

How Large is the Impact of Exports on Economic Growth? Korea from the 1960s through the 2010s

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Abstract

This paper investigates the impact of exports on Korean economic growth since its economic take-off period in the 1960s, employing the import-adjusted GDP decomposition method and the related export multiplier. Our results indicate that the direct contribution of net exports to GDP growth was 27.2% over the period 1960-2019, equivalent to 2.1 percentage points per annum over the last six decades. This figure is truly a remarkable one, taking into consideration that the average growth rates of developed and developing countries were 3.1% and 3.4% over the same period, respectively. We also find that, while the direct contribution of net exports to GDP growth remained undiminished at the later stages of economic development, the indirect impact of exports via their stimulation of domestic demand was the major source of exports' contribution to growth at the take-off period in the 1960-70s.

Keywords: Export Growth, Economic Growth, GDP Decomposition, Input-Output Analysis

JEL Classification: F14, F43, O41

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1 Introduction

Over the last several decades, the positive association between exports and economic growth has been regarded as a stylized fact in the economic growth literature. Exports can contribute to an economy through various channels: first of all, many countries, especially at the early stage of economic development, are facing the shortage of physical and human resources needed for attaining sustainable growth. Exports help to accumulate factors of production by injecting foreign reserves into the economy. Foreign receipts earned by exporting activities substantially contribute to filling the financial gap to meet surging demand for domestic investment.

Exporters can also exploit economies of scale through their access to large world markets. In addition, export promotion changes the relative prices among domestic economic activities and divert production factors into more productive market activities. Most importantly, exports can have the effect of boosting productivity by facilitating learning-by-exporting in the process of export activities, thereby raising the economic growth rate over the medium to long term.

An extensive body of existing research provides empirical evidence supporting the positive relationship between exports - more generally international trade - and economic growth. Most of these studies are based on regression analysis, especially under the framework of the neoclassical growth theory. At the same time, however, there also exist irrefutable criticisms upon such a pro-trade proposition, notably from Rodriguez and Rodrik (2001) and Rodrik, Subramanian and Trebbi (2002). These criticisms are rooted on the observation that the existing empirical studies on the trade-growth nexus are more or less subject to various modelling and data problems, including the appropriateness of trade openness measures, possible reverse causality between trade and growth, omitted variable bias, and data quality issues for developing countries. Hence, no one can conclude yet that the current literature succeeds in providing an explicit answer on the question of whether trade openness or exports really matters for achieving sustainable economic growth.

Furthermore, the existing literature has focused largely on the statistical significance of the trade-growth nexus, and it has paid less attention to the actual size of trade's impact on economic growth. If international trade is a decisive factor for long-term economic growth, its impact on economic growth should be shown to be sufficiently large in the empirical studies. As a matter of fact, studies on the gains from trade based on traditional static models generally suggest that the welfare gains from trade opening would be no larger than one percent of GDP. If this is the case, as Lewer and Van den Berg (2003) convincingly suggest, how can economists justify their strong support for free trade as a priority policy in order to attain sustained growth and to reduce huge income gaps between developed and developing countries?

On the other hand, Korea's experience on rapid structural transformation since the early 1960s has drawn great attention from international communities. It is widely recognized that export-oriented industrialization is one of the most salient features for the Korean economic development. The importance of exports to the Korean economy still remains undiminished even today, as globalization has been unprecedentedly accelerated, although the Korean economy has already entered into its mature stage of development.

While exports are almost unanimously regarded as the main driver for Korea's rapid growth, there is relatively a paucity of empirical research that provides the exact quantitative contributions of exports to GDP growth over the course of its structural transformation. How large has been the impact of exports on economic development at each stage of Korea's economic development? And how have exports contributed to economic growth in Korea?

In this respect, this paper empirically examines the impact of exports on Korea's economic development since its economic take-off in the 1960s. We adopt an alternative method of quantifying the contribution of exports to economic growth: the demand-side GDP decomposition approach. In addition, since conventional accounts of GDP provide limited insight with regard to the net contribution of exports, we employ the "import-adjusted" GDP decomposition method to estimate the actual contribution of domestic and external components to GDP growth. On top of that, we also explore the export multiplier, examining the indirect impact of exports via their stimulation of domestic demand, which is not readily shown by the

GDP decomposition analysis. Therefore, this paper sheds light on the distinctive mechanisms through which exports contribute to growth over different stages of economic development.

The structure of this paper is as follows: in Section II, we discuss the existing related literature. The basic empirical strategies, data description and estimation results are presented in Section III. Some policy implications and concluding remarks are provided in Section IV.

2 Literature Survey

As aforementioned, the positive relationship between trade and economic growth is one of the most fundamental propositions in the economics field, and economists have provided an extensive set of empirical studies supporting such pro-trade propositions. Lewer and Van der Berg (2003) argue that the existing literature has focused largely on the statistical significance of the trade-growth nexus, but less attention has been drawn to the actual size of trade's impact on economic growth. Lewer and Van der Berg (2003) re-examine the vast empirical literature from the perspective of the quantitative economic effects of international trade on economic growth. Their survey analysis indicates that the existing studies provide surprisingly consistent results: A one percent point increase in export growth is associated with a 0.2 percent point increase in economic growth. Most of these studies are based on regression analysis, especially under the framework of the neoclassical growth theory. The regression-based pro-trade empirical results are still challenged, largely due to the inherent econometric problems regarding data quality, reverse causality, omitted variable bias, and the measures of trade openness.

One possible alternative to quantify the impact of trade, more specifically exports, on economic growth is the GDP decomposition approach. Exports are a key component in the expenditure-side GDP equation, and thus its contribution to GDP could be readily estimated by using the equation. The conventional approach is to decompose GDP by its expenditure categories, - private consumption, investments, government expenditure, and net exports -, and to identify their relative contributions to the overall GDP growth.

While this conventional method is useful to highlight the net contribution of external demand through international trade, it provides limited insight into the exact contribution of exports to GDP growth. As Kranendonk and Verbruggen (2008) argue, the conventional method attributes all the intermediate and final imports to net exports and consequently results in the possible overestimation of domestic demand's contribution to growth. For example, suppose that an investment boom for an economy is driven solely by massive imports of capital goods. In this case, applying the conventional method is at risk of understating the impact of exports on economic outcome, since it is based on gross domestic demand, but not net domestic demand for domestically-produced goods.

In this context, Kranendonk and Verbruggen (2005, 2008) suggest that "the import-adjusted method" is a more sensible approach to quantify the sources of economic growth. In the import-adjusted approach, final and intermediate import demands are apportioned to each GDP expenditure category on the basis of import intensities derived from input-output tables. With such adjustment, each expenditure category represents net final demand solely for domestically-produced goods and services, which enables us to identify the exact relative contributions of domestic and external components to GDP growth.

Applying this method to six European countries and the United States, Kranendonk and Verbruggen (2008) show quite a different story, compared to that from the conventional method. For instance, for the Netherlands, the import-adjusted method suggests that the contribution of exports to GDP growth is stable and very significant for the periods of 2004-2007, while the conventional approach reveals a minimal contribution of exports to GDP growth.

The import-adjusted method has been employed in a number of studies to the Chinese case. Akyüz (2011) finds that the relative contribution of net exports to the Chinese economic growth between 2004 and 2008 is over 30 percent of GDP growth. Wu et al. (2015) show that exports are indeed a major driver of economic growth in the Eastern provinces, while little impact of exports are apparent for other regions in China. And Albala-Bertrand (2016) suggest that export demand and heavy industry appear to be the main engines of the Chinese economy over the period of 1995-2010.

Amar et al. (2016) apply this method to three Latin American countries – Brazil, Chile and Mexico – over the period 2004-2011. The traditional method consistently indicates a negative contribution of net exports in these countries, while the import-adjusted approach yields a positive contribution to growth, especially in Mexico (30 percent of GDP growth) and in Chile (20 percent). Grech and Rapa (2019) also suggest that the import-adjusted method yields more intuitive results than the traditional approach. By employing the import-adjusted approach, Martin (2015) shows that the domestic value-added of the manufacturing sector in the Philippines did not increase with the rise of exports over the second half of the 20th century. Finally, Tregenna (2012) reports a relatively small role of export expansion in South African economic growth since 2000s.

3 Empirics

3.1 Empirical Strategy

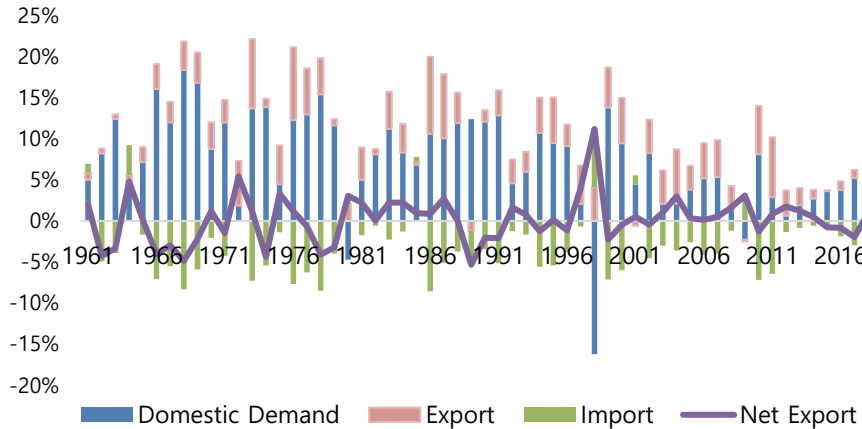
First of all, let's take a look at the following conventional GDP identity:

$$GDP_t \equiv C_t + I_t + G_t + EX_t - IM_t \quad (1)$$

In this conventional approach, GDP consists of private consumption, investments, government expenditure, and net exports, of which the first three factors represent domestic demand. The contribution of a demand component is then calculated as the growth in that component in real terms multiplied by the previous year's share of that component out of GDP in nominal terms.

Figure 1 depicts year-to-year growth rates of domestic demand and net exports for the period of 1960-2019. Over the whole period, domestic demand growth explains most of the overall GDP growth while the contribution of net exports has been rather limited. In fact, net exports recorded negative for most years.

Figure 1. Sources of GDP Growth by expenditure item 1960-2019



Source: Bank of Korea Database

As Kranendonk and Verbruggen (2008) argue, this conventional method of GDP decomposition attributes all the intermediate and final imports to net exports and results in the possible overestimation of domestic demand’s contribution to growth. To see this, let’s decompose further imports into the following:

$$IM_t \equiv IM_{C_t} + IM_{I_t} + IM_{G_t} + +IM_{EX_t} \tag{2}$$

where IM_{i_t} is final and intermediate import demand for each expenditure category $i = C, I, G, EX$. Now suppose that an investment boom for an economy is driven solely by massive imports of capital goods. In this case, the overall GDP remains the same because the increase of domestic investment ΔI_t is exactly canceled out by the increase of ΔIM_{I_t} . This implies that the conventional method is often at risk of overstating the impact of domestic demand, since it is based on gross domestic demand, but not net domestic demand for domestically-produced goods. A considerable amount of imports, especially in developing countries, is consumed by households or used for fixed capital formation, and the traditional approach fails to take into account that domestic demand and exports contain different extents of import intensities.

On the other hand, if Equation (2) is plugged into Equation (1), then we have

$$GDP_t = (C_t - IM_{C_t}) + (I_t - IM_{I_t}) + (G_t - IM_{G_t}) + (EX_t - IM_{EX_t}) \quad (3)$$

In Equation (3), we see that imports are apportioned to each of GDP expenditure components. Consequently, each term in this equation now represents *net domestic demand* for domestically-produced goods and services for an expenditure category $i = C, I, G, EX$.

With regard to economic development from a long-run perspective, the import-adjusted GDP account represented by Equation (3) can be apparently more sensible to quantify the exact relative contributions of domestic and external components to GDP growth than the conventional GDP account represented in Equation (1). Final and intermediate import demand for each expenditure category in Equation (3) is derived from input-output tables.¹ Intermediate import demand for each item can be obtained by first calculating each component's import inducement coefficients using Leontief inverse matrices and multiplying them by the amount of each item's final domestic demand. All the data come from the Bank of Korea database. Given the unavailability of IO tables based on constant prices consistent for the whole period, our estimation is based on nominal import intensity rather than real marginal import intensity.²

Let a_c , a_i , a_g , a_{ex} denote the import intensities of consumption, investment, government expenditure and exports respectively. Using the equation (2), gross imports, IM_t , can be expressed as follows:

$$IM_t \equiv a_c C_t + a_i I_t + a_g G_t + a_{ex} EX_t \quad (4)$$

where the terms to the right of Equation (4) represents imports directly and indirectly generated by each demand component.

For measuring the contribution of GDP components to economic growth, we can express the GDP identity equation into growth rate terms

¹ For more detailed information on the import-adjusted method, please refer to Kranendonk and Verbruggen (2005, 2008).

² Many technological innovations tend to be embodied in new investment goods over the past several decades, and price indices more or less reflect these quality changes. Consequently, our analytic results based on nominal values may suffer from a downward bias, especially for the import intensity of private investment.

using the observed data. The GDP growth rate can be decomposed using each element of aggregate expenditure and the observed growth rate. Therefore, we can express equation (1) as follows in ex-post growth terms;

$$R_y \equiv R_c \left(\frac{C}{Y}\right)_{-1} + R_i \left(\frac{I}{Y}\right)_{-1} + R_g \left(\frac{G}{Y}\right)_{-1} + R_x \left(\frac{EX}{Y}\right)_{-1} - R_m \left(\frac{IM}{Y}\right)_{-1} \quad (5)$$

In Equation (5), R_y , R_c , R_i , R_g , R_{ex} , R_m are real growth rates of GDP, private consumption, private investment, government expenditure, exports and imports, respectively. On the other hand, using Equation (4) is applied to Equation (5), the following equations can be obtained:

$$R_y \equiv (R_c - R_m a_c) \left(\frac{C}{Y}\right)_{-1} + (R_i - R_m a_i) \left(\frac{I}{Y}\right)_{-1} + (R_g - R_m a_g) \left(\frac{G}{Y}\right)_{-1} + (R_x - R_m a_x) \left(\frac{EX}{Y}\right)_{-1} \quad (6)$$

If the growth rate of each element of the final demand is the same as that of imports induced from domestic demand, investment, government and exports in each period, the following equation can be obtained. We can suppose $R_c = R_m$, $R_i = R_m$, $R_g = R_m$, $R_{ex} = R_m$.

$$R_y \equiv R_c(1 - a_c) \left(\frac{C}{Y}\right)_{-1} + R_i(1 - a_i) \left(\frac{I}{Y}\right)_{-1} + R_g(1 - a_g) \left(\frac{G}{Y}\right)_{-1} + R_x(1 - a_x) \left(\frac{EX}{Y}\right)_{-1} \quad (7)$$

It should be noted that the growth decomposition in Equation (3) only accounts for the direct impact of net exports to GDP growth, and does not reflect their indirect contribution to growth through the stimulation of domestic demand. In this respect, we also employ the following import-adjusted export multiplier approach to derive the overall contribution of exports:

$$R_{y/ex} = R_{ex} \left(\frac{EX}{GDP}\right) \left[\frac{(1 - a_{ex})}{1 - c_p(1 - a_c)} \right] \quad (8)$$

where $R_{y/ex}$ represents the overall contribution of exports to GDP growth and c_p is the average propensity to consume. The formula in square

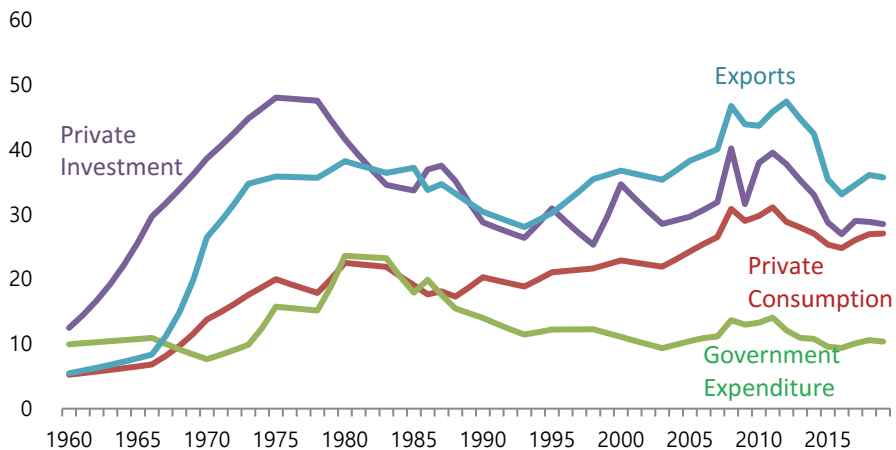
brackets on the right-hand-side is the export multiplier:

For our estimation, we use annual GDP data and input/output tables from the Bank of Korea. Since input/output tables (IO tables hereafter) are not available for certain years, we employ a linear interpolation for the missing data.³

3.2 Empirical Results

Figure 2 contains our estimates of import intensities by expenditure items. As depicted in the Figure, the import intensity of private investment had rapidly increased during the periods of 1960~70s and then declined afterward. The import intensity of exports also increased quickly from the mid-1960s to the mid-1970s, after which it stabilized and then began to increase again since the 2000s. On the other hand, import demands for private consumption have been increasing more gradually than those of private investment and exports.

Figure 2. Import Intensity by Expenditure Category (1960-2019, %)



Note: The figures are based on final and intermediate import demand for each category.

Source: Author's estimation based on input-output tables of the Bank of Korea.

³ The Bank of Korea started to release input-output tables in 1960. In addition to the benchmark data provided every 5 years, extended tables are also released in some interim years.

During Korea's golden age of economic development in 1960s-70s, import intensities for virtually all of expenditure items had simultaneously risen. The increase was most conspicuous for private investment, reaching almost 50 percent in the mid-1970s. In such situation where domestic demand increases on the back of a rapid rise in direct imports, then the traditional method has a non-negligible limitation in capturing the true relative contribution of domestic and external demand to economic growth.

Table 1 reports the relative contributions of expenditure items on both final and intermediate import demands. As for private consumption, intermediate import demand has been much larger than import consumption demand for final goods and services until recently. Private investment follows a similar pattern, with an exception of the year 1970. It is evident that import demand for exports has gained more importance in total import demand over time.

Table 1. Composition of Import Demands by Expenditure Item (%)

Year	Private Consumption		Government Expenditure		Private Investment		Export
	Final	Intermediate	Final	Intermediate	Final	Intermediate	Intermediate
1960s	14.2%	39.6%	4.9%	2.9%	18.9%	14.2%	3.6%
1970s	6.6%	28.0%	0.9%	2.7%	20.8%	16.6%	24.4%
1980s	4.2%	26.1%	0.0%	5.5%	13.9%	15.4%	34.9%
1990s	8.7%	25.2%	0.0%	4.0%	13.6%	16.7%	31.8%
2000s	11.0%	22.6%	0.0%	3.6%	9.7%	13.0%	40.1%
2010s	12.3%	18.8%	0.0%	3.9%	9.4%	12.9%	42.8%

Source: Author's estimation based on Input-output tables of Bank of Korea

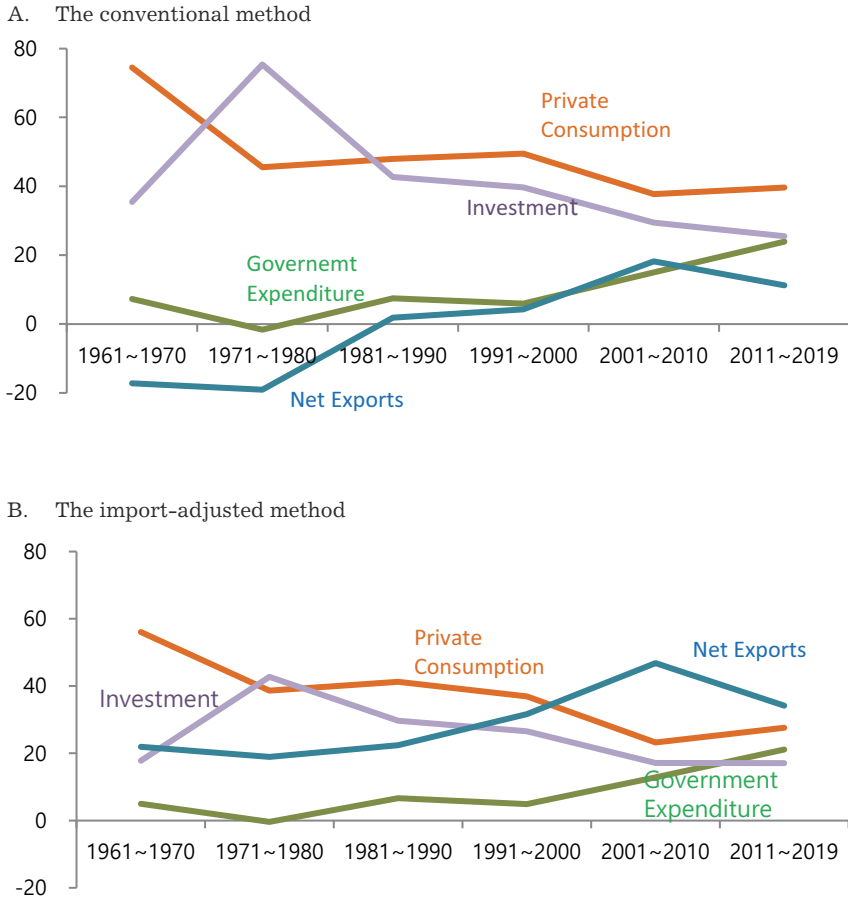
Note: The values are calculated for the induced directly or indirectly imports of each component for final demand divided by total imports.

Figure 3 contains the estimation results both from the conventional method as well as from the import-adjusted method for the case of Korea over the periods of 1960-2019.⁴⁵

⁴ The Bank of Korea started to release Input-output tables in 1960. Other than the benchmark year data for every 5 years, the extended tables are also released for some interim years. For the years that I/O tables are not available, we use the data of the closest year for estimation.

⁵ We exclude the data for the years of 1998 (Asian currency crisis) and 2009 (global financial crisis) in estimation.

Figure 3. Relative Contributions of GDP Expenditure Categories to Korea's GDP Growth

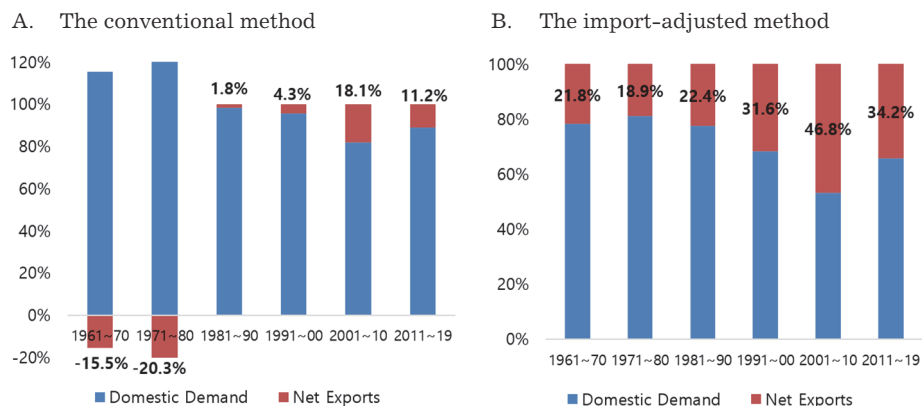


Source: Author's estimation based on national account data and input-output tables of the Bank of Korea.

According to the estimation results from the conventional approach, the main contributor of Korea's economic growth at the very early stage of development in the 1960s was shown to be private consumption, and then private investment emerged as the key driver to maintain a high growth path in the 1970s. Meanwhile, the relative contribution of net exports was recorded as negative until 1970s when Korea experienced chronic trade current account deficits.

Panel B in the table contains the estimation results based on the import-adjusted methodology. While private consumption and investment still remained as the key drivers of economic growth in the 1960~70s, their respective contributions was about 20 percent points lower compared to the estimated results in Panel A. And net exports accounted for around one-fifth of GDP growth for the periods of 1960~90s. The contribution of exports to GDP growth reaches 50 percent after 2000s, as the expansion of domestic demand slows down (See Figure 4).

Figure 4. Contribution to GDP Growth: Domestic Demand versus Net Exports



Source: Author's estimation based on national account data and input-output tables of the Bank of Korea.

The average contribution of net exports to growth over the whole period is 27.2%, which means that net exports accounts for 2.1 percentage points per annum of Korea's GDP growth. This figure is truly a remarkable one, taking into consideration that the average growth rates of developed and developing countries were 3.1% and 3.4% over the same period, respectively. Therefore, we can confirm that the role of export activities in Korea's economic development has indeed been substantial.

On the other hand, as aforementioned, the growth decomposition in Equation (7) does not account for indirect contribution of exports to growth through the stimulation of domestic demand. In this respect, we employ the import-adjusted export multiplier in Equation (8) and report the estimation results in Table 2.

Table 2. The Overall Contribution of Exports to Economic Growth (%)

	Import intensity		Average Propensity of Consumption (c_p)	Export Multiplier	Direct Contribution of Exports	Overall Contribution of Exports
	Exports (a_{ex})	Consumption (a_c)				
1960s	9.4%	7.3%	0.804	3.717	1.7%	7.1%
1970s	33.7%	17.1%	0.674	1.543	3.0%	8.0%
1980s	35.6%	20.0%	0.562	1.168	2.4%	4.4%
1990s	31.3%	19.2%	0.516	1.178	2.4%	4.4%
2000s	38.9%	22.2%	0.534	1.048	2.0%	3.8%
2010s	39.9%	23.6%	0.494	0.965	1.2%	2.2%

Note: All the figures are annual averages.

Source: Author's estimation based on input-output tables from the Bank of Korea

As shown in the table, the estimated export multiplier was very high in the early stage of Korea's development in the 1960s and 1970s, thus the indirect impact of exports via their stimulation of domestic demand was the major source of exports' contribution to growth at this stage. As this indirect impact slowed down beginning in the 1980s, the direct impact estimated using Equation (7) began to account for more than 50% of exports' overall contribution to economic growth.

4 Conclusion

This paper empirically examines the impact of exports on economic growth, for the case of Korea from its economic take-off period in 1960s to recent years. By applying the import-adjusted GDP decomposition method, we find that exports have indeed been a decisive driver of Korean economic growth. Our results also indicate that the direct contribution of net exports to GDP growth remained undiminished at the later stages of economic development, as globalization has been unprecedentedly accelerated.

While Korea is arguably an interesting case in this respect, it would definitely be interesting to apply similar analytic approaches to other countries and compare the results with the Korean case. Further investigation for a larger set of countries would also be needed in order to

answer the important policy question whether trade openness or exports really matters for achieving sustainable economic growth.

At the same time, we acknowledge that our estimation strategy has a certain limitation to explore the overall impact of exports on economic growth. Since our study is based on a demand-side accounting approach, it focuses on examining rather a short-run contribution of exports to GDP growth and thus it is silent about the long-term causal linkage between exports and economic growth. Although we also consider indirect contribution of exports to growth through the stimulation of domestic demand by employing the export-multiplier approach, there exists a gap between our study and the empirical literature based on the mainstream growth theories (Barro and Sala-i-Martin, 2005; Aghion and Howitt, 2009).

In addition, one could deepen the understanding of the exports-growth nexus by employing vector autoregression models or the error correction model, which are useful for estimating both short-run and long-term effects of one time series on another. A decomposition of the exports contribution on growth can be also investigated by variance decomposition or historical decomposition. Recently, Oh et al (2017) estimate the export multiplier for the Korean economy over the period 1998-2017 using a structural VAR model. By looking at the impulse response functions, they find that the export multiplier of the Korean economy has gradually deteriorated over time, which is consistent with our findings presented in Table 2. They also find that both a drastic reduction in marginal propensity of consumption and an increase in marginal propensity of imports contributed to the sharp decline of the exports' contribution to growth after the global financial crisis. Such an estimation approach can be applied for a longer period of time, like ours, to better understand the dynamic impacts of exports over different development stages.

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