, does not yet exist.

These findings raise an important question: What causes differences in the quality of management, both within in firms and across countries? Two of the most important factors that influence management practices appear to be competition and family ownership. More competition in a country is associated with a higher degree of management practices across firms in that country, while family ownership of a firm has a negative association with the management practices in that firm. However, the drivers of management practices are often measured through proxies and their effects remain ambiguous. As a result of the differences in competition and degree of family ownership across countries, US manufacturing firms appear to perform substantially better than their European counterparts (Bloom & Van Reenen, 2007). Furthermore, only one-third of the variation in management practices has been explained by past research, which means that there is still a lot to be discovered (Bloom, Brynjolfsson, Foster, & Jarmin, 2017).

We believe that economic freedom could be a potential proxy for competition. The Heritage Foundation, one of the leading research institutes on the topic of economic freedom, defines the concept of economic freedom as followed: *“Economic freedom is the fundamental right of every human to control his or her own labor and property. In an economically free society, individuals are free to work, produce, consume, and invest in any way they please. In economically free societies, governments allow labor, capital, and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself.”* (The Heritage Foundation, 2019a)

Just like management practices, economic freedom has been hard to quantify throughout history. Due to the sheer number of factors that influence economic freedom in a country, it has been difficult to find one be-all-end-all measure. However, there is no doubt about the central role that economic freedom plays in our society. In the past and even today, economic freedom has been one of the dividing curtains between Western and Eastern Europe, communism and capitalism, democrats and republicans, North and South Korea, and more.

In this paper, we intend to add to the existing knowledge by looking at the relationships between economic freedom, management practices, and total factor productivity. Previous research has uncovered a positive relationship between management practices and total factor productivity (Bloom et al., 2014), and between economic freedom and total factor productivity (Bjørnskov & Foss, 2010).

We intend to analyze at how these relationships interact with one another. Theoretically, multiple interactions are possible. First, differences in economic freedom across countries could drive differences in quality of management practices. Economic freedom is measured through several factors that are related to competition, such as business freedom or trade freedom, and a country with a high degree of economic freedom could very well have a business environment that enables a greater degree of competition. This increase in competition would then, as Bloom et al. (2017) have shown, lead to poorly managed firms exiting the market which in turn would lead to an increase in average management practices in a country.

Second, the relationship between economic freedom and productivity could be mediated by the quality of management practices. While the relationship between economic freedom and productivity has remained more ambiguous, the relationship between management practices and productivity certainly hasn't. If the expected effect that we describe in the previous paragraph is found to be true, then the improved quality of management practices as a result of a higher degree economic freedom would lead to an increase in productivity. Indirectly, this would mean that economic freedom is one of the drivers of productivity in a country.

Third, it is possible that, while economic freedom and management practices both influence productivity, they do not influence each other as our assumption that economic freedom acts as a proxy for competition could prove to be invalid. In that case, we might find that economic freedom either has a direct or, through another mediator, an indirect association with productivity.

Finally, there could be an omitted variable which influences both economic freedom as well as management practices. An example of such a variable would be economic institutions, of which Hall & Sobel (2008) have proven that they vary significantly across states in the United States and are associated with both economic freedom and as well as entrepreneurship. An increase in entrepreneurship stimulates market entry which in turn leads to more competition in said market. This regional difference in economic institutions is likely to also be present on a global level.

To start, in the next chapter we go more in-depth about the three most important concepts of this paper; total factor productivity, management practices, and economic freedom. While we've already briefly covered their origin and their importance in this introduction, in the next chapter we go over the existing literature on these topics and its limitations. We cover the various schools of thought that are related to these subjects, both those that are in support of and those that are critical of these concepts.

In our third chapter, we cover our research question, "*Does the effect of economic freedom on total factor productivity run through management practices?*", and the related hypotheses which focus on the relationships between the above concepts. We further explain the theoretical mechanisms that we expect to be at play between these concepts, and how these all link together.

Then, in chapter four we cover our data and perform an initial analysis. For this thesis we draw upon three different data sources: The World Management Survey, the Index of Economic Freedom and the Penn World Table. The World Management Survey provides us with cross-section data on the quality of management in firms across industries and countries.

The second, the Index of Economic Freedom, contains an annual score & ranking of the economic freedom in (nearly) all the countries in the world, as well as thirteen sub-factors that go into measuring the degree of economic freedom. Finally, the Penn World Table consists of a wide variety of macro-economic data for a wide variety of countries. However, for the sake of this thesis we will only use their total factor productivity measure, which ranks countries relative to the United States which is scored at a baseline value of 1.

In chapter five, we go over our methodology and regression framework. To study our research question and answer our hypotheses we make use of several multiple regression models that directly look at the association between economic freedom as well as business freedom and management practices. Furthermore, we use a mediation model to investigate the relationship between economic freedom as well as business freedom and total factor productivity, with management practices as a mediator. It is important to note that, given our analysis, we are unable to establish any causal relationships.

Afterward, in chapter six, we'll present the results of our analysis, and in chapter seven we'll conclude. In our last chapter, number eight, we will discuss our limitations and the possibilities for future research.

## **2.0 Theoretical framework**

### **2.1 Total factor productivity**

Empirical economists, in an attempt to measure productivity, have invented total factor productivity. Total factor productivity is a multi-factor measure of productivity in which we measure productivity based on all the inputs that are available. Originally this model focused on labor and capital as the two primary inputs of productivity, however over time an unexplained residual arose as more output was produced with the same quantity of input (Hulten, 2001).

This unexplained part of total factor productivity, the residual, has remained the object of much research and discussion. One of the explanations for this residual is that it is the result of technological changes. These days, we generally divide technological changes into two categories; hard & soft. Hard technological changes are tangible developments such as new machines or computers, while soft technological changes focus on intangible improvements such as decision making, management, and training. (Burgess & Gules, 1998) However, even when we combine all the various theories about the residual, there is still a significant part of it that remains unquantified.

There are several issues that arise when measuring productivity. Syverson (2011) has done an extensive job of covering these challenges. First, choosing an appropriate measure for output has remained challenging. Most firms produce several different outputs, should these then be aggregated to measure output? Furthermore, firms generally do not observe their output in terms of quantity, but in terms of revenue. Because of this, we usually choose revenues that are deflated to a common year as our output.

Second, choosing appropriate measures for input has also been challenging. There are several options available for both labor and capital. For labor, these include options such as the number of employees or the total hours worked, as well as quality-adjusted labor measures such as the wage bill. For capital, the most commonly used measure is the book value of the capital stock. This does, however, come with a few inherent questions. First, is stock value truly a suitable proxy for the flow of capital? Second, should the value of the capital stock be measured through a variety of methods? Or should we simply take the reported value?



Finally, whatever choices are made when measuring inputs, some part of our input shall always remain unmeasured yet still show up as productivity.

Third, in order to measure TFP, we are forced to aggregate several inputs into one measurement. To properly construct a measure, we must weigh the inputs, as well as measure their respective output elasticities. There are several ways to construct these measurements, each of which brings their own econometric issues. For a more in-depth look, we suggest looking into Syverson (2011).

According to Solow the growth of total factor productivity accounts for 87.5% of the growth of output per worker in the United States, compared to capital accumulation which only accounted for the remaining 12.5% (Solow, 1957). This is supported by Swan (1956), who discovered that 90% of the growth in output per person is associated with growth in total factor productivity.

More recent research done by Baier et al. (2006) looked into the relationship between capital & total factor productivity, and their importance for economic growth across 145 countries. Their findings are vastly different from those of Solow and Swan, as they conclude that weighted-average total factor productivity growth is only 0.22% per year. This only accounts for 14% of the growth of output per worker. However, upon comparing different regions with one another they find that total factor productivity growth accounts for 34% of output per worker growth in western countries, 26% for southern Europe and 26% for newly industrialized countries. Meanwhile, regions such as Africa and the Middle East have a negative total factor productivity growth. This would mean that more than just technology is responsible for growth in total factor productivity.

Cross-country differences in total factor productivity are known to lead to a difference in income per capita between countries (Klenow & Rodríguez-Clare, 1997). Hall & Jones (1999) show that there are significant differences in income between countries as a result of differences in social infrastructure and physical capital, which means that they both have less capital and also use it less effectively. Furthermore, they also find that there are large variations in the residual across countries.

According to Jones & Romer (2010), the differences in total factor productivity and per capita GDP are largely correlated across countries, meaning that total factor productivity could be key in understanding economic success across countries. The reason a country is economically successful is not just because it has more inputs, but also because it uses those inputs more efficiently.

Miller & Upadhyay (2000) looked into the effects of openness, trade orientation, and human capital on total factor productivity using a pooled cross-section, time-series sample of both developed and developing countries. They concluded that openness towards trade is positively associated with total factor productivity. Furthermore, they find that human capital has a positive effect on total factor productivity in most, but not all scenarios. In low-income countries, the effect of human capital on total factor productivity is negative, unless a country achieves a certain degree of openness. In middle-income countries, the effect is convincingly positive, while in high-income countries the effect is negative.

Traditional growth literature considers residual total factor productivity the result of hard technological innovations (Aghion, Blundell, Griffith, Howitt, & Prantl, 2009). However, even when controlling for a wide range of technology, a large residual still remains (Van Reenen, 2011). Furthermore, Solow's original article mentioned that "any kind of shift in the production function" could lead to changes in total factor productivity (Bloom et al., 2014). Generally, there are two schools of thought within growth economics. One is that we simply haven't measured all 'hard technology' differences out there and would be able to explain the residual if we did. We, however, agree with the second group and believe that differences in 'soft technology' make up the residual. Soft technology includes factors such as managerial and organizational aspects of a firm (Van Reenen, 2011).

## **2.2 Measuring management**

The World Management Survey (“World Management Survey,” 2019) attempts to quantify management by scoring firms in four areas: operations (3 practices), monitoring (5 practices), targets (5 practices) and incentives (5 practices). Each of these management practices is rated on a scale of 1 to 5, and the average of this gives the management practice of a firm. In the survey, managers of randomly chosen SME manufacturing firms are interviewed over the phone by MBA students. To ensure the collection of accurate responses, managers are not informed of the fact that they are being scored, open-ended questions are asked until the interviewer has a proper assessment of a management practice, having another interviewer listen-in and score the manager independently and sometimes running another survey with a different manager of the same firm. Furthermore, interviewers are not presented financial information about the firms prior to conducting the interview and due to the size of the firms, they are generally unknown to the interviewers, which prevents a potential bias due to the reputation of the firms.

When analyzing medium-sized manufacturing firms across both the US and Europe (France, Germany, United Kingdom), Bloom and Van Reenen (2007) discovered that there are significant differences in management practices both between firms within one country and across countries. These differences are significantly correlated with firm survival, profitability, productivity, sales and Tobin’s Q. Furthermore, a large number of firms within each country appear to be poorly managed and suffer from poor incentives, targets, and monitoring. Overall, the United States appears to consist of firms that have better management practices compared to their European counterparts.

The following two factors appear to play an important role in causing this variation across countries: family management and a lack of competition. First, family firms suffer from lower management practices scores when selecting their management from within the family. Especially when the successor is chosen based on primogeniture a firm tends to score exceptionally poor. Second, a lack of competition within a market allows poorly managed firms to continue to exist and may prevent CEO’s from incurring more effort to ensure survival.

Across countries, the combination of primogeniture and low competition explains half of the management gap between the US and France and one-third of the gap between the US and the UK. Overall, these two factors appear to account for a large part of the variation in management practices between countries, though there are still some parts left unexplained (Bloom & Van Reenen, 2007).

More recently, Bloom et al. (2017) have shown that 40% of the variation in management practices occurs between plants within the same firm. This rules out any influence by factors that are the same across these plants such as manager characteristics, ownership (such as family firms) or corporate governance as these would be identical in both plants. Furthermore, 20% of the variation of cross-firm productivity is caused by this variation in management practices. This effect is similar to twice the effect of information technology as well as being equal to the effect of research and development. There are four key factors that appear to be the cause of this variation; business environment, education, learning spillovers, and product market competition. Together they appear to be responsible for one-third of the 90-10 variation in management practices between plants.

Although the work done by Bloom et al. has greatly advanced research into the drivers of management, and the effects of management on firms, there is still room to be critical. First, only one-third of the variation in management has been explained thus far, which means we haven't truly discovered just why there are differences in management practices. Second, the world management survey primarily focuses on the organizational part of management. The questions are all centered around improving efficiency in existing products or services that a firm provides, and ignore more strategic areas of management such as; marketing, finance, M&A or leadership (Nicholas Bloom, Genakos, Sadun, & Van Reenen, 2012).

Third, the focus on increasing productivity might come at the cost of either the employees of a firm or the environment. While Bloom & Van Reenen cannot completely rule out a negative relationship between management practices and either employee welfare or the environment, they attempt to have attempted to refute these arguments. They have shown that there are positive correlations between management and employee welfare (Nick Bloom, Kretschmer, & Van Reenen, 2011), as well as between management and energy efficiency (Nicholas Bloom, Genakos, Martin, & Sadun, 2010).

Furthermore, what defines one unit of management? Currently, the World Management Survey measures management like a test, and any actual economic value comes from its association with other factors such as productivity or profitability. Ideally, there would be some kind of measure that allows us to value management directly. One example would be the time spent in education or the investment in physical capital by a firm (Bloom et al., 2014).

Alternatively, by taking one uniform measure of management and applying it across the globe one runs the risk of cultural bias influencing the results. Newman & Nollen (1996), for example, find that financial performance is higher when management practices are congruent with the national culture. Their findings are supported by Hoorn (2014) who finds that culture is a more important determinant of management practices than institutions and that management practices are an important mediator in the relationship between culture and per-capita income.

Finally, the lack of panel data limits the options that we have for empirical research. While firms are randomly sampled, we can't truly identify trends throughout the years that might have influenced management practices. The rise of computers, for example, might have made monitoring considerably easier, which in turn would have increased management practices across the board (Bloom et al., 2014).

### **2.3 Economic Freedom and its relationship to economic growth**

In 1996 Nobel Prize winner Milton Friedman wrote the following: *“I believe that free societies have arisen and persisted only because economic freedom is so much more productive economically than other methods of controlling economic activity”* (Milton Friedman, Foreword in Gwartney, Lawson, and Block 1996). Friedman, however, is not alone in this school of thought. The founder of modern economics, Adam Smith, considered the role of the government to be limited to national defense, administration of justice and the provision of certain public goods (Smith, 1776).

Two institutes have managed to develop a reliable measure of economic freedom. The first is The Fraser Institute who, as part of their annual human freedom index, also measure the economic freedom across 162 countries. The second is The Heritage Foundation which focuses on economic freedom and releases the annual Index of Economic Freedom. In this index, they measure the economic freedom of 186 countries based on a wide variety of factors, both within a country as well as those that look at a country’s interaction with the rest of the world. (The Heritage Foundation, 2019b) All of these factors are complements to one another, and an increase, or decrease, in one is often bound to lead to an increase, or decrease, in another. Together, these factors play a key role in measuring economic freedom and therefore prosperity (Miller, Kim, & Roberts, 2019).

Around the turn of the century, there was a movement in empirical economics that looked at the relationship between the availability of natural resources and the economic growth & productivity in a country. Economists discovered the so-called ‘curse of natural resources’, which is the slower economic growth experienced by countries that have an abundance of natural resources available to them. This effect does not appear to be the result of either geographical or climate variables, nor is there bias caused by an unobserved growth deterrent (Sachs & Warner, 2001).

Farhadi, Islam & Moslehi (2015) took a deeper look at the potential causes of this curse and specifically looked at the relationship between economic freedom and TFP growth in developing countries with an abundance of natural resources. They find, in accordance with previous literature, that there is a negative and significant relationship between natural resource rents and TFP growth. However, upon looking at the relationship between economic freedom and this effect, they find that the effect of natural resources on TFP growth improves as economic freedom increases in a country. According to them, their main finding is that the quality of economic institutions in a country decide whether natural resources are a blessing or a curse.

Furthermore, Bjornskov & Foss (2010) investigated the impact of entrepreneurship and economic freedom on total factor productivity. Their results show that while there is a positive impact of entrepreneurship on total factor productivity, this effect is greater in countries with a higher degree of economic freedom. They conclude that the availability of institutions of liberty allows for entrepreneurial experimentation to take place more freely and at a lower transaction cost.

According to De Haan & Sturm (2000), who looked at the relationship between economic freedom and economic growth, there is evidence that economic freedom is associated with economic growth within a country. They used both the index created by The Heritage Foundation as well as the Fraser Institute to examine this relationship, which despite using different variables have given similar rankings to countries. They conclude that while more economic freedom is positively associated with more economic growth, this effect is limited to allowing countries to reach their steady-state level more quickly. However, it does not appear to be that a higher level of economic freedom also raises the steady-state level within a country.

Gwartney et al. (1999), in an empirical analysis that included demographics, human & physical capital, also showed that economic freedom has a significant positive effect on economic growth. Furthermore, in Carlsson & Lundstrom (2002) attempted to decompose the effects of economic freedom on the growth of GDP and also concluded that economic freedom matters for growth rate. Size of government, legal structure & freedom to trade with foreigners had the largest effect on the growth of GDP.

Ayal & Karras (1998) studied the components of economic freedom and growth. According to them “Reports from around the world strongly suggest that countries that have reduced the direct involvement of governments in economic activities show rising rates of growth.” (1998, p. 327). They conclude that aggregate economic freedom enhances growth in two ways. First, through increasing total factor productivity and second through enhancing capital accumulation. The key factors according to them are; low money growth rate, a small role played by government enterprises, rare negative real interest rates, small differences between official and black-market exchange rates, a large trade sector and the freedom of citizens to engage in capital transactions with foreigners.

Clearly, economic freedom plays a key role in the growth of a country’s economy. However, this relationship does suffer from an inherent risk of reverse causality and therefore should not be considered lightly. In this thesis, we find another use for the measure of economic freedom, which we discuss in the next chapter.



### 3.0 Hypotheses

Where in the past the residual of total factor productivity was often written off as the result of measurement errors of capital or labor (Griliches & Jorgenson, 1967), these days the availability of micro-economic data has increased, and we have been able to slowly dissect the residual TFP into various components. Results of a review paper by Bloom et al. (2014) show that a quarter of cross-country variation in total factor productivity can be explained by management practices. This would mean that management practices play an instrumental role in increasing total factor productivity within a country, and therefore in stimulating economic growth.

Earlier in this paper, we showed that product market competition plays an important role as one of the primary causes of variation in management practices across countries. Bloom et al. (2007), in their original paper, used a number of proxies to measure the effect of product market competition on management practices. They show that greater import penetration, a higher Lerner Index score and manager's self-reported level of competition are all positively correlated with higher management scores. These relationships hold when they include a set of control variables consisting of country and industry dummies, firm size, age, and stock market listing status.

Furthermore, they included all three measures in their regression and, while less significant, the positive relationship between them and management practices continues to hold. One restraint is that none of the proxies used are instrumental variables for competition, and therefore the relationships are purely conditional correlations.

Finally, they attempt to identify the mechanisms that are the cause of this relationship. First, they look at an increase in managerial effort as a result of an increase in competition that then leads to an increase in management scores. Using hours worked as a proxy they do not find a significant relationship between tougher competition and more hours worked by managers. This means that the length of the working week has no effect on the management practice score of a manager. Nevertheless, there might still be a relationship between the intensity of the effort of a manager and his/her management practice score. Second, they look at the relationship between the exit rates of low-scoring firms compared to high-scoring firms.

In analyzing this relationship, they find a weak relationship between greater competition and a decrease in the dispersion of management practices which would suggest that competition drives low-scoring firms out of the market. However, due to the low sample size, they cannot conclude that this relationship is significant (Bloom & Van Reenen, 2007).

Competition has, since the original paper by Bloom et al. (2007), always been considered one of the primary drivers of management practices. However, as competition has always been difficult to quantify, they have been forced to resort to a variety of proxies such as import penetration, the Lerner index, trade openness or a manager's self-reported level of competition. If we look at the variables included in the index of economic freedom, we find several variables that are related to competition. These include, but are not limited to; property rights, business freedom, labor freedom, and trade freedom. Of these variables, we believe that business freedom has the strongest theoretical association with competition, as it quantifies the degree to which regulatory structure and infrastructure limit the efficient operation of businesses. A potential second variable of interest would be trade freedom, which measures the barriers of entry to a market through the degree of tariff and non-tariff barriers on imports and exports. However, for the sake of this thesis, we focus on business freedom, as our research question and hypotheses are primarily focused on the effects of economic freedom within a country (Miller et al., 2019).

We share the view of Bloom and Van Reenen with regards to the importance of product market competition as a stimulant of better management practice and, through management practices, higher total factor productivity and an increase in economic growth. Based on the previous research into the relationship between management practices and total factor productivity, we assume that there is a relevant association between these two factors.

The relationship between economic freedom and total factor productivity is more ambiguous, though there is some evidence which suggests a possible relationship between the two. As we mentioned earlier, economic freedom acts as a moderator in the relationship between entrepreneurship on total factor productivity, as well as that of the availability of natural resources on total factor productivity growth.

Theoretically speaking, if we were to take economic freedom as a proxy for competition in measuring management practices, then we could not only potentially reconfirm the relationship between competition and management practices. But we could also identify a relationship between economic freedom and total factor productivity, in which management practices acts as a mediator. We also look at business freedom, which is one of the sub-factors of economic freedom, which measures to what degree regulation, infrastructure and institutions constrain the efficient operation of businesses. By looking at the relationship between business freedom and management practices we can quantify how much of the effect is caused by economic freedom itself. In our next section we will provide a more in-depth discussion about economic and business freedom.

Therefore, we intend to answer the following research question:

*“Does the effect of economic freedom on total factor productivity run through management practices?”*

To answer this question, we investigate the following hypotheses:

*“A higher level of economic freedom in a country is associated with a higher level of management practices in that country”*

*“A higher level of economic freedom in a country is, through management practices, associated with a higher level of total factor productivity in that country”*

And the following sub-hypotheses:

*“A higher level of business freedom in a country is associated with a higher level of management practices in that country”*

*“A higher level of business freedom in a country is, through management practices, associated with a higher level of total factor productivity in that country”*

#### 4.0 Data

The data that we use in this thesis comes from three different sources. The first, the World Management Survey, is an annual, double-blind survey in which managers of randomly chosen SME manufacturing firms in various countries across the world are interviewed. These samples are randomly chosen within each country and are therefore representative of all the firms in that country. We use the same dataset as the one that was utilized in *The New Empirical Economics of Management* (Bloom et al., 2014) which contains survey data from over 11,702 firms across 34 countries in the years 2004 to 2015 (“World Management Survey,” 2019). We chose this dataset as it provides us with the most recent cross-section data. Compared to the previous World Management Survey dataset, which covers the years 2004 – 2010, fifteen new countries have been added. We looked at the number of observations for each country, and while for some countries there is a large decrease in observations, this is limited to countries that had many observations, to begin with. All countries with a smaller number of observations either saw an increase or remained constant.

Second, we use the Index of Economic Freedom, which is an annual report on the state of economic freedom in nearly all the countries in the world (Index of Economic Freedom, 2019). In an ideal world, we would have had panel data across all these countries, however, given the limited availability of the World Management Survey data, we are forced to make several assumptions:

1. Based on the exponentially increasing number of surveys in each WMS dataset, we assume that most observations were done over the last few years.
2. Based on the countries that were added to the WMS dataset before 2010 and between 2010 & 2015, we assume that the researchers focused on developed and/or larger countries at first. This would mean that some of the new countries added would not be interviewed until more recent years.

Based on these assumptions we decide to focus on the three most recent years that are available to us; 2013, 2014, 2015. As by looking at those years, we have the largest and most diverse World Management Survey dataset available to us. Furthermore, we include all the countries that are in the World Management Survey dataset, as the country with the smallest number of observations is Zambia at 65. Although this is on the lower side, we consider it high enough to include in our analysis.

Third, we use the Penn World Table dataset by Feenstra, Inklaar & Timmer (2015). This dataset contains data on relative levels of income, output, input, and productivity, from 182 countries over the years 1950 through 2017. Specifically, we use their measure for total factor productivity, which is measured using real PPP and the United States as a baseline. To match our EF dataset, we use the years 2013, 2014 and 2015.

Since there are some discrepancies in the way our datasets name countries, we made the following adjustments:

- In the WMS dataset, renamed country “Northern Ireland” to “United Kingdom” to match the EF dataset.
- In the WMS dataset, renamed country “Great Britain” to “United Kingdom” to match the EF dataset.
- In the WMS dataset, renamed country “Republic of Ireland” to “Ireland” to match the EF dataset.
- In the WMS dataset, renamed country “Myanmar” to “Burma” to match the EF dataset.
- In the EF dataset, renamed variable “name” to “country” to match the WMS dataset.
- In the TFP dataset, renamed all values for the variable country, which originally were abbreviations, to match the EF dataset.

#### 4.1 World Management Survey

In the World Management Survey middle-level managers are asked open-ended questions to score them on eighteen management practices across three categories:

1. Monitoring: How well do organizations monitor what goes on inside the firm, and use this information for continuous improvement?
2. Targets: Do organizations set the right targets, track the right outcomes, and take appropriate action if the two are inconsistent?
3. Incentives: Are organizations promoting and rewarding employees based on performance, prioritizing hiring, and trying to keep their best employees?

Based on their answers they are scored on a scale of 1 (lowest) to 5 (highest) in each of these practices, of which the average is taken to calculate the level of management practices across each category and the entirety of the firm (Bloom et al., 2010).

We make use of the panel dataset that contains data on manufacturing firms across 34 countries and contains the survey results of 11,702 firms, which were gathered in the period of 2004 through 2015. The dataset contains the management score of the firm, which shall be our dependent variable, as well as the scores for the three categories. Furthermore, it includes the score for each of the individual questions. Finally, it also contains the country in which the firm is located, the number of employees, the number of times a specific firm has been interviewed, and the 2-digit industry code. The number of employees is divided into the following groups; A) 50 to 100, B), 101 to 250, C) 251 to 500, D) 501 to 1000, E) 1000+.

The mean of management practices across all firms is 2.822, with a standard deviation of .653, a minimum of 1 and a maximum of 4.889 (Table A.1). Across countries, there is more difference in the average management score, with Mozambique scoring the lowest at an average management score of just 2.018 across 107 firms, and the United States scoring the highest at 3.285 (Figure A.1). When looking at the standard deviation we find that the largest standard deviation, India at .680, is almost twice as large as the smallest standard deviation, Ghana at .341 (Table A.4).

## 4.2 Index of Economic Freedom

The Index of Economic Freedom is an annual report which ranks countries based on their economic freedom. They measure the economic freedom in a country, on a scale of 1 to 100, as the average of four categories, which contain three sub-categories each (Table A.2):

- Rule of Law (property rights, judicial effectiveness, government integrity)
- Government size (tax burden, government spending, fiscal health)
- Regulatory efficiency (business freedom, labor freedom, monetary freedom)
- Market openness (trade freedom, investment freedom, financial freedom)

Each of these sub-categories is scored through a variety of means. Some are directly measured, others contain a varying number of factors that go into measuring their score. Business freedom, for example, is measured using 13 sub-factors such as the minimum capital required to start a business, the number of days it takes to obtain a license or the recovery rate when closing a business (Table A.3). Each of these sub-factors is then converted to a scale of 0 to 100 relative to other countries, using Equation (A.1). Upon doing so, the average of all 13 sub-factors is taken to calculate the business freedom score. After all 13 sub-categories are scored, the average of this score is taken to calculate the economic freedom score of a country (Miller et al., 2019).

The data in each edition of the index stems from June in the year before, which means that for us to analyze the scores of 2015 we must look at the index of 2016 (About The Index, 2019). Our dataset contains the overall economic freedom scores of 2014 through 2016, which matches the world management survey data from 2013 through 2015. Because of this, we add the variable ‘year’ to our dataset, which takes the value of ‘indexyear’ and subtracts one year. For the remainder of this paper, we refer to the variable ‘year’ when we mention year(s), unless specifically stated otherwise.

For each of the countries included in our world management survey dataset the equivalent is available, except for Northern Ireland which is merged with the United Kingdom. Besides the overall score, we also have the scores of 10 of the 12 sub-categories. Both judicial effectiveness, as well as fiscal health, are only included from the 2017 Index of Economic Freedom onward and are not a part of our dataset and the resulting economic freedom.

#### **4.2.1 Economic Freedom score**

The mean of the worldwide overall economic freedom score in our period of interest is 64.742, with a standard deviation of 11.009 and a range of 43.8 to 89.4 (Table A.5). If we look at the trend of the worldwide overall economic freedom score throughout the years 1996 - 2015, we find that the mean worldwide economic freedom fluctuates around a mean of 63.899, with a standard deviation of .862, a minimum of 61.768 and a maximum of 64.750. Of these 20 years, only the first three (1996/1997/1998) are significantly different from the mean throughout this time. (Table A.7) Because of this, we can assume that there are no significant differences between the years 2013, 2014 & 2015, and therefore we can take the average of these years without risking the internal validity of our results. For the remainder of this thesis, we always refer to the average over these three years when we mention economic freedom unless specifically mentioned otherwise.

When we look at the differences between countries, we discover a relative distribution not all that different from the one we saw in the world management survey. Singapore sits at the top with an average economic freedom score of 88.867. The United States, our leader in the world management survey, sits in eighth place at 75.700 points. Meanwhile, the country with the lowest average economic freedom score is Argentina, with 44.167 points (Figure A.2).

Brazil appears to be the most stable country, with a standard deviation of .208. Meanwhile, Vietnam has the highest standard deviation at 1.650 and has risen from 50.8 in 2013 to 54 in 2015 (Table A.8).



### **4.2.2 Business freedom**

We repeat our initial analysis for our second independent variable of interest; business freedom. We find a mean of 70.159, a standard deviation of 16.937, a min of 28.3 and a max of 96.9. This would indicate that business freedom, while higher on average, is more volatile either throughout the years or across countries (Table A.6).

To check this, we look at the mean and standard deviation of business freedom over the years 1996 – 2015. We find slightly more variation than with economic freedom, with some years being significantly different from the overall mean. However, as none of the average values deviate for more than 2 standard deviations, and as the last 4 years are not significantly different, we assume that any variation in business freedom is likely to be across countries (Table A.11).

Next, we look at a detailed summary of business freedom across countries. Here we find larger differences, with Singapore coming out on top with a mean of 96.233. Meanwhile, Burma comes in last with a mean business freedom of 29.8667 (Table A.12).

### 4.3 Total Factor Productivity

The Penn World Table (Feenstra, R. C., Inklaar, R., Timmer, 2015) consists of 182 countries over the years 1950 through 2017. It attempts to measure the standard of living in, as well as production capacities of, countries across the world. They do so by using prices collected in certain years/countries as a benchmark, and by measuring concepts such as:

- Real GDP, employment and population levels
- Current price GDP, capital and total factor productivity
- National accounts-based variables
- Exchange rates and GDP price levels
- Data information variables
- Shares in output-side real GDP at current PPPs
- Price levels, expenditure categories, and capital

For the sake of this thesis, we only use the total factor productivity variable that is included with the data. Feenstra, Inklaar & Timmer (2015) measure TFP by calculating the difference in real GDP between a country and the United States and then deflating that value by an index that is constructed using the observed factor prices and shares of goods. This results in a measure of relative PPP in a country, with the United States acting as a benchmark at a value of 1.<sup>1</sup>

Currently, of all the countries that are included in our WMS dataset, the following do not have a TFP measure available:

- Burma
- Ethiopia
- Ghana
- Vietnam
- Zambia

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<sup>1</sup> Ultimately, in measuring TFP one has to make various assumptions, and one should choose those that one is most comfortable in making. Several studies have tested the robustness of the various methods, and they find that there are no significant differences, which means that a high-productivity firm or country will be considered as such, regardless of the method that one has chosen (Syverson, 2011).

The mean of total factor productivity across all countries is .702, with a standard deviation of .653, a minimum .296 and a maximum of 1.164. When we look at the individual countries, we find that there is significantly more variation. Tanzania scores lowest on the scale of relative TFP with a mean of .300, while Turkey comes in at first place with a relative TFP of 1.089, almost three times as high as that of Tanzania. Most of the countries show little variation over the years, except for Ireland which has a standard deviation of .102, which is considerably larger than the next country; Brazil at .026 (Table A.13).

#### 4.4 Correlation

To prepare our Economic Freedom dataset for the merge, we calculate the means of economic freedom and business freedom across countries. Next, we drop all the variables in our Economic Freedom dataset except for ‘country’, ‘mean\_overallscore\_c’, and “mean\_businessfreedom\_c”. This allows us to add these variables to our existing observations in the World Management Survey dataset. We then do the same for our TFP dataset and merge it with a copy of the EFXWMS dataset. In this second dataset, we drop all countries for which no TFP score is available. The first dataset is the one that we refer to whenever we focus on the interactions between EF and WMS. When TFP is included in the analysis, we refer to the second dataset.

We find that, when including every individual observation, the correlation between economic freedom in a country and management scores of firms in that country is 0.280 (Table A.9). When we use the average management score at the country level, we find a correlation of 0.654 (Table A.9) (Figure A.3).

After this, we also look at the relationship between business freedom in a country and average management score in a country. Looking at each firm individually, we find a correlation of 0.326 (Table A.9) Once again, we take the average management score at a country level and find a correlation of 0.727 (Table A.9) (Figure A.4).

We repeat our correlation analysis for our other variable of interest, TFP. We find that TFP in a country is positively correlated, with a factor of 0.297, with management scores of individual firms in that country (Table A.10). Once again, we average our management scores at the country level and find a correlation of 0.720 (Table A.10) (Figure A.5).

Finally, we look at the correlation between TFP and economic freedom & business freedom. The correlation between TFP and economic freedom across countries is 0.566 (Figure A.6), which is slightly lower than the correlation between TFP and business freedom at 0.644 (Table A.10).

## 5.0 Methodology

In our initial data analysis, we already observed a strong correlation between both economic freedom as well as business freedom and our dependent variable management practices. In the remainder of this paper, we take a more in-depth look at these relationships.

### 5.1. Economic Freedom<sup>2</sup>

To investigate our first hypothesis, we run a linear regression model of economic freedom on management practices. We start with the following simple linear regression model:

$$(1) \text{ Management practices}_{i,c} = \beta_0 + \beta_1 * \text{Economic Freedom}_c + \varepsilon_{i,c}$$

In this model,  $\beta_0$  is our constant,  $\beta_1$  is the coefficient of our independent variable and  $\varepsilon_{i,c}$  is our residual. The subscript  $i$  means we have observed this variable at a firm level, while subscript  $c$  refers to country.

Next, we add control variables for the size of the firm, industry code and country. This provides us with the following linear regression model:

$$(2) \text{ Management practices}_{i,c} = \beta_0 + \beta_1 * \text{Economic Freedom}_c + \beta_{2-6} * i. \text{Employees} + \beta_{7-27} * i. \text{Industry} + \varepsilon_{i,c}$$

In which  $\beta_{2-6}$  is the effect of firm size on management practices and  $\beta_{7-27}$  is the effect of a certain industry on management practices.

Finally, we rerun regression (1) and (2) using the average management practice scores of firms in a country. This gives us the following two linear regression models:

$$(3) \text{ Management practices}_c = \beta_0 + \beta_1 * \text{Economic Freedom}_c + \varepsilon_c$$

$$(4) \text{ Management practices}_c = \beta_0 + \beta_1 * \text{Economic Freedom}_c + \beta_{2-6} * i. \text{Employees} + \beta_{7-27} * i. \text{Industry} + \varepsilon_c$$

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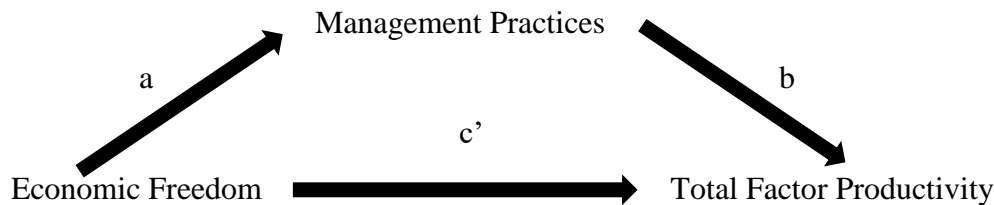
<sup>2</sup> Unfortunately we are unable to include country-fixed effects in our regression models, as we do not have access to panel data from the World Management Survey.

## 5.2. Total Factor Productivity

Next, we investigate our second hypothesis, which focuses on the relationship between economic freedom and total factor productivity, with management practices as a mediator. The unmediated model for this relationship, in diagrammatic form, is as followed:



Meanwhile, the mediated model is as followed:



To investigate this relationship we use the ‘Difference of Coefficients Approach’ by Judd & Kenny (1981). This approach allows us to measure the mediation effect through the following two relationships:

- Economic Freedom -> TFP
  - Gives us  $c$
- Economic Freedom & Management Practices -> TFP
  - Gives us  $c'$  &  $b$

The first relationship is measured using the following multiple regression model:

$$(5) \text{ Total Factor Productivity}_c = \beta_0 + \beta_1 * \text{Economic Freedom}_c + \varepsilon_c$$

And the second relationship through the following linear regression model:

$$(6) \text{ Total Factor Productivity}_c = \beta_0 + \beta_1 * \text{Management Practices}_c + \beta_2 * \text{Economic Freedom}_c + \varepsilon_c$$

We can then calculate the mediation effect using the following equation:

$$(E.1) \text{ Mediation} = C - C'$$

If management practices completely mediates the relationship between economic freedom and total factor productivity, then  $c'$  will be 0. Otherwise, there is a relationship with partial mediation. We can use the following equation to measure the percentage of the relationship that is mediated:

$$(E.2) \frac{\text{Mediation}}{c} * 100\%$$

### 5.3. Business Freedom

We repeat the above for our sub-hypotheses which focus on the relationships between business freedom, management practices, and total factor productivity. For Model (1) & (2) this gives us the following linear regression models:

$$(7) \text{ Management practices}_{i,c} = \beta_0 + \beta_1 * \text{Business Freedom}_c + \varepsilon_{i,c}$$

$$(8) \text{ Management practices}_{i,c} = \beta_0 + \beta_1 * \text{Business Freedom}_c + \beta_{2-6} * i. \text{Employees} + \beta_{7-27} * i. \text{Industry} + \varepsilon_{i,c}$$

As with Model (3) & (4), we rerun the regressions using average management practice scores of firms in a country, which gives us the following models:

$$(9) \text{ Management practices}_c = \beta_0 + \beta_1 * \text{Business Freedom}_c + \varepsilon_c$$

$$(10) \text{ Management practices}_c = \beta_0 + \beta_1 * \text{Business Freedom}_c + \beta_{2-6} * i. \text{Employees} + \beta_{7-27} * i. \text{Industry} + \varepsilon_c$$

Finally, we rerun Model (5) & (6) using business freedom as our independent variable. This gives us the following two models:

$$(11) \text{ Total Factor Productivity}_c = \beta_0 + \beta_1 * \text{Business Freedom}_c + \varepsilon_c$$

$$(12) \text{ Total Factor Productivity}_c = \beta_0 + \beta_1 * \text{Management Practices}_c + \beta_2 * \text{Business Freedom}_c + \varepsilon_c$$

## **6.0. Results**

### **6.1. Management Practices**

#### **6.1.1. Economic Freedom**

We start with the results of our first hypothesis. The result of Model (1) through (4) are presented in Table 1. Column 1 reports the results of Model (1), a simple OLS regression of economic freedom on management practices, without any control variables. We find that there is a significant association with a coefficient of 0.016, which is significant at the 0.001 level. To put this number into perspective, a one standard deviation increase in economic freedom leads to a 0.181 increase in management practices, on a scale of 1 to 5, which equals a 0.278 standard deviation increase in management practices.

In Column 2, which reports the results of Model (2), we add controls for industry and firm size. Our association remains significant with a coefficient of 0.014 at the 0.001 level. When economic freedom increases by one standard deviation, this leads to a 0.158 increase in management practices, which equals a 0.242 standard deviation increase in management practices.

We repeat the above at a country level in Column 3 & 4, which represent Model (3) & (4) and find similar results to our individual model. We find that, without any control variables, a one standard deviation increase in economic freedom in a country leads to a 0.200 increase in average management practices in that country, which equals a 0.638 standard deviation increase in average management practices.

When we include our control variables this effect drops slightly, to a 0.144 increase in average management practices, or a 0.461 standard deviation increase in average management practices.



|                    | 1.<br><u>Management</u><br><u>Practices</u> | 2.<br><u>Management</u><br><u>Practices</u> | 3.<br><u>Average</u><br><u>Management</u><br><u>Practices</u> | 4.<br><u>Average</u><br><u>Management</u><br><u>Practices</u> |
|--------------------|---|---|---|---|
| Intercept          | 1.755***<br>(0.208)                         | 1.757***<br>(0.170)                         | 1.521***<br>(0.242)   | 1.712***<br>(0.224)   |
| Economic Freedom   | 0.016***<br>(0.003)                         | 0.014***<br>(0.003)                         | 0.018***<br>(0.004)   | 0.013***<br>(0.004)   |
| Industry controls  | No  | Yes   | No  | Yes   |
| Firm size controls | No  | Yes   | No  | Yes   |
| R-Squared          | 0.079                                       | 0.149                                       | 0.428   | 0.719   |
| Countries          | 34  | 34  | 34  | 34  |
| Observations       | 11,702                                      | 11,702                                      | 34  | 34  |

*Note: All regressions were done using clustered standard errors by country.*

|                    | 1.<br><u>Management</u><br><u>Practices</u> | 2.<br><u>Management</u><br><u>Practices</u> | 3.<br><u>Mean</u><br><u>Management</u><br><u>Practices</u> | 4.<br><u>Mean</u><br><u>Management</u><br><u>Practices</u> |
|--------------------|---|---|--|--|
| Intercept          | 1.918***<br>(0.108)                         | 1.914***<br>(0.096)                         | 1.775***<br>(0.145)  | 1.939***<br>(0.155)  |
| Business Freedom   | 0.013***<br>(0.002)                         | 0.011***<br>(0.001)                         | 0.013***<br>(0.002)  | 0.010***<br>(0.002)  |
| Industry controls  | No  | Yes   | No   | Yes  |
| Firm size controls | No  | Yes   | No   | Yes  |
| R-Squared          | 0.106                                       | 0.161                                       | 0.528  | 0.757  |
| Countries          | 34  | 34  | 34   | 34   |
| Observations       | 11,702                                      | 11,702                                      | 34   | 34   |

*Note: All regressions were done using clustered standard errors by country.*

### **6.1.2. Business Freedom**

Next, we investigate our first sub-hypothesis. The results of Model (7) through (10) are presented above in Table 2. We find a positive association between business freedom and management practices. Without any control variables, the coefficient is 0.13, which is significant at the 0.001 level. This means that a one standard deviation increase in business freedom translates into a 0.221 increase in management practices or a 0.338 standard deviation increase in management practices.

We add our control variables and we find that the coefficient decreases slightly to a value of 0.011, while remaining significant at the 0.001 level. This translates into a 0.187 increase in management practices for every one standard deviation increase in business freedom, which equals a 0.285 standard deviation increase in management practices.

Once again, we take the average level of management practices in a country and rerun our regressions. We find that business freedom in a country has a positive association with average management practices in that country, which is significant at the 0.001 level. Without any control variables, this effect is 0.013, and a one standard deviation increase in business freedom leads to a 0.220 increase in average management practices, which in turn equals a 0.704 standard deviation increase in average management practices.

When we add our control variables this effect diminishes slightly, to a coefficient of 0.010. However, the effect remains significant at the 0.001 level. This effect, in turn, means that a one standard deviation increase in business freedom in a country leads to a 0.170 increase in average management practices in that country, which equals a 0.542 standard deviation increase in average management practices.

## 6.2. Total Factor Productivity

### 6.2.1. Economic Freedom

We now turn to investigate our second hypothesis. The results of Model (5) & (6) are presented below in Table 3, Column 1 & Column 2 respectively. We find that economic freedom is positively related to total factor productivity with a coefficient of 0.012, which means that a one standard deviation increase in economic freedom leads to a 0.125 increase in total factor productivity relative to a base value of 1, which equals a 0.566 standard deviation increase in total factor productivity. When we include management practices in the model, we find that his effect changes to 0.004.

The fact that the effect of economic freedom on total factor productivity is no longer significant in Column 2 indicates that there could be a case of complete mediation, however Judd & Kenny (1981) advise being cautious before making such a claim. Given our small sample size, which could influence the significance of our results, we are not comfortable with claiming complete mediation and instead believe that we have uncovered a partial mediation effect.

In order to measure the mediation effect, we then enter the unrounded values into Equation (E.1). This gives us the following equation:

$$(E.3) \textit{Mediation} = 0.0115523 - 0.0039119 = 0.0076404$$

We then add this value to Equation (E.2) to find that 66.137% of the association between economic freedom and total factor productivity is mediated through management practices.

$$(E.4) \frac{\textit{Mediation}}{c} * 100\% = \frac{0.0076404}{0.0115523} * 100\% = 66.137\%$$

**Table 3: Estimated effect of economic freedom on total factor productivity, with average management practices as a mediator.**

|                              | 1.<br>Total Factor Productivity | 2.<br>Total Factor Productivity |
|------------------------------|---------------------------------|---------------------------------|
| Intercept                    | -0.066<br>(0.247)               | -0.833***<br>(0.204)            |
| Economic Freedom             | 0.012**<br>(0.004)              | 0.004<br>(0.004)                |
| Average Management Practices |                                 | 0.459***<br>(0.100)             |
| R-Squared                    | 0.320                           | 0.337                           |
| Countries                    | 29                              | 29                              |
| Observations                 | 29                              | 29                              |

*Note: All regressions were done using clustered standard errors by country.*

### 6.2.2. Business Freedom

Finally, we investigate the results of our second sub-hypothesis which focuses on the relationship between business freedom, management practices, and total factor productivity. The results of Model (11) & (12) are presented in Table 4. Our results show that business freedom has an unmediated effect on total factor productivity with a coefficient of 0.009. Upon including average management practices in the regression, this effect drops to 0.003. We add our results into Equation (E.1) to calculate the mediation effect:

$$(E.5) \textit{Mediation} = 0.0088098 - 0.0033862 = 0.0054236$$

When we add the resulting value into Equation (E.2) we find that 61.563% of the relationship between business freedom and total factor productivity is mediated through management practices.

$$(E.6) \frac{\textit{Mediation}}{c} * 100\% = \frac{0.0054236}{0.0088098} * 100\% = 61.563\%$$

| <b>Table 4: Estimated effect of business freedom on total factor productivity, with management practices as a mediator.</b> |  |  |
|---|--|--|
|   | 1.<br><u>Total Factor Productivity</u> | 2.<br><u>Total Factor Productivity</u> |
| Intercept   | 0.063<br>(0.137)                       | -0.684***<br>(0.173)                   |
| Business Freedom  | 0.009***<br>(0.002)                    | 0.003<br>(0.002)                       |
| Average Management Practices  |  | 0.410***<br>(0.093)                    |
| R-Squared   | 0.415                                  | 0.546                                  |
| Countries   | 29                                     | 29                                     |
| Observations  | 29                                     | 29                                     |

Note: All regressions were done using clustered standard errors by country.

## 6.3 Robustness checks

### 6.3.1. Management Practices

To check the robustness of our results, we rerun the regression from Model (3), (4), (9) & (10) while adding a weight variable to the regression, which represents the number of firms that were surveyed in each country. Across the board, we find that our results are like those presented in Section 6.1.1. & 6.1.2. While there are some minor deviations, these do not warrant any reason for concern.

| <b>Table 5: Estimated effects of economic freedom &amp; business freedom on average management practices, using a weight indicator.</b> |   |   |   |   |
|---|---|---|---|---|
|   | 1.<br><u>Average<br/>Management<br/>Practices</u> | 2.<br><u>Average<br/>Management<br/>Practices</u> | 3.<br><u>Average<br/>Management<br/>Practices</u> | 4.<br><u>Average<br/>Management<br/>Practices</u> |
| Intercept   | 1.755***<br>(0.211)                               | 1.707***<br>(0.228)                               | 1.918***<br>(0.110)                               | 1.936***<br>(0.135)                               |
| Economic Freedom  | 0.016***<br>(0.003)                               | 0.014***<br>(0.003)                               |   |   |
| Business Freedom  |   |   | 0.013***<br>(0.002)                               | 0.010***<br>(0.002)                               |
| Industry controls   | No  | Yes   | No  | Yes   |
| Firm size controls  | No  | Yes   | No  | Yes   |
| Analytic weights  | Yes   | Yes   | Yes   | Yes   |
| R-Squared   | 0.459   | 0.780   | 0.620   | 0.8199  |
| Countries   | 34  | 34  | 34  | 34  |
| Observations  | 34  | 34  | 34  | 34  |

*Note: All regressions were done using clustered robust standard errors by country.*

### 6.3.2. Total Factor Productivity

Next, we rerun Model (5), (6), (11) & (12), while including the weight variable that we mentioned above. Once again, we find similar coefficients to the ones that we found in our main analysis. For economic freedom, we find that the mediated coefficient is 0.008 (Equation A.2) and that 72.940% (Equation A.3) of the relationship between economic freedom and total factor productivity runs through management practices.

Furthermore, for business freedom, we find that the mediated coefficient is 0.006 (Equation A.4) and that 61.977% (Equation A.5) of the relationship between business freedom and total factor productivity runs through management practices.

| <b>Table 6: Estimated effect of economic freedom on total factor productivity, with average management practices as a mediator and while using a weight indicator</b> |  |  |  |  |
|---|--|--|--|--|
|   | 1.   | 2.   | 3.   | 4.   |
|   | <u>Total Factor</u><br><u>Productivity</u> | <u>Total Factor</u><br><u>Productivity</u> | <u>Total Factor</u><br><u>Productivity</u> | <u>Total Factor</u><br><u>Productivity</u> |
| Intercept   | -0.042<br>(0.253)                          | -1.054***<br>(0.225)                       | 0.054<br>(0.125)                           | -0.848***<br>(0.205)                       |
| Economic Freedom  | 0.011**<br>(0.004)                         | 0.003<br>(0.003)                           |  |  |
| Business Freedom  |  |  | 0.009***<br>(0.002)                        | 0.003<br>(0.002)                           |
| Average Management Practices  |  | 0.550***<br>(0.102)                        |  | 0.461***<br>(0.102)                        |
| Analytic weights  | Yes  | Yes  | Yes  | Yes  |
| R-Squared   | 0.358                                      | 0.599                                      | 0.499                                      | 0.611                                      |
| Countries   | 29   | 29   | 29   | 29   |
| Observations  | 29   | 29   | 29   | 29   |

*Note: All regressions were done using clustered standard errors by country.*

## 7.0 Discussion

We find that economic freedom has a positive association with both management practices as well as total factor productivity. Furthermore, a large portion of the relationship between economic freedom and total factor productivity appears to run through management practices. Our findings are in accordance with those of Bloom & Van Reenen (2007). In our theoretical framework we consider economic freedom a potential proxy for competition, one of the primary drivers of management practices, and our results support this hypothesis.

One of the reasons that management practices are considered so valuable is their positive association with a variety of beneficial factors such as firm-level productivity, profitability, Tobin's Q and survival rates. These findings are supported by our own, which is that management practices have a positive association with country-level productivity. This association also supports the theory of Burges & Gules (1998), which is that the residual of total factor productivity is partially explained by soft technological changes such as management, decision making and training.

This raises a new question for us to answer: Does an increase in economic freedom lead to an increased total factor productivity growth? Or does it lead to an increase in the steady-state level of total factor productivity? According to De Haan & Sturm (2000), economic freedom has a positive association with growth, however, it does not appear to raise the steady-state level in a country. We are of the opinion that an increase in economic freedom does both. An increase in economic freedom allows countries to make better use of their inputs, in turn leading to more output and therefore a higher steady-state level. Over time, as economic freedom and productivity in a country increase, this effect can also be interpreted as growth. However, given the cross-sectional nature of our data, we are unable to observe a growth effect. We would highly encourage future research to use panel data about management practices, as it gradually becomes more available while Bloom and Van Reenen continue their efforts.



When we substitute economic freedom for business freedom, one of its sub-factors, we find similar results across the board. Business freedom also has a positive association with management practices and, through management practices, with productivity. Although the effect of business freedom is smaller than that of economic freedom, it does come quite close. Therefore, we believe that business freedom might be one of the primary drivers of the effect that economic freedom has on management and productivity. And because of this, we might be unfairly attributing the effect to economic freedom, while it is business freedom that is doing all the work.

Furthermore, given the small number of control variables included in our research, it is likely that there is a degree of omitted variable bias at play. Both economic freedom, as well as productivity, are macro-economic variables that are influenced by a wide variety of factors, in which there is bound to be some overlap. By not including a factor that drives both economic freedom and productivity, we are probably overestimating the effect of economic freedom on total factor productivity.

Then there is also the risk of reverse causality. Economic freedom consists of a wide variety of sub-factors, which in turn are also measured using a wide range of criteria. Many of those are closely related to productivity, such as government expenditure, tax burden or inflation, and it is therefore not unthinkable that productivity drives economic freedom and not the other way around. However, given the important role that management practices play in this relationship, we do not believe this to be the case, though it is still good to remain wary.

## 8.0 Conclusion

In this thesis, we look at the relationships between economic freedom, management practices, and total factor productivity. While we are not able to provide a definitive answer to the question that Francis Walker once posed, we do believe we have made a significant step in the right direction. We find, in support of our first hypothesis, that economic freedom has a significant, positive relationship with management practices as a one standard deviation increase in economic freedom leads to a 0.200 increase in average management practices. Furthermore, in our support of our second hypothesis, management practices play a significant role in mediating the relationship between economic freedom and total factor productivity. We find that of this 66.137% relationship runs through management practices. This result is consistent across all relevant models, both at a firm as well as a country level and with and without our control variables. Therefore, we accept our hypotheses.

The above results remain consistent when we swap out economic freedom for business freedom. We find that business freedom has a significant, positive relationship with management practices and that management practices acts as a mediator in the relationship between business freedom and total factor productivity. Although the effects are slightly smaller than those of economic freedom, we still find that a one standard deviation increase in business freedom leads to a 0.170 increase in management practices, and that 61.563% of the relationship between business freedom and total factor productivity runs through management practices. Once again, this effect is consistent across the various models that we analyzed. Therefore, we accept our sub-hypotheses.

While our findings are a first indication of the importance of economic freedom and business freedom in stimulating both a higher quality of management as well as productivity, we believe further research is warranted before policy makers adopt our findings. One of the primary reasons for this is the fact that we were limited to cross-sectional data, where ideally, we would have used panel data to answer our research question. And given the limited number of control variables that we possess, we cannot exclude the fact that there could be a potential omitted variable which stimulates both freedom as well as management in a country, which would skew the interpretation of our results and their adaptability to real life situations.

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## Appendix

### Tables

| <b>Table A.1: Detailed summary of management score.</b> |                    |                 |                     |        |
|---|--------------------|-----------------|---------------------|--------|
|   | <u>Percentiles</u> | <u>Smallest</u> |                     |        |
| 1%  | 1.333              | 1               |                     |        |
| 5%  | 1.722              | 1               |                     |        |
| 10%   | 1.944              | 1.056           | <u>Observations</u> | 11,702 |
| 25%   | 2.389              | 1.056           | <u>Sum of Wgt.</u>  | 11,702 |
| 50%   | 2.833              |                 | <u>Mean</u>         | 2.822  |
|   |                    | <u>Largest</u>  | <u>Std. Dev.</u>    | 0.653  |
| 75%   | 3.278              | 4.833           |                     |        |
| 90%   | 3.667              | 4.833           | <u>Variance</u>     | 0.427  |
| 95%   | 3.917              | 4.889           | <u>Skewness</u>     | 0.025  |
| 99%   | 4.306              | 4.889           | <u>Kurtosis</u>     | 2.758  |

| <b>Table A.2: The sub-categories of economic freedom.</b> |                        |                             |                     |
|---|------------------------|-----------------------------|---------------------|
| <u>Rule of Law</u>  | <u>Government Size</u> | <u>Regulator Efficiency</u> | <u>Open Markets</u> |
| Property Rights   | Government Spending    | Business Freedom            | Trade Freedom       |
| Government Integrity                                      | Tax Burden             | Labor Freedom               | Investment Freedom  |
| Judicial Effectiveness                                    | Fiscal Health          | Monetary Freedom            | Financial Freedom   |

| <b>Table A.3: The sub-factors of business freedom.</b> |                               |                                     |                               |
|--|-------------------------------|-------------------------------------|-------------------------------|
| <u>Starting a business</u>                             | <u>Obtaining a license</u>    | <u>Closing a business</u>           | <u>Getting electricity</u>    |
| Procedures (number)                                    | Procedures (number)           | Time (years)                        | Procedures (number)           |
| Time (days)  | Time (days)                   | Cost (% of estate)                  | Time (days)                   |
| Cost (% of income per capita)                          | Cost (% of income per capita) | Recovery rate (cents on the dollar) | Cost (% of income per capita) |
| Minimum capital (% of income per capita)               |                               |                                     |                               |

| <b>Table A.4: Detailed summary of management score across countries.</b> |                     |              |                  |            |              |
|--|---------------------|--------------|------------------|------------|--------------|
| <u>Country</u>   | <u>Observations</u> | <u>Mean</u>  | <u>Std. Dev.</u> | <u>Min</u> | <u>Max</u>   |
| Argentina  | 415                 | 2.682        | .613             | 1.111      | 4.778        |
| Australia  | 451                 | 2.998        | .571             | 1.111      | 4.444        |
| Brazil   | 814                 | 2.661        | .625             | 1.056      | 4.500        |
| Burma  | 147                 | 2.371        | .589             | 1.111      | 4.056        |
| Canada   | 418                 | 3.143        | .621             | 1.444      | 4.556        |
| Chile  | 410                 | 2.704        | .558             | 1.056      | 4.167        |
| China  | 873                 | 2.645        | .596             | 1.111      | 4.778        |
| Colombia   | 170                 | 2.578        | .544             | 1.167      | 3.944        |
| Ethiopia   | 131                 | 2.224        | .394             | 1.333      | 3.500        |
| France   | 490                 | 3.000        | .591             | 1.389      | 4.778        |
| Germany  | 430                 | 3.178        | .556             | 1.588      | 4.722        |
| Ghana  | 98                  | 2.228        | .341             | 1.222      | 3.056        |
| Greece   | 416                 | 2.693        | .631             | 1.222      | 4.333        |
| India  | 711                 | 2.527        | .680             | 1.000      | 4.667        |
| Ireland  | 161                 | 2.766        | .769             | 1.278      | 4.889        |
| Italy  | 437                 | 2.947        | .550             | 1.333      | 4.500        |
| Japan  | 127                 | 3.165        | .591             | 1.444      | 4.778        |
| Kenya  | 182                 | 2.543        | .524             | 1.111      | 4.222        |
| Mexico   | 406                 | 2.886        | .642             | 1.389      | 4.611        |
| Mozambique   | 107                 | 2.018        | .613             | 1.056      | 4.222        |
| New Zealand  | 150                 | 2.851        | .561             | 1.111      | 4.055        |
| Nicaragua  | 83                  | 2.427        | .523             | 1.500      | 3.444        |
| Nigeria  | 111                 | 2.486        | .459             | 1.500      | 4.500        |
| Poland   | 238                 | 2.878        | .583             | 1.056      | 4.389        |
| Portugal   | 193                 | 2.769        | .566             | 1.389      | 4.074        |
| Singapore  | 406                 | 2.954        | .690             | 1.222      | 4.833        |
| Spain  | 214                 | 2.748        | .616             | 1.278      | 4.389        |
| Sweden   | 258                 | 3.166        | .516             | 1.500      | 4.500        |
| Tanzania   | 146                 | 2.252        | .472             | 1.111      | 3.333        |
| Turkey   | 332                 | 2.706        | .400             | 1.722      | 4.056        |
| United Kingdom   | 1008                | 2.971        | .617             | 1.111      | 4.889        |
| United States  | 953                 | 3.285        | .612             | 1.222      | 4.833        |
| Vietnam  | 151                 | 2.608        | .516             | 1.556      | 3.824        |
| Zambia   | 65                  | 2.319        | .575             | 1.111      | 3.500        |
| <i>Overall</i>   | <i>11702</i>        | <i>2.822</i> | <i>.653</i>      | <i>1</i>   | <i>4.889</i> |

**Table A.5: Detailed summary of economic freedom score.**

|     | <u>Percentiles</u> | <u>Smallest</u> |                     |         |
|-----|--------------------|-----------------|---------------------|---------|
| 1%  | 44.1               | 43.8            |                     |         |
| 5%  | 48.7               | 44.1            |                     |         |
| 10% | 51.7               | 44.6            | <u>Observations</u> | 102     |
| 25% | 55.7               | 46.5            | <u>Sum of Wgt.</u>  | 102     |
| 50% | 63.35              |                 | <u>Mean</u>         | 64.742  |
|     |                    | <u>Largest</u>  | <u>Std. Dev.</u>    | 11.009  |
| 75% | 73.8               | 82.1            |                     |         |
| 90% | 79.1               | 87.8            | <u>Variance</u>     | 121.196 |
| 95% | 81.6               | 89.4            | <u>Skewness</u>     | 0.203   |
| 99% | 89.4               | 89.4            | <u>Kurtosis</u>     | 2.152   |

**Table A.6: Detailed summary of business freedom score.**

|     | <u>Percentiles</u> | <u>Smallest</u> |                     |         |
|-----|--------------------|-----------------|---------------------|---------|
| 1%  | 28.7               | 28.3            |                     |         |
| 5%  | 45                 | 28.7            |                     |         |
| 10% | 48                 | 32.6            | <u>Observations</u> | 102     |
| 25% | 55.9               | 37.7            | <u>Sum of Wgt.</u>  | 102     |
| 50% | 71.1               |                 | <u>Mean</u>         | 70.159  |
|     |                    | <u>Largest</u>  | <u>Std. Dev.</u>    | 16.937  |
| 75% | 84.9               | 95.5            |                     |         |
| 90% | 91.1               | 96.1            | <u>Variance</u>     | 286.861 |
| 95% | 94.6               | 96.8            | <u>Skewness</u>     | -0.328  |
| 99% | 96.8               | 96.9            | <u>Kurtosis</u>     | 2.271   |



**Table A.7: Detailed summary of the worldwide economic freedom score throughout the years 1996 – 2015.**

| <u>Year</u>    | <u>Observations</u> | <u>Mean</u>   | <u>Std. Dev.</u> | <u>Min</u>    | <u>Max</u>   |
|----------------|---------------------|---------------|------------------|---------------|--------------|
| 1996           | 34                  | 61.768        | 11.100           | 38.6          | 87.3         |
| 1997           | 34                  | 61.974        | 10.803           | 40.4          | 87           |
| 1998           | 34                  | 62.947        | 10.292           | 42.7          | 86.9         |
| 1999           | 34                  | 63.394        | 10.236           | 43.7          | 87.7         |
| 2000           | 34                  | 63.906        | 10.813           | 44.3          | 87.8         |
| 2001           | 34                  | 64.103        | 10.739           | 45.5          | 87.4         |
| 2002           | 34                  | 63.638        | 10.993           | 44.9          | 88.2         |
| 2003           | 34                  | 63.574        | 11.042           | 43.6          | 88.9         |
| 2004           | 34                  | 63.224        | 11.637           | 40.5          | 88.6         |
| 2005           | 34                  | 64.009        | 11.789           | 40            | 88           |
| 2006           | 34                  | 64.226        | 11.405           | 41            | 87.1         |
| 2007           | 34                  | 64.591        | 11.517           | 39.5          | 87.3         |
| 2008           | 34                  | 64.626        | 11.602           | 37.7          | 87.1         |
| 2009           | 34                  | 64.688        | 11.532           | 36.7          | 86.1         |
| 2010           | 34                  | 64.750        | 11.284           | 37.8          | 87.2         |
| 2011           | 34                  | 64.132        | 11.289           | 38.7          | 87.5         |
| 2012           | 34                  | 64.197        | 11.497           | 39.2          | 88           |
| 2013           | 34                  | 64.747        | 11.184           | 44.6          | 89.4         |
| 2014           | 34                  | 64.729        | 11.301           | 44.1          | 89.4         |
| 2015           | 34                  | 64.750        | 10.869           | 43.8          | 87.8         |
| <i>Overall</i> | <i>680</i>          | <i>63.899</i> | <i>.862</i>      | <i>61.768</i> | <i>64.75</i> |

| <b>Table A.8: Detailed summary of economic freedom scores across countries.</b> |                     |               |                  |               |               |
|---|---------------------|---------------|------------------|---------------|---------------|
| <u>Country</u>  | <u>Observations</u> | <u>Mean</u>   | <u>Std. Dev.</u> | <u>Min</u>    | <u>Max</u>    |
| Argentina   | 3                   | 44.167        | 0.404            | 43.800        | 44.600        |
| Australia   | 3                   | 81.233        | 0.862            | 80.300        | 82.000        |
| Brazil  | 3                   | 56.667        | 0.208            | 56.500        | 56.900        |
| Burma   | 3                   | 47.367        | 1.172            | 46.500        | 48.700        |
| Canada  | 3                   | 79.100        | 1.100            | 78.000        | 80.200        |
| Chile   | 3                   | 78.600        | 0.529            | 77.700        | 78.700        |
| China   | 3                   | 52.400        | 0.361            | 52.000        | 52.700        |
| Colombia  | 3                   | 71.067        | 0.551            | 70.700        | 71.700        |
| Ethiopia  | 3                   | 51.000        | 0.866            | 50.000        | 51.500        |
| France  | 3                   | 62.767        | 0.643            | 62.300        | 63.500        |
| Germany   | 3                   | 73.867        | 0.503            | 73.400        | 74.400        |
| Ghana   | 3                   | 63.400        | 0.893            | 63.000        | 64.200        |
| Greece  | 3                   | 54.300        | 1.277            | 53.200        | 55.700        |
| India   | 3                   | 55.500        | 0.819            | 54.600        | 56.200        |
| Ireland   | 3                   | 76.700        | 0.557            | 76.200        | 77.300        |
| Italy   | 3                   | 61.267        | 0.404            | 60.900        | 61.700        |
| Japan   | 3                   | 72.933        | 0.473            | 72.400        | 73.300        |
| Kenya   | 3                   | 56.733        | 1.002            | 55.600        | 57.500        |
| Mexico  | 3                   | 66.133        | 0.833            | 65.200        | 66.800        |
| Mozambique  | 3                   | 54.333        | 0.987            | 53.200        | 55.000        |
| New Zealand   | 3                   | 81.633        | 0.451            | 81.200        | 82.100        |
| Nicaragua   | 3                   | 58.200        | 0.529            | 57.600        | 58.600        |
| Nigeria   | 3                   | 55.800        | 1.609            | 54.300        | 57.500        |
| Poland  | 3                   | 68.300        | 1.179            | 67.000        | 69.300        |
| Portugal  | 3                   | 64.633        | 0.987            | 63.500        | 65.300        |
| Singapore   | 3                   | 88.867        | 0.924            | 87.800        | 89.400        |
| Spain   | 3                   | 67.767        | 0.666            | 67.200        | 68.500        |
| Sweden  | 3                   | 72.600        | 0.557            | 72.000        | 73.100        |
| Tanzania  | 3                   | 57.933        | 0.513            | 57.500        | 58.500        |
| Turkey  | 3                   | 63.400        | 1.411            | 62.100        | 64.900        |
| United Kingdom  | 3                   | 75.700        | 0.755            | 74.900        | 76.400        |
| United States   | 3                   | 75.700        | 0.436            | 75.400        | 76.200        |
| Vietnam   | 3                   | 52.167        | 1.650            | 50.800        | 54.000        |
| Zambia  | 3                   | 59.300        | 0.953            | 58.700        | 60.400        |
| <i>Total</i>  | <b>102</b>          | <b>64.742</b> | <b>11.009</b>    | <b>43.800</b> | <b>89.400</b> |

**Table A.9: Correlation between economic freedom score & business freedom score, and management score across countries, by looking at firm & average management scores.**

|                        | <u>Management score</u> | <u>Average management score</u> |
|------------------------|-------------------------|---------------------------------|
| Economic Freedom score | 0.280                   | 0.654                           |
| Business Freedom score | 0.326                   | 0.727                           |

*Note: N = 11,702*

**Table A.10 Correlation between total factor productivity and economic freedom, business freedom, management score, and average management score.**

|                          | <u>Total Factor Productivity</u> |
|--------------------------|----------------------------------|
| Management score         | 0.297                            |
| Average management score | 0.720                            |
| Economic Freedom score   | 0.566                            |
| Business Freedom score   | 0.644                            |

*Note: N = 11,110*

**Table A.11: Detailed summary of business freedom over the years  
1996 – 2015.**

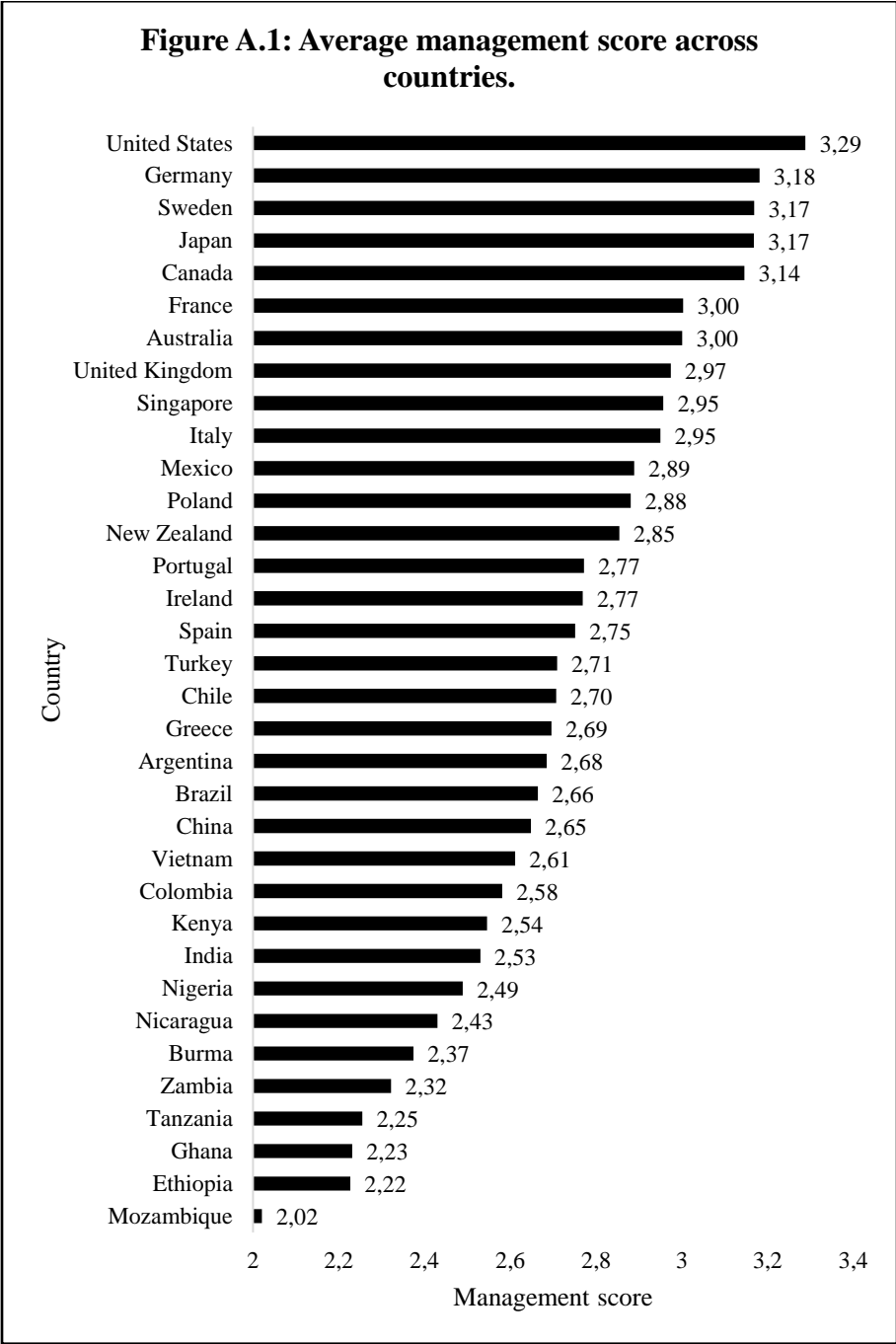
| <u>Year</u>    | <u>Observations</u> | <u>Mean</u>   | <u>Std. Dev.</u> | <u>Min</u>    | <u>Max</u>    |
|----------------|---------------------|---------------|------------------|---------------|---------------|
| 1996           | 34                  | 67.794        | 15.285           | 40            | 100           |
| 1997           | 34                  | 67.353        | 15.435           | 40            | 100           |
| 1998           | 34                  | 67.794        | 15.285           | 40            | 100           |
| 1999           | 34                  | 67.353        | 14.987           | 40            | 100           |
| 2000           | 34                  | 67.794        | 14.365           | 40            | 100           |
| 2001           | 34                  | 66.912        | 14.196           | 40            | 100           |
| 2002           | 34                  | 67.353        | 13.553           | 20            | 99.9          |
| 2003           | 34                  | 67.353        | 13.553           | 20            | 99.9          |
| 2004           | 34                  | 67.353        | 13.553           | 20            | 99.9          |
| 2005           | 34                  | 70.259        | 19.937           | 20            | 99.9          |
| 2006           | 34                  | 71.029        | 19.006           | 20            | 99.9          |
| 2007           | 34                  | 71.368        | 18.960           | 20            | 99.9          |
| 2008           | 34                  | 72.247        | 18.461           | 20            | 99.9          |
| 2009           | 34                  | 71.859        | 19.377           | 20            | 99.9          |
| 2010           | 34                  | 72.144        | 19.270           | 20            | 99.9          |
| 2011           | 34                  | 72.000        | 19.614           | 20            | 99.9          |
| 2012           | 34                  | 71.415        | 19.312           | 20            | 99.9          |
| 2013           | 34                  | 71.003        | 17.910           | 28.3          | 96.8          |
| 2014           | 34                  | 69.924        | 17.633           | 28.7          | 96.9          |
| 2015           | 34                  | 69.550        | 15.656           | 32.6          | 95.0          |
| <i>Overall</i> | <i>680</i>          | <i>69.493</i> | <i>1.968</i>     | <i>66.912</i> | <i>72.247</i> |

| <b>Table A.12: Detailed summary of business freedom across countries.</b> |                     |               |                  |             |             |
|---|---------------------|---------------|------------------|-------------|-------------|
| <u>Country</u>  | <u>Observations</u> | <u>Mean</u>   | <u>Std. Dev.</u> | <u>Min</u>  | <u>Max</u>  |
| Argentina   | 3                   | 54.233        | 1.626            | 52.8        | 56          |
| Australia   | 3                   | 92.7          | 2.869            | 89.4        | 94.6        |
| Brazil  | 3                   | 56.267        | 4.447            | 53.6        | 61.4        |
| Burma   | 3                   | 29.867        | 2.376            | 28.3        | 32.6        |
| Canada  | 3                   | 86.7          | 4.246            | 81.8        | 89.3        |
| Chile   | 3                   | 70.233        | 1.617            | 69.3        | 72.1        |
| China   | 3                   | 52            | 2.252            | 49.7        | 54.2        |
| Colombia  | 3                   | 81.633        | 3.502            | 78.2        | 85.2        |
| Ethiopia  | 3                   | 56.5          | 1.127            | 55.8        | 57.8        |
| France  | 3                   | 79.5          | .964             | 78.4        | 80.2        |
| Germany   | 3                   | 89.367        | 1.012            | 88.2        | 90          |
| Ghana   | 3                   | 62.2          | .608             | 61.5        | 62.6        |
| Greece  | 3                   | 74.3          | 1.323            | 73.3        | 75.8        |
| India   | 3                   | 42.867        | 4.964            | 37.7        | 47.6        |
| Ireland   | 3                   | 81.7          | 1.931            | 79.6        | 83.4        |
| Italy   | 3                   | 72.567        | 2.663            | 70.3        | 75.5        |
| Japan   | 3                   | 82.2          | 2.066            | 80          | 84.1        |
| Kenya   | 3                   | 50.767        | 4.373            | 47.9        | 55.8        |
| Mexico  | 3                   | 73            | 3.315            | 70.7        | 76.8        |
| Mozambique  | 3                   | 60.667        | 4.654            | 55.9        | 65.2        |
| New Zealand   | 3                   | 94.333        | 2.558            | 91.4        | 96.1        |
| Nicaragua   | 3                   | 57.267        | 4.347            | 52.6        | 61.2        |
| Nigeria   | 3                   | 48.333        | .351             | 48          | 48.7        |
| Poland  | 3                   | 68.7          | 1.400            | 67.3        | 70.1        |
| Portugal  | 3                   | 85.9          | 1.400            | 84.9        | 87.5        |
| Singapore   | 3                   | 96.233        | 1.069            | 95          | 96.9        |
| Spain   | 3                   | 76.933        | .814             | 76          | 77.5        |
| Sweden  | 3                   | 89.567        | 1.604            | 87.9        | 91.1        |
| Tanzania  | 3                   | 46.5          | 1.323            | 45          | 47.5        |
| Turkey  | 3                   | 64.667        | 3.361            | 61          | 67.6        |
| United Kingdom  | 3                   | 89.7          | 3.236            | 86          | 92          |
| United States   | 3                   | 87.567        | 2.491            | 84.7        | 89.2        |
| Vietnam   | 3                   | 60.6          | 2.007            | 58.3        | 62          |
| Zambia  | 3                   | 69.833        | 4.479            | 66.4        | 74.9        |
| <i>Overall</i>  | <b>102</b>          | <b>70.159</b> | <b>16.937</b>    | <b>28.3</b> | <b>96.9</b> |

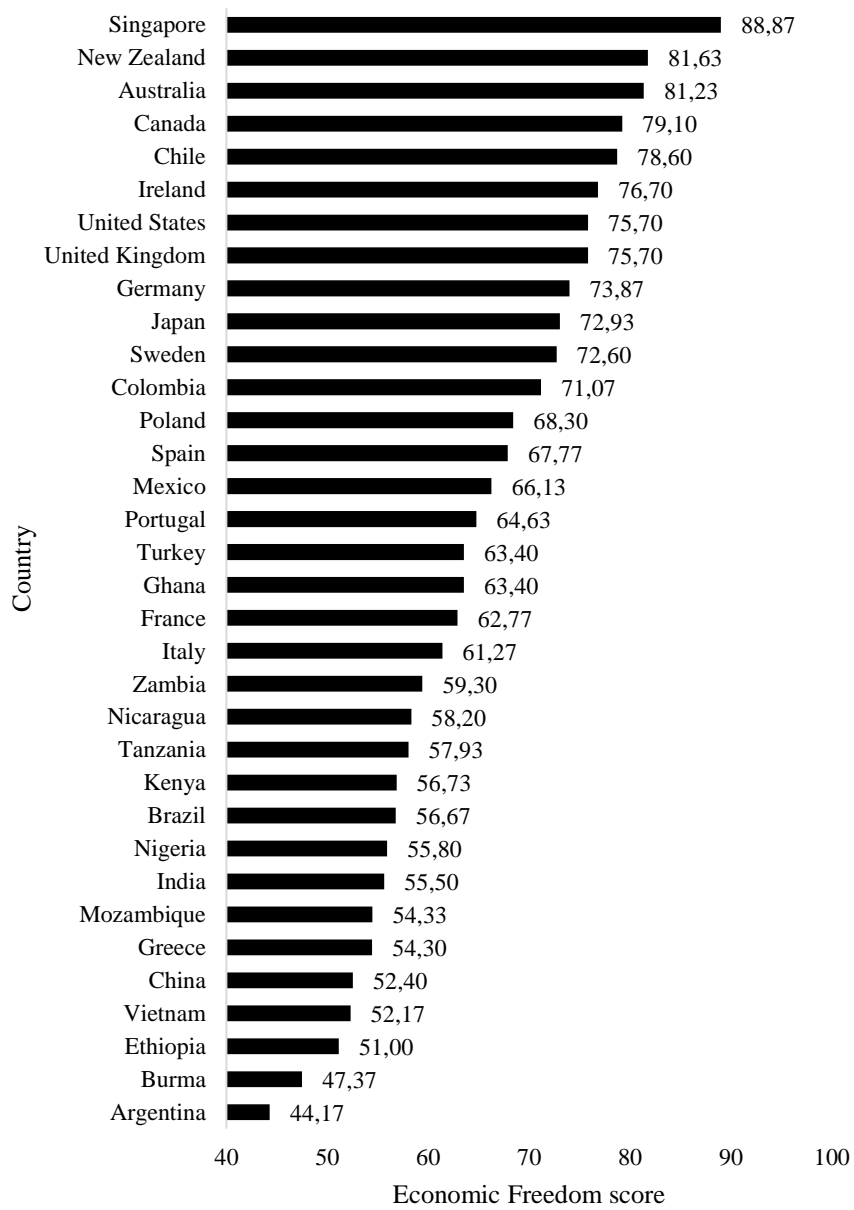
**Table A.13: Detailed summary of relative total factor productivity across countries.**

| <u>Country</u> | <u>Observations</u> | <u>Mean</u> | <u>Std. Dev.</u> | <u>Min</u>  | <u>Max</u>   |
|----------------|---------------------|-------------|------------------|-------------|--------------|
| Argentina      | 3                   | .755        | .018             | .744        | .776         |
| Australia      | 3                   | .838        | .023             | .813        | .857         |
| Brazil         | 3                   | .521        | .026             | .493        | .546         |
| Canada         | 3                   | .845        | .018             | .833        | .865         |
| Chile          | 3                   | .729        | .008             | .724        | .739         |
| China          | 3                   | .395        | .009             | .385        | .401         |
| Colombia       | 3                   | .583        | .019             | .562        | .597         |
| France         | 3                   | .968        | .008             | .960        | .976         |
| Germany        | 3                   | .939        | .006             | .933        | .945         |
| Greece         | 3                   | .527        | .004             | .522        | .530         |
| India          | 3                   | .426        | .006             | .421        | .432         |
| Ireland        | 3                   | 1.049       | .102             | .970        | 1.164        |
| Italy          | 3                   | .756        | .003             | .754        | .760         |
| Japan          | 3                   | .737        | .010             | .728        | .748         |
| Kenya          | 3                   | .350        | .008             | .343        | .359         |
| Mexico         | 3                   | .654        | .012             | .646        | .668         |
| Mozambique     | 3                   | .359        | .009             | .349        | .365         |
| New Zealand    | 3                   | .863        | .002             | .864        | .879         |
| Nicaragua      | 3                   | .392        | .003             | .388        | .394         |
| Nigeria        | 3                   | .649        | .0115            | .632        | .658         |
| Poland         | 3                   | .872        | .008             | .864        | .879         |
| Portugal       | 3                   | .657        | .011             | .644        | .664         |
| Singapore      | 3                   | .706        | .013             | .692        | .717         |
| Spain          | 3                   | .830        | .016             | .817        | .848         |
| Sweden         | 3                   | .799        | .012             | .788        | .812         |
| Tanzania       | 3                   | .300        | .003             | .296        | .303         |
| Turkey         | 3                   | 1.089       | .015             | 1.076       | 1.105        |
| United Kingdom | 3                   | .780        | .005             | .777        | .786         |
| United States  | 3                   | 1           | 0                | 1           | 1            |
| <i>Overall</i> | <i>87</i>           | <i>.702</i> | <i>.220</i>      | <i>.296</i> | <i>1.164</i> |

**Figures**

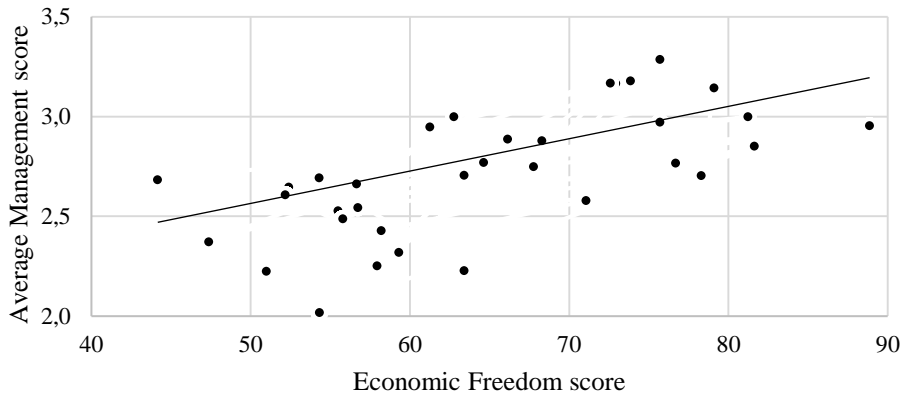


**Figure A.2: Average economic freedom score across countries.**

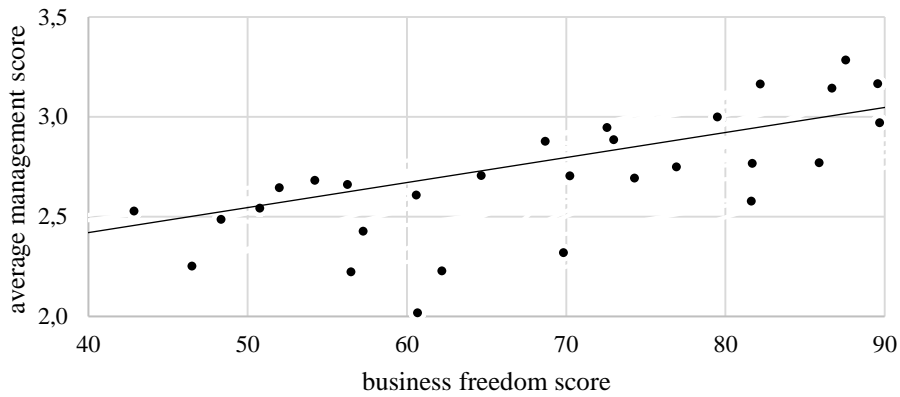




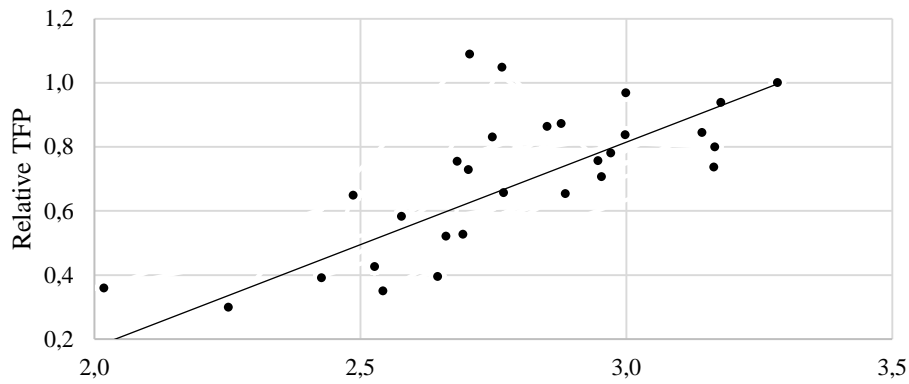
**Figure A.3: Scatterplot of the relationship between economic freedom score and average management score across countries.**



**Figure A.4: Scatterplot of the relationship between business freedom score and average management score across countries.**

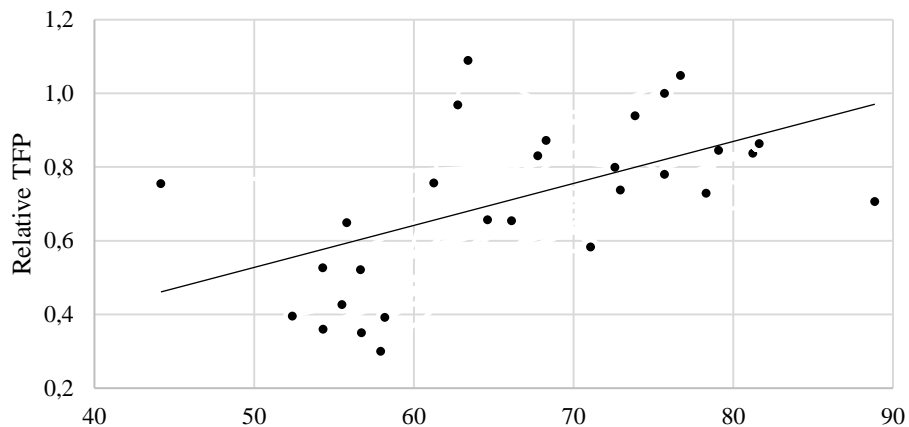


**Figure A.5: Scatterplot of the relationship between average management score and total factor productivity across countries.**



Note: TFP is measured as relative TFP, with USA = 1 as a benchmark.

**Figure A.6: Relationship between economic freedom score and total factor productivity across countries.**



Note: TFP is measured as relative TFP, with USA = 1 as a benchmark.

## Equations

$$(A.1) \textit{Sub - factor score}_i = 50 \times \left( \frac{\textit{Sub-factor}_{average}}{\textit{Sub-factor}_i} \right)$$

$$(A.2) (11) \textit{Mediation} = 0.011395 - 0.0030835 = 0.0083115$$

$$(A.3) \frac{\textit{Mediation}}{c} * 100\% = \frac{0.0083115}{0.011395} * 100\% = 72.940\%$$

$$(A.4) (11) \textit{Mediation} = 0.009058 - 0.0034441 = 0.0056139$$

$$(A.5) \frac{\textit{Mediation}}{c} * 100\% = \frac{0.0056139}{0.009058} * 100\% = 61.977\%$$