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Service Matters: Capital Misallocation and Sectoral Economic Growth†

By WOO JIN CHOI AND WOO JIN ROH*

Growth of the Korean economy has been sluggish, and this situation is more pronounced in the service sector. We argue that capital misallocation, especially in the service sector, could contribute to this slowdown. Utilizing firm and sectoral level data, first we assess the rising dispersion of the marginal revenue product of capital (MRPK) driven by the service sector. This could represent a widening misallocation of capital. Furthermore, a panel regression shows that within-sector misallocations at the sectoral level are closely correlated with the lower growth rate of sectoral real value added. Again, this is mainly observed in the service sector, but not in the manufacturing sector. Misallocations of other resources, labor and the intermediate inputs do not stand out.

Key Word: Resource Misallocation, Firm-level Data, Sectoral Growth
JEL Code: D24, O40, O41, O49

I. Introduction

Prosperity and the growth of the aggregate economy are unarguably among the oldest and most important topics in macroeconomics. Efficiency in resource allocation and properly functioning production mechanisms are crucial to any system of macroeconomics. As the Korean economy has passed through various stages of development, the overall growth rate has been reduced, and this is natural from the perspective of growth convergence. As one economy passes through the middle-income stage and enters the advanced group, the growth rate would gradually be reduced. However, it has not been thoroughly examined as to whether production resources are optimally allocated or whether there is any room for improvement in the Korean economy. Although misallocation is a common usual suspect of hampered growth, it is only recent that detailed documentation of misallocation in

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the Korean economy has been reported. Also, the importance of the service sector has been overlooked and no rigorous assessments exist thus far.

In this paper, we fill this gap and attempt to examine how this distribution of factors of production can affect the overall productivity of the Korean economy. While doing so, we also focus on the service sector and assess how it differs from its counterpart in the economy, i.e., the manufacturing sector. First, through the lens of firm-level data, we examine how the efficiency of resource allocation in the Korean economy has changed over the period of 2000 to 2018. We measure the dispersion of the marginal revenue product of production resources, i.e., capital, labor, and the intermediate inputs, and we assess potential misallocations of production factors in the aggregate economy.

We focus on the service sector for the following reasons. First, it is widely documented that the growth rate of the Korean economy has gradually slowed. More importantly, the downward trend is most notable in the service sector. In Figure 1, the relative level of production per capita for the aggregate economy, that for manufacturing, and that for service are plotted. If we anchor the level of output at the year 2000 (log scale=100), then the level of aggregate per capita output reaches the level of 148 by 2018. However, service sector output reaches only the level of 123, while manufacturing sector output reaches level 187. Although the growth rate of the manufacturing sector, which is the slope of the log output, has fluctuated more in the manufacturing sector, it is observable that the average growth rate and the marginal growth rate at the end of our sample period are far above those of the service sector. International evidence also has demonstrated that the service sector is much more vulnerable to misallocations. It is widely documented that in the run-up to the Euro crisis or the Great Financial Crisis, the service sector was the main driver of the sluggish GDP growth in southern European countries. Institutional friction such as downward wage rigidity, which is known to be stronger in the service sector, has also been posited as the main driver of the sub-optimal adjustment of the

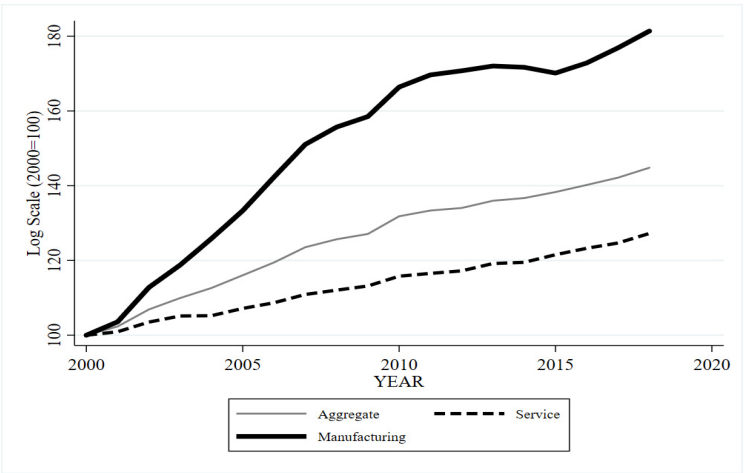

FIGURE 1. RELATIVE LEVEL OF OUTPUT PER CAPITA: MANUFACTURING VS. SERVICE

Note: Author's calculations based on OECD STAN data. Each series plots the log of value added per employment engaged. All series are anchored at 100 in 2000. Aggregate output is the value added of all sectors. Service output includes every sector except Agriculture, Mining, and Manufacturing.

macro-economy during the crisis. Motivated by this international and local evidence, the service sector is worth a thorough examination in terms of misallocations.

Our empirical results document the pattern of resource misallocation utilizing firm-level data. We incorporate nationally representative firm-level data and assess the dispersion of the marginal revenue product of capital, labor, and intermediate inputs (MRPK, MRPL, and MRPM, respectively). We calculate value added divided by each production resource after deflating those firm-level variables with sectoral deflators. Among others, the dispersion of MRPK has been widening notably. The dispersions of MRPL and MRPM improved when compared to 2000, while that of MRPK deteriorated. Furthermore, this trend is mostly driven by the service sector. The increasing dispersion of MRPK in the service sector is clearly observed throughout the entire sample period, i.e., from 2000 to 2018. We also note that the variations in the dispersion of MRPK depend on the size of the firm. We show that inefficiencies in capital allocations are predominant in firms with a small number of workers. We believe that this suggests that capital misallocation is a critical factor behind the growth slowdown of the Korean economy.

At the same time, we also show that these misallocations at the sectoral level are tightly correlated with the (realized) growth of real value added. Moreover, the service sector strongly contributed to this pattern. We run a fixed-effect panel regression in which we regress 26 sectoral misallocations on sectoral value added growth. If the lagged standard deviation of MRPK rises by one percent, the growth of real value added tends to decrease by 1.1 percentage point. These results are statistically significant. If we further control for the time trend and use a crisis dummy for the Global Financial Crisis, the results still hold. Thus, the correlation between the dispersion of MRPK and the growth of realized value added does not merely come from a confounding factor of a time trend; rather, it partly stems from cross-sectional covariations. Again, the result is mostly driven by the service sector. If we split our sample and run the sectoral regression independently, the results are preserved in the sample of the service sector, but not in the manufacturing sector. If the lagged standard deviation of MRPK rises by one percent, the growth of real value added also tends to decrease by 1.1 percentage point in the sample of the service sector. However, this result does not hold in the manufacturing sector. Not only are the signs of the regression preserved, but we also lose all statistical significance. These are interesting new stylized facts. Moreover, rising dispersions of MRPK in the aggregate service sector do not necessarily predict these patterns. Our second results indicate that on average, there is a much tighter correlation between the MRPK dispersions and the hampered real value added growth in the service sector. Within-group dispersions at the 26-sectoral level are meaningfully associated with realized value added growth. This is a different approach from those in the literature in the sense that we incorporate *realized* values of sectoral output.

Our results are derived from firm-level data. Researchers also tend to utilize plant-level data and thus only focus on the manufacturing sector. However, misallocations in the service sector are much severe than those in the manufacturing sector. This is widely documented in the literature. At the same time, it could also be more important to assess resource misallocation at the firm level instead of at the plant level, depending on the intent or scope of the question. Whether it is important to focus on firm-level data or plant-level data is self-evident. For one, a central question

would be whether to observe variation at the plant level, which uses rather a homogenous technology. Then, researchers could find results that are relatively free from the issue of heterogeneity in production technology. However, the weak performance of the service sector in the Korean economy is of great importance and an immediate issue at hand. To the best of our knowledge, our work is the first to assess misallocations at the firm level in Korea covering not only listed and audited firms but virtually every firm for which data are available.

It is natural to mention that there are a few shortcomings in our approach. As for all other studies that deal with misallocations, measurement error could be a critical factor; it may also be more severe for the small firms in the service sector. We complement our analysis as much as possible and provide exhaustive results for robustness. It is also important to note that our work is mute with regard to the source(s) of these dispersions. Heterogeneity in production technology could be an essential factor that drives the dispersion of MRPK. Given that we are covering the service sector using firm-level data, heterogeneity in production technology could be the factor that generates the significant fraction in the dispersion of MRPK. That is, it is possible that the heterogeneity in production technology could be much more severe in the service sector. Our results need to be interpreted carefully. In such a case, the high dispersion of MRPK does not necessarily imply capital misallocation. Nonetheless, however, we believe that our work is meaningful in relation to several ways. First even if the dispersion of MRPK could partly stem from the heterogeneity of production technologies among firms, its steady rise entirely due to rising heterogeneity in technology would be less probable. Furthermore, it is not likely that rising dispersion is mainly due to the rising heterogeneity in production technology. It would also be not very likely that these outcomes are further correlated with the growth of sectoral value added. Our work does not attempt to identify causality and does not address the sources of these potential misallocations. We still believe that our work provides invaluable empirical evidence which connects the dispersion of capital allocations and sectoral value added as long as readers fully understand its limitations.

In summary, we argue that the misallocation of capital, but not the misallocation of labor or intermediates inputs, matters. These findings have important policy implications. Our results provide strong evidence that financial intermediation for the service sector, possibly aiming at the domestic market, faces more distorted friction than that in the manufacturing and/or export sectors. Thus, we claim that friction in financial intermediation should be prioritized during institutional reforms. Alternatively, any policy that aims to affect the service sector should be evaluated from the perspective of macroeconomic resource allocation and should be assessed as to whether it has affected resource misallocation. Although these sources of misallocation and policy-related issues are important, our work is mute on those. We believe that these issues are beyond the scope of our paper, and we will leave them to future researchers. In the next chapter we introduce literature relevant to this study and describe how our work stems from or is distinguished from previous works.

II. Literature

Our work is related to several strands in the literature. First, there is a vast amount of literature regarding the misallocation of resources, especially capital misallocations. Most notably, Hsieh and Klenow (2009) measure the resource misallocation and argue that the differences in economic performances between China, India and the US economy can be explained significantly in terms of efficiency losses from capital allocations. Utilizing plant-level data, they measure the marginal revenue product of capital (MRPK) and the marginal revenue product of labor (MRPL). Our methodology that measures misallocations is in principle identical to their canonical methodology, except that we exploit intermediate inputs and gross output instead of value added as was done in Hsieh and Klenow (2009). Also, we exploit firm-level data such that we can focus on the dynamic variations of misallocations of resources. Their work is clearly seminal, and much research has followed. Although the intuition that resource misallocation could be a potentially critical factor accounting for GDP growth, they were among the first to document the idea in a systematic manner.

In a similar vein, Restuccia and Rogerson (2008) build a theoretical model that suggests a framework by which to understand how differences in resource allocation among different establishments can account for differences in production among different countries. As in Hsieh and Klenow (2009), these authors also provide a counterfactual analysis arguing that reallocating resources to the most efficient level, even without any other technological progress, could contribute to increase total factor productivity by 30 to 50 percent. Recently in Restuccia and Rogerson (2017), the authors further review certain strands in the literature and conclude that misallocation matters in practice and could account for significant output losses. Also, it could account for cross-country differences in the levels of output. However, the sources of allocation vary and are fiercely debated.[1]

Thus far, the literature has explained the within-industry dispersion of the resources. Oberfield (2013), in contrast, stressed the importance of between-industry misallocation. He extends Hsieh and Klenow (2009) and provides a methodology with which to disentangle misallocations into within-industry and between-industry types. Then, armed with Chilean manufacturing establishment data, he argues that the latter matters more in accounting for the total factor productivity declines during the 1982 financial crisis.

It should also be noted that capital misallocation in southern European countries has been at the forefront of economic debate there. Gopinath *et al*. (2017) document that capital misallocation has widened since the commencement of the Euro system, noting that this situation is more eminent in Spain, Portugal, and other southern European countries. Empirically, they incorporate firm-level data, as we do, and claim that capital inflows triggered by adopting the Euro have been the main driver of capital misallocations. Along with size-dependent financial friction, these inflows are allocated not to the most efficient firms but to larger firms with lower productivity. They show that this is essentially one of the most critical factors in accounting for

[1]Please also check Banerjee and Moll (2010), Moll (2014), Buera and Shin (2013) for the extended rationale pertaining to the sources of misallocation.

the low performance outcomes of the Euro system. Capital flows also matter for resource reallocation out of the manufacturing sector in general. Benigno and Fornaro (2015) incorporate a panel of 70 countries from 1990 to 2014, showing that large capital inflows are associated with labor reallocation to the non-manufacturing sectors. However, they do not incorporate the dispersions of marginal product revenue.

The closest documentation to ours is Dias *et al*. (2016; 2019), who utilize Portuguese firm-level data, including service firms, and claim that allocative efficiency deteriorated leading up to the Euro crisis. They also incorporate a three-factor production model and argue that within-industry misallocations doubled from 1996 to 2011. Similar to Gopinath *et al*. (2017), they conduct a counterfactual analysis and conclude that the allocation of resources at the most efficient level would increase the level of GDP by 79%. We mostly apply this canonical methodology when measuring the dispersions of production factors in Korea, confirming that the service sector matters as well.

Our work is distinguished from previous work in several ways. Instead of calculating counterfactual efficiency gains from the reallocation of production resources to the most efficient firms within the industry, we provide the correlation between the realized growth of sectoral value added and MRPK misallocation. We apply sectoral regression and highlight the contribution of the service sector. We argue that this is an interesting exercise in the sense that misallocations could account for an important fraction of the sluggish economy ex post. Although many studies have conducted counterfactual exercises to account for reallocative gains, our work focuses on documenting regression results out of the 26 aforementioned sectors. Choi (2021) shows that capital misallocation is correlated with aggregate GDP growth for a panel of ten countries from 2002 to 2017, but not at the sectoral level.

There also has been recent documentation stepping further from the canonical methodology. David and Venkateswaran (2019) suggest a methodology to account for sources of capital misallocation. They categorize technological or informational types of friction, such as adjustment costs, uncertainty, technological or markup heterogeneity. They conclude that adjustment costs explain a significant fraction of misallocation in large US firms, but not in China. On the other hand, Bils *et al*. (2021) stressed the importance of measurement errors. They exploit the dimension that if measurement error exists, the dynamic correlation between revenue growth and input growth could be loose. Based on their newly developed methodology, they also conclude that measurement errors matter more in relation to the accounting misallocations of the US than they do for those of India. For the US, these errors could account for most of the increases in revenue per input (TFPR) dispersion. Baqaee and Farhi (2020) present a general equilibrium framework which provides a nonparametric methodology to measure inefficiencies from misallocation or markup dispersions. Through the lens of their model, they argue that reallocations of resources to firms with greater markup would increase the overall productivity (TFP) by 15% for the US. An article by Liu *et al*. (2021) also claims that state-owned enterprises (SOEs) combined with interest rate liberalization could lead to misallocations. Analyzing a Chinese case with a distorted financial system, the policy indeed has hampered the allocative efficiency and lowered aggregate productivity.

Moving our interests to the Korean economy, many scholars have pointed out the sluggish growth over the last several decades. Kim *et al*. (2018) report a gradual

decrease of the GDP growth rate and argue that it is more likely a long-run trend instead of a cyclical downturn. According to the author, the average growth rates of real GDP for the decades of 1981 to 1990, 1991 to 2000, 2001 to 2010, and 2011 to 2017 have been 9.9%, 7.0%, 4.4%, and 3.0%, respectively. Also and more interestingly, residuals after accounting for aggregate labor and capital allocated to the production have gradually decreased from 3.7%, 2.0%, 1.7%, and 0.7%, respectively. The author notes that sluggish growth rates were also reported in many other countries after the Global Financial Crisis. Also, he notes the possibility that external demand could be a critical factor behind this decrease. However, allocative efficiency measured by MRPK dispersion has not been covered. Here, instead, we argue that deteriorating allocative efficiency from the service sector could be an essential element to account for sluggish growth rates.[2]

Regarding misallocation in the Korean economy, Kim, Oh, and Shin (2017) present one of several works to deal with the efficiency of resource allocation. Applying the canonical methodology of Hsieh and Klenow (2009), the authors analyze the efficiency of capital allocation in the Korean economy from 1982 to 2007. With establishment-level data from the manufacturing sector, they conclude that the efficiency of capital allocation in the Korean economy as a whole increased before 1992 but has continued to deteriorate since then. They further assert that the downward trend in capital allocation until 2007 continues to be observed even after the global financial crisis.

Results from Cho (2017) are also worth mentioning. He argues that this decrease in the growth rate is due to inefficient capital allocation by certain business groups. Through the dynamic Olley-Pakes decomposition proposed by Melitz and Polanec (2015), he shows that the covariance between productivities and shares decreased. Based on these new findings, he concludes that the efficiency of capital allocation decreases. More importantly, their findings suggest that such inefficiencies in capital allocation are manifested by companies belonging to the corporate group. We do not focus on the corporate group, rather focusing on the manufacturing versus service sector. Complementing earlier works, our work contributes to the rationale of the sluggish growth rate and potential inefficiencies in the Korean economy.

The remainder of this paper proceeds as follows. In Chapter III, we describe the data used to calculate the dispersions of MRPK, MRPL, and MRPM and look at the various dispersions by year and by industry. Chapter IV provides our main empirical results related to misallocation and sectoral economic growth. Chapter V concludes the paper.

III. Resource Misallocation

A. *Measuring Misallocation*

In this section, we describe the methodology to estimate marginal revenue productivity. Our methodology is based on Dias *et al*. (2016) and Gopinath *et al*.

[2] Bergin, Choi, and Pyun (2022) show that different growth rates between the manufacturing and non-manufacturing sectors can be attributed to the capital account policy, which combines reserves and capital controls.

(2017), which extends the model of Hsieh and Klenow (2009).

$$Y_{st} = \left[\sum_{i=1}^{N_{st}} D_{ist} (y_{ist})^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

The production of individual firms in each industry is aggregated into total industrial output by CES production technology. Here, s is the subscript for industry, t is the time series, and D_{ist} is the demand shock of individual firms. As in earlier studies, ε is the elasticity of substitution. In addition, it is assumed that the production of individual firms combines labor, capital and intermediate inputs,[3]

$$y_{ist} = A_{ist} k_{ist}^{\alpha} l_{ist}^{\beta} m_{ist}^{1-\alpha-\beta}.$$

A firm's output is given by a Cobb-Douglas production function where A_{ist}, k_{ist}, l_{ist}, and m_{ist} denote firm i's total factor productivity (TFP), capital stock, labor and intermediate inputs, respectively. Individual firms maximize their profits and choose their price, capital, labor and intermediate inputs,

$$\pi_{ist} = (1-\tau_{ist}^{y}) p(y_{ist}) y_{ist} - (1+\tau_{ist}^{k}) R_{st} k_{ist} - (1+\tau_{ist}^{l}) W_{st} l_{ist} - Z_{st} m_{ist}.$$

Here, π_{ist} denotes the profit of an individual firm belonging to industry s, $p(y_{ist})$ is the inverse demand function of the individual firm's product, R_{st} is the market interest rate and the depreciation, and W_{st} is the market wage in the industry. τ_{ist}^{y}, τ_{ist}^{k}, and τ_{ist}^{l} are wedges for the total output, total capital, and total labor, respectively. These wedges are exogenous, and we assume they cause the prices of the factors of production faced by an individual firm marginally different from those of other individual firms.

The nominal value added of an individual firm would be its total nominal production ($p_{ist} y_{ist}$), which is the value of the firm's operating revenue minus the material cost, wage bill and direct labor cost on the firm's financial statements. In addition, as in Gopinath *et al*. (2017), the monopoly market price of each individual firm is replaced with the price at the second level (two-digit level) of ISIC Rev2. Labor (l_{ist}) is the sum of the wage bill on the income statement and labor costs and welfare costs on the statement of the costs of goods manufactured.[4] Capital (k_{ist}) of an individual firm uses the price discounted for fixed assets, which includes both

[3]Jones (2011) emphasizes the importance of intermediate inputs in the production function, as intermediate inputs are very similar to capital. Intermediate inputs can be put in quickly relative to capital and can be fully depreciated. However, as capital takes a comparatively long time to be invested, it is partially depreciated. Therefore, from a long-term and short-term perspective, intermediate inputs and capital are essentially identical to the factors of production.

[4]In South Korea, the labor cost and welfare cost on the statement of the costs of goods manufactured changed from a mandatory disclosure to a voluntary disclosure in 2004. In other words, observations since 2004 only apply to firms that voluntarily disclosed the statement of the costs manufactured.

tangible and intangible fixed assets. We used OECD STAN deflators from 2000 to 2018 and incorporate the industry classification of ISIC Rev 2.

The first-order condition for the profit maximization problem of the above firm can be summarized as follows,

$$MRPK_{ist} := \left(\frac{\alpha}{\mu}\right)\left(\frac{p_{ist}y_{ist}}{k_{ist}}\right) = R_{st}\frac{1+\tau^{k}_{ist}}{1-\tau^{y}_{ist}},$$

$$MRPL_{ist} := \left(\frac{\beta}{\mu}\right)\left(\frac{p_{ist}y_{ist}}{l_{ist}}\right) = W_{st}\frac{1+\tau^{l}_{ist}}{1-\tau^{y}_{ist}},$$

$$MRPM_{ist} := \left(\frac{1-\alpha-\beta}{\mu}\right)\left(\frac{p_{ist}y_{ist}}{m_{ist}}\right) = Z_{s}\frac{1}{1-\tau^{y}_{ist}}.$$

Here, $\mu = \varepsilon/(\varepsilon-1)$ is the mark-up applied to the marginal cost. As in Gopinath *et al*. (2017), this is assumed to be fixed at 1.5 in all industries. From the above equation, we note that it is the optimal choice for an individual firm to invest capital until the marginal revenue product of capital (MRPK) reaches the real interest rate, depreciation (R_{st}), and the wedge. In order to estimate the dispersions of MRPK, MRPL, and MRPM, we calculate the dispersion of the firm's marginal product by industry and then aggregate with the weighted average.[5]

B. *Data and the Empirical Results: Manufacturing vs Service*

In this section, first we describe the data, after which we calculate the marginal revenue productivity of the production factors. Utilizing the methodology presented in the previous section, we then show the dispersions of the production resources and consequent various facets of the empirical results. We utilize financial statements and industry factor shares. The firm-level data are from Korea Investor Service (KIS DATA). The data provide detailed information about each firm's balance sheets, income statements and the cost of the manufactured goods. The data cover various types of firms, both listed firms and SMEs, and we utilize virtually all firm data available. Thus, we believe that the dataset represents the largest of its type available for our purposes, making it suitable to construct nationally representative data and analyze consequent production factor misallocations.

From the dataset, we obtain information about a firm's gross output, capital stock (tangible fixed assets and intangible fixed assets), labor costs (wage bill, direct labor cost and other employee benefits), intermediate consumption (material cost), number of employees and variables for the value added calculation. Although these data are

[5]Because this is calculated using the four-digit method of ISIC Rev. 2 to maintain the variation of each observation, different weights are applied for each industry (four digit) and year (2000~2018). We also exclude extreme values by dropping observations that are below 0.1 percentile and above 99.9 percentile levels.

available from 1975, we confine ourselves from 2000 to 2018 to focus on recent periods and to ensure consistent industry classifications with OECD STAN data. Missing observations and errors are removed. In order to use the deflator of OECD STAN, we match the KSIC (Korea Standard Industry Code) and ISIC (International Standard Industrial Classification). After several steps, we have our final dataset with 459,021 observations.

For the industry-level factor shares, we utilize the values from Dias *et al*. (2016). Similar to Dias *et al*. (2016), our analysis cannot identify the input distortions (average wedges) and the input elasticities in each industry. As an alternative, we incorporate U.S. data; for the U.S. economy, there is relatively little distortion, and using this data can be a simple way to control the problem caused by distortion. We use the average factor shares of the U.S. during the period of 1998 to 2010, as published by the BEA (Bureau of Economic Analysis). The U.S. economy between 1998 and 2010, the factor share of labor compensation (=Compensation of employees / Gross output) is approximately 33% and the consumption of intermediate inputs (=Intermediate inputs / Gross output) is about 46%.[6]

Table 1 shows the summary statistics for each industry classification in this study. There are 345,248 manufacturing firms, representing approximately 75% of the sample. In manufacturing, Machinery and equipment n.e.c. (CK) had the highest number of observations at 71,535. Among the services, Construction (F) had the highest number at 82,330. Although the difference isn't large, sales and material costs tend to be higher in manufacturing. However, with the exception of the industries Electricity, gas and water supply; sewerage, waste management and remediation activities (D-E); Transportation and storage (H); and Financial and insurance activities (K), which show high values on average, most service industries have higher labor costs and lower material costs than those of the manufacturing industries.

For a preliminary examination, we assess the dispersion of MRPK for individual industries at the 2-digit level of ISIC Rev2. First, we compare the MRPK dispersion from 2000 to 2002 and the dispersion from 2016 to 2018. In the top figure in Figure 2, we find that the levels of dispersion for the service industry are higher than those of the manufacturing sector; the service industry is mostly distributed in the right tail. However, the levels of dispersion in the service sector are even further escalated; in a sample from 2016 to 2018, the overall composition of the dispersions is further polarized, and we can observe that dispersion in the service industry increased. Even in these simple snapshots, a widening misallocation of capital is already evident.

Next, instead of showing snapshots of the two different periods, we provide misallocations for each production factor over time. Figure 3 shows the changes in marginal revenue productivity dispersions according to different sectors.

It should be noted that we anchor our series at the year 2000 and plot the dispersions of MRPK, MRPL and MRPM. First, we find that the dispersion of MRPK shows a rising trend over the sample periods. Although the dispersion of

[6]We calculated the factor share from 2000 to 2018 for robustness of the analysis. For the U.S. economy between 2000 and 2018, the factor share of labor compensation (= Compensation of employees/Gross output) is approximately 30% and the consumption of intermediate inputs (= Intermediate inputs/Gross output) is about 44%. However, because the factor share of each input is not significantly different, the value from Dias *et al*. (2016) was used as is.

TABLE 1—SUMMARY STATISTICS

(Unit: 10 million KRW)

Industry Code	Obs.	Sales	Capital	Labor	Intermediate
Manufacturing					
Food products, beverages and tobacco [CA]	20,136	2,126	715	242	1,022
Textiles, wearing apparel, leather and related products [CB]	17,307	1,219	365	146	436
Wood and paper products, and printing [CC]	13,321	1,148	691	140	579
Chemical, rubber, plastics, fuel products and other non-metallic mineral products [CD-CG]	54,746	2,824	1,249	264	1,391
Basic metals and fabricated metal products, except machinery and equipment [CH]	38,093	2,254	1,080	210	1,298
Computer, electronic and optical products [CI]	50,565	1,313	482	157	626
Electrical equipment [CJ]	31,150	1,290	390	147	723
Machinery and equipment n.e.c. [CK]	71,535	992	377	142	475
Transport equipment [CL]	24,161	5,083	1,990	602	2,815
Furniture; other manufacturing; repair and installation of machinery and equipment [CM]	24,234	835	284	155	318
Sub-total	345,248	1,855	747	211	942
Service					
Electricity, gas and water supply; sewerage, waste management and remediation activities [D-E]	3,988	7,152	11,567	426	2,309
Construction [F]	82,330	976	106	201	296
Wholesale and retail trade, repair of motor vehicles and motorcycles [G]	799	205	148	68	70
Transportation and storage [H]	1,888	10,658	12,044	1,842	2,669
Accommodation and food service activities [I]	1,389	2,918	4,098	759	708
Information and communication [J]	13,691	1,169	345	252	286
Financial and insurance activities [K]	310	37,319	20,567	4,123	16,456
Real estate activities [L]	953	2,965	952	287	711
Professional, scientific and technical activities [M]	5,745	1,180	346	295	254
Administrative and support service activities [N]	1,219	932	276	387	132
Education [P]	207	3,223	864	396	586
Human health and social work activities [Q]	250	3,598	1,570	1,322	757
Arts, entertainment, repair of household goods and other services [R-U]	1,004	2,375	2,188	714	387
Sub-total	113,773	1,542	884	274	454
Total	459,021	1,777	781	226	821

Source: KIS DATA from the Korea Investor Service, OECD STAN. Units of capital and labor are both denominated in mil KRW. Observations include all year-firm observations during the sample period.

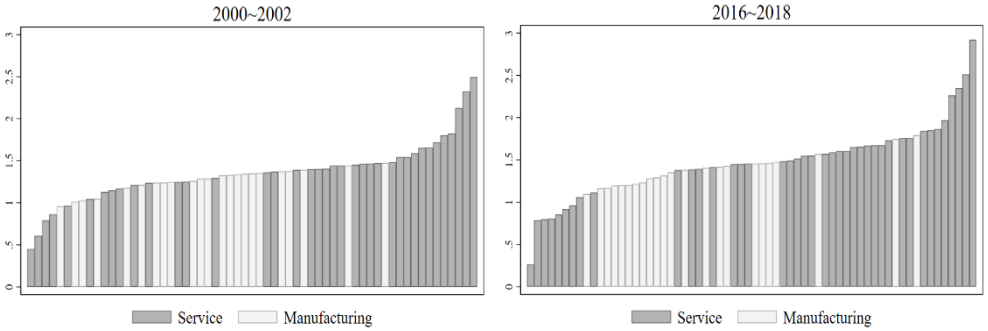

FIGURE 2. LEVEL OF MRPK DISPERSION BY INDUSTRY AND YEAR

Source: Author's calculations based on KIS DATA.

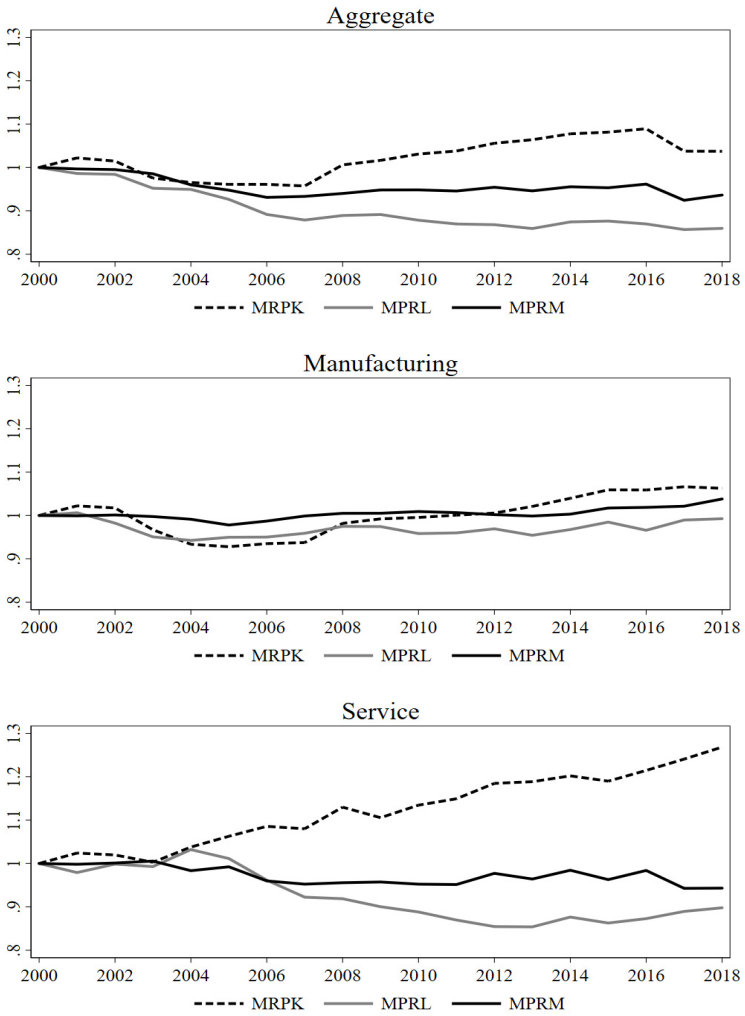

FIGURE 3. COMPARISON OF REGULATORY SENTIMENT INDEXES

Source: Author's calculations based on KIS DATA.

MRPK had been widening (and thus inefficiency has been dwindling) up to 2008, it increased sharply after that date. It shows an increase during the financial crisis and up to 2016. On the other hand, MRPL and MRPM showed steady improvements after 2000.

Most importantly, we stress that the trend is mostly driven by the service sector. We divide our sample into the manufacturing and service sectors and further examine the changes in the dispersions of MRPK, MRPL, and MRPM over time.[7] First, manufacturing shows relatively little variation in the dispersions of the production factors. On the other hand, for the service sector, the dispersion of MRPK significantly rises over the sample period. Relative to the misallocation anchored at 1 in the year 2000, the dispersion of MRPK reached approximately 1.3 by 2018. This is quite stark compared to the dispersion of ln MRPK within the band between 0.9 and 1.1 in the manufacturing sector. Also, while the potential misallocation of the manufacturing sector shows some fluctuations around the anchor, those of the service sector show a rapidly increasing trend from 2003 onward. Overall, the rising trend of inefficiencies are mostly notable for capital, while those of labor and intermediate inputs are rather mild or even in a decreasing trend.

It is also important to note that the simultaneous increase or decrease of the dispersions of MRPK, MRPL and MRPM may be driven by co-movements with mark-ups. In particular, in the period where MRPK, MRPL, and MRPM decreased simultaneously (from 2002 to 2007), it is not feasible to identify whether those that drive the downward trends of all three series are mark-ups or not. However, we can see a clear pattern of a rising MRPK dispersion after 2008. The dispersion of MRPK, which steadily increases even in a situation where MRPL and MRPM decrease, appears to be independent of any mark-up, and this may be a situation in which the inefficiency of production factor allocation increases.

Now, we change gears and further document an important factor pertaining to the widening misallocation. Figure 4 shows the bilateral relationship between the dispersion of MRPK and log employment. Here, as in Figure 2, we take snapshots of the periods of 2000 to 2002 and 2016 and 2018. Also, we divide our aggregate results further into manufacturing and services. Several interesting results stand out. First, as in the previous figures, the overall dispersions of MRPK are more pronounced in the service sector. When comparing the dispersions of the manufacturing and the service sectors, we can confirm that the dispersions of MRPK in the service sector are much larger regardless of the employment size. These results hold for both the 2000 to 2002 and for the 2016 to 2018 samples.

Secondly, while a firm with more employee shows small dispersion and spread outcomes, the gap widens in 2016 to 2018. Again, this phenomenon is more prominent in the comparison between the manufacturing and service industries. For the manufacturing industry, the averages of the dispersion and variations between 2000 to 2002 and 2016 to 2018 did not show much of a difference, whereas in the service industry, the MRPK dispersion increased significantly, and the spread of the dispersion also increased. It is readily apparent that the average dispersion of MRPK

[7]Foster *et al.* (2008) emphasized the important mechanisms of "entry and exit" to improve aggregate productivity. The mechanism seeks to reallocate market share to more efficient firms through entries and exits. We confirmed the effectiveness of the entry and exit strategy from the analysis, and the details are described in the appendix.

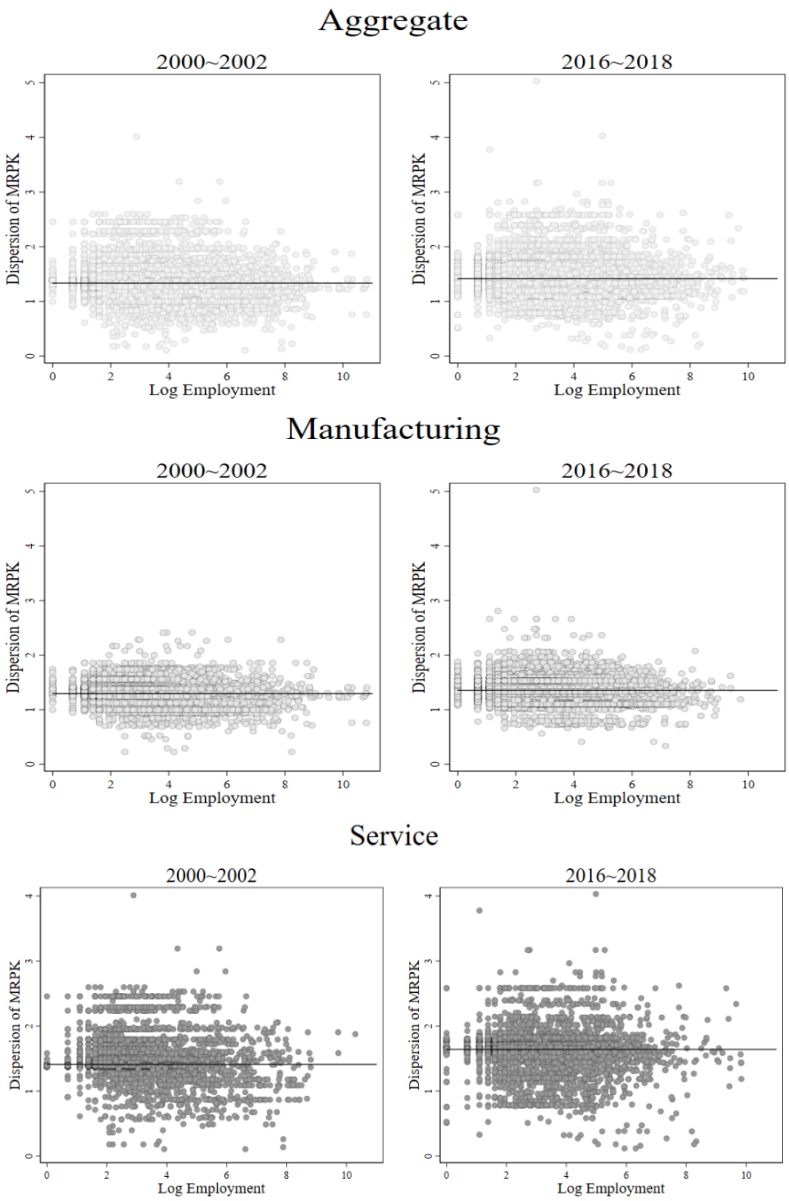

FIGURE 4. RELATIONSHIP BETWEEN THE DISPERSION OF MRPK AND LOG EMPLOYMENT

Note: The black lines are the average dispersion of MRPK for 2000-2002 and for 2016-2018 by industry in the corresponding images.

Source: Author's calculations based on KIS DATA.

in the service sector in the sample 2016 to 2018 is higher than that in the sample of 2000 to 2002.

Full-blown time series data of the misallocations between small and large firms are depicted in Figure 5. Here, we split the sample according to firm size (small firms and large firms) and sectors. The firm size was defined as 'small firm' on the left

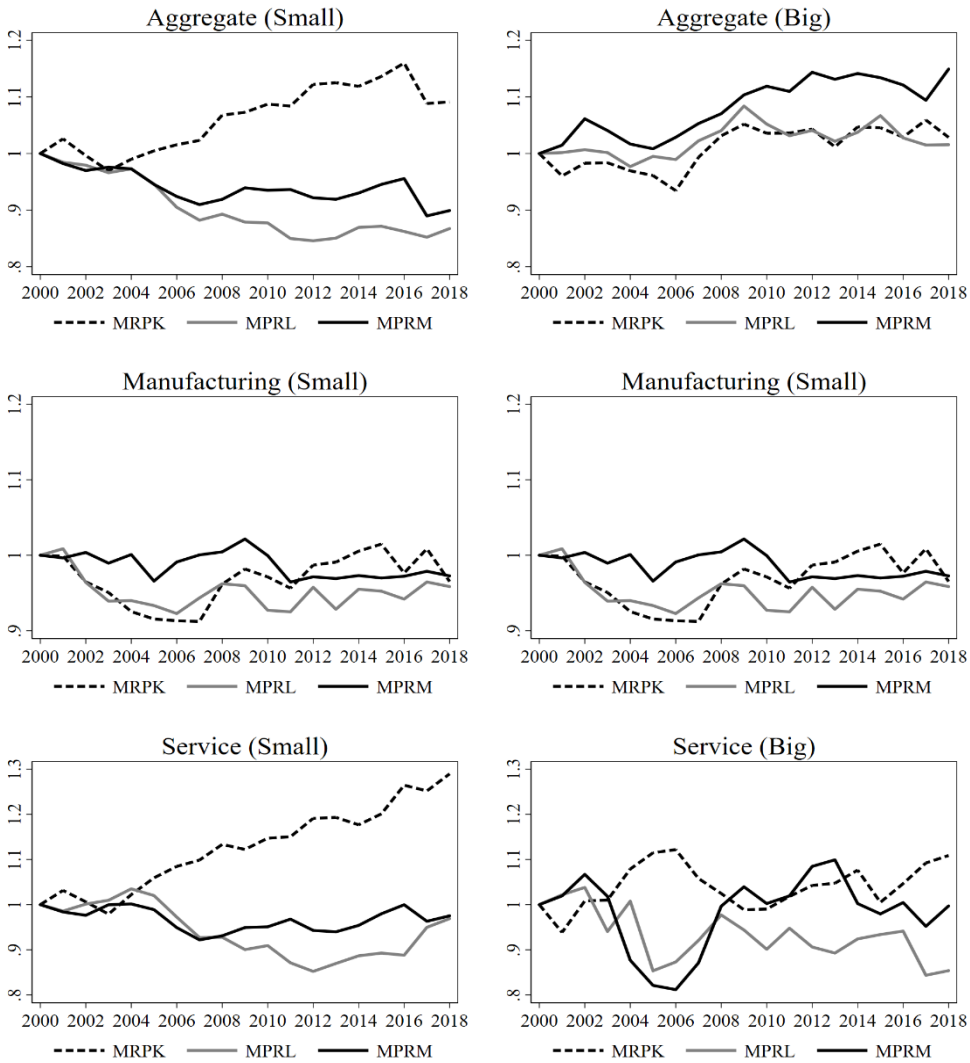

FIGURE 5. DISPERSIONS OF MRPK, MPRL, AND MRPM (SMALL FIRMS VS LARGE FIRMS)

Source: Author's calculations based on KIS DATA.

side for those with fewer than 50 workers and 'large firm' on the right side for those with more than 50 workers. From Figure 5, we also claim that small firms are the main driver of the widening capital misallocation. Again, capital misallocation is much more severe for service firms. Capital misallocations in service firms are clearly in a rising trend for most of the sample periods. However, those of large service firms fluctuate instead and do not show a clear pattern. In the manufacturing sector, the difference between small and large firms is also evident. However, capital misallocation does not severely deteriorate and is maintained under level 1.1. Interestingly, misallocations of intermediate inputs matter much more in large manufacturing firms.

To wrap up, we argue that the size of the firm matters when attempting to explain

misallocations. While the deterioration of MRPK dispersion is mainly noticeable for small firms, the inefficiency of labor and intermediate inputs is intensifying for large firms. We argue that capital misallocations are widening and are mostly driven by small service firms.

IV. Misallocation and Sectoral Economic Growth

Thus far, we have documented the trend of the marginal revenue product of capital (MRPK), that of labor (MRPL), and that of intermediate goods (MRPM). There is a clear pattern of rising dispersions of MRPK, and the trend is mainly driven by the service sector. Our evidence implies that there exists a widening of misallocation mainly coming from the service sector, which could also be found in other international episodes. That is, the service sector matters and is responsible for the aggregate efficiency losses. In this chapter, we change gears again and assess the relationship between resource misallocation and economic growth through a panel regression. More specifically, we construct a panel of real value added growth and the dispersions of production resources at the sectoral level. As in the previous sections, within-group dispersions of marginal revenue products are measured at four-digit level and are aggregated by the weight of nominal value added. For the sectoral data of nominal value added, the deflator, and the employment engaged number are from OECD STAN data. Our data span the period of 2000 to 2018. We exclude the most recent years due to the data availability issue. Because our focus is on tranquil periods, the years after Covid-19 should be dropped anyway and we restrict our sample up to 2018. To construct real value added growth, we deflate nominal value added by sectoral deflators. As in the previous section, we have 26 sectors (10 manufacturing, 14 services, and 2 others). We focus on manufacturing and service and do not report results for agriculture and mining, as the shares of value added and employment to overall output for the sector are not significant. Details of the data construction process and the title of each sector can be found in the appendix.

Our empirical specification is as follows;

$$d\ln y_{st} = \alpha_i + \beta^0 \ln y_{st-1} + \beta^1 \ln(sdMRPK_{st}) + \beta^2 \ln(sdMRPL_{st}) + \beta^3 \ln(sdMRPM_{st}) + Z_t + \varepsilon_{st}$$

where s and t stand for sector and time respectively. y_t stands for sectoral value added and Z_t includes further controls such as crisis dummies for 2008 and 2009, and time and time squared terms. We include a lagged level of value added to control for growth convergence. The crisis dummy captures growth rate hampering due to external crisis shocks, and time dummy captures the time trends. The squared term is included to capture possible reversions and the consequent hump shapes of the growth rates.

Through the empirical specification, we could assess whether realized value added is statistically correlated with resource misallocation. Although widening dispersions of marginal revenue product of resources will in principle lead to efficiency losses,

TABLE 2—RESOURCE MISALLOCATIONS AND THE GROWTH OF THE SECTORAL REAL VALUE ADDED: ALL SECTORS

Dependent Var:	All Sectors			
d ln(real VA)	(1)	(2)	(3)	(4)
Lagged ln(real VA)	-0.05***	-0.05***	-0.06***	-0.06**
	(-4.89)	(-4.90)	(-3.33)	(-2.23)
Lagged MRPK disp.	-1.04**	-1.23**	-1.10**	-0.78*
	(-2.15)	(-2.66)	(-2.20)	(-1.80)
Lagged MRPL disp.	0.85	0.80	1.46	0.96
	(0.70)	(0.66)	(1.39)	(0.81)
Lagged MRPM disp.	0.24	0.10	-0.00	-0.28
	(0.46)	(0.18)	(-0.01)	(-0.49)
Crisis		-0.02**	-0.02***	-0.02***
		(-2.66)	(-2.98)	(-3.08)
Time			0.00	0.00
			(1.62)	(1.30)
Time Sq.			-0.00	-0.00
			(-1.68)	(-1.37)
Growth of Empn				0.15**
				(2.58)
Obs.	447	447	447	423
Num. of Sectors.	26	26	26	26
R squared	0.08	0.10	0.11	0.13

Note: 1) *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; 2) MRPK, MRPL, and MRPM represent the log value of the marginal revenue product of capital, labor and the intermediate inputs divided by a hundred, respectively; 3) Time and Time squared terms are included; 4) Lagged ln (real VA) is included to control for the convergence of the growth rate; 5) A sector fixed effect is included.

few attempts have been made to conduct a panel analysis. The lack of work at the country level is mostly due to a lack of data availability. If one wants to examine whether misallocations account for significant fraction of the overall realized growth rate, one needs to incorporate firm- or plant-level data from multiple economies. Here, our task is more narrowly focused on the service sector. Thus, we assess whether or not the service sector matters with a panel of 26 sectoral levels. Even if our setup is relatively simple, it yields solid results and informs us clearly that on average, within-capital allocation matters for growth on average.

Our baseline results are reported in Table 2. Here, we run a fixed-effect panel regression for all 26 sectors, initially noting that the lagged level of log real value added shows a strong convergence pattern; as the previous level of output is high, the current growth rate will be lower. These outcomes capture the convergence of economic growth, which is the standard in growth accounting regressions.

More importantly, we show that the statistical significance of the lagged standard deviation of MRPK stands out. That is, as the dispersion of MRPK increases, the growth rate of sectoral real value added tends to decrease; if the lagged standard deviation of MRPK rises by a single percent, growth of real value added tends to decrease by 1.04 percentage points without any further controls (column (1)). Moreover, if we add an indicator for the crisis period and possible time trend, the coefficients become larger. In column (3), if the lagged standard deviation of MRPK rises by one percent, the growth of real value added tends to decrease by 1.1 percentage points.

It is equally interesting that the other two production resources show few

statistically meaningful results. The increases in the lagged standard deviations of MRPL are positively correlated with sectoral real value added growth. This is counterintuitive in the sense that the possible misallocation of labor is correlated with higher sectoral value added growth. However, the coefficients feature no statistical significance, making it difficult to interpret the results. For the intermediate inputs, there is essentially no contribution to growth.

Lastly, in column (4), we add the growth of employment as an additional control measure. That is, we add the log difference of employment engaged for each sector. Readers can now interpret the value added growth as a per-capita term. The increase in employment is correlated with higher economic growth, implying that the growth of aggregate employment allocated partly contribute to economic growth. Interestingly, the coefficient of the dispersion of MRPK becomes smaller. At this point, if the lagged standard deviation of MRPK rises by one percent, the growth of real value added tends to decrease by 0.78 percentage points. Even when adding employment growth as a control factor, our overall messages are preserved. The coefficients of the dispersion of MRPL and MRPM do not show any statistically meaningful results.

It is also important to note that for our baseline regression covering all sectors, the time trend does not show any meaningful results. Finally, the indicators for the Global Financial Crisis period show a strong negative impact on sectoral value added growth, as expected.

Now, we move on to the next stage and focus on the manufacturing or service sector independently. We split our sample and redo the regression but for the manufacturing sample and for the service sector sample independently. In Table 3, we report our results for the manufacturing sector. Most notably, we find that the statistically meaningful coefficient for the dispersion of MRPK has disappeared throughout all specifications. Not only does the statistical significance disappear, the signs of the coefficients change or fluctuate significantly over different specifications. These results suggest that the outcomes of the baseline regression (Table 2) do not stem from the manufacturing sector. Moreover, our baseline message of a tight correlation between capital misallocation and sectoral economic growth is not preserved.

Contrary to the results in the manufacturing sector, the results from the service sector sample are consistent. In Table 4, the coefficients of the dispersion of MRPK are all negative and statistically significant. Without any control but with the convergence term, if the lagged standard deviation of MRPK rises by one percent, the growth of real value added tends to decrease by 0.81 percentage points (column (1)). As we add the further controls of the indicator of the Global Financial Crisis and the time trend, the coefficients increase and more statistical significance becomes evident. In column (3), if the lagged standard deviation of MRPK rises by a single percent, the growth of real value added tends to decrease by 1.11 percentage points. As in our baseline results for all sectors, no other coefficients of the dispersions of production factors are statistically meaningful. It is also interesting to note that labor growth does not play an important role in shaping the growth rate. Typically, the labor share for the service sector increases over the development path, while that of the manufacturing sector has a hump-shaped pattern. Bergin *et al*. (2022) document that the pattern is evident for East Asian countries and that Korea

TABLE 3—RESOURCE MISALLOCATION AND THE GROWTH OF THE SECTORAL REAL VALUE ADDED: MANUFACTURING SECTOR

Dependent Var:	Manufacturing Sector			
d ln(real VA)	(1)	(2)	(3)	(4)
Lagged ln(real VA)	-0.06***	-0.06***	-0.10***	-0.13***
	(-5.77)	(-5.11)	(-4.22)	(-4.39)
Lagged MRPK disp.	1.22	-3.45	2.94	-4.95
	(0.18)	(-0.46)	(0.43)	(-0.55)
Lagged MRPL disp.	-18.53**	-19.47**	-2.82	4.49
	(-3.18)	(-2.63)	(-0.52)	(0.44)
Lagged MRPM disp.	-3.02	0.07	-6.63	-11.18
	(-0.37)	(0.01)	(-0.64)	(-1.12)
Crisis		-0.03*	-0.04**	-0.03*
		(-2.15)	(-2.95)	(-2.19)
Time			0.02***	0.01**
			(4.26)	(2.74)
Time Sq.			-0.00***	-0.00**
			(-3.76)	(-2.30)
Growth of Empn				0.49***
				(3.71)
Obs.	180	180	180	168
Num. of Sectors.	10	10	10	10
R squared	0.12	0.15	0.20	0.27

Note: 1) *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; 2) MRPK, MRPL, and MRPM represent the log value of the marginal revenue product of capital, labor and the intermediate inputs divided by a hundred, respectively; 3) Time and Time squared terms are included; 4) Lagged ln (real VA) is included to control for the convergence of the growth rate; 5) A sector fixed effect is included.

TABLE 4—RESOURCE MISALLOCATION AND THE GROWTH OF THE SECTORAL REAL VALUE ADDED: SERVICE SECTOR

Dependent Var:	Service Sector			
d ln(real VA)	(1)	(2)	(3)	(4)
Lagged ln(real VA)	-0.04*	-0.04*	-0.06	-0.06
	(-2.01)	(-2.02)	(-1.43)	(-1.21)
Lagged MRPK disp.	-0.81*	-0.90**	-1.11**	-1.16**
	(-1.96)	(-2.22)	(-2.16)	(-2.51)
Lagged MRPL disp.	0.80	0.89	0.95	0.52
	(0.70)	(0.76)	(0.65)	(0.33)
Lagged MRPM disp.	0.11	-0.15	-0.12	-0.38
	(0.18)	(-0.24)	(-0.19)	(-0.50)
Crisis		-0.02***	-0.01**	-0.01**
		(-3.88)	(-2.29)	(-2.42)
Time			-0.00	-0.00
			(-0.11)	(-0.59)
Time Sq.			0.00	0.00
			(0.40)	(0.85)
Growth of Empn				0.00
				(0.04)
Obs.	231	231	231	219
Num. of Sectors.	14	14	14	14
R squared	0.08	0.11	0.11	0.13

Note: 1) *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; 2) MRPK, MRPL, and MRPM represent the log value of the marginal revenue product of capital, labor and the intermediate inputs divided by a hundred, respectively; 3) Time and Time squared terms are included; 4) Lagged ln (real VA) is included to control for the convergence of the growth rate; 5) A sector fixed effect is included.

is not an exception. Here, we also claim that labor reallocation does not play an essential role in shaping the within-sector allocative efficiency outcomes. While it is likely to result in more labor in the service sector, it is virtually muted with regard to shaping how much capital each firm receives and how capital misallocation worsens.

It is also important to note that without a time trend, the growth of the manufacturing sector is closely related to the dispersion of MRPL. In columns (1) and (2) of Table 3, the coefficients of the dispersion of MRPL are very large and are also statistically significant. However, once we control for the time trends, the statistically meaningful results are all erased. The negative correlations between the lagged standard deviation of MRPL and the growth rates are greatly lower, not showing, however, any statistical significance. It is likely that the dispersions of MRPL are correlated with the time trends or there is a confounding factor that affects the dispersion of MRPL and the increasing pattern of output growth simultaneously.

Again, careful interpretation is needed when considering the results. If the dispersion of the marginal product of capital rises consistently over time, it is likely that the allocative efficiency deteriorates. In principle, those deteriorating misallocations should contribute negatively to the growth of output. However, the rising trend of the dispersion itself does not necessarily imply a tight correlation between realized growth and misallocation at the sectoral level. Thus, here we argue that the service sector matters in the sense that on average, resource misallocation affects the growth of output ex post, and this is more clearly observed in the service sector.

Our results provide several policy implications. First, we note that the overall atmosphere towards the service sector had changed in last couple of decades. The government has launched various measures to strengthen the competitiveness of the service industry. Two policy directions were declared: to revise any regulations restricting competition and to establish an institutional basis for fostering the service industry. It has long been argued that industrial policies were biased towards the manufacturing sector. Since 2000, the government has attempted to revise the environment deemed as only favorable to the manufacturing and to implement policies that support start-ups and provide tax favors to service firms. Furthermore, by expanding the coverage of industries subject to financial support from the manufacturing industry to all industries, service firms also enjoyed a more favorable loanable fund market. In addition, regulations in the service industry such as those related to tourism, culture, and entertainment were alleviated. Since then, "Service-PROGRESS" was implemented to advance the service industry in 2008, and various policies have been implemented and supported thus far to create jobs and improve productivity through service innovations.

We conjecture that the more favorable atmosphere implemented by the government could be a possible trigger for the growing inefficiencies in the service sector. However, here we do not provide any meaningful correlation with such policies, leaving this work for future researchers.

V. Conclusion

The Korean economy has suffered from a slowdown of growth recently. At the same time, relatively low performance in the service sector has been widely noted.

In this paper, we assess the probability of capital misallocations as measured by the dispersion of the marginal revenue product of capital, being an essential factor in accounting for the recent hampered growth rate. We claim that the service sector matters after all. We document a strong correlation between capital misallocation and the growth rate, especially in the service sector. Utilizing firm- and sectoral-level data from 2000 to 2018, we show that the dispersion of the marginal revenue product of capital (MRPK) has been clearly in a rising trend in the service sector. This could represent a widening misallocation of capital. The pattern is not as clearly observed for the other two factors of the production resources, labor and intermediate goods. Capital misallocation, as in other economies such as those in southern European countries leading up to the Euro crisis, matters, especially for the service sector.

Furthermore, we conduct a panel regression analyses and show that within-sector misallocations at the sectoral level are correlated with the realized lower growth rate of sectoral real value added. This is mainly observed in the service sector, but not in the manufacturing sector. Capital misallocation shows a widening trend over time. For the average service sector, ex-post realized real value added may stem from the widening capital misallocation. Misallocations of other resources, labor and the intermediate input do not stand out.

Measurement errors may also be important, meaning that readers should interpret our results with care. Also, we note that heterogeneity in production technology in the service sector could also be a factor when deriving the dispersion of MRPK. However, we nonetheless argue that it is not very likely that heterogeneity in production is in a rising trend and that it thus shapes our overall message. It is also unlikely that the tight correlation between the growth rate and the dispersion of MRPK is attributed to varying heterogeneity in production technology. It is also difficult to imagine that measurement errors are evolving in a systematic manner such that they strengthen the role of the service sector.

Our results imply that correcting distortions or friction in terms of capital intermediation should be assigned higher priority on the policy to-do list. Any allocative friction associated with capital effective in the service sector should be carefully assessed from the perspective of aggregate efficiency. Regarding the source of the widening capital misallocation, this study remains silent, and we thus call for future research in this area.

APPENDIX

A. *Data construction*

For the dispersions of the MRPK, MRPL, and MRPM calculations, the data were extracted from financial information (KIS DATA) provided by the Korea Investor Service. We utilize balance sheets, income statements, and the statements of the costs of goods manufactured. The following steps are implemented to establish the data, particularly the capital stock, labor costs, intermediate inputs, and value added.

First, capital stock is calculated as the sum of tangible fixed assets and intangible fixed assets and is dropped if missing or if the sum of the two variables is negative. We also drop the observation when the ratio of tangible fixed assets to total assets exceeds one. Labor costs use the wage bill on the income statement and labor and welfare expenses on the statement of the costs of goods manufactured. The observations are dropped if the wage bill, labor cost, and welfare cost are negative or missing. Similarly, intermediate inputs use material costs on the statement of the costs of goods manufactured, and missing or negative observations are dropped. Value added is calculated as the value of the firm's operating revenue minus the material costs and direct labor costs. Direct labor costs include miscellaneous allowances, bonuses, and provisions for severance indemnities and are dropped if missing or negative.

In addition, observations with clear errors are removed, including negative liabilities, a negative number of workers, and a number of workers exceeding 1,500,000 (one observation). We calculate the standard deviation based on the four digits of ISIC Rev. 2, which may include too few observations for certain industries. Certain cases are excluded from the analysis if the possibility arises that they may overestimate or underestimate the representation of a specific industry. 'Manufacture of tobacco products;' 'Water collection, treatment and supply;' 'Postal and courier activities;' and 'Libraries, archives, museums and other cultural activities' are excluded.

B. *Entry and Exit*

In this section, we examine the impact of entries and exits on the dispersions of MRPK, MRPL, and MRPM. First, the analysis period is extended from 1993 to 2021 to define a "survived firm," referring to a firm that has survived for more than ten years. Subsequently, the dispersions of MRPK, MRPL, and MRPM are calculated by industry and year with the same methodology used in the main text. We thus have 314,619 final observations.

The aggregate shows a trend similar to that of the total sample but with a lower dispersion. Likewise, the same phenomenon is observed in the manufacturing and service sectors. In contrast, after 2016 it appears that the inefficiency of production factors improved compared to 2000. However, the dispersion of MRPK is still high in the service industry, and the inefficiency of capital in the service sector is considered to be an issue that exists even after considering entries and exits.

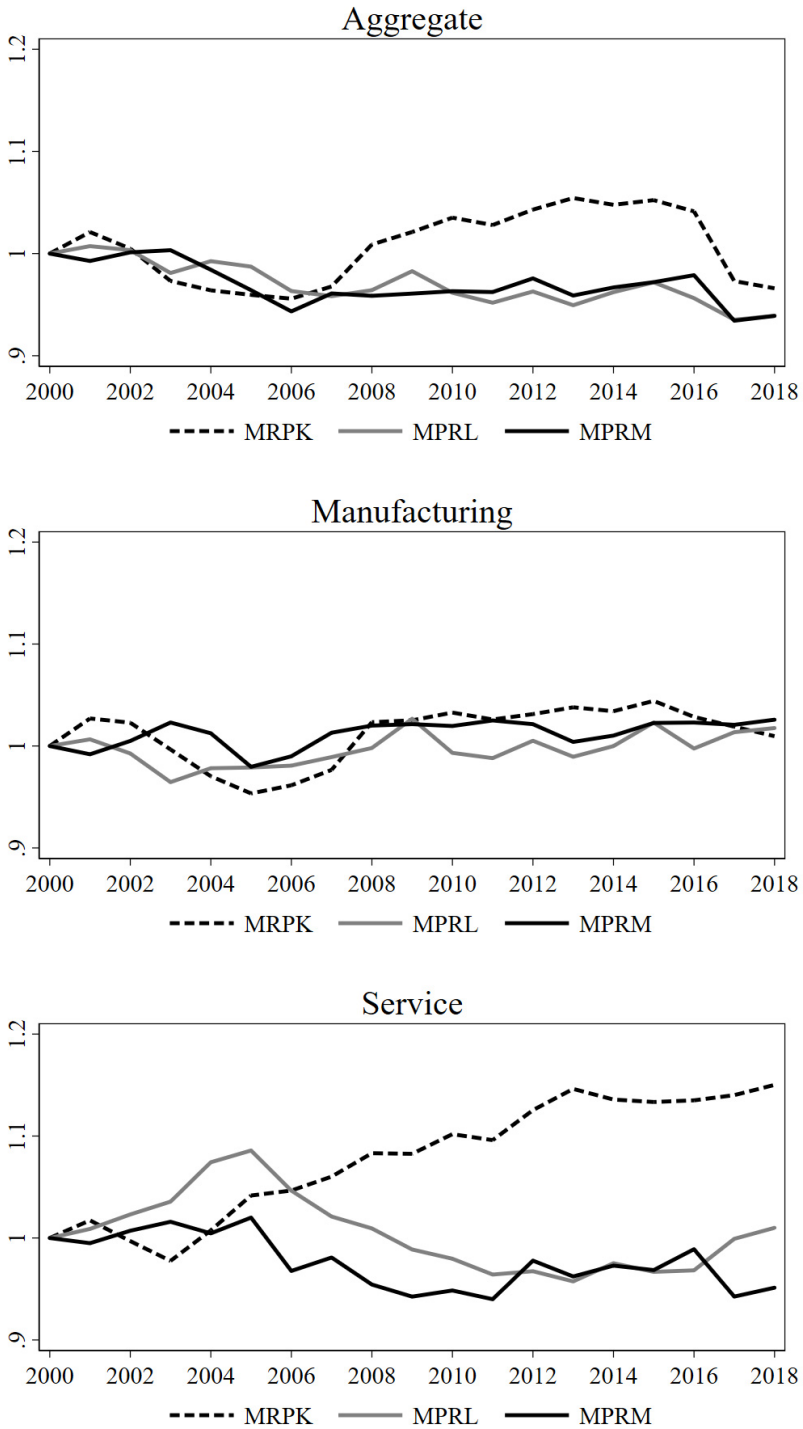

FIGURE A1. DISPERSIONS OF MRPK, MPRL, AND MRPM OF SURVIVED FIRMS

Source: Author's calculations based on KIS DATA.

C. *Disaggregate Results*

Here, we plot the unconditional series of growth of real value added and dispersion of MRPK for the 26 sectors. Again, the dispersion of MRPK is measured by the standard deviation of the log of MRPK. Sector [O] was dropped due to incomplete observations. Although the identification of the relationship between the growth of real value added and the dispersion of MRPK will come not only from the time-series dimension but also from the cross-sectional dimension, we believe that it is informative to document individual series. Figures A2 to A5 show the results. First, we note that a rising trend of the widening dispersion can be observed. The dash line gradually increases in most cases in the sector. This trend is most clear in the Construction, and Information and Communication sectors. These two sectors feature steadily rising trends for most of the sample periods. After 2010, Accommodation and Food Services Activities also shows a similar trend. Considering the weight of these sectors in the overall economy, it is not surprising that the aggregate trend of the service sector shows a clear upward trend. We can also find an upward rising trend in several manufacturing sectors, notably Transport Equipment.

Next, we examine whether the negative correlation between value-added growth and the capital misallocation stands out. Several sectors show clear and negative co-movement between two series: Real Estate Activities and Administration and Support Service Activities. Though this is not our main focus, it is notable that Mining and Quarrying shows clear negative correlation. For construction, although it shows a clear pattern of rising dispersions of MRPK, it is difficult to conclude that value added growth features a downward trend.

In Tables A1 and A2, we also report single sector regressions. Again, the identification of a correlation between the dispersion of MRPK and sectoral real value added growth comes from the cross-sectional variation. However, it is also somewhat apparent that the coefficients of the dispersion of MRPK are mostly negative. For the manufacturing sector, it shows larger swings of the coefficients among different subsectors.[8] On the other hand, the service sector shows smaller swings, but on average the values of coefficients tend to be negative. Again, readers should read the results with care, as these regressions only incorporate a single series.

[8]Textile, Wearing Apparel, Leather and Related Product [CB] shows an extreme value, with approximately a 90.6 percentage point increase of sectoral growth, while Machinery and Equipment [CK] shows another extreme value of around 89.6 percentage points.

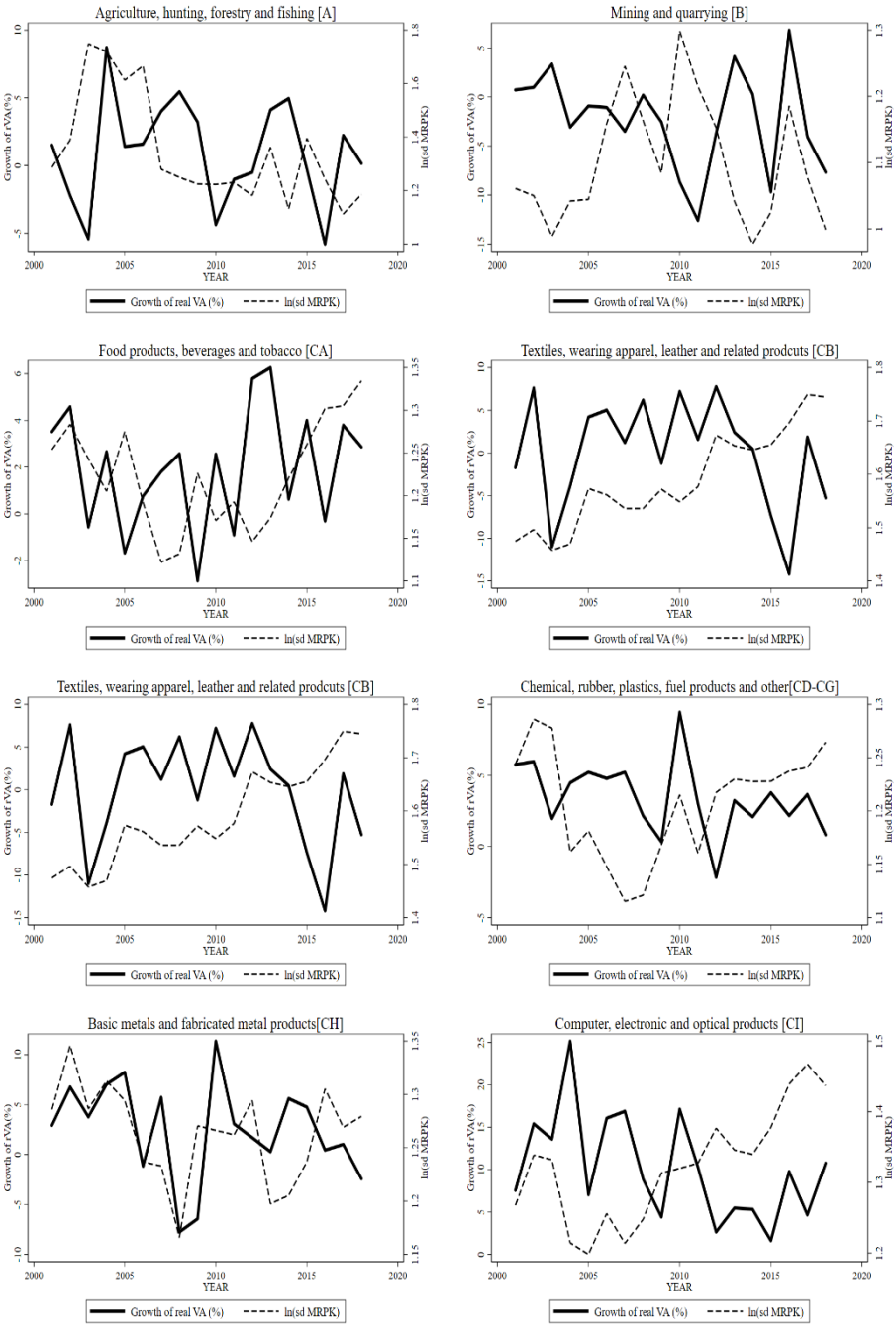

FIGURE A2. CAPITAL MISALLOCATION AND SECTORAL GROWTH

Note: In all cases, the solid line is the growth of real value added per employment engaged. The dash line is the log of the dispersion of MRPK.

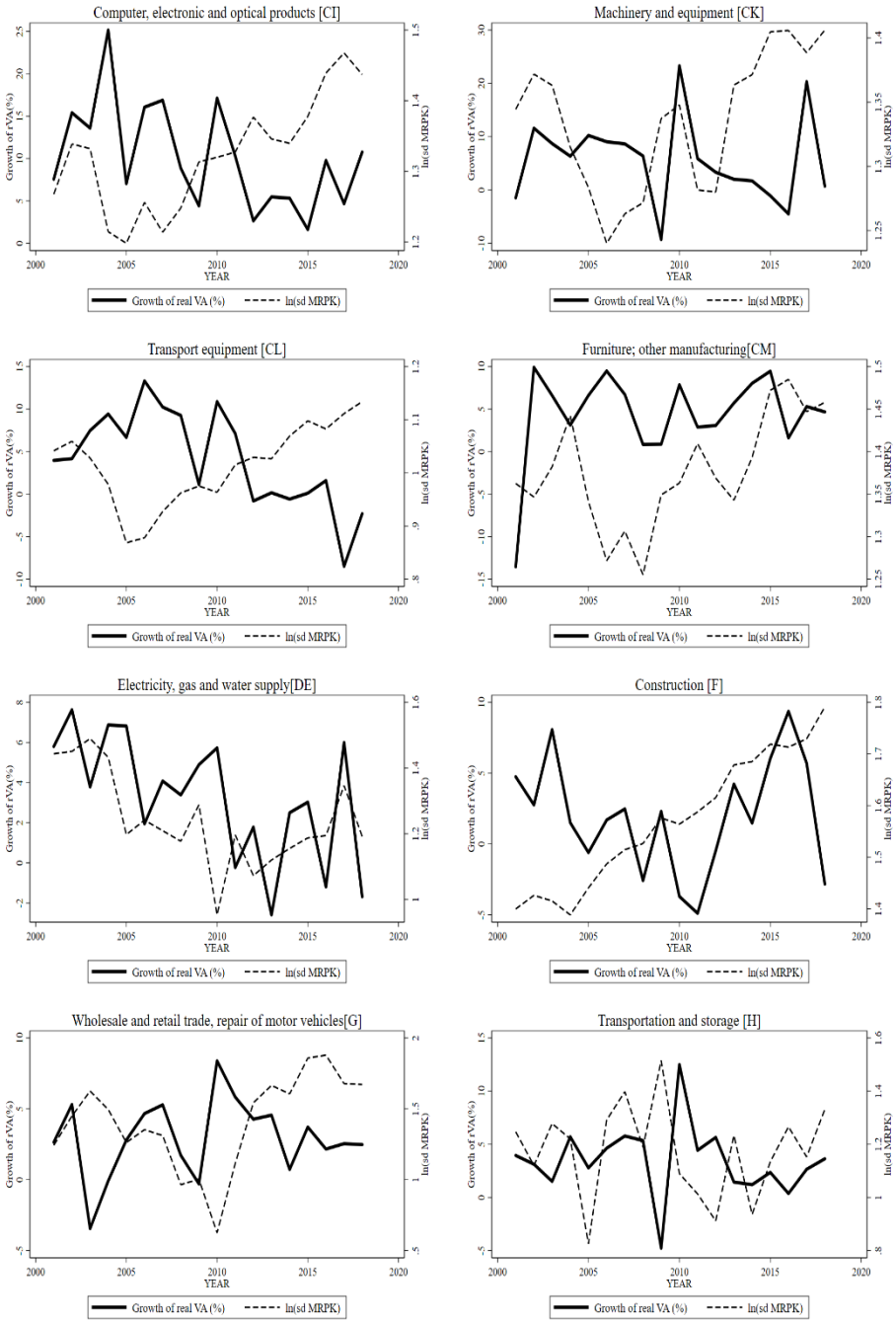

FIGURE A3. CAPITAL MISALLOCATION AND SECTORAL GROWTH

Note: In all cases, the solid line is the growth of real value added per employment engaged. The dash line is the log of the dispersion of MRPK.

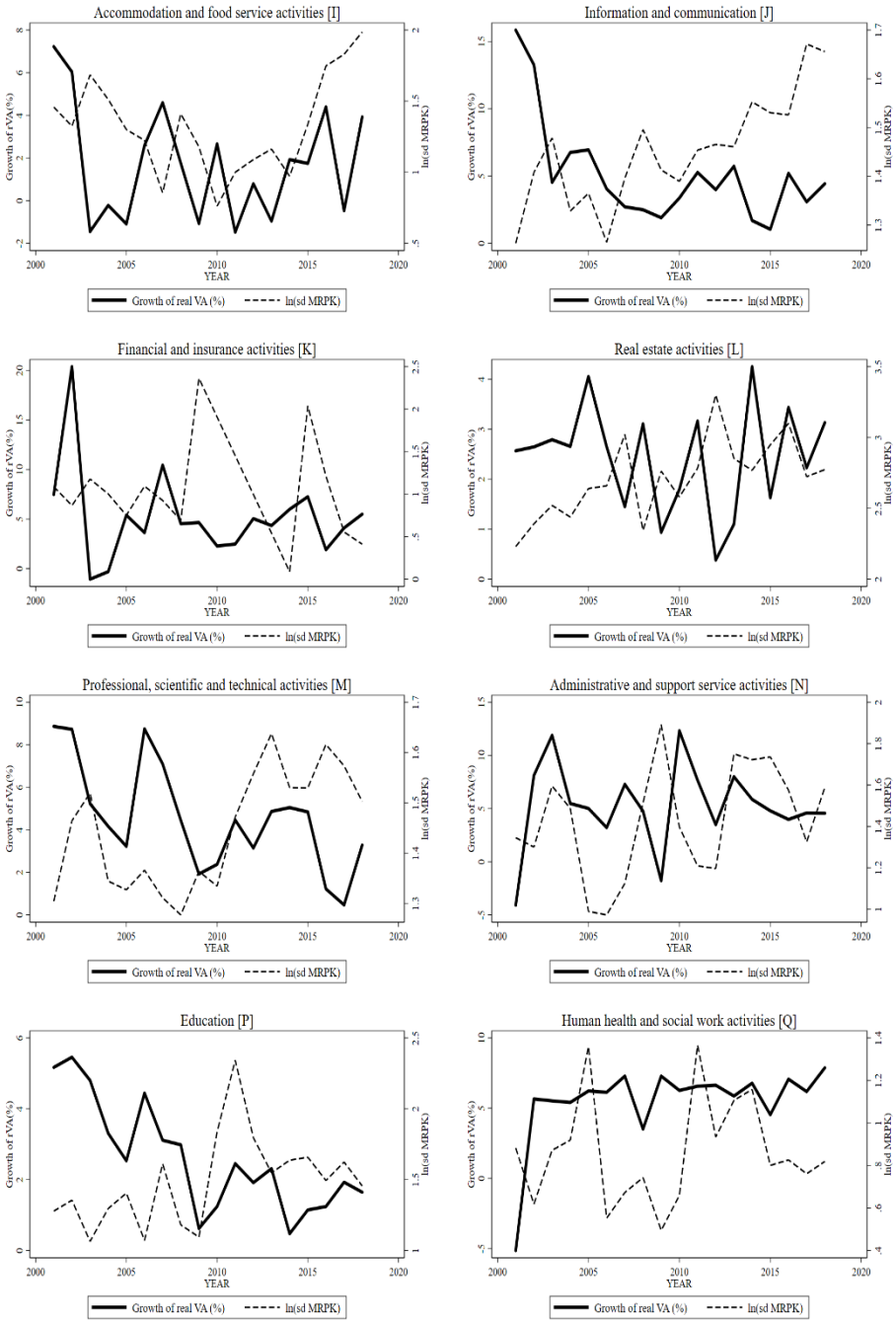

FIGURE A4. CAPITAL MISALLOCATION AND SECTORAL GROWTH

Note: In all cases, the solid line is the growth of real value added per employment engaged. The dash line is the log of the dispersion of MRPK.

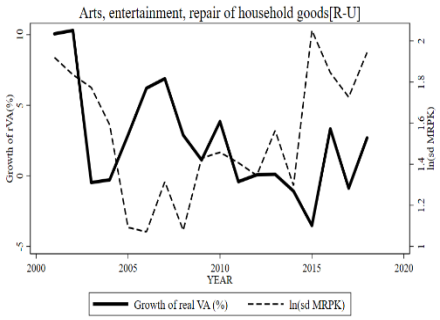

FIGURE A5. CAPITAL MISALLOCATION AND SECTORAL GROWTH

Note: In all cases, the solid line is the growth of real value added per employment engaged. The dash line is the log of the dispersion of MRPK.

TABLE A1—RESOURCE MISALLOCATION AND THE GROWTH OF THE SECTORAL REAL VALUE ADDED: MANUFACTURING SECTOR

Dependent Var:	Manufacturing									
d ln(real VA)	CA	CB	CC	CD-CG	CH	CI	CJ	CK	CL	CM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged ln(real VA)	-0.33	-0.13	-1.31***	-0.95*	-0.34	-0.93***	-1.07**	-1.21***	-0.57***	-1.00***
	(-1.18)	(-0.53)	(-4.24)	(-2.12)	(-1.58)	(-4.04)	(-3.02)	(-4.15)	(-3.37)	(-4.35)
MRPK disp.	-42.49	90.67*	37.87**	-21.93*	11.52	-42.92	61.00	-89.56*	26.48	-25.03
	(-1.70)	(2.00)	(3.01)	(-1.95)	(0.51)	(-1.42)	(1.29)	(-2.05)	(0.66)	(-1.17)
MRPL disp.	12.71	-12.23	-6.89	13.21	2.95	14.03	-0.07	40.37	74.26**	18.90
	(0.79)	(-0.29)	(-0.37)	(0.52)	(0.05)	(0.27)	(-0.00)	(0.68)	(2.29)	(0.54)
MRPM disp.	1.42	-0.37	-30.98	23.59	-7.53	37.73	-33.63	-39.70	-59.19	32.67
	(0.06)	(-0.01)	(-1.76)	(1.04)	(-0.52)	(0.75)	(-0.37)	(-0.52)	(-1.44)	(1.11)
Crisis	-0.01	-0.01	-0.01	-0.03**	-0.11***	-0.03	-0.06	-0.06	-0.03	-0.01
	(-0.90)	(-0.18)	(-0.36)	(-2.30)	(-5.12)	(-0.82)	(-1.39)	(-1.13)	(-1.05)	(-0.50)
Time	-0.02	0.02	0.02**	0.05*	0.02**	0.18***	0.11**	0.11***	0.10**	0.06***
	(-1.76)	(0.94)	(2.52)	(1.98)	(2.42)	(3.79)	(2.67)	(3.92)	(2.99)	(3.22)
Time Sq.	0.00**	-0.00**	0.00	-0.00	-0.00*	-0.00***	-0.00**	-0.00**	-0.00**	-0.00
	(3.16)	(-2.48)	(0.28)	(-1.68)	(-2.16)	(-3.27)	(-2.49)	(-2.31)	(-2.98)	(-0.63)
Obs.	18	18	18	18	18	18	18	18	18	18
Num. of Sectors.	1	1	1	1	1	1	1	1	1	1
R squared	0.64	0.46	0.75	0.68	0.78	0.68	0.62	0.72	0.84	0.78

Note: 1) *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; 2) MRPK, MRPL, and MRPM represent the log value of the marginal revenue product of capital, labor and the intermediate inputs divided by a hundred, respectively; 3) Time and Time squared terms are included; 4) Lagged ln (real VA) is included to control for the convergence of the growth rate; 5) A sector fixed effect is included.

TABLE A2—RESOURCE MISALLOCATION AND THE GROWTH OF THE SECTORAL REAL VALUE ADDED: MANUFACTURING SECTOR

Dependent Var:							Service						
d ln(real VA)	DE	F	G	H	I	J	K	L	M	N	P	Q	RU
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Lagged ln(real VA)	-0.80**	-0.09	-0.14	-0.83**	-0.56**	-0.55***	-0.76*	-0.54	-0.97**	-0.90***	-0.39	-1.05***	-0.43
	(-3.13)	(-0.34)	(-0.48)	(-2.89)	(-3.04)	(-4.46)	(-2.40)	(-1.67)	(-3.13)	(-4.96)	(-1.34)	(-19.16)	(-1.52)
MRPK disp.	-5.41	33.43	-6.38**	-8.47*	-3.33	0.69	-1.88	-3.04*	-1.40	-2.57	0.36	0.19	0.61
	(-0.51)	(0.59)	(-2.39)	(-1.87)	(-0.88)	(0.09)	(-0.75)	(-2.21)	(-0.25)	(-0.66)	(0.38)	(0.22)	(0.15)
MRPL disp.	4.78	20.79	-1.20	9.73	-12.44**	-7.26	9.59	3.80**	14.55*	10.07	-0.21	2.19	2.43
	(0.37)	(0.69)	(-0.12)	(1.57)	(-3.05)	(-0.80)	(1.07)	(2.73)	(2.18)	(1.79)	(-0.25)	(1.78)	(0.25)
MRPM disp.	-0.10	102.40***	4.65	-1.32	-1.37	23.08**	-6.45	-0.68	-3.99	-1.12	0.89***	-2.70***	-5.21
	(-0.02)	(4.69)	(0.70)	(-0.29)	(-0.32)	(3.06)	(-0.81)	(-0.59)	(-1.21)	(-0.47)	(3.41)	(-3.39)	(-1.05)
Crisis	0.01	0.03	-0.05**	-0.03	0.02	-0.02**	0.03	-0.01	0.03	-0.06	0.01	-0.01	0.00
	(0.41)	(0.75)	(-2.89)	(-1.07)	(1.06)	(-3.12)	(0.96)	(-1.17)	(1.39)	(-1.60)	(1.41)	(-1.43)	(0.29)
Time	0.05**	-0.00	0.01	0.05**	-0.01	0.02*	0.03	0.02	0.07**	0.06***	0.01	0.06***	0.01
	(2.36)	(-0.30)	(1.20)	(2.96)	(-1.06)	(2.02)	(1.93)	(1.68)	(3.09)	(4.51)	(0.76)	(24.10)	(0.47)
Time Sq.	-0.00**	0.00	-0.00	-0.00**	0.00	-0.00	-0.00	-0.00	-0.00**	-0.00**	-0.00	0.00**	-0.00
	(-2.35)	(0.34)	(-0.75)	(-2.42)	(1.71)	(-0.52)	(-0.07)	(-1.09)	(-2.93)	(-2.27)	(-0.53)	(2.78)	(-0.37)
Obs.	18	18	18	18	18	18	14	18	18	18	18	18	18
Num. of Sectors.	1	1	1	1	1	1	1	1	1	1	1	1	1
R squared	0.63	0.62	0.58	0.71	0.79	0.93	0.60	0.53	0.74	0.77	0.89	0.98	0.63

Note: 1) *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; 2) MRPK, MRPL, and MRPM represent the log value of the marginal revenue product of capital, labor and the intermediate inputs divided by a hundred, respectively; 3) Time and Time squared terms are included; 4) Lagged ln (real VA) is included to control for the convergence of the growth rate; 5) A sector fixed effect is included.

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Effects of the Utilization of Non-Reciprocal Trade Preferences Offered by QUAD Countries on Economic Growth in Beneficiary Countries†

By SENA KIMM GNANGNON*

The present article investigates empirically whether non-reciprocal trade preferences (NRTPs) offered by QUAD countries (Canada, the European Union, Japan, and the United States) to developing countries have helped to promote economic growth in the beneficiary countries. Two main blocks of NRTPs are considered here: Generalized System of Preferences (GSP) programs and other trade preferences programs. The analysis used a set of 90 beneficiary countries of NRTPs that are concurrently recipients of development aid over the period of 2002-2018. Using the two-step system generalized method of moments, the analysis indicated that while a higher degree of utilization of each of these two blocks of NRTPs has been associated with a high economic growth rate, development aid enhances this positive effect. This highlights the need for donors to support a development strategy based on the provision of both development aid and NRTPs if they are to help beneficiary countries to promote economic growth. Finally, when the positive economic growth effect of the utilization of NRTPs is higher, the result is a greater country's share of exports (under preferential tariffs) to QUAD countries out of their total merchandise exports.

Key Word: Utilization of Non-reciprocal Trade Preferences, Economic Growth, QUAD Countries, Developing Countries
JEL Code: F13, F43, F35, O10

I. Introduction

Do non-reciprocal (or unilateral) trade preferences (henceforth, NRTPs) provided by advanced economies to developing countries contribute to spurring economic

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growth in the latter? The present paper addresses this question, which has received little attention in the literature.

Among the major policy tools available to wealthier nations to assist developing countries in their effort to promote economic development are what are termed Official Development Assistance (ODA) and non-reciprocal (or unilateral) trade preferences (henceforth, NRTPs). "The provision of development aid[1] aims to promote the economic development and welfare of developing countries" (OECD, 2021), while the offer of NRTPs aims to provide developing countries with opportunities to expand their exports, better integrate into the global trading system, and ultimately to promote development. The present study investigates the effect of NRTPs on beneficiary countries' economic growth performance outcomes and further considers the extent to which development aid affects these outcomes.

The first conference of the United Nations Conference on Trade and Development (UNCTAD) held in 1964 recommended explicitly that developed countries need to supply unilateral trade preferences to developing countries; that is, developed nations should grant trade concessions to developing countries and should not require concessions in return (e.g., Bartels, 2003; Persson, 2015a;[2] 2015b). At the second conference of the UNCTAD held in 1968, members states adopted a resolution (i.e., Resolution 21 (ii)) that called for the establishment of a "generalized, non-reciprocal, non-discriminatory system of preferences[3] (referred to as GSP) in favor of the developing countries, including special measures in favor of the least advanced among the developing countries" (see Grossman and Sykes, 2005). Resolution 21 (ii) further stated that "such preferences had three objectives: to increase the export earnings of developing countries, to promote their industrialization, and to accelerate their rates of economic growth" (Grossman and Sykes, 2005, p.42). The permanent legal basis for granting unilateral trade preferences to developing countries was established in 1979 through what is informally known as the Enabling Clause, also referred to as "Differential and More Favourable Treatment, Reciprocity and Fuller Participation of Developing Countries."

NRTPs are not confined to GSPs, as they also include other non-reciprocal trade preferences authorized through a Waiver under the World Trade Organization (WTO) Agreement[4] (see WTO, 2010). For example, in addition to the GSP schemes that they provide to eligible developing countries (and the least developed countries among them), wealthier countries such as Canada, European Union countries, and the United States also offer special treatments to selected developing countries, including some through a special Waiver (adopted for each preference-granting country) under the WTO Agreement. The United States (US) offers the African

[1]In 1969, the Development Assistance Committee (DAC) adopted the official development assistance (ODA) as the "gold standard" of foreign aid, and since then, it has remained the main source of financing for development aid (e.g., OECD, 2021).

[2]An overview of the legal and historical background of trade preferences can be found in Persson (2015a), and the history of GSPs is provided in Cunha *et al*. (2005).

[3]These types of preferences are commonly referred to as "Generalized System of Preferences (GSP)."

[4]NRTPs are referred to as "preferential trade arrangements" (PTA) in the WTO's jargon. The WTO PTA database contains a wealth of information concerning NRTPs offered by WTO Members, with notifications to the WTO. These include GSP schemes, NRTPs schemes offered through a special Waiver under the WTO Agreement, as well as other PTAs supplied by developing countries to least developed countries (see WTO, 2010). Information on PTAs for which the WTO has been notified can be found in the WTO PTA database online at: http://ptadb.wto.org/default.aspx

Growth and Opportunity Act (AGOA) to eligible countries in Sub-Saharan Africa (SSA). The US also offers the Caribbean Basin Economic Recovery Act to Caribbean countries, and particularly the Hemispheric Opportunity through Partnership Encouragement initiative to Haiti. It also grants special (non-reciprocal) trade preferences to Nepal. The European Union (EU) currently offers non-reciprocal preferential concessions to products originating from the Western Balkans. Canada is currently providing a tariff treatment to products from Commonwealth Caribbean countries.

A large body of the literature[5] has examined whether the first objective of Resolution 21(ii) has been achieved, i.e., whether NRTPs have effectively increased the export earnings of beneficiary countries. The literature in this area has reached mixed conclusions, as some studies have found a positive effect (recent ones include, for example, Hakobyan, 2020; Ito and Aoyagi, 2019; Ornelas and Ritel, 2020) while others have found that the effects are heterogeneous across beneficiary countries, sectors, and products (recent studies include, for example Cipollina *et al*., 2017; Cipollina and Demaria, 2020; Klasen *et al*., 2021; and Tobin and Busch, 2019). At the same time, other works have uncovered a negative effect of NRTPs on the export earnings of beneficiary countries (e.g., Admassu, 2020; Borchert, 2009; Gil-Pareja *et al*., 2019; Herz and Wagner, 2011; Seyoum, 2006; and Zappile, 2011). For example, some of the latter (e.g., Admassu, 2020; Gil-Pareja *et al*., 2019; Herz and Wagner, 2011, and Zappile, 2011) have concluded that developing countries would be better off (in terms of exports) if they opted for reciprocal trade agreements to the detriment of NRTPs. Herz and Wagner (2011) found that GSP schemes that existed for less than ten years have positively influenced beneficiary countries' exports (see also Gil-Pareja *et al*., 2014), while GSP schemes with longer durations (i.e., one or two decades) have exerted a negative effect on the exports of beneficiary countries because, over the long term, the strict or complicated rules of origin exert distortive effects on these countries' exports, causing these countries to export under most-favored-nations tariffs rather than under non-reciprocal GSP programs.

In contrast to the voluminous literature that assesses the effectiveness of NRTPs in terms of increasing the export earnings of beneficiary countries, very few works have investigated whether NRTPs have achieved the second objective of Resolution 21(ii), i.e., promoting the industrialization of beneficiary countries, although the concept of "industrialization" can be interpreted in different ways (see for example the discussion in Persson, 2015a). Some of these works are concerned with the effect of NRTPs on manufacturing exports (e.g., de Melo and Portugal-Pérez, 2008; Gradeva and Martínez-Zarzoso, 2016; Klasen *et al*., 2021), while others examine the effects of NRTPs on export product diversification (e.g., Gamberoni, 2007; Persson and Wilhelmsson, 2016; Yannopoulos, 1986) or on economic complexity (e.g., Gnangnon, 2021). For example, Yannopoulos (1986) has found that unilateral trade preferences offered by the European Community to Mediterranean countries have led to export diversification in these countries. Gamberoni (2007) found for NRTPs offered by the EU (over the period 1994-2005) that while the GSP and the drug regime have led to export product diversification at extensive margins in beneficiary

[5]Discussions of the effects of trade preferences can be found in Hoekman and Özden (2005), Cardamone (2007), Gnangnon and Iyer (2021), Klasen *et al*. (2021) and Ornelas (2016).

countries, this has not been the case for African Caribbean and Pacific (ACP) countries. For the latter group, NRTPs have exerted an anti-export diversification effect. Additionally, for least developed countries that have enjoyed special concessions among beneficiary countries, the effects of NRTPs have been unstable and vary depending on the specifications. Persson and Wilhelmsson (2016) considered all preference schemes implemented by the EU during the period of 1962-2007 and examined how eligibility for a given preference program has affected export product diversification in beneficiary countries. They found empirically that while some trade preferences have resulted in greater export product diversification, no significant export product diversification effects could be found for preferences offered to Mediterranean countries (except, however, for some very earlier versions of these programs). Gnangnon (2021) examined the effects of the utilization of NRTPs (GSP programs and other trade preferences) offered by QUAD countries on the economic complexity level of beneficiary countries. He established empirically, *inter alia*, and in other ways that the utilization of GSP programs (at the expense of the usage of other trade preferences) has been instrumental in achieving greater economic complexity, with this effect being greater for high-income beneficiary countries. In addition, development aid flows are complementary with the utilization of NRTPs in fostering economic complexity in beneficiary countries, especially when beneficiary countries receive high amounts of such aid.

In other work, de Melo and Portugal-Pérez (2008) demonstrated that the more flexible preferential rules of origin under the AGOA preferential regime of the US (compared to those under the EU's EBA initiative and the Cotonou Economic Partnership Agreement) have allowed the top seven African beneficiaries of the AGOA regime to increase the amounts of apparel exported significantly (i.e., the export volume rose by 300%). Gradeva and Martínez-Zarzoso (2016) in an empirical study found no significant effect of the EU's EBA initiative on the manufacturing exports of least developed countries (among ACP beneficiaries), possibly due to the erosion of preferences margins enjoyed by these countries (this erosion was due to MFN[6] trade liberalization). Klasen *et al*. (2021) reported, *inter alia*, that certain individual preferential regimes (among those of developed countries[7]) offered to least developed countries have been associated with an expansion of export agricultural goods and light manufacturing products, including textiles and leather after 1990.

With regard to the third objective of Resolution 21(ii) (i.e., the expectation that NRTPs would accelerate the economic growth rates of beneficiary countries), we are not aware of a study in the empirical literature that has examined whether NRTPs have actually achieved this objective. In fact, while Ornelas (2016) has provided a theoretical discussion of the possible effects of NRTPs on beneficiary countries' economic growth performance outcomes, no empirical work has concentrated on the matter.

The present paper aims to fill this gap in the empirical literature by investigating whether NRTPs provided by QUAD countries have led to higher economic growth

[6]The acronym "MFN" refers to the Most Favored Nations principle of the WTO.

[7]The trade preference regimes offered to LDCs considered in the study by Klasen *et al*. (2021) are those of the EU, USA, Canada, Japan, Australia, New Zealand, Norway, and Turkey.

performances in beneficiary countries. The QUAD countries here include Canada, EU countries, Japan, and the US. It is important to note that in contrast to many previous empirical works that have examined the effects of NRTP eligibility on the export performance of beneficiary countries, the current article investigates the effects of the 'utilization' of these NRTPs (rather than eligibility for them) on beneficiary countries' economic growth performance outcomes. Two main blocks of NRTPs provided by QUAD countries are considered: the Generalized System of Preferences (GSP) programs and the other trade preferences programs.

The focus on QUAD countries (and not on all preference-granting countries, including all wealthier countries that provide NRTPs to developing countries) is explained by the data available to perform the analysis. The latter covers an unbalanced panel dataset of 90 countries over the period of 2002 to 2018. Using primarily the two-step system generalized method of moments (GMM) estimator, it is established that a higher utilization rate of GSP programs, on the one hand, and a higher utilization rate of other trade preference programs, on the other hand, are associated with stronger economic growth performance in beneficiary countries. Moreover, the concomitant utilization of the two blocks of NRTPs contributes to enhancing economic growth in beneficiary countries. On another score, the utilization of both GSP programs and other trade preferences improves economic growth in the context of terms of trade improvements. Moreover, and interestingly, the utilization of NRTPs is positively and significantly associated with economic growth in countries that receive high amounts of development aid. Finally, and not least, countries that export (under preferential tariffs) a high share of their merchandise exports to the QUAD countries experience a positive economic growth effect of the utilization of the unilateral trade preferences that they enjoy.

The rest of the article is organized around five sections. Section II provides a theoretical discussion of the effects of both NRTPs and development aid on economic growth. Section III lays out the model specifications used to examine empirically the effects of the utilization of NRTPs (and development aid) on economic growth and discusses the econometric approach used to perform the empirical analysis. Section IV discusses the empirical outcomes. Section V deepens the analysis, and Section VI concludes the paper.

II. Theoretical Discussion

This section provides a theoretical discussion of the effects of NRTPs on economic growth (sub-section II.A) and of the effects of development aid on economic growth (sub-section II.B).

A. *Effects of non-reciprocal trade preferences on economic growth*

The utilization of NRTP programs can affect economic growth in beneficiary countries through aggregate productivity and firm de-location effects and learning spillover, but also due to the insecurity that may be associated with NRTPs (e.g.,

Grossman and Helpman, 2015; Ornelas, 2016[8]).

The utilization of foreign market access opportunities under NRTPs could promote economic growth in beneficiary countries through its positive effect on aggregate productivity. The theoretical model developed by Melitz (2003) indicates that export expansion due to better access to foreign markets would lead to the expansion of the most efficient firms and better resource allocation in the beneficiary economy. This expansion of the most efficient firms would contribute to enhancing economic growth in the beneficiary country. At the same time, it would also induce a rise in local wages and limit the ability of indigenous firms to take advantage of these foreign market access opportunities, as they could not sustain the payment of higher wages to workers in the domestic market. Attempts by the government to prevent the decline of indigenous firms could limit the expansion of exporting firms in the country receiving the preferences and ultimately hurt economic growth.

The model developed by Melitz and Ottaviano (2008) has shown that better access to foreign markets (e.g., through preferential treatment) facilitates firm entry in the presence of less domestic competition. Additionally, a greater degree of firm entry in the presence of firm heterogeneity would generate higher industry productivity. Ossa (2011) demonstrated that in the context of trade agreements, greater firm entry in the domestic market of the beneficiary country would be beneficial to that country when there are increasing returns to scale and international trade costs. All of these factors would contribute to promoting economic growth in countries that enjoy better access to foreign markets. However, the positive economic growth effect of better access to foreign markets (that works through the improvement in aggregate productivity due to firm entry) could be mitigated by competition over domestic resources if purely domestic firms remain large and protected (Ornelas, 2016).

'Learning spillover' associated with export expansion[9] (arising from better access to foreign markets through NRTPs) can also contribute to promoting economic growth in the beneficiary country. According to Hausmann and Rodrik (2003), preferential market access may spur the exports of beneficiary countries by promoting pioneer firms from which domestic rivals can learn. The export expansion induced by positive spillover from pioneer firms to domestic rivals can promote economic growth. Along the same lines, Albornoz *et al*. (2012) proposed a model to explain why despite substantial entry costs new exporters give up exporting very shortly while other firms greatly increase their foreign sales and expand to new destinations. They posit and provide empirical support for the theoretical hypothesis that while individual export profitability may initially be uncertain, it can become positively correlated over time and across destinations. This leads to what Albornoz *et al*. (2012) refer to as a "sequential exporting," whereby the possibility of profitable

[8]Ornelas (2016) discussed the theoretical channels through which NRTPs can affect the economic growth performance of beneficiary countries.

[9]Many studies have found a positive economic growth effect of export expansion via, for example, the productivity channel (e.g., Al-Yousif, 1997; Awokuse and Christopoulos, 2009; Bernard and Jensen, 1999; Feder, 1983; Hagemejer and Mućk, 2019; Kalaitzi and Cleeve, 2018; Lucas, 1988; Tang *et al*., 2015; Tyler, 1981; Van Biesebroeck, 2005). However, other studies have reported that the types of products exported matter with regard to economic growth, as reliance for example on the exporting of low-value-added products (e.g., primary commodities) is negatively associated with economic growth (e.g., Hausmann *et al*., 2007; Herzer *et al*., 2006; Kim and Lin, 2009). See also Giles and Williams (2001) for a literature review on the relationship between exports and economic growth concerning pre-2000 studies. Wagner (2007) has also provided a literature survey of the relationship between exports and productivity based on firm-level data.

export expansion (at both the intensive and extensive margins) makes initial entry costs worthwhile despite high failure rates. This suggests, in the context of the present study, that the utilization of NRTPs can spur economic growth through export expansion as these trade preferences may allow firms to learn their own capabilities by expanding their exports not only to the market of the preference-granting country but also to other destinations.

Innovation could be another avenue through which better foreign market access (including through NRTPs) could foster economic growth (e.g., Bustos, 2011; De Loecker, 2007; Lileeva and Trefler, 2010; Spulber, 2010). The innovation effect of NRTPs could arise from the fact that NRTPs enlarge the potential export market for firms in the beneficiary country and hence increase their expected return from innovation, ultimately improving their innovation performance. For example, Lileeva and Trefler (2010) found that the size of the export market of a firm is key for their innovation performance and hence for their productivity. In fact, exporting is complementary with innovation when having access to new export opportunities (for example through NRTPs) allows firms (especially low-productivity firms) to innovate and start exporting, meaning that their productivity improves as they export further (for example, see also De Loecker, 2007; Spulber, 2010). On another note, Chui *et al*. (2001) documented theoretically and empirically that developing countries could benefit from north-south trade (as is the case for NRTPs) through the creation of new winners and better skilled workers. Their model was built on four stages of southern development, whereby countries in the south initially specialize in a traditional good and then start copying northern high-tech manufactured goods (second stage), start innovating (third stage), and finally only innovate in the same way as in the north (fourth stage).

Finally, the insecurity associated with NRTPs could hamper economic growth (Ornelas, 2016). As highlighted by Ornelas (2016), the key issue here is whether the S&D treatment (in particular NRTPs) genuinely promotes industries such that it fosters economic growth over the long term. This may be the case because the sectoral and product coverage rates of NRTPs are deemed to promote infant industries and accelerate economic growth in beneficiary countries, as envisaged in UNCTAD Resolution 21 (II)). However, the choices of products and country eligibilities are at the discretion of the preference-granting countries, and it is a priori unclear whether the latter always choose products that would generate learning externalities [10] (Ornelas, 2016). Additionally, there are often certain conditionalities[11] attached to the supply of NRTPs by developed nations (e.g., Silva, 2011; Tobin and Busch, 2019) that could raise questions about the predictability of these preferences (e.g., Zappile, 2011). The uncertainty that could surround these preferences could lead to lower exports and hamper economic growth. For example, Zappile (2011) found no significant effect of AGOA membership and eligibility for AGOA textile benefits on eligible African trade. The author explained this outcome as related to the uncertainty surrounding the expiration of these preferences, the erosion of preferential margins,

[10]Ornelas (2016) has also pointed out that it would be difficult to identify whether the export industries and products covered by the existing NRTP schemes are those that have the potential to generate significant learning spillover.

[11]Such conditionalities include for example intellectual property rights, investors' rights, and labor standards (e.g., Zappile, 2011).

and the inability of African producers to exploit preferences adequately. Hakobyan (2020) noted that the 2011 expiration of the United States' GSP program has had a detrimental impact on developing countries' exports to the USA. On average, further to this expiration, these exports dropped by 3% in 2011. In particular, developing countries' exports of agricultural products as well as of textiles and clothing fell respectively by 5% and 9%. Additionally, exports did not fully recover by 2012, thereby suggesting that the adverse export effect of the 2011 expiration of the US's GSP persisted. Ornelas (2016) has pointed out that flexible criteria for graduation from the list of beneficiaries of NRTPs, as well as occasional overhauls in NRTPs, may not generate dynamic gains given that exports would not expand beyond a certain level. Li (2018) developed and tested empirically a dynamic model of exporting with a view to investigating how productivity on the one hand, and uncertain foreign demand on the other, influence firms' export participation. In this model, firms face uncertainty about their own foreign demand and update their beliefs by relying on individual export transactions according to Bayes' rule. Using data on firm-level production and transaction-level exports to Germany in the Chinese ceramics and glass industry, Li (2018) found empirically that productivity is the main driver of export participation for experienced firms, while demand learning drives export participation for potential entrants.

Overall, the uncertainty (if any at all) arising from NRTPs could lead to a wait-and-see approach by exporting firms in beneficiary countries, cloud an otherwise clear horizon for proper planning, weaken incentives for investment and innovation, and result in lower exports than expected (Ornelas, 2016), that is, lower utilization of NRTPs. In that context, NRTPs would be associated with lower economic growth performance in beneficiary countries.

Considering the foregoing, we postulate that NRTPs could spur economic growth in beneficiary countries through their associated productivity enhancements, improved innovation performance outcomes, and export expansion effects (***hypothesis 1***). However, these economic growth benefits of NRTPs can erode if there is uncertainty surrounding the preferences such that these trade preferences would ultimately lead to lower economic growth (***hypothesis 2***).

B. *Effects of development aid on economic growth*

A voluminous body of literature has explored the effects of development aid on economic growth, though overall the findings have been inconclusive[12]. More generally, development aid is a controversial issue in the field of development economics (Edwards, 2014). Some believe that foreign aid has been ineffective in promoting the development of poor countries and their integration into the global economy (e.g., Easterly, 2014; Moyo, 2010), while others claim that aid should not only increase significantly to reach its intended objective (that is, promoting economic growth and reducing poverty), but the way it is provided should be rethought (e.g., Sachs, 2009; Stiglitz, 2002). Other researchers such as Collier (2007)

[12]We do not intend to present here an extensive literature survey on the economic growth effects of development aid. Such a survey can be found, for example, in Asatullaeva *et al*. (2021), who provide a systematic literature review and content analysis of the top 50 most influential papers on the impact of development aid on economic development in recipient countries.

have argued - in the context of the lack of aid effectiveness in promoting economic development in beneficiary countries - that it would be important for the international community, including industrialized nations, to adopt a bold new plan to help failed states that are home to the poorest billion people on Earth. Such a plan could include, *inter alia*, the offer of preferential trade as well as policies, new laws against corruption, and new international charters (Collier, 2007). Banerjee and Duflo (2011) proposed that the fight against poverty and underdevelopment might require researchers to rely on 'randomized control trials' to devise effective and specific aid programs.

On the empirical front, the large literature survey (based on 97 studies) conducted by Doucouliagos and Paldam (2008; 2009) has led to the conclusion that development aid has a small positive but statistically insignificant effect on economic growth. Bourguignon and Sundberg (2007) contend that the inconclusiveness of empirical studies on the effect of development aid on economic growth can be attributed to the use of aggregate data. They suggested that empirical analyses of the effects of development aid on economic growth should go beyond econometrics and should break down the 'black box' of development aid. In the same vein, Edwards (2014) has put forth there are multiple black boxes, referring to the black box in Bourguignon and Sundberg (2007) and noting that it is in fact highly elastic and changes over time. Therefore, it is important to carry out in detail country-specific analyses to understand why aid works at certain times and not others and why some projects are successful while others fail. In the same vein, Addison and Tarp (2015) emphasized the need for accounting for country-specific situations and problems when studying the effects of development aid on economic growth.

Among recent studies, one by Chauvet and Ehrhart (2018) is worth emphasizing. The authors used firm-level data to investigate the mechanisms through which development aid affects economic growth. They obtained evidence that development aid helps to relax the financing constraints of firms, exerting a positive effect on firms' sales growth. Specifically, this positive effect appears to be stronger for firms that operate in sectors intensive in infrastructure and external finance. Among other recent works, Pham and Pham (2020) have shown that while development aid may promote economic growth in the recipient country, the global dynamics of equilibrium are complex due to non-monotonicity and steady-state multiplicity.

In the present study, one cannot dissociate the effect of the utilization of NRTPs from that of development aid on economic growth, given the debate on whether NRTP regimes are superior, inferior, or complementary to development aid in promoting economic growth in recipient countries (e.g., Adam and O'Connell, 2004; Ornelas, 2016). According to Adam and O'Connell (2004), the two policy instruments are equivalent in a simple neoclassical model with a non-traded good, and a lack of market imperfections. However, Ornelas (2016) has argued that due to the terms of trade effects, the export responses of NRTP beneficiary countries is stronger with tariff preferences than with an equivalent transfer. In the meantime, in their endogenous growth model, Acemoglu and Ventura (2002) found that in a sufficiently open world, countries that accumulate capital more rapidly (and hence enjoy higher economic growth) than average experience declining export prices, a situation that depresses the rate of return on capital and discourages the further accumulation of capital. In other words, Ornelas (2016) argued that export-led

growth in a country would result in lower economic growth in the future due to terms of trade effects. In such a context, NRTPs could generate higher economic growth than development aid because the improvement in terms of trade that could result from these preferences for beneficiaries countries could more than outweigh the negative economic growth effect via the terms of trade (as demonstrated by Acemoglu and Ventura, 2002).

We can also argue that development aid could be complementary to the utilization of NRTPs in promoting economic growth in countries that are both beneficiaries of these trade preferences and aid recipients In fact, in a recent study, Gnangnon and Iyer (2021) found evidence that Aid for Trade (AfT) - part of the overall development aid package devoted to the promotion of the integration of developing countries into the global trading system - contributes to enhancing the utilization of NRTPs. The other part of the overall development (i.e., NonAfT flows) could also contribute to improving the utilization of NRTPs if for example they were instrumental in enhancing human capital and improving institutional quality levels, which are both essential for export expansion, notably under NRTPs regimes. For example, Birchler and Michaelowa (2016) and Dreher *et al*. (2008) reported a positive effect of aid for education on educational outcomes. Kotsadam *et al*. (2018), Pickbourn and Ndikumana (2016) and Yogo and Mallaye (2015) uncovered empirically a positive effect of health aid on health outcomes in recipient countries. Likewise, aid was found to be able to improve the utilization of NRTPs through its positive effect on the quality of institutions and governance in recipient countries (e.g., Freytag and Heckelman, 2012; Jones and Tarp, 2016; Dijkstra, 2018). Gnangnon (2020) obtained empirical evidence that the cumulative amount of total development aid exerts a positive effect on the quality of regulatory policies in recipient countries. Dzhumashev and Hailemariam (2021) have shown empirically that the effects of development aid on economic growth and development work mainly through economic institutions, as aid has been found to exert a significant, positive effect on the quality of economic institutions in recipient countries. Against this backdrop, we can postulate that by enhancing the utilization of NRTPs, development aid could be complementary to the utilization of NRTPs in spurring economic growth in beneficiary countries (***Hypothesis 3***).

III. Empirical Strategy

This section presents the model specifications that would help to examine the effect of the utilization of NRTPs on economic growth (sub-section III.A). It then discusses the econometric method used to perform the empirical analysis (sub-section III.B).

A. *Model specifications*

We investigate the effect of the utilization of NRTPs on economic growth by building upon the standard literature on the macroeconomic determinants of economic growth, in particular the literature on the effects of exports on economic growth (see the studies cited in section 2 - recent studies include for example,

Hagemejer and Mućk, 2019; Jetter, 2017; Kalaitzi and Cleeve, 2018; Tang *et al*., 2015). Hence, the model specifications contain not only the variables capturing the utilization of NRTPs, as well as the development aid variable (which represents the other main way through which developed countries assist developing countries ones), but also the following control variables: trade policy[13] (e.g., Alesina *et al*., 2005; Chang *et al*., 2009; Fukuda, 2019; Grossman and Helpman, 2015; Hsieh *et al*., 2020; Melitz, 2003); terms of trade (e.g., Jawaid and Raza, 2013; Kaneko, 2000; Vianna and Mollick, 2021); economic complexity[14] (e.g., Hausmann and Hidalgo, 2009; 2011; Hidalgo, 2021; Jarreau and Poncet, 2012; Koch, 2021); government consumption (e.g., Lin, 1994; Mo, 2007; Olaoye *et al*., 2020); inflation rate (e.g., Barro, 2013; Christiansen *et al*., 2013; De Gregorio, 1993) and population size (e.g., Becker *et al*., 1999).

The variable capturing FDI inflows (in percentage of GDP) is introduced in the analysis in light of the importance of FDI inflows with regard to utilizing NRTPs (e.g., Yannopoulos, 1987) and given that FDI inflows can exert a significant positive effect on economic growth, (e.g., Baldwin *et al*., 2005; De Gregorio, 2005). The literature on the effect of FDI inflows on economic growth is voluminous but still inconclusive, as this effect may depend on several factors. These include host country characteristics such as the level of human capital (e.g., Borensztein *et al*., 1998; Li and Liu, 2005; Su and Liu, 2016), the depth of financial development (e.g., Alfaro *et al*., 2010; Hermes and Lensink, 2003; Kottaridi and Stengos, 2010; Osei and Kim, 2020), the level of information and communication technology (ICT) (e.g., Asongu and Odhiambo, 2020), the institutional and governance quality (e.g., Azman-Saini *et al*., 2010; Bengoa and Sanchez-Robles, 2003; Hayat, 2017), and how FDI inflows affect domestic investment (e.g., Morrissey and Udomkerdmongkol, 2012; Farla *et al*., 2016). Building on the existing works on this issue, we cannot predict the direction of the effect of FDI inflows on economic growth, and the issue is essentially empirical.

At this stage of the analysis, it is important to note that according to the literature on the determinants of economic growth, human capital[15] and the institutional quality[16] also contribute to the economic growth performance of countries. However, we have not included these two variables in the baseline model (1) because we found a strong correlation between them and other control variables in model (1), specifically economic complexity, development aid and FDI inflows.

We consider the following baseline model specification (1):

[13]The effects of trade policy reform (for example, trade policy liberalization) on economic growth have been the subject of a numerous theoretical and empirical studies that reach inconclusive outcomes (see, for example, Irwin (2019) for a recent survey of this literature).

[14]Economic complexity, which reflects the diversity (i.e., the number of products exported) and the ubiquity (i.e., the number of countries that also export these products) of an economic system, measures the amount of knowledge embedded in a country's productive (including export) structure (Hausmann *et al*., 2014; Hausmann and Hidalgo, 2009). A higher level of economic sophistication exerts a strong positive effect on economic growth.

[15]See for example Lucas (1988), Matousek and Tzeremes (2021), Zhang and Zhuang (2011), and Zhang and Wang (2021).

[16]See for example Aixalá and Fabro (2008), Alesina and La Ferrara (2005), Barro (1996), Corradini (2021), Efendic *et al*. (2011), and Rigobon and Rodrik (2005).

$$
\begin{aligned}
GROWTH_{it} = {} & \alpha_1 GROWTH_{it-1} + \alpha_2 URGSP_{it} + \alpha_3 UROTP_{it} + \alpha_4 ODA_{it} \\
& + \alpha_5 TERMS_{it} + \alpha_6 TP_{it} + \alpha_7 ECI_{it} + \alpha_8 GCONS_{it} + \alpha_9 INFL_{it} \\
& + \alpha_{10} FDI_{it} + \alpha_{11} \log(POP)_{it} + \mu_i + \delta_t + \varepsilon_{it}
\end{aligned} \tag{1}
$$

Here, the subscripts i and t indicate respectively a country and a time-period. The parameters α_1 to α_{11} are to be estimated. μ_i represents the time-invariant specific effects of each country in the panel dataset. The δ_t symbols are time dummies that capture global shocks that influence together all countries' economic growth paths. ε_{it} is a well-behaving error-term. The panel dataset used to estimate model (1) and its different variants described below is unbalanced and contains 90 countries (beneficiaries of both NRTPs and development aid) over the period of 2002-2018. This dataset has been constructed based on data availability. Following studies such as that by Christiansen *et al*. (2013), we use non-overlapping three-year sub-periods of 2000-2002, 2003-2005, 2006-2008, 2009-2011, 2012-2014 and 2015-2018 (the latter sub-period covers four years rather than three). This helps to mitigate the effects of business cycles on the variables at hand. Table A1 presents a description of all variables in model (1) as well as their respective sources. Table A2 reports the standard descriptive statistics related to these variables, and Table A.3 reports the list of countries used in the analysis.

The dependent variable "GROWTH" is the growth rate (annual percentage) of the real GDP per capita (constant prices in 2010 US$). We followed the extant literature by including the one-period lag of this variable as a regressor in model (1). This helps capture the state-dependent feature of the economic growth rate and concurrently helps to address possible omitted-variable bias in the model specifications.

The variable "URGSP" represents the utilization rate (in percentage) of GSP programs provided by QUAD countries to developing countries. It captures the extent to which imports which are eligible for GSP programs are actually imported under these preferences. It is computed here using a formula adopted by both the WTO and the UNCTAD (see WTO, 2016). The formula is as follows:

$$URGSP = 100 * (\text{GSP Received Imports}) / (\text{GSP Covered Imports}),$$

where "GSP Received Imports" refers to the value of imports that received GSP treatment, and "GSP covered imports" indicates the value of imports that are classified in tariff lines that are dutiable and covered by the GSP scheme of the preference-granting country.

The indicator "UROTP" is the utilization rate (in percentage) of the other NRTPs offered by QUAD countries to developing countries. For the US, the other trade preferences cover the African Growth and Opportunity Act (AGOA) and the Caribbean Basin Initiative. In the case of the EU, it includes preferences under the Economic Partnership Agreements entered with selected Africa Sub-Saharan countries. It has been computed as follows:

$$UROTP = 100 * (\text{Other-preferential Imports}) / (\text{Other Preferential Covered Imports}).$$

"Other-Preferential Imports" refers to the value of imports that benefitted from

NRTPs other than GSP programs. "Other-Preferential Covered Imports" refers to the value of imports that are classified in tariff lines that are dutiable and covered by the other preferential schemes.

The variables "ODA", "TERMS", and "TP" are respectively the transformed development aid variable (see Table A1 for more details), the terms of trade, and the trade policy (higher values of the latter indicate greater trade policy liberalization). Similarly, the variables "ECI", "GCONS", and "INFL" are respectively the economic complexity index, the share of government consumption in GDP, and the transformed inflation variable (see Table A1 for more details). Finally, the variables "FDI" and "POP" stand for the FDI-to-GDP ratio and the population size.

B. *Econometric approach*

Regarding the econometric approach, first we estimate model (1) using standard econometric estimators (i.e., the pooled ordinary least squares - POLS - and the within fixed effects estimator - FE) bearing in mind that the estimates obtained and reported in columns [1] and [2] of Table 1 could be biased[17] owing to the endogeneity problems that could plague model (1). These endogeneity concerns can be due to the possible bi-directional causality between the economic growth rate variable and the regressors (except for the population size and terms of trade) included in model (1), but may also stem from the correlation between the one-period lag of the dependent variable and the time-invariant country-specific effects for each country. This is referred to as the Nickell bias (Nickell, 1981).

To handle the endogeneity problems, we follow many previous studies (e.g., Chang *et al*., 2009; Christiansen *et al*., 2013; Eicher and Schreiber, 2010; Feeny *et al*., 2014; Lee and Kim, 2009; Museru *et al*., 2014) and use the two-step system generalized method of moments (GMM) proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator helps to correct for unobserved country heterogeneity, measurement errors, the endogeneity issues raised above, and omitted-variable bias. In the present analysis, omitted-variable bias can arise from the fact that we have not introduced in the baseline model (1) indicators that capture the utilization rates of NRTPs provided by preference-granting countries other than QUAD countries. This possibility exists here simply because data on such indicators is, for the time being, not available.

The two-step system GMM estimator combines a system of equations, an equation in differences and an equation in levels, where lagged first differences are used as instruments for the levels equation, and lagged levels are used as instruments for the first-difference equation. It improves the consistency and efficiency of the estimates compared to the difference GMM estimator[18] proposed by Arellano and Bond (1991), which uses lags of variables as instruments of endogenous variables to address endogeneity concerns. It is important to note that we expect that the

[17]We, nevertheless, report results based on the POLS and FE estimators with a view to comparing them to those obtained by means of the two-step system GMM estimator used (later in the analysis) to address the endogeneity concerns that plague model (1).

[18]The difference GMM estimator wipes out countries' fixed effects and uses lags of variables as instruments of endogenous variables.

TABLE 1— EFFECTS OF THE UTILIZATION OF NON-RECIPROCAL TRADE PREFERENCES ON ECONOMIC GROWTH (ESTIMATORS: POLS, WITHIN FIXED EFFECTS AND TWO-STEP SYSTEM GMM)

Variables	POLS GROWTH (1)	Within Fixed Effects GROWTH (2)	Two-Step System GMM GROWTH (3)
$GROWTH_{t-1}$	0.371***	0.157***	0.241***
	(0.0483)	(0.0518)	(0.0161)
URGSP	0.00944**	0.0105*	0.0114***
	(0.00468)	(0.00623)	(0.00225)
UROTP	-0.00259	0.00927	0.0163***
	(0.00458)	(0.00751)	(0.00224)
ODA	-0.000997	0.00937	-0.00988**
	(0.0141)	(0.0171)	(0.00442)
TERMS	-0.00218	0.0112	0.0133***
	(0.00298)	(0.00827)	(0.00222)
ECI	0.324	0.694	0.714***
	(0.259)	(1.146)	(0.125)
TP	0.0326	0.0172	0.0331***
	(0.0199)	(0.0288)	(0.00944)
GCONS	-0.122***	-0.0927	-0.0903***
	(0.0424)	(0.105)	(0.0235)
INFL	-0.0334***	-0.0508***	-0.0110
	(0.0111)	(0.0159)	(0.0110)
FDI	0.101	0.156*	0.148***
	(0.0642)	(0.0863)	(0.0184)
Log(POP)	0.262**	-3.104	0.845***
	(0.123)	(3.310)	(0.0777)
Observations - Countries	404 - 90	404 - 90	404 - 90
R-squared	0.395		
Within R-squared		0.2975	
AR1 (P-Value)			0.0001
AR2 (P-Value)			0.1989
AR3 (P-Value)			0.1996
OID (P-Value)			0.2474

Note: 1) *p-value<0.1, **p-value<0.05, ***p-value<0.01, 2) Robust standard errors are in parenthesis, as they are clustered at the country level, 3) Time dummies are included in the regressions.

coefficient of the dependent variable obtained by the two-step system GMM estimator to lie between the estimate of this variable generated by the FE estimator and that generated by the POLS estimator (e.g., Bond *et al*., 2001), as the POLS estimator generates an upwardly biased coefficient of the lagged dependent variable, while the FE estimator leads to downward bias of the estimate related to the dependent variable.

We evaluate whether model (1) (or its different variants described below) estimated by the two-step system GMM technique is correctly specified by means of several statistical tests. These include the Arellano-Bond test of the presence of a first-order serial correlation in the first-differenced error term (denoted AR(1)), the Arellano-Bond test of the absence of second-order autocorrelation in the first-differenced error term (denoted AR(2)), and the Sargan-Hansen test of over-identifying restrictions (OID). Although not required, we also carried the Arellano-Bond test of the absence of a third-order serial correlation in the first-differenced error term (denoted as AR(3)). Model (1) and its variants estimated by means of the two-step system GMM estimator will be considered as correctly specified if we

reject the null hypotheses of the absence of a first-order autocorrelation in the first-differenced error term (associated with the AR(1) test) and if we do not reject the absence of a second-order autocorrelation in the first-differenced error term (associated with the AR(1) test) or the null hypothesis of the validity of instruments associated with the OID test of over-identifying restrictions. Accepting the null hypothesis of the absence of a third-order serial correlation in the first-differenced error term for the AR(3) test could provide an indication that model (1) and its variants (described below) are not affected by omitted-variable bias. Finally, following for example Bowsher (2002) and Roodman (2009), we ensure that in the regressions carried out, the number of instruments is lower than the number of countries lest the above-mentioned tests become less powerful. To that effect, the regressions used a maximum of three lags of the dependent variable as instruments and two lags of the endogenous variables as instruments.

The analysis utilized several regressions using the two-step system GMM estimator. In all of these regressions, the variables "URGSP", "UROTP", "ECI", "TP", "GCONS", "ODA", "INFL", "FDI", and the interaction variables were treated as endogenous. The population size and terms of trade variables were considered as exogenous.

First, we estimate model (1), the results of which are reported in column [3] of Table 1.

Second, we estimate the first variant of model (1), in which we interact each of the two variables measuring the utilization of NRTPs with the development aid variable. The results of this estimation are reported in column [1] of Table 2 and can help to examine how the two major policy tools (unilateral trade preferences and development aid) available to donor-countries to assist developing countries interact as they purportedly affect economic growth in recipient countries.

Third, we estimate a second variant of model (1) that allows an investigation of how the two types of NRTPs interact as they purport to affect the economic growth performance in beneficiary countries. The rationale for estimating this variant of model (1) is to examine whether utilizing concurrently both GSP programs and other trade preferences helps to foster economic growth in beneficiary countries, i.e., whether both GSP programs and other trade preferences are complementary or substitutable in promoting economic growth in beneficiary countries. The outcomes of this estimation are presented in column [2] of Table 2.

Fourth and finally, we test whether terms of trade improvements enhance the positive effect of NRTPs on economic growth in beneficiary countries, as theoretically NRTPs provide beneficiary countries with a higher export prices than other exporters (that do not enjoy those preferential regimes) to the preference-granting countries. The increased export prices would lead to an improvement in terms of trade for the beneficiary countries and possibly help foster their economic growth performance. To test this hypothesis empirically, we estimate another specification of model (1), that is, the baseline model (1) in which we introduce the interaction between both variables with regard to measuring the utilization of NRTPs and the terms of trade indicator. We are, nevertheless, aware that the improvement of the indicator of terms of trade may not always reflect the increase in the export prices of the products exported under the NRTP regimes. The outcomes of the estimation of this last specification of model (1) are reported in column [3] of Table 2.

TABLE 2— EFFECTS OF THE UTILIZATION OF NON-RECIPROCAL TRADE PREFERENCES ON ECONOMIC GROWTH (ESTIMATOR: TWO-STEP SYSTEM GMM)

Variables	GROWTH (1)	GROWTH (2)	GROWTH (3)
$GROWTH_{t-1}$	0.219***	0.238***	0.237***
	(0.0130)	(0.0167)	(0.0145)
URGSP	-0.0205**	-0.00948**	-0.0384***
	(0.00917)	(0.00401)	(0.00590)
UROTP	-0.00179	-0.00841*	-0.0479***
	(0.00598)	(0.00468)	(0.00574)
URGSP*ODA	0.00154***		
	(0.000508)		
UROTP*ODA	0.00103***		
	(0.000302)		
URGSP*UROTP		0.000470***	
		(8.10e-05)	
URGSP*TERMS			0.000412***
			(4.29e-05)
UROTP*TERMS			0.000422***
			(3.95e-05)
ODA	-0.0881***	-0.00253	0.0189***
	(0.0267)	(0.00444)	(0.00633)
TERMS	0.0124***	0.0150***	-0.0312***
	(0.000973)	(0.00132)	(0.00318)
ECI	0.648***	0.518***	1.718***
	(0.0838)	(0.109)	(0.0965)
TP	0.0346***	0.0564***	0.0393***
	(0.00739)	(0.0112)	(0.00975)
GCONS	-0.0756***	-0.148***	-0.0807***
	(0.0232)	(0.0293)	(0.0182)
INFL	-0.0110	-0.00851	-0.0309***
	(0.00775)	(0.00692)	(0.00325)
FDI	0.144***	0.158***	0.157***
	(0.0143)	(0.0145)	(0.0122)
Log(POP)	0.546***	1.051***	0.489***
	(0.0898)	(0.0710)	(0.106)
Observations - Countries	404 - 90	404 - 90	404 - 90
AR1 (P-Value)	0.0001	0.0001	0.0001
AR2 (P-Value)	0.1970	0.2425	0.1434
AR3 (P-Value)	0.2020	0.2078	0.2147
OID (P-Value)	0.4268	0.4594	0.6026

Note: 1) *p-value<0.1, **p-value<0.05, ***p-value<0.01, 2) Robust standard errors are in parenthesis, 3) The variables "URGSP", "UROTP", "ECI", "TP", "GCONS", "ODA", "INFL", "FDI", and the interaction variables are treated as endogenous, 4) The variables "POP" and "TERMS" are treated as exogenous. 5) Time dummies are included in the regressions.

IV. Empirical Results

We observe from the three columns of Table 1 that the coefficients of the lagged dependent variable are all significant at the 1% level. This is in line with the voluminous literature on the macroeconomic determinants of economic growth that has found that there exists a state-dependent path of economic growth. In addition, we note, as expected, that the coefficient of the lagged dependent variable obtained in column [3] (i.e., based on the two-step system GMM estimator) is lower than the coefficient of the same variable obtained when using the POLS estimator but higher

than the estimate obtained when using the FE estimator. The same finding applies to estimates of the lagged dependent variable reported in all columns of Table 2 (i.e., these estimates are all significant at the 1% level and can be found between that obtained from the use of the FE estimator and the estimate obtained when using the POLS estimator).

We note from results in columns [1] and [2] of Table 1 that the utilization rate of GSP programs positively influences economic growth at the 5% level for results based on the POLS estimator but only at the 10% level for results based on the FE estimator. Considering the outcome in column [1], we find that a 100-percentage point increase in the utilization rate of GSP programs (i.e., doubling this rate) is associated with a 0.9 percentage point increase in the economic growth rate. At the same time, in both columns [1] and [2], there is no significant effect of the utilization rate of other trade preferences on economic growth at the conventional significance levels.

Regarding the other variables, we find from the results presented in column [1] that the economic growth rate is positively and significantly driven (at least at the 5% level) by lower government consumption, lower inflation rates, and a rise in the population size. Development aid, terms of trade, economic complexity, trade policy liberalization, and FDI inflows exert no significant effects on economic growth at the conventional significance levels. The outcomes reported in column [2] of Table 1 indicate that the inflation variable is negatively and significantly associated with economic growth (at the 1% level), while FDI inflows exert a positive effect on economic growth only at the 10% level. The other variables show no significant coefficients at the conventional significance levels.

As mentioned above, these results could be biased due to the endogeneity concerns highlighted earlier. Therefore, we turn to the estimates based on the two-step system GMM approach, as reported in column [3] of Table 1 and Table 2.

We note from the bottom in column [3] of Table 1 and in all columns of Table 2 that all model specifications are correctly specified as they successfully pass the diagnostic tests described above. In fact, the p-values associated with the AR(1) test are lower than 0.1 (i.e., the 10% level) and the p-values related to the AR(2) and AR(3) tests are greater than 0.1. Moreover, the p-values of the OID test, as expected, exceed 0.1. Taken together, all of these outcomes allow us to conclude that the two-step system GMM approach is appropriate for undertaking the empirical analysis.

The estimates presented in column [3] of Table 1 suggest that both the utilization rate of GSP programs and the utilization rate of other trade preferences programs exert a positive and significant (at the 1% level) effect on economic growth in beneficiary countries. An increase of one percentage point in the utilization rate of GSP programs is associated with a 0.011 percentage point increase in the economic growth rate in the beneficiary countries of these trade preferences. Likewise, a one percentage point increase in the utilization rate of other trade preferences is associated with a 0.016 percentage point increase in the economic growth rate in the beneficiary countries of these trade preferences. Interestingly, the use of other trade preferences has a slightly stronger positive effect on economic growth than the use of GSP programs. Moreover, the magnitude of the effect of the utilization rate of GSP programs on economic growth (which amounts to 0.011) is slightly higher than that (0.009) obtained in column [2] of Table 1 (results based on the POLS estimator).

At the same time, we find, with surprise, that development aid inflows appear to exert a negative and significant effect (at the 1% level) on economic growth. This outcome certainly hides the fact that the effect of development aid on economic growth is dependent on the utilization of NRTPs. Put differently, this result suggests the existence of a joint (complementarity or substitutability) effect of the utilization of NRTPs (including both GSP programs and other trade preferences) on economic growth. We will consider later in the analysis whether there complementarity or substitutability exists between development aid inflows and NRTPs with regard to any influence on the economic growth of the beneficiaries.

The control variables in column [3] of Table 1 display, in general, the expected coefficients. Terms of trade improvements, greater economic complexity, greater trade policy liberalization, higher FDI inflows, and the rise in the population size influence positively and significantly (at the 1% level) economic growth in beneficiary countries. Government consumption influences negatively and significantly (at the 1% level) economic growth, while the inflation rate has no significant effect on economic growth at the conventional significance levels. The findings concerning the control variables in columns [1] to [3] of Table 2 are broadly in line with those in column [3] of Table 1, except for the inflation rate whose coefficient is still yet negative but becomes significant at the 1% level in column [3] of Table 2.

The outcomes displayed in column [1] of Table 2 indicate that the interaction terms related to the variables "URGSP*ODA" and "UROTP*ODA" are positive and statistically significant at the 1% level, while at the same time the coefficients of "URGSP" and "UROTP" variables are respectively negative and significant at the 5% level and negative but not statistically significant at the conventional significance levels. These outcomes suggest firstly that other trade preferences programs and development aid inflows are strongly complementary in fostering economic growth in beneficiary countries, and the greater the development aid flows, the greater is the magnitude of the positive effect of the utilization rate of other trade preferences programs on economic growth performance in beneficiary countries. Secondly, the use of GSP programs and development aid is also strongly complementary in fostering economic growth, notably when the development aid flows exceed a certain amount.[19] For low amounts of development aid, the utilization of GSP programs has a negative effect on economic growth, and for high amounts of development aid, it exerts a positive and significant effect on economic growth; the magnitude of this positive effect rises as development aid inflows increase. Interpreting this differently, the results in column [1] of Table 2 suggest that higher development aid flows induce positive and significant economic growth performance in beneficiary countries whose utilization rate of GSP programs exceeds 85.53% (= 0.0881/0.00103); for these countries, the greater the utilization rate of GSP programs (i.e., for rates higher than 85.53%) is, the higher the magnitude of the positive effect of development aid flows on economic growth becomes. Similarly, aid flows exert a positive and significant effect on economic growth in

[19]It is difficult to compute the amount of total development aid inflows above which the effect of the utilization of GSP programs would influence positively and significantly economic growth due to the method used to transform the aid variable in the analysis here.

beneficiary countries whose utilization rates of other trade preferences exceed 57.21% (= 0.0881/0.00154), and the magnitude of the positive effect of development aid flows on economic growth rises as the utilization rate of other trade preferences improves (as long as the rate is at least 57.2%).

As these findings represent the 'average' of the full sample, a better picture of these impacts can be obtained through a graphical analysis of the marginal impacts of development aid on economic growth for varying rates of the utilization of GSP programs, and of the utilization of other trade preferences. Figures 1 and 2 present, at the 95 percent confidence intervals, respectively, the marginal impact of development aid on economic growth for varying rates of the utilization of GSP programs and the marginal impact of development aid on economic growth for varying rates of the utilization of other trade preferences. The marginal impacts that are statistically significant at the 95 percent confidence intervals are those encompassing only the upper and lower bounds of the confidence interval that are either above or below the zero line. Both figures show that the marginal impacts increase with greater utilization rates of NRTPs. However, Figure 1 indicates that development aid promotes economic growth in countries whose utilization rate of GSP programs exceeds 68.7%. With regard to lower rates, the economic impact of development aid is at best statistically nil. It is, in fact, negative and significant when the utilization rate of GSP programs is lower than 53% and statistically nil when the rate is between 53% and 68.7%. Figure 2 conveys the message that the economic growth impact of development aid is at best statistically nil, including when utilization rates of other preference programs are higher than 73.8%. This impact is negative and significant at utilization rates of other preference programs lower than 73.8%. These pictures are slightly different when we consider, at the 95 percent confidence intervals in both cases the marginal impact of the utilization of GSP programs on economic growth for various amounts of development aid (see Figure 3) and the marginal impact of the utilization of other trade preferences programs on economic growth for various amounts of development aid (see Figure 4). Both figures show that these marginal impacts increase as countries receive greater amounts of development aid, but they are positive and significant only for high

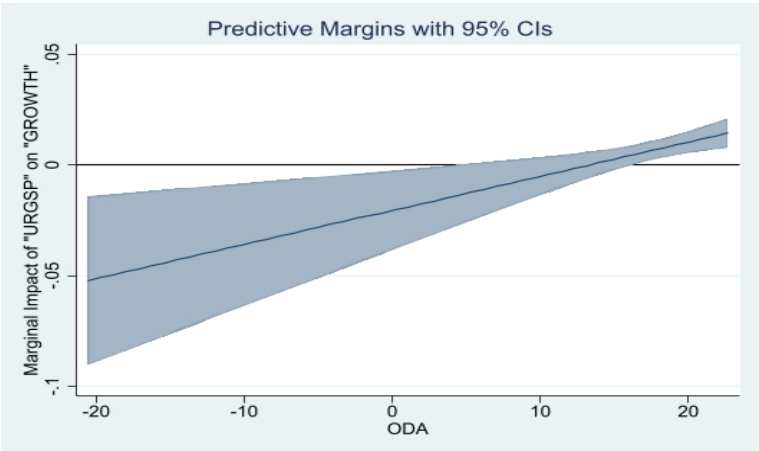

FIGURE 1. MARGINAL IMPACTS OF "URGSP" ON "GROWTH" FOR VARYING AMOUNTS OF "ODA"

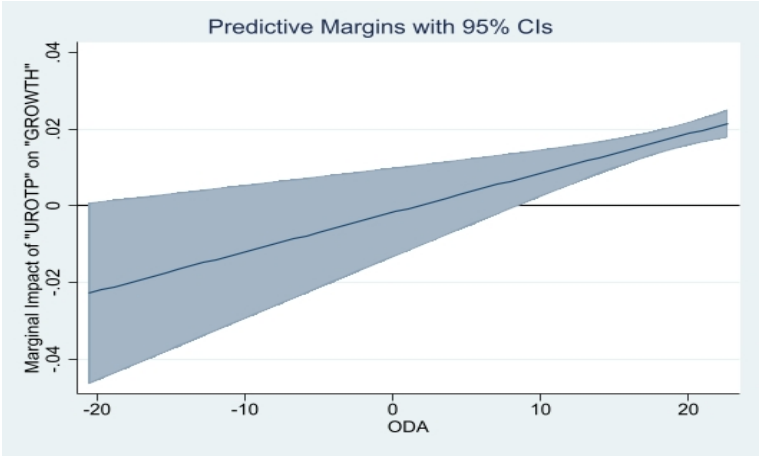

FIGURE 2. MARGINAL IMPACTS OF "UROTP" ON "GROWTH" FOR VARYING AMOUNTS OF "ODA"

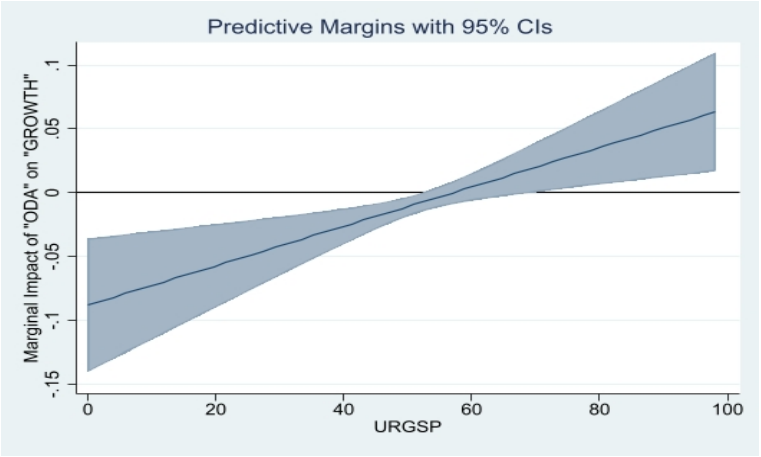

FIGURE 3. MARGINAL IMPACTS OF "ODA" ON "GROWTH" FOR VARYING RATES OF "URGSP"

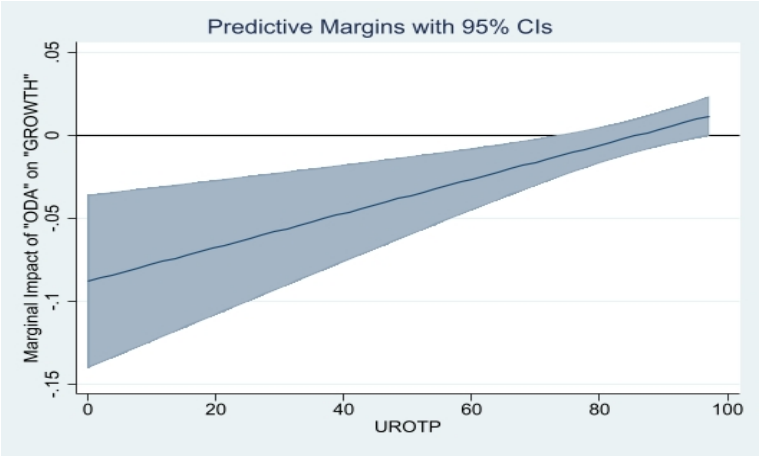

FIGURE 4. MARGINAL IMPACTS OF "ODA" ON "GROWTH" FOR VARYING RATES OF "UROTP"

amounts of development aid. In particular, the utilization rate of GSP programs exerts a positive and significant effect on economic growth for amounts of development aid higher than US$ 16.22 million (otherwise, this effect is either statistically nil or negative, including cases of low amounts of development aid). Likewise, the utilization rate of other trade preference programs positively and significantly influences economic growth only for amounts of development aid higher than US$ 6788.2 (otherwise, this effect is not significant).

In sum, the key message conveyed by these findings is that GSP programs are strongly complementary with development aid flows in fostering economic growth performance in beneficiary countries. Specifically, the effects of GSP programs and other trade preferences on economic growth depend on the amounts of development aid that accrue to countries. These effects increase as the amounts of development aid rise and are particularly positive for relatively high amounts of development aid; the greater the aid amount is, the higher the magnitude of the positive effect of the utilization of GSP programs and other trade preferences programs on economic growth becomes. Interestingly, the minimum amount of development aid (US$ 16.22 million) necessary to ensure that GSP programs would exert a positive effect on economic growth is far higher than the minimum development aid amount (US$ 6788.2) necessary to ensure that other trade preference programs positively and significantly economic growth influence.

We now consider the outcomes in column [2] of Table 2. These outcomes aim to help examine whether GSP programs and other trade preferences offered by QUAD countries are complementary or substitutable with regard to promoting economic growth in beneficiary countries. We find that the interaction term of the variable ["URGSP*UROTP"] is positive and significant at the 1% level, while the coefficients of the variables "URGSP" and "UROTP" are respectively negative and significant at the 5% level and positive and significant at the 10% level. These outcomes suggest strong complementarity between GSP programs and other trade preferences in enhancing economic growth in beneficiary countries. However, at the 5% level, this strong complementarity occurs for any rate of utilization of other trade preferences, becoming higher as the rate increases. Similarly, at the 5% level, GSP programs and other trade preferences are complementary in fostering economic growth in beneficiary countries when the utilization rate of GSP programs is higher than 20.17% (= 0.00948/0.00047), holding the utilization rate of other trade preferences constant. Otherwise (that is, for utilization rates of GSP programs lower than 20.17%), GSP programs and other trade preferences are substitutable with regard to their ability to enhance economic growth in beneficiary countries.

As these outcomes represent "averages" effects across countries in the full sample, we find it useful to examine how the impact of the utilization of GSP programs on economic growth evolves for varying utilization rates of other trade preferences, and inversely, how the utilization of other trade preferences affects economic growth for varying rates of the utilization of GSP programs. Figure 5 presents, at the 95 percent confidence level, the developments of the marginal impact of the utilization of GSP programs on economic growth for varying levels of the utilization of other trade preferences. Figure 5 shows that the marginal impact of the utilization of GSP programs on economic growth takes positive and negative values and increases as the rate of the utilization of other trade preferences improves. However, it is not

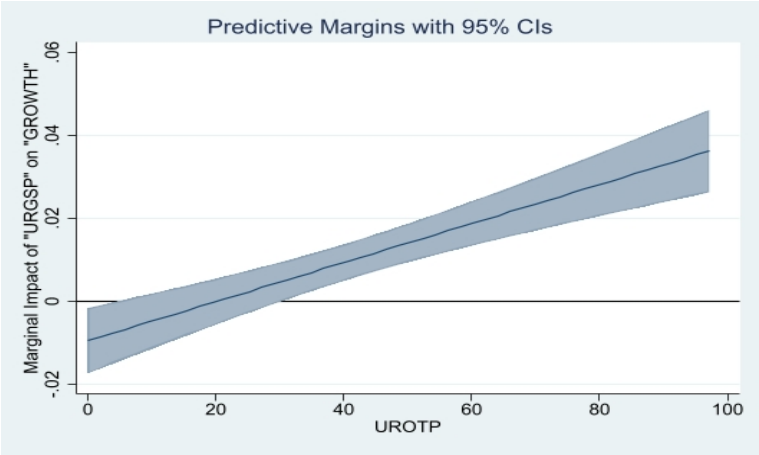

FIGURE 5. MARGINAL IMPACTS OF "URGSP" ON "GROWTH" FOR VARYING LEVELS OF "UROTP"

always statistically significant. It is not statistically significant when the utilization rates of other trade preferences are between 5.83% and 29.14%. This means that countries whose levels of utilization of other trade preferences are between 5.83% and 29.14% experience no significant effect of the utilization of GSP programs on economic growth. For countries with very low levels of utilization of other trade preferences (i.e., those with utilization rates of other trade preferences lower than 5.83%), GSP programs are associated with negative economic growth, and the lower the utilization rates of other trade preferences are, the higher is the magnitude of the negative effect of GSP programs on economic growth. However, countries whose utilization rates of other trade preferences exceed 29.14% experience a positive effect of GSP programs on economic growth, and the magnitude of the positive effect rises as the utilization rate of other trade preferences increases. Overall, the key message conveyed by Figure 5 is that GSP programs and other trade preferences jointly promote economic growth in beneficiary countries when both rise and exceed a certain level.

Figure 6 presents, at the 95 percent confidence level, the developments of the marginal impact of the utilization of other trade preferences on economic growth for varying levels of utilization of GSP programs. This figure confirms the strong complementarity between GSP programs and other trade preferences in enhancing economic growth. In fact, Figure 2 indicates that this marginal impact increases as the degree of utilization of GSP programs rises, but it is only statistically significant when the utilization rate of GSP programs exceeds 29.4%. Otherwise, the utilization of other trade preferences has no significant effect on economic growth. Thus, the utilization of other trade preferences exerts a positive and significant effect on economic growth only when countries also utilize GSP programs at a rate higher than 29.4%. Such countries enjoy a higher magnitude of the positive effect of the utilization of other trade preferences on their economic growth rate as the utilization rate of GSP programs rises.

The outcomes in column [4] of Table 2 aim to examine how the utilization of NRTPs affects the economic growth rate as the terms of trade improve. Estimates in this column suggest negative and significant (at the 1% level) coefficients of the

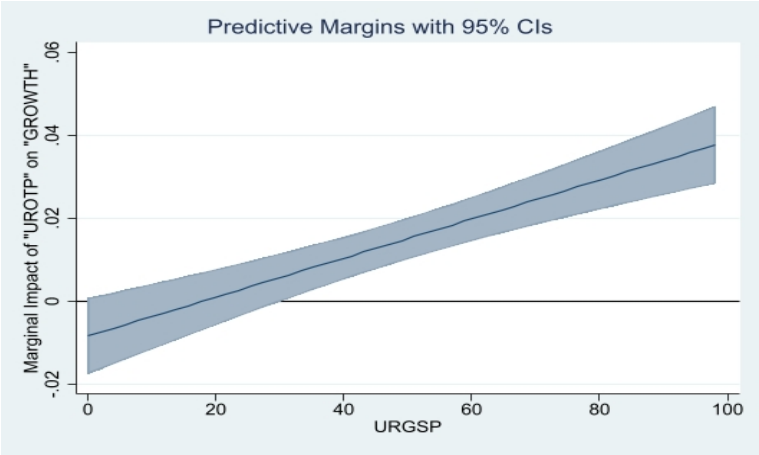

FIGURE 6. MARGINAL IMPACTS OF "UROTP" ON "GROWTH" FOR VARYING LEVELS OF "URGSP"

variables "URGSP" and "UROTP." At the same time, we find that the interaction terms associated with the interaction variables ["URGSP*TERMS"] and ["UROTP*TERMS"] are positive and significant (at the 1% level). Taken together, these outcomes suggest, on the one hand, that at the 1% level, the utilization of GSP programs affects positively and significantly the economic growth rate in beneficiary countries as terms of trade improve, in particular when the terms of trade level is higher than 93.2 (= 0.0384/0.000412). On the other hand, at the 1% level, the utilization of other trade preferences affects positively and significantly the economic growth rate in beneficiary countries as terms of trade improve, notably when the terms of trade level is higher than 116.3 (= 0.0479/0.000412). It is important to note that the values of the variable capturing the terms of trade range are 50.64 and 453.72. To illustrate these impacts further, we display in Figures 7 and 8, at the 95 percent confidence intervals, respectively, the marginal impact of the utilization of GSP programs on economic growth for varying levels of terms of trade improvements, and the marginal impact of the utilization of other trade preference

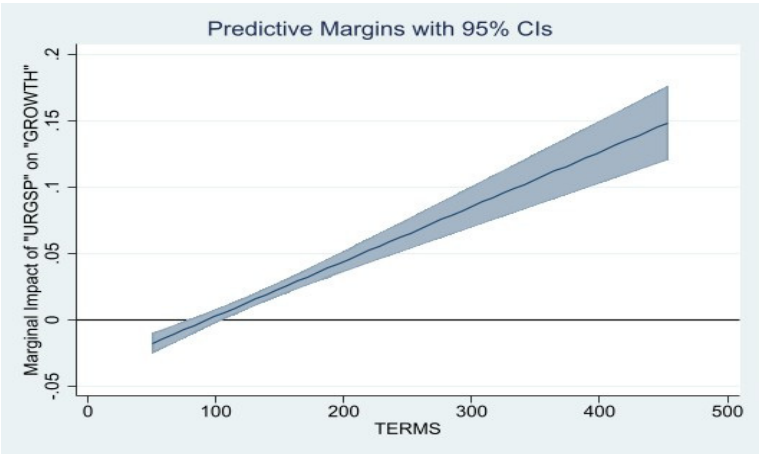

FIGURE 7. MARGINAL IMPACTS OF "URGSP" ON "GROWTH" FOR VARYING LEVELS OF "TERMS"

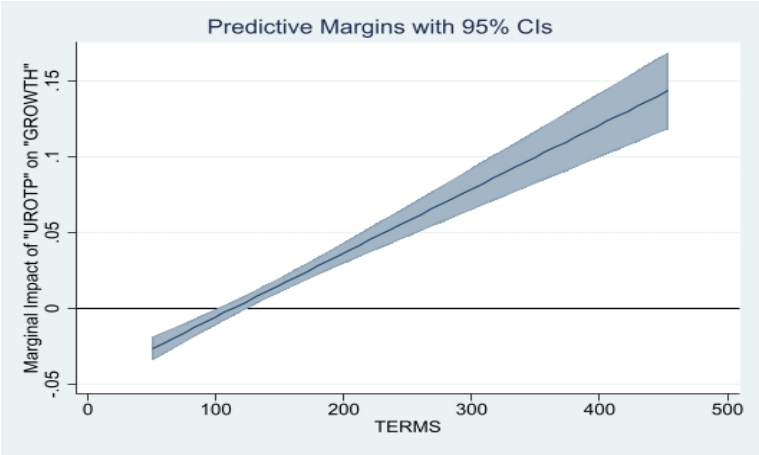

FIGURE 8. MARGINAL IMPACTS OF "UROTP" ON "GROWTH" FOR VARYING LEVELS OF "TERMS"

programs on economic growth for varying levels of terms of trade improvements. Both figures show that the marginal impact of either GSP programs or other trade preferences on economic growth increase as the terms of trade improve, in particular becoming positive for values of terms of trade slightly higher than 100. With greater improvements of the terms of trade, the positive effect of the utilization of both types of NRTPs on economic growth improves.

V. Further Analysis

Thus far, we have found that both GSP programs and other trade preferences promote economic growth in beneficiary countries, in line with the initial objectives of these programs. At the same time, one may question whether the positive effects of these programs do not depend on the share of exports under each of these programs relative to total merchandise exports. The rationale for this question is that economic growth in beneficiary countries may be enhanced further if these countries take advantage of these preferences to the utmost by exporting essentially under trade preferences programs rather than exporting at MFN tariff rates to the preference-granting countries. To address this question, we estimate a specification of model (1) in which we include a multiplicative variable between each indicator of the utilization of NRTPs (each of the indicators "URGSP" and "UROTP") and the variable (denoted as "SHEXPPGC") that represents for a given country and in a given year the share total exports to all preference-granting countries (i.e., QUAD countries) out of total merchandise exports. The outcomes of the estimation of this model specification by means of the two-step system GMM estimator are presented in Table 3. We note at the outset that while the coefficients of the variables "URGSP" and "UROTP" are negative and significant at the 1% level, the interaction terms of the multiplicative variables "(URGSP*SHEXPPGC)" and "(UROTP*SHEXPPGC)" are all positive and significant at the 1% level. Therefore, we deduce that on average over the full sample, the utilization of GSP programs and the utilization of other trade preference programs positively influence economic

TABLE 3— EFFECTS OF THE UTILIZATION OF NON-RECIPROCAL TRADE PREFERENCES ON ECONOMIC GROWTH FOR VARYING SHARES OF MERCHANDISE EXPORTS UNDER NRTPS TO PREFERENCE-GRANTING COUNTRIES' MARKETS (ESTIMATOR: TWO-STEP SYSTEM GMM)

Variables	GROWTH (1)
$GROWTH_{t-1}$	0.257***
	(0.0127)
URGSP	-0.0136***
	(0.00450)
UROTP	-0.0329***
	(0.00345)
URGSP*SHEXPPGC	0.000557***
	(8.52e-05)
UROTP*SHEXPPGC	0.00105***
	(9.20e-05)
SHEXPPGC	-0.0717***
	(0.00651)
ODA	-0.00480
	(0.00684)
TERMS	0.0158***
	(0.00217)
ECI	0.626***
	(0.168)
TP	0.0654***
	(0.0125)
GCONS	-0.0907***
	(0.0232)
INFL	-0.0525***
	(0.00828)
FDI	0.115***
	(0.0173)
Log(POP)	0.710***
	(0.0709)
Observations - Countries	395 - 88
AR1 (P-Value)	0.0001
AR2 (P-Value)	0.2622
AR3 (P-Value)	0.3305
OID (P-Value)	0.6466

Note: 1) *p-value<0.1, **p-value<0.05, ***p-value<0.01, 2) Robust standard errors are in parenthesis, 3) The variables "URGSP", "UROTP", "ECI", "TP", "GCONS", "ODA", "INFL", "FDI", and the interaction variables are treated as endogenous, 4) The variables "POP" and "TERMS" are treated as exogenous, 5) Time dummies are included in the regressions.

growth when the share of total exports to QUAD countries out of all merchandise exports exceeds 24.4% (= 0.0136/0.000557) and 31.3% (= 0.0329/0.00105), respectively. Otherwise, the effect is negative. It is also important to note here that in the full sample, the values of countries' shares of total exports to all preference-granting countries out of all merchandise exports are between 0.007% and 99.32%. Figures 9 and 10 correspondingly display, at the 95 percent confidence level, the marginal impact of the utilization of GSP programs on economic growth for varying shares of total exports to all preference-granting countries relative to total merchandise exports, and the marginal impact of the utilization of other trade preference programs on economic growth for varying shares of total exports to all preference-granting countries out of all merchandise exports. It appears from these two figures that the marginal impacts increase as the share of total exports to all

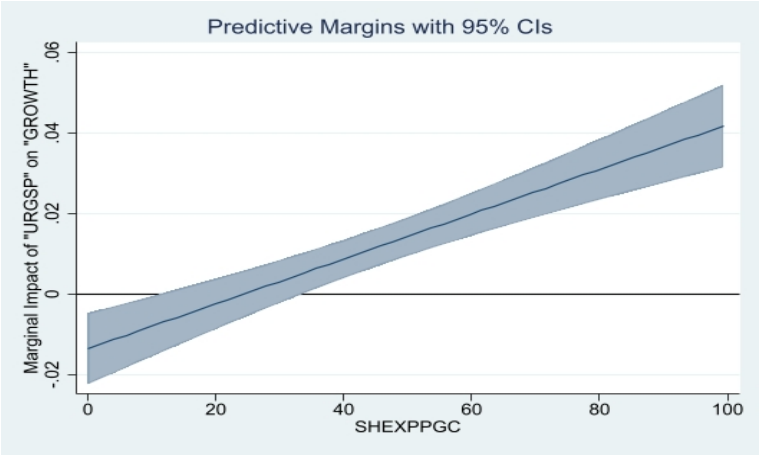

FIGURE 9. MARGINAL IMPACTS OF "URGSP" ON "GROWTH" FOR VARYING VALUES OF "SHEXPPGC"

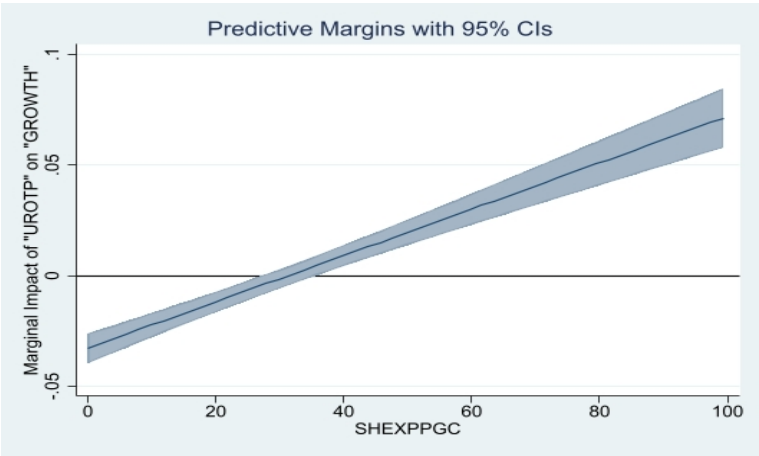

FIGURE 10. MARGINAL IMPACTS OF "UROTP" ON "GROWTH" FOR VARYING VALUES OF "SHEXPPGC"

preference-granting countries relative to total merchandise exports improves. The marginal impact of GSP programs on economic growth is positive when the share of total exports to QUAD countries out of all merchandise exports exceeds 33.8%; otherwise, this impact is at best statistically nil or in worse cases negative, in particular for values of this share lower than 11.9%. On the other side, the marginal impact of GSP programs on economic growth is positive when the share of total exports to QUAD countries out of all merchandise exports exceeds 33.8%; otherwise, this impact is at best statistically nil or negative in worse cases, in particular for values of this share lower than 27.8%.

In a nutshell, the main message that can be derived from Figures 9 and 10 is that both GSP programs and other trade preference programs foster economic growth in countries that export significantly under NRTPs to preference-granting countries, especially when the share of their exports to QUAD countries relative to total merchandise exports exceeds 33.8%.

VI. Conclusion

Among the major policy tools available to wealthier countries to assist developing countries in their efforts to promote development are development aid and non-reciprocal trade preferences. The offer of NRTPs by industrialized nations builds upon Resolution 21(ii) adopted by member states at the second UNCTAD conference held in 1968. This resolution stated, *inter alia*, that the provision of NRTPs, including GSPs in favor of developing countries and the less developed countries among them, should have three goals: to "increase the export earnings of developing countries, promote their industrialization, and accelerate their rates of economic growth."

Many studies have assessed whether NRTPs have in fact effectively increased the export earnings of beneficiary countries, as envisaged in Resolution 21(ii), reaching mixed conclusions. Few other works have explored whether the second goal stated in Resolution 21(ii), i.e., the promotion of industrialization of the beneficiary countries, has been achieved. These works have also obtained mixed empirical evidence. However, less attention has been paid to the issue of whether NRTPs have been effective in promoting economic growth in beneficiary countries.

The present paper aims to fill this void in the empirical literature by using a recent dataset compiled by UNCTAD on the utilization of NRTPs offered by QUAD countries and investigating the effects of the utilization of NRTPs provided by QUAD countries on the economic growth performance outcomes of beneficiary countries. The paper also examines how development aid and the utilization of NRTPs interact as they purportedly influence the economic growth performances of beneficiary countries. This empirical exercise has established several findings. First, both the utilization rate of GSP programs and the utilization rate of other trade preferences promote economic growth in beneficiary countries. Second, GSP programs and other trade preferences jointly foster economic growth in beneficiary countries, notably in cases of high rates of the utilization of GSP programs. Third, GSP programs and development aid flows are complementary in fostering economic growth performance in beneficiary countries, especially in cases of high amounts of development aid. Results have also suggested that when countries experience strong improvements in terms of trade, both GSP programs and other trade preferences influence economic growth positively. Finally, when the positive economic growth effect of the utilization of NRTPs is higher, a country's share of exports (under preferential tariffs) to QUAD countries out of their total merchandise exports is also higher.

From a policy perspective, this analysis suggests that wealthier countries should support the development strategies of developing countries by combining the supply of high amounts of development aid with the offer of generous NRTPs (that would, *inter alia*, cover the export products of interest to beneficiary countries accompanied by lenient preferential rules of origin).

APPENDIX

TABLE A1—DEFINITION AND SOURCE OF VARIABLES

Variables	Definition	Source
GROWTH	Growth rate of the real GDP per capita (constant 2010 US$), annual percentage	World Development Indicators (WDI)
URGSP	This is the indicator of the utilization rate of unilateral trade preferences under the Generalized System of Preferences (GSP) schemes provided by what are termed "Quadrilaterals" (i.e., QUAD countries), specifically Canada, European Union (EU) countries, Japan and the United States of America (USA). It captures the extent to which imports which are eligible for trade preferences are actually imported under these preferences (e.g., WTO, 2016). This indicator has been computed using the following formula adopted both by the WTO (see WTO, 2016) and UNCTAD, URGSP = 100*(GSP Received Imports)/(GSP Covered Imports), where "GSP received imports" refers to the value of imports (by preference-granting countries) that received GSP treatment, and "GSP covered imports" indicates the value of imports (by preference-granting countries), i.e., exports by beneficiary countries that are classified in tariff lines that are dutiable and covered by the GSP scheme of the preference-granting country. Detailed information about the dataset is available on the Internet at https://gsp.unctad.org/about. Values of the indicator "URGSP" are between 0 and 100, with higher values indicating a greater utilization rate of GSP programs.	United Nations Conference on Trade and Development (UNCTAD) Dataset: https://gsp.unctad.org/utilization.
UROTP	This is the indicator of the utilization rate of the other trade preferences than the GSP programs provided by QUAD countries to developing countries, including the least-developed countries among them. This indicator has been calculated using a formula similar to that used to compute the indicator "URGSP." The formula is written as follows, UROTP = 100*(Other-Preferential Imports)/(Other Preferential Covered Imports), where "Other-Preferential Imports" refers to the value of imports (by preference-granting countries) that benefitted from NRTPs other than GSP and under selected Economic Partnership Agreements into which the EU has entered with several African countries. In addition, "Other-Preferential Covered Imports" refers to the value of imports (by preference-granting countries) that are classified in tariff lines that are dutiable and covered by the other-preferential schemes. Detailed information about the dataset is available on the Internet at https://gsp.unctad.org/about. Values of the indicator "UROTP" range from 0 to 100, with higher values indicating a greater utilization rate of other trade preferences programs.	United Nations Conference on Trade and Development (UNCTAD) Dataset: https://gsp.unctad.org/utilization.
SHEXPPGC	This variable represents the share (in percentage) of a country's total exports to all preference-granting countries (i.e., QUAD countries) in a given year relative to this country's total merchandise exports.	Author's calculations based on data on countries' total exports to QUAD countries (in current US dollars) extracted from the UNCTAD dataset: https://gsp.unctad.org/utilization.
ECI	This is the economic complexity index. It reflects the diversity and sophistication of a country's export structure. It has been estimated using data connecting countries to the products they export and applying the methodology in Hausmann *et al*. (2014).	MIT's Observatory of Economic Complexity (https://oec.world/en/rankings/eci/hs6/hs96)
GCONS	This is the measure of the general government final consumption expenditure. It is the ratio (in percentage) of the general government final consumption expenditure to GDP.	Data on general government final consumption expenditures (% GDP) extracted from the WDI

TABLE A1—DEFINITION AND SOURCE OF VARIABLES (CONT'D)

Variables	Definition	Source
ODA	This is the 'transformed' real net disbursements of total Official Development Assistance, expressed in constant prices in 2018 US dollars. Here, "ODA1" represents the real net disbursements of total Official Development Assistance, expressed in constant prices in 2018 US dollars. As this variable displays high skewness, it has been transformed using the following formula (see Yeyati *et al*., 2007; Dabla-Norris *et al*., 2015): $\text{ODA} = sign(ODA1) * \log(1 + \lvert ODA1 \rvert)$, where $\lvert ODA1 \rvert$ refers to the absolute value of the variable "ODA1."	Author's computations based on data extracted from the database of the Organization for Economic Cooperation (OECD)
INFL	The variable "INFL" has been calculated using the following formula (e.g., Yeyati *et al*., 2007): $\text{INFL} = sign(INFLATION) * \log(1 + \lvert INFLATION \rvert)$ (2), where $\lvert INFLATION \rvert$ refers to the absolute value of the annual inflation rate (%), denoted by "INFLATION." The annual inflation rate (%) is based on the Consumer Price Index -CPI- (annual%) where missing values has been replaced with values of the GDP deflator (annual%).	Author's calculations based on data from the WDI
TERMS	This is the indicator of the terms of trade, as measured by the net barter terms of trade index (2000 = 100).	WDI
FDI	The variable represents the net inflows of foreign direct investment (in percentage of GDP).	WDI
TP	This is the indicator of trade policy, as measured by the trade freedom score. The latter is a component of the Economic Freedom Index. It is a composite measure of the absence of tariff and non-tariff barriers that affect the imports and exports of goods and services. The trade freedom score is graded on a scale of 0 to 100, with a rise in its value indicating lower trade barriers, i.e., higher trade liberalization, while a decrease in its value reflects rising trade protectionism.	Heritage Foundation (see Miller *et al*., 2021)
POP	This is the measure of the total population.	WDI

TABLE A2—DESCRIPTIVE STATISTICS FOR THE VARIABLES USED IN THE ANALYSIS

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
GROWTH	404	2.825	3.273	-9.571	27.902
URGSP	404	51.670	32.532	0.000	98.145
UROTP	404	34.279	36.595	0.000	97.130
SHEXPPGC	395	37.779	23.837	0.0072	99.318
ECI	404	-0.422	0.704	-2.352	1.190
TP	404	71.662	10.230	27.400	89.200
GCONS	404	13.386	3.941	3.964	26.254
ODA1	404	743,000,000	873,000,000	-852,000,000	6,880,000,000
INFL	404	7.362	9.568	-3.107	146.285
FDI	404	4.504	4.862	-11.196	42.331
TERMS	404	133.411	47.522	50.636	453.720
POP	404	65,400,000	204,000,000	1031486	1,390,000,000

TABLE A3—LIST OF COUNTRIES CONTAINED IN THE FULL SAMPLE

Albania	Georgia	Nicaragua
Algeria	Ghana	Niger
Angola	Guatemala	Nigeria
Argentina	Guinea	North Macedonia
Armenia	Haiti	Oman
Azerbaijan	Honduras	Pakistan
Bangladesh	India	Panama
Belarus	Indonesia	Paraguay
Benin	Iran, Islamic Rep.	Peru
Bolivia	Jamaica	Philippines
Bosnia and Herzegovina	Jordan	Saudi Arabia
Brazil	Kazakhstan	Senegal
Burkina Faso	Kenya	Sierra Leone
Cambodia	Kyrgyz Republic	Sri Lanka
Cameroon	Lao PDR	Sudan
Chad	Lebanon	Syrian Arab Republic
Chile	Liberia	Tanzania
China	Libya	Thailand
Colombia	Madagascar	Togo
Congo, Rep.	Malawi	Tunisia
Costa Rica	Malaysia	Turkey
Cote d'Ivoire	Mali	Turkmenistan
Croatia	Mauritania	Uganda
Dominican Republic	Mauritius	Ukraine
Ecuador	Mexico	Uruguay
Egypt, Arab Rep.	Moldova	Uzbekistan
El Salvador	Mongolia	Venezuela, RB
Equatorial Guinea	Morocco	Vietnam
Ethiopia	Mozambique	Zambia
Gabon	Myanmar	Zimbabwe

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Regulatory Sentiment and Economic Performance†

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Regulatory sentiment refers to the market's subjective evaluation of regulatory reform and is one of the most widely adopted indicators to those charged with implementing and diagnosing regulatory policies. The use of regulatory sentiment in advanced analysis has become universal, albeit it is often limited due to difficulties in articulating consistent and objective quantitative indicators that can meticulously reflect market sentiment overall. Thus, despite ample effort by scholars to read the economic impact of regulatory sentiment in the real economy, causal links are difficult to spot. To fill this gap in the literature, this study analyzes a regulatory sentiment index and economic performance indicators through a text analysis approach and by inspecting diverse tones in media articles. Using different stages of tests, the paper identifies a causal relationship between regulatory sentiment and actual economic activities as measured by private consumption, facility investment, construction investment, gross domestic investment, and employment. Additionally, as a result of analyzing one-unit impulse of regulatory perception, the initial impact on economic growth and private investment was found to be negligible; this was followed by a positive (+) response, after which it converged to zero. Construction investment showed a positive (+) response initially, which then rapidly changed to a negative (-) response and then converged to zero. Gross domestic investment as the initial effect was negligible after showing a positive (+) reaction. Unfortunately, the facility investment outcome was found to be insignificant in the impulse response test. Nevertheless, it can be concluded that it is necessary and important to increase the sensitivity to regulations to promote the economic effectiveness of regulatory reforms. Thus, instead of dealing with policies with the vague goal of merely improving regulatory sentiment, using regulatory sentiment as an indicator of major policies could be an effective approach.

Key Word: Regulatory Reform Policy, Social Sentiment, Topic Analysis
JEL Code: C32, E71, K23

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I. Introduction

Kaynes (1936) explains that unpredictable economic bubbles, specifically the Great Depression, occurred as a result of animal spirits. Akerlof and Shiller (2009) also highlight the importance of animal spirits to accurately comprehend the cause of the 2008 financial crisis. Scholars argue that classic economic theory fails to explain why people could not presage the economic crisis until the complete collapse of a bank. Instead, animal spirits, which refer to the irrational behavior of economic agents affected by the mood of the market, help justify such a phenomenon. When people resort to animal spirits, their intuitive, emotional, and irrational moods for undue optimism about the economy induce bubbles and contribute to a financial crisis. Hence, policy advisers must take precautions against animal spirits and reflect irrational behaviors during the process of writing regulations.

To quantify the mood of the economy, several indices are adopted universally. The most widely used indicator is the Consumer Sentiment Index (CSI), or the Consumer Confidence Index (CCI), representing sentiment as it pertains to the general economic situation. CSI measures households' economic perceptions based on their expectations as stated in financial situation survey responses and is known as a leading explanatory factor of economic growth. Additionally, the Korea Business Survey Index (BSI) seeks to determine companies' perceptions of the present condition of their businesses, product stock, and investment agendas in terms of facilities and equipment. BSI monitors output growth and anticipates turning points in economic activity. Accordingly, recent macroeconomic studies have formed a consensus that sentiment indices are pertinent predictors of economic fluctuations (The Bank of Korea, 2019).

Public sentiment is also used in many political studies that analyze public opinion to evaluate policy performance outcomes (Mutz and Soss, 1997; Frost, 2010; Berinsky, 1999). Numerous policy successes are determined through public support. The Korean government has implemented various regulatory reform policies over the past 30 years to improve the economic environment and to improve performance outcomes. Regulatory reform policies are continuously implemented regardless of the period, and most policy goals ultimately seek to achieve economic growth. Therefore, measuring public sentiment involves speculation over regulatory reforms. In response, the Federation of Korean Industries (FKI) regularly announces the annual Regulatory Reform Perception Index (RRPI), which consists of surveys of enterprises with scores standardized at 100, where a score exceeding 100 indicates satisfaction while one below 100 indicates dissatisfaction. This index peaked at 116.5 in 2010, though it has continued to show a declining trend. The most recently announced value was 93.8 in 2020 (116 in 2010 and 93.8 in 2020). This downward trend indicates that there is growing negative sentiment toward regulatory policies, and studies point out that the negative sentiment over regulations and the modest performance of regulatory reforms are correlated (Kim, 2014; Lee-M, 2017; Lee and Park, 2017; Lee, 2006; Choi, 2008).

Regulatory sentiment serves as both a driver and an outcome indicator of regulatory reforms, and several major arguments are based upon this claim. This

claim, however, must be carefully reviewed. The limitations of assessing regulatory sentiment stem from the heavy reliance on qualitative measures. Regulatory reform affects a wide range of social activities, and gathering reliable sentiment indicators that achieve representativeness and replicability is often viewed as troublesome. The issue of representativeness is related to the question of whether the derived index contains bias in its representation of social sentiment. In most cases, surveys that collect information on social sentiment are conducted through sampling, and it is difficult to guarantee that what is gained in this way represents people from all walks of life, engaging in relevant economic activities. There is also the issue of non-replicable questions, referring to whether the survey can yield the same results if repeated in the same manner.

In this study, we focus on whether social regulatory sentiment is an actually decisive factor in economic performance. Given that the Korean government is continuously implementing various regulatory reform policies, we consider regulatory reform policies collectively as an endogenous variable of regulatory sentiment, which means that all regulatory reform policy information is assumed to contain regulatory sentiment during the analysis period. Therefore, as we do not analyze separating regulatory reform policies from regulatory sentiment, regulatory sentiment can be used to evaluate regulatory reform policies.

By quantifying regulatory sentiment and identifying the positive and negative tones from articles related to regulatory reforms, the study utilizes several notable indices to analyze the impact on macroeconomic variables. If a regulatory reform policy acts as intended to improve economic environment, economic growth, investments and employment increases will occur through regulatory reforms. The study concludes by finding that macroeconomic indicators and regulatory sentiment are closely linked, suggesting that regulatory sentiment should be acknowledged more actively when implementing regulatory policies.

The rest of this paper is structured as follows: Chapter II summarizes the existing research on regulatory sentiment. Chapter III introduces the regulatory psychology index and other relevant variables, followed by the model used for this study's analysis; Chapter IV presents the results of the analysis, and Chapter V summarizes the nature of regulatory sentiment and discusses measures for improvement.

II. Literature Review

Over time, an extensive collection of literature has developed, focusing on the economic outcomes of regulatory reform policies. However, only a handful of studies verify the exact factors that had significant impacts on regulatory reform policies, and whether pessimistic regulatory policy sentiment reduces policy outcomes is questionable. To assess the effects of regulatory sentiments, scholars have relied on survey results that measure the sentiment over a specific regulatory policy (Regulatory Reform Committee, 2020; FKI, 2020; Korea Federation of Small and Medium Businesses, 2014; Choi, Koo, and Kim 2007; Kim, 2014; Kang, 2004: Park and Son, 2015; Lee-J, 2017). Choi, Koo and Kim (2007) assessed the sentiment associated with participatory governmental regulatory reform policies through a survey of business groups, academia, experts, and public officials. Interestingly, their

work found different responses from each survey group. Compared to public officials who implement regulatory reform policies, the index related to the regulatory compliance sentiment of business groups, academia, and experts appeared to be relatively more pessimistic. Their study confirms that regulatory sentiment differs among groups, emphasizing the need to promote policy reforms that satisfy all non-public official groups.

Park and Son (2015) attempted to analyze major issues related to improving the regulatory positive sentiment when adjusting regulatory reform policies. Using a structural equation model based on the results of a survey of entrepreneurs, they find that regulatory authorities greatly affect the entrepreneurial sentiment. Lee (2017) analyzed regulatory types that directly affect business activities in regional areas using the Regional Business Environment Map of the Korea Chamber of Commerce and Industry (KCCI), survey data on the regulatory sentiment of regional entrepreneurs. Their results show that regulations related to industrial sites are the major factors driving the strong negative sentiment of entrepreneurs. This result feeds into the existing literature that holds that the initiation of new regulations has a significant impact on entrepreneurial sentiment. However, results are also somewhat limited in their use of questionnaire-derived data, the continuity problem of time series in the study, and the frequent alteration of the questionnaire.

Regulatory uncertainty is reflected in regulatory sentiment, and work by Finkelstein and Hambrick (1996) describes regulatory uncertainty as the basis for cognitive judgments by decision makers. The major works on regulatory uncertainty can be narrowed down to two channels in the literature. On one hand, entrepreneurs perceive regulatory uncertainty as a factor of future risks. Higher perceived risk leads to postponements of investment decisions to avoid any possible crisis. On the other hand, decision makers take on risky but rewarding investments as a survival tactic during times of uncertainty (Park, 2020; Fabrizio, 2012; Henisz and Delios, 2001; Hoffmann *et al*., 2009; Aragón-Correa and Sharma, 2003; Marcus, Aragon-Correa, and Pinkse, 2011).

Park (2020) analyzed the impact of regulatory uncertainty during the startup of new businesses, focusing on venture startups that make aggressive investments to overcome their limited capital. The study results deliver surveys of two groups which were divided according to the presence of regulatory experience to identify regulatory uncertainty. Park (2020) further analyzed the survey results based on different levels of difficulty with regulatory compliance. Accordingly, for venture startups, the intention to enter a new industry was high when there was no regulatory experience. The findings suggest that the higher the uncertainty about regulation, the higher the intention to start a business. However, among companies that have prior experience with regulations, the group that experienced severe regulatory compliance difficulties expressed a negative attitude toward new investments. This highlights the tendency of firms to rely heavily on their previous experiences, confirming that the factors promoting corporate investment are not the content of the regulatory policies but the hardships companies face considering their past experiences with regulatory compliance.

Hoffmann *et al.* (2009) analyzed the impact of regulatory uncertainty in the European Union Emissions Trading System (EU ETS). After analyzing German companies, their study found that the influence of regulatory uncertainty on

corporate decision-making was insignificant. In contrast, Lee (2004) examined the effect of regulatory uncertainty on what was termed the Total Contribution Limit System between business groups. The Total Contribution Limit System prevents the spilling of one affiliate's crisis to other business groups. Due to a lack of social consensus, the system was amended several times before finally being abolished in 2009. The author focused on regulatory uncertainty and analyzed how business investment strategies change depending on the perception of regulatory uncertainty. They found that affiliates accumulate cash without investing in the event of regulatory uncertainty, even when they increase their cash flow. This result indicates the possibility that regulatory sentiment has an impact on the entrepreneurial economic behavior and the economic activity of a society.

III. Data and Analysis

A. *Regulatory sentiment*

Regulatory sentiment is often employed to assess governmental regulatory reform policies (Kang, 2004; Choi, Koo, and Kim, 2007; Lee-J, 2017). As the working principles of each regulation policy are vastly complex, it is challenging to evaluate regulatory reform policies. Here, regulatory sentiment is utilized to evaluate regulatory reform policies according to various social groups with distinctive compliance experiences. Earlier studies derive regulatory sentiment through diverse methods. The majority rely on surveys to construct regulatory sentiment variables. The present study extracts information from media articles and constructs an index representing the social mood from regulation reforms. We are confident that the sentiment index used in this study is more comprehensive and representative than those adopted in existing studies.

The oldest and most well-known indicator of regulatory sentiment in Korea is the Regulatory Reform Satisfaction index, presented by the Regulatory Reform Commission. The index has been published annually since 2005, and it is derived from a survey of satisfaction with regulatory reform policies as recorded each year. The survey groups consist of the public, experts, and public officials. As this survey is conducted by the Regulatory Reform Committee, which promotes and manages regulatory reform policies, the questionnaires are often changed according to regulatory policy issues that are deemed timely. Therefore, the use of a time series analysis accompanies the crucial problem of the consistency of the questionnaires.

The next most widely used indicator of regulation sentiment is the Regulatory Reform Perception index, prepared by the Federation of Korean Industries (FKI). Although this indicator uses the same method of surveying satisfaction used to compile the Regulatory Reform Satisfaction index, it limits the subjects of the survey to companies and focuses on the impact on corporate management. Therefore, while this indicator can be viewed as a representation of corporate regulatory reform consciousness, it cannot be broadly interpreted as representing society's sentiment toward regulatory reform policies. This data also undergoes frequent changes of the questionnaires, with an expansion of the sample as well from large enterprises to small and medium-sized enterprises (SMEs).

A survey on corporate perceptions published by the Korea Chamber of Commerce and Industry is also a universally used index. This indicator was published annually for four years from 2014 to 2017, and what sets it apart from other indicators is that it provides regulatory awareness at a regional level. However, Lee-J (2017) pointed out that the subjects of this survey were limited to well-established companies with sufficient regulatory experience. Lee-J (2017) argues that the perceptions of local residents are not taken into account, reducing the indicator's representativeness of the region.

In broader terms, the Burden of Government Regulation issued by the World Economic Forum (WEF) is an indicator of regulatory sentiment that compares international regulatory levels. This indicator is derived from a survey of companies that responded to questionnaires regarding their administrative burden as they conducted business in their respective country.[1] Respondents can select a score on a scale of one (very burdensome) to seven (not burdensome at all) regarding on how burdensome the regulations are to their businesses, allowing for an international comparison. However, because this index is a relative indicator that measures the intensity of regulations, it is not suitable for identifying changes over time. Consequently, as a majority of the regulatory sentiment surveys published to date rely on questionnaires, the problem of using time series analysis data arises due to the changes and instability of the questionnaire sample and items. Additionally, the fact that most questionnaires are scored on a Likert-type scale makes interpreting the results more complex due to the frequently mentioned problem of the error of central tendency (Douven, 2018).

This study utilizes the research results in Kim *et al.* (2020) on regulatory sentiment. Kim *et al.* (2020) analyzed and derived the tone of media articles using a text analysis, as the media represent the most representative and appropriate medium in which to express public opinion and grasp social sentiment. In deriving regulatory sentiment, Kim *et al.* (2020) collected regulation-related internet articles from January of 1998 to June of 2020 by means of web crawling to build a database and then conducted a sentiment analysis to determine social trends. For the sentiment analysis, the SO-PMI (Semantic Orientation from Pointwise Mutual Information) tool by Turney (2002) was used. SO-PMI is a technique that relies on the fact that a basic word can be a seed of positive/negative words and that words used along with

TABLE 1—SEED SELECTION USING THE KOSAC SENTIMENT LEXICON

Positive	Negative
Support, Positivity, Reformation, Active, Beneficiary, Contribution, Expectation, Supervision, Cooperation, Introduction, Arrangement, Necessity, Reinforcement, Adequacy, Autonomy, Vitality, Creation, Relief, Effect, Recovery, Approval, Right-, Support, Protection, Supervision, Maintenance, Alley, Insufficient	Dysfunction, Distortion, Weakening, Criticism, Ankle, Stumbling Block, Protest, Backlash, Refusal, Excessive, Controversy, Injustice, Over-, Exacerbation, Inappropriate, Seriousness, Disability, Blow, Threat, Concern, Infringement, Condemn, Reverse Discrimination, Slowing, Burden, Excess, Withdrawal, Spark

Source: Kim *et al*. (2020). Figure 4-3, p.49.

[1]The index of the Burden of Government Regulation is established based on the answer of this question: "In your country, how burdensome is it for a business to comply with governmental administrative requirements, e.g., permits, regulations, reporting?"

TABLE 2—TOP 20 $SO-PMI(w)$ VALUES

Positive	Negative
Fuel Cell, Smart City, Forestry, Mobis, Deputy Director, Special Zone, Battery, Fintech, Tuning, Sandbox, Commercialization, Traffic Safety, Commercial Vehicle, Health, Light Weight, Reits, Hydrogen, Active, Summit, Specialization	Boycott, Protesters, Condemnation, Murdock, Minerva, Reading Law, Top News, Insult, Censorship, Uprising, Liquid, Asosan, Jojungdong, Disgust, Exile, Demonstration, Protest, Arrest, Agitation, Rally

Source: Kim *et al*. (2020). Figure 4-4, p.52.

that basic word have characteristics similar to the seed. In selecting seeds, the KOSAC sentiment lexicon was used, where 28 words were selected and used after removing some words with low credibility.

The SO-PMI of a specific word was calculated by deriving the co-occurrence frequency ($P(w_1, w_2)$) and the co-occurrence probability ($PMI(w_1, w_2)$) of each word based on the seed. SO-PMI indicates the difference between the used positive word seed set and the negative word seed set.

$$SO-PMI(w)=\sum_{p\in PW} PMI(w,p)-\sum_{n\in NW} PMI(w,n)$$

Using this, 9,013 words with an appearance frequency of 0.1% or more with the selected seed were selected, and as a result of evaluating the positive/negative characteristics of each word, 4,002 positive ($SO-PMI(w)>0$) and 5,011 negative ($SO-PMI(w)<0$) words were drawn out.

The top 20 positive/negative words are shown in Table 2.

By using the positive and negative $SO-PMI(w,p)$ outcomes of the published article (d), positive $P(d)$ and negative $N(d)$ values of the 9,013 derived words could be identified.

$$P(d)=\frac{\sum_{w\in d}\sum_{p\in PW} SO-PMI(w,p)}{N(w\in d)}$$

$$N(d)=\frac{\sum_{w\in d}\sum_{n\in NW} SO-PMI(w,n)}{N(w\in d)}$$

Using the derived $P(d)$ and $N(d)$ outcomes, the regulatory trend $POL(t_1,t_2)$ of the analysis period (t_1,t_2) was calculated.

$$POL(t_1,t_2)=\frac{\sum_{d\in(t_1,t_2)} P(d)-N(d)}{N(d\in(t_1,t_2))}$$

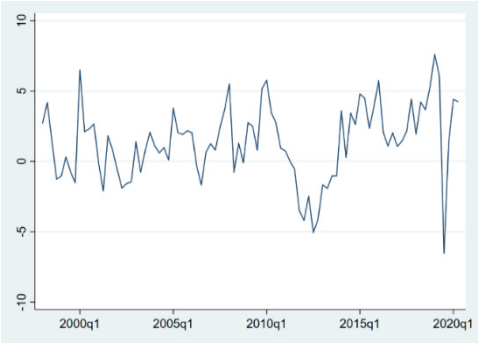

FIGURE 1. MEDIA REGULATORY SENTIMENT INDEX

Note: Just before the first quarter of 2020, a sharp negative feeling of regulation was derived, likely stemming from regulations such as social distancing due to COVID-19.

TABLE 3—BASIC STATISTICS FOR MEDIA RS

Obs words	631,115,211
Mean	6,860,139
Std.Dev	5,368,586
Min	68,339
Max	20,895,179

Figure 1 shows the sensitivity to regulation (rs) outcome as derived in Kim *et al.* (2020). However, it is helpful to suppose that t in Kim *et al*. (2020) is derived by month. In such a case, because all macro-variables used in this analysis are quarterly data, recalculation as a quarterly value is done for consistency of the analysis. The basic statistics for the media regulatory sentiment variables used in the analysis are shown in Table 3. A derived (+) value indicates a socially positive attitude towards a regulatory policy, and a negative (-) values can be interpreted as a negative trend emerging in the market.

Kim *et al.* (2020) analyzed and derived the tone of media articles by means of a text analysis, as the media sources are the most representative and appropriate type by which express public opinion and grasp social sentiment. Thus, the authors identified the positive and negative tone of voices from the words used in articles over time and identified the tones to quantify trends in social regulation sentiment overall. The index value derived by this method offers an excellent advantage in that it is more objective, complementing the aforementioned shortcoming of using survey data. In addition, the continuity of the data makes it the most suitable index for the purpose of this study. Figure 2 shows the discontinuities and restrictions associated

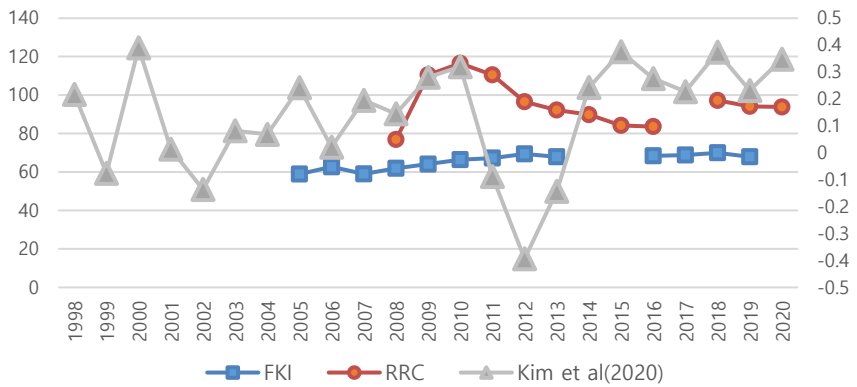

FIGURE 2. COMPARISON OF REGULATORY SENTIMENT INDEXES

Source: FKI (2015; 2016), Regulatory Reform Commission (2005; 2013; 2016; 2019), Kim *et al*.(2020).

with the use of regulatory and other sentiment indices. The time series analysis, which serves as this study's analysis method, can be used with our index to identify the effects of regulation sentiment on economic activities.

Note that FKI's 2014 and 2015 evaluations were performed qualitatively. RRC's 2017 data only evaluated companies, and the score range is 0 to 5. Because regulatory sentiment in Kim *et al*. (2020) is derived by month, it is recalculated to determine a yearly value for comparison with the other indexes.

B. *Analysis Model*

The Vector Auto Regression (VAR) model of Sims (1980) is used widely in empirical analyses. In general, VAR models fully utilize the information contained in time series of economic data without setting an explicit economic hypothesis (Stock and Watson, 2001; Moon, 1997; Lee and Kim, 2014; Park and Lee, 2014; Kim, 2011). Using the VAR model in an empirical analysis allows researchers to grasp the dynamic ripple effect by including the lagged variable from the VAR analysis as an explanatory variable.

In this study, a VAR analysis was conducted to confirm the effects of regulatory sentiment on the macro economy in terms of investment, employment, and economic growth.

$$Y_t = \Gamma u_t + \Phi Y_{t-1} + \Omega X_{t-1} + w_t$$

Here, Y_t is composed of the seven variables of the economic growth rate (gr), regulatory sentiment (rs_q), investment (private investment (cs), facility investment (is), construction investment (i_cs), gross domestic investment (tgt)), and employment (employment rate (en)). Seven vector functions were derived in unison, one for each of the variables, where the regressors in all equations are lagged values of all of the variables. Thus, X_{t-1} indicate all time variables except for Y_t, u_t includes terms that simultaneously fit the constant and trend, and w_t is the error term.

With the VAR model, it is difficult to identify the relationship between two variables, as different parameters are included in all cases. Therefore, based on the VAR results, a transitory volatility triggering relationship between the variables was confirmed through the Granger causality test. Granger causality tests the null hypothesis that all coefficients of variable X are zero. If the Granger causality test rejects the null hypothesis, we can say that the variable X has a Granger causal relationship with Y.

Finally, the dynamic responses of economic variables from a change in regulatory sentiment can be estimated. If the VAR model is stable, expressing it as a vector moving average (VMA) becomes possible (Box and Jenkins, 1976; Hamilton, 1994). Thus, the impulse response function can be estimated to reveal the dynamics caused by the change in regulatory sentiment on economic growth, investment and employment.

In this study, the relationship between economic growth, investment, and employment was analyzed as a macro-variable to validate the argument for an

improvement of the existing regulatory sentiment. The economic growth rate (gr), the most representative indicator, measures the degree of economic growth in Korea, and for this quarterly data published by the Bank of Korea was used.

As indicators related to investment, the indicators of private consumption (cs), facility investment (is), and construction investment (i_cs) of national income expended provided by the Bank of Korea were used to show the sideways trend of each business entity. Private consumption (cs) is an index that identifies changes in household consumption, from national income expended to final consumption expenditure, in a household. Equipment investment (is) and construction investment (i_cs) are subsections of the gross fixed capital formation of national income expended, where facility investment refers to a company's consumption expenditure for transportation equipment and all machinery used as production facilities. In contrast, construction investment refers to expenditures on buildings and civil engineering construction (The Bank of Korea, 2019). In particular, facility investment (is) is an important variable because it acts as a factor in employment and income increases along with increases in the productivity of companies (Park, Byeon, and Jeong, 2011; Young, 1995). It was also included in the analysis of the gross domestic investment ratio (tgt) as an indicator related to investment. The gross domestic investment ratio (tgt) is an indicator of total domestic capital formation divided by gross national disposable income, which refers to the ratio of total investment among the total amount of national disposable income, the most comprehensive concept of income; it is an index that can confirm an increase in assets accumulated for future consumption.

The employment rate (em) data of the Economically Active Population Survey, provided by the National Statistical Office, was used as an employment-related indicator. The unemployment rate may be biased, as those who are preparing for a job and those who are giving up searching for a job are classified as economically inactive and are excluded when counting those who are unemployed. Therefore, the employment rate, rather than the unemployment rate, was used to avoiding this source of bias.

Finally, for regulatory sentiment (rs), findings by Kim *et al*. (2020) were used. A derived (+) value indicates a socially positive attitude towards regulatory policy, and a negative (-) value can be interpreted as a negative mood in society.

The basic statistics for the variables used in the analysis, including regulatory sentiment (rs), are shown in Table 4.

TABLE 4—BASIC STATISTICS

	Number of Obs.	Mean	Standard Deviation	Minimum Value	Maximum Value
Economic Growth Rate (gr)	90	0.9233	1.3789	-6.8	4.4
Regulatory Sentiment (rs)	90	0.1336	0.2667	-0.6528	0.7601
Private Consumption (cs)	90	0.6789	2.0570	-13.8	4
Equipment Investment (is)	90	1.1633	5.6076	-24.9	15.8
Construction Investment G (i_cs)	90	0.2622	2.9211	-9.6	8.6
Gross domestic investment ratio (tgt)	90	-0.0378	1.9342	-11.4	3.8
Employment Rate (em)	90	0.0056	1.4079	-3.5	3.3

IV. Results

Prior to the analysis, a unit root test was conducted to confirm the stationarity of the time series variables used in the analysis. This was done because if the time series variable is nonstationary, the problem of spurious regression may arise. For verification, the augmented Dickey-Fuller test, which corrects the autocorrelation of the error term of Dickey-Fuller (DF), by Fuller (1976) was utilized. As a result, it was confirmed that all variables were stable (see Table 5).

After confirming that the variables are stable, verification was performed to select the optimal lag for the analysis. Lag selection is important because if too many lags are included in the analysis, the standard error of the coefficient estimate may be overestimated and the prediction error may increase. On the other hand, if the time difference to be included in the model is omitted, a biased estimation result value may be derived. An ideal verification method has been the subject of various discussions, with inconsistencies found when selecting the time difference. Thus, it is mostly selected based on the analysis result. As a result of verification using the variables for the analysis, it was derived as shown in Table 6. In FPE, AIC, and HQIC, except for SBIC, the optimal lag was determined to be 4, as in the verification, and a VAR analysis with a lag of 4 was conducted.

Based on the analysis results of VAR, Granger causality verification was utilized and the impulse response functions were derived.

First, as a result of the Granger causality test (Table 7), both investment and employment were found to have a causal effect on the economic growth rate (gr), as in economic theory. Private investment (cs) derived from economic growth (gr) and mutual Granger causality, and facility investment (is) derived from employment (en) and mutual Granger causality. Mutual Granger causality was confirmed for construction investment (i_cs) with gross domestic investment (tgt) and economic growth (gr), and for employment (en) with economic growth (gr).

Cases of single Granger causality were as follows: construction investment (tgt) to private investment (cs), private investment (cs) to construction investment (i_cs), and facility investment (is) to gross domestic investment (tgt). Private investment (cs) and gross domestic investment (tgt) were single Granger causality factors related to employment (en).

TABLE 5—RESULTS OF THE UNIT ROOT TEST

	Number of Obs.	Test Statistic	Interpolated Dickey-Fuller		
			1% Critical Value	5% Critical Value	10% Critical Value
Economic Growth Rate (gr)	89	- 7.760			
Regulatory Sentiment (rs)	89	- 5.381			
Private Consumption (cs)	89	-12.144			
Equipment Investment (is)	89	-8.132	-3.525	-2.899	-2.584
Construction Investment G(i_cs)	89	-9.155			
Gross domestic investment ratio (tgt)	89	-14.547			
Employment Rate (em)	89	-14.741			

TABLE 6—SELECTION OF THE LAG ORDER

lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-994.818		30.9681	23.2981	23.3785	23.4979*
1	-918.027	153.58	16.2879	22.6518	23.295	24.25
2	-881.511	73.031	22.2471	22.9421	24.1481	25.9387
3	-778.064	206.9	6.63328	21.6759	23.4447	26.0709
4	-688.175	179.78*	2.86362*	20.725*	23.0566*	26.5184

Note: * LL (Log-Likelihood function), LR(Likelihood ratio), FPE (Akaike's final prediction error), AIC (Akaike information criterion), HQIC(Hannan and Quinn information criterion), SBIC(Schwarz's Bayesian information criterion)

TABLE 7—VAR-BASED GRANGER CAUSALITY TESTS

		Dependent Variable						
		gr	rs	cs	is	i_cs	tgt	em
Restricted Regressors	gr	-	4.048	8.901*	4.518	5.533	11.010**	23.083***
	rs	17.651***	-	33.987***	9.610**	9.380*	13.959***	8.334*
	cs	69.217***	2.932	-	6.850	10.031**	1.686	16.422***
	is	9.5645**	4.846	1.773	-	2.918	17.198***	8.567*
	i_cs	5.1227	0.920	5.315	3.106	-	8.3498*	4.933
	tgt	17.464***	2.083	15.747***	6.983	16.330***	-	13.457***
	em	18.553***	12.785	14.562***	12.005**	4.385	6.9543	-
	ALL	152.98***	22.949	80.751***	47.939***	54.238***	60.605***	127.36***

Regarding regulatory sentiment (rs), which is the main subject of interest in this study, Granger causality was statistically significant with all macro indicators, specifically investment (cs), facility investment (is), construction investment (i_cs), gross domestic investment (tgt), employment rate (en), and economic growth rate (gr). In other words, it was confirmed that regulatory sentiment affects the decision-making of actual economic agents. This means that changes in regulatory sentiment have an effect on both investment and employment and ultimately affect economic growth. In addition, it is notable that the causality factor of other macro-variables, in this case economic growth, employment, and investment, as well as economic growth, was not significant with regulation (rs). This indicates that regulatory sentiment, which is regulatory trend, is not a relative concept that is affected by the real economy but a social trend that is independent of real economic indicators.

Finally, when a unit impulse was applied to regulatory sentiment (rs) through the impulse response function, a dynamic pattern of macro-variables was identified (Figure 3). As a result of analyzing one unit impulse of regulatory sentiment (rs), the initial impact on economic growth (gr) and private investment (cs) was found to be negligible; this was followed by a positive (+) response, with the impact then converging to zero. In other words, these two indicators are positively affected by a regulatory sentiment (rs) shock. On the other hand, construction investment (i_cs) showed a positive (+) response at the beginning which rapidly changes to a negative (-) response and then converges to zero. This shows that the impulse of regulatory

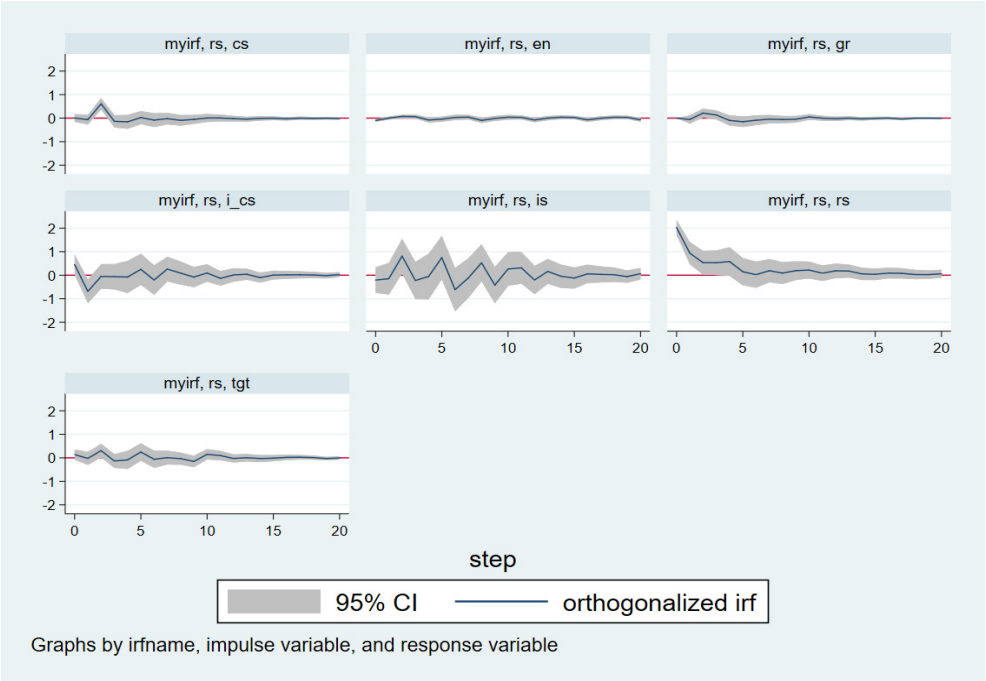

FIGURE 3. IMPULSE RESPONSE FUNCTION

sentiment may be temporarily positive but smoothens out over time. Even in the case of gross domestic investment (tgt), the initial effect was negligible. After showing a positive (+) reaction, it converged to zero after a few sideways movements. Among economic agents, for facility investment (is), which represents corporate behavior, the impact of such a shock showed a positive (+) and negative (-) sideways pattern for a considerable period of time compared to the other variables. However, facility investment (is) remained at zero in all confidence intervals, meaning that caution is required when interpreting this outcome. Comprehensively considering the results of the previous Granger causality test, regulatory sentiment shows a Granger causal relationship in facility investment, but the unit stochastic impact is not significant enough to track in future periods.

V. Conclusion

Based on work by Kim *et al.* (2020), who determined regulatory sentiment by analyzing the tone of media articles as positive and negative, the relationship with economic indicators is analyzed in this study to determine the impact of regulatory sentiment on actual economic activities. In this study, an empirical analysis was conducted to identify the factors that have a significant impact. The study found a Granger causal relationship between regulatory sentiment and certain actual economic activities, specifically private consumption, facility investment, construction investment, gross domestic investment, and employment. In other words, if regulatory sentiment is improved, a positive effect on economic activity

can be guaranteed. Additionally, it can be concluded that among diverse economic entities, corporations, in particular, are most sensitive to the impact of regulatory sentiment and are affected for the longest period.

As previously acknowledged, the research results provide evidence that efforts to increase regulatory sentiment are necessary to derive the effects of regulatory reform policies. It is necessary to increase the participation of the private sector in planning and implementing policies while actively discovering their demand. Thus, instead of dealing with policies with the vague goal of merely improving regulatory sentiment, using regulatory sentiment as derived from Kim *et al.* (2020) as an indicator of major policies could be an effective approach.

A causal relationship between this indicator and major economic indicators has been revealed in this study and the credibility of the indicator has been guaranteed. Accordingly, the indicator can serve as a means of official regulatory policy management. In addition, as mentioned in the work of Kim *et al*. (2020), in contrast to determining regulatory sentiment through a survey, the use of the text analysis approach has the advantage of being able to draw more objective and quicker values, meaning that it is more convenient and efficient.

APPENDIX

TABLE A1—VAR. ANALYSIS RESULTS

	Dependent Variable						
	gr	rs	cs	is	i_cs	tgt	em
gr L1.	-0.0776	0.0381	0.0733	0.0800	-0.7982*	-0.1678	0.2236***
L2.	0.0484	-0.0808*	-0.0480	1.1894**	-0.0156	0.5557**	-0.0405
L3.	0.1181	-0.0039	0.2623	-0.8001	-0.0876	-0.0671	0.2196***
L4.	0.0594	-0.0248	0.5215*	0.8308	0.7266	0.5754**	-0.0333
rs L1.	-0.3586	0.4838***	-0.4302	-1.7930	-2.7410*	-0.1319	-0.0260
L2.	1.1894***	0.0713	2.7235***	5.3419***	0.8304	1.9087***	0.1186
L3.	-1.0613***	0.1583	-2.5400***	-4.9999**	-0.4436	-0.2157	-0.5581***
L4.	-0.1741	-0.0815	0.3440	2.3460	2.5142**	0.3079	0.3455*
cs L1.	0.6032***	-0.0354	0.3485***	1.1342***	0.6427**	-0.0616	0.1522***
L2.	0.1402	0.0253	0.3284*	-0.1272	-0.1805	-0.0810	-0.0646
L3.	-0.0301	-0.0165	0.0466	-0.0720	0.5981*	-0.1380	-0.0630
L4.	-0.0687	-0.0281	-0.3416***	-0.0958	-0.2459	-0.0940	-0.0006
is L1.	-0.0084	0.0036	0.0315	0.0567	0.0245	0.0927**	0.0020
L2.	0.0504**	0.054*	0.0241	0.3208***	0.0643	0.0785**	0.0015
L3.	0.0344	-0.0032	-0.0089	0.3278***	-0.1033	0.1042***	-0.0254**
L4.	-0.0274	-0.0001	-0.0224	-0.4106***	0.0036	-0.0632	-0.0185*
i_cs L1.	-0.0034	0.0005	-0.0328	0.1111	0.0825	0.1215***	-0.0198
L2.	0.0458	-0.0073	0.0682	0.2256	0.0465	0.0363	0.0237
L3.	0.0433	0.0021	0.0621	0.0922	0.0509	0.0893*	-0.0090
L4.	0.0071	0.0052	0.0235	-0.0959	0.2239***	-0.0043	-0.0030
tgt L1.	-0.2052***	-0.0078	-0.2868***	-0.2029	-0.7165***	-0.6518***	-0.0175
L2.	-0.1623**	0.0059	-0.3343***	-0.9754**	-0.3129	-0.6377***	0.0534
L3.	-0.0638	-0.0225	-0.0835	-0.3492	-0.1289	-0.5913***	0.0571*
L4.	0.0372	0.0028	-0.0345	-0.0844	-0.5802***	-0.3694***	0.0873***
em L1.	-0.6085***	0.0012	-0.6354***	-1.5612*	-0.4630	-0.6310**	-0.2786***
L2.	-0.5733***	0.0280	-0.4125*	-0.2829	-0.1934	-0.4662*	-0.2558***
L3.	-0.5406***	0.0433	-0.5989***	-0.6668	-0.4220	-0.3573	-0.2914***
L4.	-0.5377***	-0.0423	-0.4279**	-1.4209	-0.1036	-0.4325*	0.6448***
cons	0.3509*	0.1019	-0.3659	-1.2336	0.1010	-1.4866***	-0.2705
R-sq	0.7206	0.4216	0.5646	0.5167	0.3988	0.4818	0.9526

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