The US CHIPS Act on Domestic and Foreign Direct Investment

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Introduction

Within the last year, the US implemented a policy known as the CHIPS Act with the goal of attracting both FDI and direct investment into the US's chip manufacturing sector via tax incentives and subsidies including $52.7 billion for US semiconductor R&D, manufacturing, and workforce development whereby $39 billion of the amount is allocated to manufacturing incentives and $13.2 billion to R&D and workforce development (Hufbauer & Hogan, 2022). The act also provides a 25% investment tax credit to encourage semiconductor manufacturing in the US.

The CHIPS Act comes because of concern for how advanced semiconductor manufacturing is presently concentrated in foreign nations such as South Korea and Taiwan. Currently, over 53% of the global foundry market semiconductor share is attributed to one company, TSMC (Taiwan Semiconductor Manufacturing Company) (Ryan, 2022). According to Ryan (2022), "The fact that only TSMC and Samsung (South Korea) can make the most advanced semiconductors (five nanometres in size) 'puts at risk the ability to supply current and future [US] national security and critical infrastructure needs.' This means that China's long-term goal of reunifying with Taiwan is now more threatening to US interests." (The portion quoted by Ryan was taken from the Biden Administration's 100-Day Supply Chain Review Report). Therefore, the act shows the perceived US need to secure future advanced semiconductor supply regardless of developing events in Asia that could undermine this security. Furthermore, advanced semiconductors are used in a variety of applications from Artificial Intelligence to missile guidance systems to advanced medical equipment. Many other countries, including those in Europe, China, and South Korea have also proposed similar legislation to counteract the expected effect of the US CHIPS Act may have on international chip

manufacturing (Kreps & Timmers, 2022) and, in the case of China, to counteract US chip export restrictions on the nation.

This paper will examine the impact of these tax incentives and subsidies in the chip manufacturing sector on FDI and direct investment in the US. With an increase in tax incentives and subsidies related to chip manufacturing, more FDI and domestic investment should be attracted into the US. These tax incentives could provide domestic US companies with the ability to invest in chip manufacturing centers initially more easily, something that was before not deemed to be potentially profitable as they could more easily compete with foreign manufacturers. Regarding FDI, the justification for an increase is much the same as opening a chip manufacturing facility in another country could have before not been deemed profitable in the US. In fact, Ryan (2022) writes that "the cost of manufacturing in the US is deemed to be too high without government subsidies." Other factors such as foreign tax incentives and subsidies relating to chip manufacturing investment and corporate tax rates must be considered as they may impact the size of these expected impacts.

To find the expected result of the posed research question, journal articles related to the effectiveness of US chip manufacturing tax incentives on FDI, and domestic investment will be examined and more broadly, journal articles related to the effectiveness of tax incentives in general and/or subsidies on FDI and domestic investment will be as well. Additionally, journal articles about this relationship set in the context of US states and even other countries such as China will also be helpful. Finally, the academic journal by Holland and Vann in the references list below focuses on income tax incentives implemented by developing and transition countries for investment. Although the US is not either of the two, if the state of its current chip

manufacturing sector is considered, then it could be said that the US fits into one of these categories with respect to the chip manufacturing sector.

Summary of the Literature

Overall Summary of the Literature

With the recent passage of the US CHIPS Act (August 2022), the effectiveness of the act in attracting investment (specifically FDI) to the US's chip manufacturing sector is under scrutiny. Such scrutiny motivates this review of the literature around whether the enactment of investment incentives (such as seen in the CHIPS Act) will increase FDI in a specific country (the US in this case). One claim, that an increase in investment incentives proposed by the US is expected to lead to an increase in received FDI into the chip manufacturing sector of the US, is echoed or inferred by studies in other countries in several papers and a policy brief (Klemm & Van Parys, 2012; Hufbauer & Hogan, 2022; Buettner & Ruf, 2007) that use an empirical approach in showing the relationship between tax incentives and FDI. Alternatively, Bobenič Hintošová et al. (2021) suggests that some forms of investment incentives (fiscal incentives) are ineffective and even negatively affect FDI. Similar research concerns the effect that these incentives have on domestic investment, which has been addressed by several studies (Liu & Mao, 2019; Hufbauer & Hogan, 2022). Finally, the presence of heterogeneity in attracting FDI as elucidated in the study by Hanousek et al. (2011) is a major determining factor concerning the effectiveness of tax incentives. Considering this heterogeneity makes a firm conclusion on the effect of investment incentives (specifically tax incentives) difficult to draw in certain situations.

Direct Effect

The papers by Klemm and Van Parys (2012) as well as Buettner and Ruf (2007) take an empirical approach in analyzing the effectiveness of tax incentives in attracting FDI into countries in certain cases. Klemm and Van Parys (2012) found through panel data analysis of the datasets of tax incentives and macroeconomics variables from over 40 countries in Latin America, the Caribbean, and Africa that a lower corporate income tax and longer tax holidays were effective in attracting FDI in Latin America and the Caribbean but not Africa. Macroeconomic data was taken from the IMF World Economic Outlook and World Bank World Development Indicators databases while corporate tax data was taken from the Price Waterhouse worldwide summaries of corporate taxes. This was done by employing the use of maximum likelihood estimators in a spatial lag model to account for prior announcement of a tax reform policy before the actual implementation which is usually the case. Buettner and Ruf (2007), through the utilization of OLS estimate regression on panel data of the FDI of German multinationals from the German Bundesbank for 1996 to 2001, concluded that while the marginal tax rate had no predictive power for the location decisions of German multinationals, significant effects on these location decisions were exhibited when considering effective average and statutory tax rates. The results indicated that an increase of the statutory tax rate and effective average tax rate would cause the odds of a positive direct investment to decrease by about 20% and 12.5% respectively (Buettner & Ruf, 2007).

The policy brief by Hufbauer and Hogan (2022) outlined aspects of the US CHIPS Act. Through the utilization of information regarding country chip subsidy packages, global market share of semiconductor production, and sales revenue by chip companies among others, the brief analyzed the effectiveness of the CHIPS Act. Data was taken from various sources including but

not limited to Statista, company annual reports and forms, the FRED, and the US Bureau of Labor Statistics. The brief concluded that CHIPS Act subsidies will increase US chip production and spur US chip research and that the US should focus on exporting advanced, high-value chips and importing basic, lower-value chips, as fits their comparative advantage.

While not being considered entirely ineffective, the counterclaim of an aspect of the CHIPS Act is proposed and researched by other papers. This is concerning the implementation of fiscal incentives (such as corporate income tax breaks) to attract FDI. An empirical study done by Bobenič Hintošová et al. (2021) used an OLS method to analyze the effect of this policy implementation on FDI in Slovakia. The study found that in the period from 2002-2019 when the preference of specific forms of investment incentives by the Slovakian government changed slightly, that while the usage of financial incentives (e.g., grants for tangible and intangible assets, contributions for new jobs creation, etc.) to attract FDI in Slovakia were found to increase FDI inflow, the usage of fiscal incentives had the opposite effect. The data regarding the investment incentives imposed in Slovakia was collected by the Slovakian government from 2002-2019 and data on the FDI inflow in that period was taken from the World Bank database. Included in the study is also a literature review in which the conclusions of a multitude of studies regarding the effects of investment incentives on FDI in certain cases are presented. It starts by stating that there are several examples that investment incentives attracted significant FDI, especially in transition countries (Bobenič Hintošová et al., 2021). However, the ability to attract FDI is not the same in every country as a study comparing Central European and Baltic countries found that the former attracted more FDI through the utilization of both fiscal and financial incentives. This combination was highlighted as having the potential of being quite effective in certain situations. Bobenič Hintošová et al. (2021) then goes on to say how tax-related fiscal

incentives are considered more important for attracting FDI and have received more attention in the literature.

Alternative Policies

The outcome of investment incentives is another factor that should be considered. In the context of the CHIPS Act, current US manufacturing capabilities by domestic firms do not seem to lend much potential for being influenced as many relevant firms such as NVIDIA outsource all their production. Intel, on the other hand, maintains fabs of its own and plans to expand them in the future. As a result, while certain domestic firms such as Intel are the only that will see current manufacturing operations potentially expand because of the CHIPS Act, we could see a shift from international outsourcing of chip manufacturing to domestic sourcing from companies like AMD and NVIDIA to Intel, and currently, such negotiations and ideas have been floating around.

Several papers look at policies enacted with the purpose of increasing domestic investment in other countries and their effectiveness in realizing their goal. Such papers include the policy brief by Hufbauer and Hogan (2022) as well as the empirical study conducted by Liu and Mao (2019) on Chinese domestic investment. Hufbauer and Hogan (2022) cites stated chip manufacturers plans for expansion of fabs into the US, both domestic and international. Already mentioned was Intel, who plans to open a $20 Billion manufacturing facility in Ohio, but others such as TSMC and Samsung are included as well. On an empirical note, the study by Liu and Mao (2019) directly quantifies the effect of a Chinese capital taxation reform between 2004 and 2009 on domestic investment of firms. The study found through difference-in-difference (DID)

analysis on a unique dataset of the investment of 120,000 Chinese firms from 2005-2012 that the reform raised investment by 38.4 percent for the treated firms relative to the control firms.

Heterogeneity

While the main consensus is that the CHIPS Act will increase FDI into the US regarding chip manufacturing, there exists heterogeneity that can influence the expected outcome of the implementation of investment incentives on FDI in different ways. Such aspects include factors that are considered to hamper FDI such as political instabilities, disputed borders, and weak states in the Balkans (Hanousek et al., 2011). Hanousek et al. (2011) is a meta-analysis which summarizes the empirical results on the direct and spillover effects of FDI from 21 studies in transition countries.

In the literature review in included in the study by Bobenič Hintošová et al. (2021), ambiguity regarding the effectiveness of investment incentives has arisen in literature in which certain characteristics such as the complexity of a country's tax system, employment costs, labor productivity, macroeconomic conditions, infrastructure, and transparent institutions played a role in determining the effectiveness of these investment incentives at attracting FDI. Differences in countries that can lead to heterogeneous impacts regarding FDI include whether the country is developing vs. developed, whether it has a high vs. low GDP relative to the country in comparison, export controls, and agreements with other countries can constitute heterogeneous impacts.

The study by Culahovic (2000), containing mostly theoretical information with some generalized empirical data from previous studies and reports as well as the OECD's own work, focuses on the policy and structural framework of countries and its conduciveness to FDI.

Among the most important sets of factors for the selection of FDI location are a country's policy framework, business performance influencing factors such as country image and the general political environment, and economic factors such as labor costs and market size. Culahovic (2000) goes on to analyze Bosnia and its transition from socialist to market economy after the Bosnian war. In the analysis, it is stated that an unhealthy environment for doing business was formed in Bosnia from obstacles rooted in political, systemic, and administrative areas. Examples include current systems of public expenditure and the current fiscal system with the country. Furthermore, regarding tax and investment incentives and their role in attracting FDI, Culahovic (2000) explains that key to FDI success were stable and sound economic policies, supporting legislation and institutions, and development of human capital and democratic rules. Comparatively, tax incentives were only useful when used carefully and as a part of other sound policy measures (not independently without any strategy).

Accordingly, the CHIPS Act utilizes tax incentives in such a manner as it is bundled with other aspects such as those previously laid out in being key for FDI success (regarding the US economy) and export control agreements with other countries. The policy brief by Hufbauer and Hogan (2022) brings to light the emergence of a proposed alliance between the US, Japan, South Korea, and Taiwan to better limit chip development in China amidst the ongoing "chip war." The "Chip 4," or "Fab 4" alliance includes apart from China, as Hufbauer and Hogan (2022) put it:

"The world's four biggest semiconductor powerhouses—to increase cooperation on sophisticated semiconductor design and production as well as to counter China's growing influence in global semiconductor supply chains. Each country in the alliance plays a unique and critical role in the supply chain: The United States dominates advanced chip design, Japan

supplies essential materials and equipment, and both South Korea and Taiwan dominate semiconductor manufacturing."

On another note, another aspect of heterogeneity found in the paper by Buettner and Ruf (2007) is the effect that a country's GDP can have on FDI. The study found that in the case of chosen FDI location for German multinationals, GDP played a significant role. Klemm and Van Parys (2012) seems to potentially offer support to the influence of GDP on attracting FDI. As referenced from the study, though lower CIT rates and longer tax holidays were found to be effective in attracting FDI to the Caribbean and Latin America, it did not have a significant effect in the case of Africa. An explanation offered by Klemm and Van Parys (2012) is that the investment climate in Africa is too poor for tax incentives to compensate for that poor investment climate. Of note is the fact that Africa, especially sub-Saharan Africa, is much poorer than Latin America and the Caribbean, highlighting a difference in GDPs and lending credence to the possible explanation of there being a poor climate for investment.

Analysis of Literature

Internal Validity

To properly analyze the literature used, the internal and external validity of each paper must be examined. Concerning the internal validity of these papers, the found causal effect as well as the data and analysis method will be scrutinized for various factors. These include the possible presence of bias, poor data, unbacked assumptions, etc. The first study under scrutiny is that by Bobenič Hintošová et al. (2021). In it, OLS estimate regression is used on panel data provided by the Slovakian government. While the data used is solid, the analysis method used is

lacking because of the presence of omitted variable bias that is usually associated with these types of regressions. Additionally, the paper does not do enough to address this bias by using such tools as instrumental variable regressions. Buettner and Ruff (2007) also utilizes OLS estimate regression on panel data, however, it is not internally valid for the same reason that the previous paper was not. Culahovic (2000), being a more theoretical brief on FDI by the OECD with some summarized empirical data, utilizes a significant amount of data to explain FDI flow trends and reasons for heterogeneity in the ability to attract FDI and is believed to be internally valid. Hanousek et al. (2011) is a meta-analysis of 21 studies on the direct and spillover effects of FDI in transition countries. As meta-analysis is viewed as a method that provides a more objective appraisal of evidence and can help to minimize bias, the drawn conclusions of the study are believed to be internally valid. The policy brief by Hufbauer and Hogan (2022) on the US CHIPS Act utilizes already existing statements for investment, several sources of data looking at such material as the scale of country-specific incentive and subsidy initiatives, and the investment environment of specific countries. The study is believed to have analyzed the data effectively and is thus believed to be internally valid. Klemm and Van Parys (2012) utilizes maximum likelihood estimators in a spatial lag model on panel data and though this seems to possibly be better than a simple OLS regression, it is also not believed to be internally valid. Finally, the paper by Liu and Mao (2019) utilizes a quasi-experimental design in the form of D-in-D analysis of panel data. As the parallel trend assumption is perceived to hold, it is found to be internally valid.

External Validity

External validity concerns literature that generalizes to the case examined in the research question which is related to the influence of the tax incentives and subsidies within the CHIPS Act on FDI inflow into the US. Characteristics such as the GDP of the country in the study as well as tax system complexity will be considered in determining this generalizability to the US. Bobenič Hintošová et al. (2021) was found to not be externally valid because the location in which the study was done, Slovakia, maintains a substantially different GDP and policy structure as compared to the US. Buettner and Ruf (2007), because it looks at determinants for FDI investment of German multinationals that can be applicable to the US, and really any country. Information within the study by Culahovic (2000) was viewed as being generalizable to the US because the data on FDI within the OECD contains data on a multitude of developed countries such as France, Germany, Japan, and the United States. The meta-analysis by Hanousek et al. (2011) concerns transition countries which are not generalizable to the United States. Hufbauer and Hogan (2022) on the other hand is, as it is specific to the US CHIPS Act policy. Klemm and Van Parys (2012) looks at countries in Latin America, the Caribbean, and Africa, none of which are similar enough to the United States in either GDP levels or policy structure, especially when considering Africa. Finally, Liu and Mao (2019), despite looking at domestic investment in China, looks at a policy implementation at a time in which the Chinese economy could be viewed as similar enough to the United States (despite the policy being implemented in 2009).

Conclusion

Concerning the literature that was looked at through this literature review and specifically those studies which were found to be valid both internally and externally, certain conclusions can be taken away. Consequently, valid literature (both externally and internally) concludes that the investment incentives implemented through the CHIPS Act would lead to greater FDI into the United States. This is because even despite the presence of heterogeneity in attracting FDI, the US's characteristics are conducive toward attracting FDI (high GDP, solid policy structure, etc.). Additionally, according to valid literature the act would also lead to an increase in domestic investment within the US.

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