KIEP Working Paper 17-02



Investment puzzle: Deeper roots



The Korea Institute for International Economic Policy (KIEP) was founded in 1990 as a government-funded economic research institute. It is a leading institute concerning the international economy and its relationship with Korea. KIEP advises the government on all major international economic policy issues and serves as a warehouse of information on Korea's international economic policies. Further, KIEP carries out research by request from outside institutions and organizations on all areas of the Korean and international economies by request.

KIEP possesses highly knowledgeable economic research staff. Our staff includes many research fellows with PhDs in economics from international graduate programs, supported by dozens of professional researchers. Our efforts are augmented by our affiliates, the Korea Economic Institute of America (KEI) in Washington, D.C. and the KIEP Beijing office, which provide crucial and timely information on local economies. KIEP has been designated by the government as its Center for International Development Cooperation and the National APEC Study Center. KIEP also maintains a wide network of prominent local and international economists and business people who contribute their expertise on individual projects.

KIEP continually strives to increase its coverage and grasp of world economic events, and expanding cooperative relations has been an important part of these efforts. In addition to many joint projects in progress KIEP is aiming to become a part of a broad but close network of the world's leading research institutes. Considering the rapidly changing economic landscape of Asia, which is leading to further integration of the world's economies, we are confident that KIEP's win-win proposal for greater cooperation and sharing of resources and facilities will increasingly become standard practice in the field of economic research.

> HYUN Jung Taik President

Korea Institute for International Economic Policy Building C, Sejong National Research Complex, 370, Sicheong-daero, Sejong-si, Korea Tel. 82-44-414-1251 Fax. 82-44-414-1144 www.kiep.go.kr



Price USD 3

Working Paper 17-02

Investment puzzle: Deeper roots

KIM Sujin



Working Paper 17-02

Investment puzzle: Deeper roots

KOREA INSTITUTE FOR INTERNATIONAL ECONOMIC POLICY (KIEP) Building C, Sejong National Research Complex, 370, Sicheong-daero, Sejong-si, Korea Tel: (822) 82-44-414-1251 Fax: 82-44-414-1144 URL: http://www.kiep.go.kr

HYUN Jung Taik, President

Published May 4, 2017 in Korea by KIEP ISBN 978-89-322-4268-2 94320 978-89-322-4026-8 (set) Price USD 3

© 2017 KIEP

Executive Summary

Even at near-zero interest rates for a prolonged period since the financial crisis, why has business investment in advanced economies remained persistently below its pre-crisis level? This paper investigates empirically the roots of this investment puzzle from the global megatrend perspective. The empirical model of this study augmented the uncertainty-finance accelerator investment model with megatrend variables of a transition to service industry, ageing population and a rise in income inequality. The main estimation results show that they have affected negatively the business investment over the period 1980-2014. The shift-to-service driven investment fall is the price-dominant effect during the transition, which is not necessarily pessimistic news, while the suppressing effects from ageing and a rise in income inequality require adequate policy reactions. In addition, the analysis finds significant negative spillover effects of trade partners' ageing and income inequality on a country's own private investment. Based on the empirical results, I expect that the G20's efforts in inclusiveness with structural reforms will stimulate global business investment.

Keywords: investment, megatrends, aggregate demand, uncertainty, G20, inclusiveness

JEL classification: E20, F41, F42

Contributors

KIM Sujin

Research specialist in the G20 Research Support Group & the Department of Int'l Macroeconomics and Finance at the Korea Institute for Int'l Economic Policy. Her research interests include global liquidity and global imbalance issues, structural reforms and international macroeconomics in general. She completed PhD studies in international economics at the Graduate Institute in Geneva and the Swiss Doctoral program in economics at the Study Center Gerzensee of the Swiss National Bank. She received her MSc in Economics from the Humboldt University of Berlin and her M.A. in European Studies and B.A. from the Seoul National University.

Contents

Executive Summary · · · · · · · · · · · · · · · · · · ·	3
---	---

I. Introduction · · · · · · · · · · · · · · · · · · ·
II. Data 13
1. Investment · · · · · · · · · · · · · · · · · · ·
2. (Global) Megatrends · · · · · · 15
3. Uncertainty · · · · · · · · · · · · · · · · · · ·
III. Empirical Model: Augmented Demand Accelerator Model •••• 21
IV. Results and Policy Implication · · · · · · · · · · · · · · · · · · 25
1. Closed Economy · · · · · · · · · · · · · · · · · · ·
2. Open Economy · · · · · · · · · · · · · · · · · · ·
V. Conclusion · · · · · · · · · · · · · · · · · · ·
Appendix · · · · · · · · · · · · · · · · · · ·
References • • • • • • • • • • • • • • • • • • •

Tables

Table 1. Baseline Correlation 12
Table 2. Benchmark Measurement of a Shift toward Service Economy – the US
case : ratio of employees in service to manufacturing sector as a proxy
for firm share ratio · · · · · · · · · · · · · · · · · · ·
Table 3. Main Result 26

Figures

Figure 1. Investment in G20 and Long Rates · · · · · · · · · · · · · · · · 8
Figure 2. Business Investment · · · · · · · · · · · · · · · · · · ·
Figure 3. Population Ageing · · · · · · · 16
Figure 4. Income Inequality
Figure 5. (A) Shift toward Service Economy · · · · · · · · · · · · · · · · · · 19
(B) Shift toward Service Economy · · · · · · · · · · · · · · · · · · ·
Figure 6. Firm Unit Investment Value Indices: Manufacturing vs Service ······ 28
Figure 7. (A) Firm Share and Unit Investment Value Indices by Sector: the US \cdots 30
(B) Firm Share and Unit Investment Value Indices by Sector: Korea $\ \cdots \ 31$

Investment puzzle: Deeper roots*

KIM Sujin⁺

I. Introduction

One puzzling feature of the recent global recovery is an apparent disconnect between investment and financing conditions (the "investment puzzle"). Despite historically low nominal interest rates over a prolonged period, the investment in advanced economies has remained persistently below its pre-crisis level (Figure 1). The aggregate investment-GDP ratio in the G20 advanced economies in 2014 stood 23%p below its 2007 level, while short-run and longterm nominal interest rates have prevailed at near zero thanks to highly accommodative monetary policies over recent years. Less disappointing compared to the formers', though, Korea's stagnant investment has continued to weigh on growth prospects in the country; its total fixed investment ratio in 2014 still remains 10%p below its 2007 record and continues to lag behind that of other G20 emerging economies since the crisis.

Business investment is a pivotal determinant of potential output growth and

^{*} I thank Sungbae An, Gregory Thwaites, Yihan Kim, Hyelin Choi, Juyoung Cheong, Elitza Mileva, anonymous referees and participants at the seminar meeting at the Bank of England for their comments and suggestions. A preliminary version and result of this paper was presented at the Bank in February 1, 2017.

[†] Research Specialist at the G20 Research Support Group and the Department of Int'l Macroeconomics and Finance, the Korea Institute for International Economic Policy (KIEP).



Figure 1. Investment in G20 and Long Rates

Note: (a) the index is the GDP weighted average of total fixed investment in current local currency, normalized to 1 for the year 2007. The GDP used is based on purchasing-power-parity (PPP) share of world total. "Advanced" economies include Australia, Canada, France, Germany, Italy, Japan, the UK and the US. "Emerging" economies are Argentina, Brazil, China, Korea, Mexico, Russia, South Africa and Turkey.

(b) the benchmark bond 10 year yields.

Source: (a) IMF (WEO), author's calculation, (b) Datastream

the main driver of employment creation. With a growing concern that its delayed recovery¹ discourages our growth expectation and job security, the slump in business investment has been at the core of policy debates on its roots and remedies and of the G20's efforts to promote an inclusive growth. Recently, a group of economists from the OECD (Lewis *et al.*, 2014), the BIS (Banerjee *et al.*, 2015), the IMF (2015), the Banque de France (Bussière *et al.*, 2015) and the Bank of Canada (Leboeuf *et al.*, 2016) contributed to the investment puzzle debate. Their analysis results show that weak (expected) aggregate demands and expected future economic conditions and high uncertainty have continued to depress private investment since the crisis², while financial conditions having

¹ Yellen addressed "the failure" of advanced economies' restoring the pre-recession trend (2016).

² The OECD (2014) discussed additional explanatory factors such as regulation and competition where barriers to entry and to trade and competition were addressed to affect negatively investment, a transition from tangible investment to intangible investment and the possibility of

less of an impact. Using profits and excess equity returns as a proxy for expected future demand, Banerjee et al. (2015) estimated the investment model for the G7 countries over the period 1990-2014. Their empirical evidence presents that uncertainty about the future state of the economy and expected future demand have dominantly driven business investment, while the role of finance conditions relatively small. Bussière et al. (2015) also identified weak expected demand and uncertainty as key determinants of the recession in business investment for 22 advanced economies. To avoid the endogeneity problem between contemporaneous investment and GDP, they proxy vintage forecast data for an expected demand, when they estimate the forward looking accelerator model augmented with uncertainty and cost of capital. Exploiting the coefficients from the model estimation, the study investigates aggregate contributions of each variable to the drop in investment growth from 4.5% to 0.5% of all 22 countries over the period 2008-2014. According to the results, expected demands account for more than 80% and uncertainty about 17% of the fall, while capital costs explain little. Leboeuf et al. (2016) add some open economy features to the ongoing investment puzzle debate. They include domestic as well as trade partners' growth prospect in the uncertainty augmented accelerator model. As its contribution, the study tests various proxies for a measure of uncertainty in the estimation model for five advanced economies over years 2003-2014. The empirical evidence underlines the role of foreign demand prospect on the part of firms' investment decision. They conclude that the sluggish private investment over recent years is mostly due to a gloomy outlook on the strength of global demand from the private sector.

The main policy recommendation from the literature is obvious: boosting aggregate demands, signaling positive economic prospects and reducing uncer-

increasing outward investment. As for the latter, the paper explains that the G7 FDI net outflows have increased vis à vis domestic investment after the crisis and points that according to empirical studies, the relationship between aggregate FDI outflow and domestic investment is not clearly defined. My study, which focuses on advanced economies, abstains from the impact of FDI flows in the discussion.

tainty. But, when it comes to which specific policy tools policymakers could take to encourage business investment, we need to further investigate the deeper roots of origins for depressed business investment. The fall in business investment in advanced economies is not a recent phenomenon; rather, it follows a historical downward trend. This feature has an important implication for Korea whose investment record is stagnant but might embrace the trend observed in advanced economies in the long term³. In addition, investment itself is a primary component of aggregate demands. Therefore, it is worth trying to elaborate on the mechanism to shed light on the (in)direct effects of aggregate demands on investment. As its contribution to the recent literature, this study attempts to augment the uncertainty-finance accelerator investment model with new driving forces that connect the (future) aggregate demands and investment from a structural perspective.

The purpose of this study is to empirically explain the root origins of the investment puzzle or a persistently low private investment from the demand side. Building up an investment model for an empirical exercise, I assume that some structural changes have persistently affected the aggregate demands and had an adverse effect on private investment.⁴ To examine main determinants that explain the impacts of aggregate demands on investment, this study approaches the investment puzzle from the global megatrend perspective (OECD (GSG), 2015)⁵ for the first time in the literature: a shift from manufacturing to

³ Reading a historical trend, Huefner *et al.* (2014) approached the puzzle from a long-run and structural perspective which is close to my approach, but my study is different in that I emphasize the determinants of the secular stagnation such as the ageing population from the demand side perspective, not as they do the slowing growth of working age population from the supply side. In addition, they also argued that the long-run decline in investment-GDP ratio in advanced economies are measurement issues of the decreasing relative prices of investment goods that Karabarbounis *et al.* (2014) discussed. Still, it did not provide empirical evidences based on theoretical model.

⁴ This exercise finds clear support in Yellen (2016)'s speech as she addressed, "are there circumstances in which changes in aggregate demand can have an appreciable, persistent effect on aggregate supply?"

⁵ "Megatrends" is defined as "separate trends resulting from the cumulative impact of multiple drivers of change, reflecting linkages between political, economic, technological, social and en-

service oriented economy, population ageing and a rise in income inequality. This also links to the recent secular stagnation hypothesis (Summers, 2014, Eichengreen, 2015 and Thwaites, 2015) but I emphasize more the implication of an industrial shift to service economy to take into account sector-dependent firm dynamics effects on business investment.

The empirical model of the study identifies a shift toward service-oriented economy, demographic changes and income inequality as megatrend variables of having restrained private investment by aggregate demand channel. A shift toward service economy explains business investment via price and quantity channels. The price effect of the transition is measured by a firm unit investment value index which I calculate by dividing the total business investment by total number of firms in the manufacturing and service sectors. In my analysis, the firm unit investment value in the service sector is substantially lower than in manufacturing. Since the price effect of the industrial shift always dominates the quantity effects generated by more firm entries in the service sector, it reduces business investment during the transition to service. But this does not always mean that investment activity has been suppressed. My study points that the entry rate of firms in service is always higher than in manufacturing in the OECD countries. It is just not high enough to trade off the price effects. In this line, the fall in business investment could send an unjustly pessimistic signal to the market. As Weil (1999) and Hock and Weil (2012) studied the role of rising old-age dependency in reductions in consumption, population ageing adds to the financial burden on the working population to support retirees via the channel of the (future) fiscal transfers to elderly people. This would decrease the disposable incomes of the working generation to consume, while the longer life expectancy intensifies savings motives in the working and old population together.6

vironmental systems" (OECD (GSG), 2015).

⁶ Kwon (2016) showed the increasing life expectancy has driven the rise in Korea's savings rate (a fall in consumption) although its population has been already rapidly ageing. The average propensity to consume in Korea dropped from 78% in 2003 to 72% in 2015. According to the study, this is a common event in all age groups with a sharper fall in older groups.

These might drag down the average propensity to consume in economy. According to empirical evidences on decreasing marginal propensity to consume in income distribution (see Alichi et al., 2016 for the US; Carroll et al., 2014 and O'Farrell et al., 2016 for the European countries; and Jeon et al., 2009 for Korea). I also hypothesize that an increase in income inequality also plays a role in pulling down (expected) aggregate consumption, and thus business investment. With most of academic discussions exclusively focusing on economic impacts of changes in the functional income distribution, there is little empirical research on the personal income distribution on aggregate consumption (see Stockhammer et al., 2016 for the discussion⁷). However, Carvalho et al. (2016) theoretically prove that income inequality in wage earners affects negatively the aggregate demand in economy, observing increasing saving rates with income in

Table 1. Baseline Correlation						
	Invest_ GDP	Private Con.**	Age_Dep	Gini_net	Gini_market	Em_S/M_ Share
Invest_GDP	1					
Private Con.**	0.3672* (0.0000)	1				
Age_Dep	-0.4786* (0.0000)	-0.6372* (0.0000)	1			
gini_net	-0.1580* (0.0055)	0.0566 (0.3182)	0.0087 (0.8766)	1		
gini_market	-0.7486* (0.0000)	-0.3853* (0.0000)	0.6909* (0.0000)	0.4159* (0.0000)	1	
Em_S/M_Share	-0.6428* (0.0000)	-0.3691* (0.0000)	0.2793 [*] (0.0000)	0.3144 [*] (0.0001)	0.5730* (0.0000)	1

Note: * indicates significance at 5 percent level.

**Private con. indicates private consumption growth.

⁷ Stockhammer et al. (2016) summarize diverse empirical literature that discusses the wage-led or profit-led demand regimes, the impact of inequality on aggregate demands and how these effects are different based on the definition of income such as functional income distribution or personal income distribution and whether or not the latter includes wealth and debt.

the US. Cho (2007) empirically showed the negative impact of income inequality on household consumption in Korea using the ratio of the 5th quintile to the 1st quintile households' income, based on the assumption that decreasing marginal propensity to consume in income suppresses aggregate consumption in a rise in income inequality. In Table 1, the baseline correlation confirms the main assumptions on the relationship among investment, private consumptions and megatrend variables (see Table A.2. for data description).

As additional contribution specifically for the G20 discussion, the empirical model in the study estimates the potential spillover effects of megatrend variables across countries through trade channel. I assume that this would amplify their negative (positive) effects on investment when it happens simultaneously as global megatrends. The paper is organized as follows. Section II describes the stylized facts of megatrends and the data for the empirical exercise. Section III presents the model and the estimators. In Section IV, I report the estimation results and discuss the policy implications of the outcomes and Section V concludes.

II. Data

The empirical study uses the annual data set of 10 advanced economies over 1980-2014. The panel of countries are composed of the G7 economies, and Australia, Korea and Switzerland (see Table A.1.). Concerning the sample collection, I focus on advanced economies that have seen historically a falling trend in business investment and the clear structural changes which the study identifies as megatrends. As the size of sample and the observation period are constrained by limited data availability for the variables of our interest, the panel dataset is unbalanced. The following section presents the stylized facts of megatrends observed in my dataset with data description.

1. Investment

Investment in the analysis is gross net investment in fixed capital assets (gross fixed capital formation, GFCF) by the business sector. For business investment, I use the data of gross fixed capital formation in machinery, equipment and transportation from the OECD National Accounts Database given that this component of the fixed investment is mostly covered by the business sector. Investment and GDP data in current local currency are used to create the ratio of business investment to GDP for the empirical study.

Figure 2 shows a marked fall in business investment across 10 countries. In the period over 1980-2014, the investment record for the UK, Canada and Korea are the most impressive among the countries, with a fall by 88%, 70% and



Figure 2. Business Investment

Source: OECD.

64% respectively, while Japan (11%), the US (28%) and France (30%) see a relatively modest drop. As discussed in the former section, the investment performance in 2014, compared to the level in 2007, still has not recovered to the precrisis level, still showing a slightly on-going downward trend. As for the postcrisis comparison, Australia (32%), Italy (28%) and Canada (26%) have experienced a relatively big fall in investment, while the US (4%), Korea (5%) and Japan (6%) show a relatively moderate recession in investment.

2. (Global) Megatrends

The term "(global) megatrends" is unusual in economics discussions but reflects well the feature of *synchronicity* across countries. The main (global) structural changes have not been fairly well perceived as fundamental systemic changes before the crisis. The following megatrends are closely linked to the secular stagnation discussion as put forth in Summer (2014) and Thwaites (2015) but I try to add values by measuring further potential spillover effects from the neighboring countries' megatrends. And such an industrial transition to service sector as this study quantifies would provide an additional view to the debates on relative price of investment goods.

Population ageing Based on the elderly population data from the OECD, in year 1980, all sample countries except for Korea, Germany and the UK entered the ageing society⁸, with the former still young and the latter two countries already too old and classified as aged societies. In year 2014, all countries moved up to the higher level of an elderly society. Korea is now an aged society (elderly population, 12.5%). Germany (21.4%), Italy (21.3%) and Japan (25.1%, 2013) have entered into a hyper-aged society. The US, which was classified as an aged society in 2013, is relatively young (14.5%), as is Australia (14.7%) and

⁸ According to the UN definition, when the elderly population (+65) in a country exceeds 7% of its total population, it is classified as an ageing society. When it accounts for 14% (21%) or more, it is defined as an aged society (a hyper-aged or super-aged society).

Canada (15.7%). For the empirical analysis, however, I employ the old-age dependency ratio, i.e. the number of persons older than 64 years per one hundred working age population aged 15-64. This ratio reflects not only the degree of population ageing but also the burden on society to support the elderly people. It further potentially plays the role of a barometer that makes people believe in a prolonged life expectancy. These all drive the saving motivation of working and old aged groups. From this saving motivation, as discussed in the former section, an increase in the ratio would decrease consumption. The datasets for the ratio come from the World Development Indicators. Figure 3 shows a clear upward trend in the old-age dependency ratio across all 10 countries. The growing burden from ageing is startling in Japan and Korea, approximately increasing annually by 3.4% and 3.0% respectively in 1980-2014. In 1980, 16 people from the working-aged population in Korea shared the burden of support for one



Source: World Development Indicators.

elderly (aged 65 and over), while only six people supported one in 2014.⁹ In light of ageing deepening¹⁰, Korea (5.7 per 1), the US (4.6 per 1) and Australia (4.5 per 1) are under relatively less saving pressures, while Japan (2.4 per 1), Italy (2.9 per 1) and Germany (3.7 per 1) bear a relatively heavier ageing burden. The old-age dependency ratio in the US, the UK and France has been elevated since 2006. The average annual growth rate of ageing in the US and the UK in 2006-2014 is almost three times the average growth rate during the whole observation period.

Income inequality Income inequality in the study is measured as Gini coefficients. The study borrows the Gini indices of net and market from the Standardized World Income Inequality Database (SWIID) (Solt, 2016). The Gini net index here is based on equivalised disposable income after social transfers and taxes while the Gini market is calculated on the market income before the public redistribution treatment. By comparing the estimates of two indices in the empirical study, we could check the effect of fiscal policy or government intervention on business investment.

Figure 4 presents an overview of the income inequality trend across countries. Two features are clearly observed. First, in terms of Gini market, income inequality follows an upward trend in most of countries, having slightly improved recently after touching the highest point in the aftermath of the financial crisis. In light of the level comparison, the Gini market coefficients have exceeded 50¹¹ in the US, the UK and Germany during the observation period. Japan is the fastest converging one to the high level of income concentration with a Gini market score of 46 in 2011. Second, Gini net coefficients have substantially been lower than the Gini market records. This indicates a crucial role of government's social and fiscal policy in most countries, with this role relatively weak in Korea. In Gini net comparison, the upward trend in income ine-

⁹ This is the inverse of the old-age dependency ratio which is defined as potential support ratio (UN, 2015). The corresponding old-age dependency ratio is 6.2 in 1980 and 17.4 in 2014.

¹⁰ The inverse of the old-age dependency ratio.

¹¹ The Gini coefficients in the SWIID range from 0 to 100.

quality has been modest in most countries, while the inequality condition of the UK has positively improved (declined) since the financial crisis. It is the US that presents a clear upward trend and touches in records high with a Gini net coefficient of 37 in 2013.



Source: SWIID, F.Solt (2016).

A shift toward service-oriented economy In terms of value added, the global economy continues to move to a service economy. The global value added in the service sector accounts for 69% (63%) of the global GDP in 2014 (1997). The figure for the OECD countries is much higher, explaining 74% of their GDP, an increase by 7%p, compared to the level of 1997. By contrast, at the global level, the share of value added in the manufacturing sector relative to GDP has shrunken by 26p% in 1997-2014, while for the OECD countries by 20p% (see Figure 5.(A)).



Note: (a) WLD_SV (OECD_SV) is the global (OECD countries') value added in the service sector (ISIC divisions 50-99) as % of GDP. (b) normalized to 1 for the base year 1997. WLD_MF (OECD_MF) is the global (OECD countries') value added in the manufacturing sector (ISIC divisions 15-37), author's calculation.

Source: World Development Indicators and OECD National Accounts.

To emphasize the sector-dependent business dynamic effects on investment via price and quantity channels, I initially planned to use the ratio of firm share in the service sector relative to the manufacturing sector's which explains the impact of a shift toward service on business investment. However, the panel data of sector-level enterprise number¹² is highly unbalanced and short. By using the full dataset of number of firms for the US¹³, I found an alternative proxy for a variable of industrial shift to service. After several correlation tests, the ratio of total employees in the sectors is almost identically correlated to the firm share ratio as in the Table 2. The ratio of employees in service to manufacturing is used as a variable for the industrial shift in the empirical estimation. The study draws the dataset of total employees in the sectors from the AME-

¹² SDBS Business Demography Indicators (ISIC Rev.3&4) from the OECD

¹³ SDBS Business Demography Indicators (ISIC Rev.3) from the OECD

CO12. Figure 5. (B) presents a distinct transition to service economy in terms of the ratio of employees in service to manufacturing.

Table 2. Benchmark Measurement of a Shift toward Service Economy – the US case : ratio of employees in service to manufacturing sector as a proxy for firm share ratio

	Invest_GDP	Firm_S_M_Share	Em_S_M_Share
Invest_GDP	1		
Firm_S_M_Share	-0.8321 [*] (0.0000)	1	
Em_S_M_Share	-0.8981 [*] (0.0000)	0.9816 [*] (0.0000)	1

Note: * indicates significance at 5 percent level. Firm_S_M_Share is the ratio of number of enterprises in the service sector (ISIC3) to that in the manufacturing (ISIC3). Em_M_Share is the ratio of number of employees in service to that in the manufacturing.

Source: Business Demography Indicators (ISIC Rev.3) (OECD) and the AMECO12.



Figure 5. (B) Shift toward Service Economy

Note: the ratio of employees in service to manufacturing. **Source:** AMECO12.

3. Uncertainty

Referring to the previous literature, the paper introduces three different measures for uncertainty. One is a macroeconomic forecast uncertainty. The second is a financial volatility measure as mostly used to estimate uncertainty in the literature. The financial volatility in the paper is calculated by the square root of mean squared monthly stock market index returns during the year. The third measure of our interest is the Economic Policy Uncertainty (EPU) index which assesses the policy-related economic uncertainty. At the time of writing this paper, the EPU index has been available for almost all sample countries except for Switzerland. Motivated by the prevailing warning of the negative impact of policy uncertainty on business investment, Baker *et al.* (2016) invented the index based on newspaper coverage frequency: they quantify the frequency of "economic", "uncertainty" and one or more policy-relevant terms in the newspapers.¹⁴According to their empirical investigation using the EPU for the US, escalating policy uncertainty depresses investment and employment in policy-sensitive sectors, associated with greater stock price volatility.

III. Empirical Model: Augmented Demand Accelerator Model

The empirical framework of the study builds on the accelerator model of investment as in Bussière *et al.* (2015) and Leboeuf *et al.* (2016). The theory assumes a constant relation between the desired capital stock and output as in

¹⁴ For the US, the authors constructed three kinds of indices but did only the newspapers-based one for other countries. In this study, therefore, I use the newspapers-based policy uncertainty index. The authors keep the EPU index updated, extending the country coverage. More information available at : www.policyuncertainty.com

equation (a). This implies that if output deviates from its desired level, capital stock instantly adjusts to that change. In the simple model without capital depreciation, the change in capital stock that is *investment* in equation (b) is explained by *changes in the level of output* in equation (c).¹⁵

(a)
$$K_t^* = \rho Y_t$$
, (b) $I_t = K_{t+1}^* - K_t$,
(c) since $K_t = K_t^*$, $I_t = \rho(Y_{t+1} - Y_t)$

Taking into account the forward-looking behavior of investors in their investment decision, the former studies focused on the selection of different datasets that could reflect well future expected aggregate demands. Modifying and extending the empirical models of Bussière *et al.* (2015) and Leboeuf *et al.* (2016), my empirical framework adds the roles of (global) megatrend variables to affect the expected aggregate demands. In addition, I construct the trade partners' megatrend indices to measure their spillover effects via trade channel. This estimation result could give considerable policy implications at the level of the G20 discussion. The baseline empirical model in the study is presented as in equation (1).

$$I_{i,t} = \beta_1 I_{i,t-1} + \beta_2 g dppc_g_{i,t-1} + \beta'_3 M_{i,t} + \beta_4 U_{i,t} + \delta' Z_{i,t} + \eta_i + \varepsilon_{i,t}$$
(1)

All variables are transformed into log values. The dependent variable $I_{i,t}$ is business investment. $gdppc_g_{i,t}$ and $M_{i,t}$ represent a variable for gdp per capita growth and a vector of megatrend variables. The latter includes the explanatory variables for population ageing $(Ag_{i,t})$, income inequality (Gini net $(Ie_N_{i,t})$, Gini market $(Ie_M_{i,t})$), industrial shift to service sector $(SM_{i,t})$. $U_{i,t}$ is a measure of uncertainty. $Z_{i,t}$ is a set of finance condition measures of long-term rates, short-term rates and credit volumes. As for short-term and

¹⁵ Bussière *et al.* (2015) present three theoretical models of investment behavior with related literature such as Clark (1917), Jorgenson (1971) and Jorgenson *et al.* (1968).

long-term rates, I use the annual data of the OECD indicator. The short-term rates (*short_r_{i,t}*) are based on three-month money market rates and the long-term rates (*long_r_{i,t}*) are calculated on yields of 10-year government bonds. I employ the ratio of M2 ($M2_{i,t}$) supply to nominal GDP in local currency¹⁶ for a measure of financing condition.

$$I_{i,t} = \beta_1 I_{i,t-1} + \beta_2 g dppc_{g_{i,t-1}} + \beta'_3 M_{i,t} + \beta_4 U_{i,t} + \beta_5 N e_{M_{-i,t}} + \beta_6 Exp_{i,t} + \delta' Z_{i,t} + \eta_i + \varepsilon_{i,t}$$
(2)

Regarding the open economy version of the baseline model, the study extends the equation (1) with trade partners' megatrend effects on a country's own investment via trade channel as in the equation (2). A variable $Ne_M_{i,t}(Ne_Ag_{-i,t}, Ne_Ie_{-i,t}, Ne_SM_{-i,t}^{17})$ to measure trade partners' megatrend effects for each country is calculated by the GDP share weighted average of its trade partners' old-age dependency ratio and Gini coefficients as in the equation (3) :

$$Ne_{-i,t} = \sum_{\substack{j=1\\i\neq j}}^{9} global \ gdp_share_{j,t} * M_{j,t}$$
(3)

where each country exports worldwide and its major trade partners are nine countries in the study sample to make the estimation procedure simple, which is fair based on that the total volume of each country's export to the nine coun-

¹⁶ The M2 money data are collected from the CEIC and the nominal GDP from the IMF.

¹⁷ To create megatrend indices which are used to examine the spillover effects of structural changes in trade partners, we need complete datasets over the observation period since the trade or GDP share of each trade partner in our sample countries is not negligible. The omitted dataset would distort the estimation results. As for the ratio of employees in service to manufacturing, the index covers only a short period over 1991-2008. Using this short index, I measured the trade partners' industry shift effects on domestic investment but its negative effect with small scale is statistically insignificant. The main result table does not include this estimation. Concerning the Gini coefficients, some omitted data which are not seriously long and frequent in the sample are linearly extrapolated and the robustness of result could be tested in more extended country samples.

tries takes over 50% of its total export to the world in average across the sample in the beginning of the period. To produce the average megatrend index for each country, this study employs the global GDP share of each country, instead of the trade weight which shortens the observation period with omitted dataset in some countries¹⁸. To smoothen the changes in the global GDP share of each country over the long time span, I use a three-year moving average of the global GDP share of each trade partner (in PPP basis from IMF (WEO) database).

The dynamic panel model of investment in the study contains unobserved country fixed effects and lagged dependent variables that generate serial correlations in error terms. In addition, I assume that some explanatory variables such as an industrial shift to service, long-term rates and credit volumes are endogenous and might be correlated with the error terms given investment could affect these variables contemporaneously. To solve these estimation problems, I use the Arellano-Bond system GMM (Generalized Method of Moments) estimator, based on Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). First, to remove the country fixed effect (η_i), the study transforms the equation (1) into the equation (4) by first differencing.¹⁹

$$\Delta I_{i,t} = \beta_1 \Delta I_{i,t-1} + \beta_2 \Delta g dppc_g_{i,t-1} + \beta'_3 \Delta M_{i,t} + \beta_4 \Delta U_{i,t} + \delta' \Delta Z_{i,t} + \Delta \varepsilon_{i,t}$$
(4)

As we will read in the estimation results later, the estimated value for the

¹⁸ Nevertheless, I consider that it would be worth to use the trade-weight average in the regression, adding more trade partners, which would verify the effects of diversifying demand risks from the structural changes of old trade partners by trading with new trade partners. This work is one line of research to be pursued in the next step.

¹⁹ In the regression model, I do not consider time fixed effects as in other empirical literatures (Banerjee *et al.*, 2016 and Mileva, 2008) in that it increases the number of instruments, which resulted in lower power of Sargan/Hansen test statistics. In addition, since the variables for political uncertainty and stock market uncertainty respond to common global shocks, including fixed effects reduces the explanatory power of these variables.

lagged dependent variable is substantially high, which implies strongly persistent effects of the past investment on current business investment. It could make the lagged values of the dependent variable weaker instruments in the differenced equations (Blundell and Bond, 1998). To improve the efficiency of the estimator, I add the lagged differences of $I_{i,t}$ as instruments for equations in levels as in the Arellano-Bond system GMM estimator. The endogenous variables in the estimator are those for investment, industrial shift to service economy, long-term rates and credit volumes, which is empirically acceptable since the selection improves the Arellano-Bond first- and second-order correlation test statistics and the Sargan test results of over-identifying restrictions.

IV. Results and Policy Implication

1. Closed Economy

Megatrends

Table 3 presents the main empirical results. To explain the model specification test outcomes, the Arellano-Bond test for the second-order correlation does not reject the null hypothesis of no autocorrelation in all columns and the Sargan test of over-identifying restrictions fails to reject that the instruments are exogenous. However, I found that, instead of GDP growth forecasting dispersion (column (1)), using policy uncertainty and stock market volatility for a variable of uncertainty (column (2)) improves the model specification given the selection of instruments for the moment conditions. The p-value of the Sargan test for the first column is not unacceptable but low as much as 0.082.

The first two columns set out the estimation results of the closed economy framework. As we expected, the estimation evidence supports that the mega-trend variables that I assume affect (future) aggregate demands play a substantial role to explain business investment behavior (see column (2)). A 10% p rise

Table 3. Main Result					
	(1)	(2)	(3)	(4)	(5)
<i>Lagged business investment</i> (I _{i,t-1})	0.924 ^{***} (41.18)	0.904 ^{***} (32.91)	0.871 ^{***} (27.20)	0.865 ^{***} (24.53)	0.867 ^{***} (24.80)
<i>Old Age Dependency Ratio</i> (<i>Ag</i> _{<i>i</i>,<i>t</i>})	-0.048 ^{**} (-1.99)	-0.068 [*] (-2.61)	-0.115 ^{**} (-2.57)	-0.097 ^{**} (-2.28)	-0.097 ^{**} (-2.28)
Gini_Net (Ie _{i,t})	-0.052 ^{**} (-2.50)	-0.038 (-1.62)	-0.085 ^{***} (-2.00)	-0.019 (-0.61)	-0.015 (-0.48)
Shift to service sector $(SM_{i,t})$	-0.063 ^{***} (-3.37)	-0.074 ^{***} (-3.74)	-0.104 ^{***} (-3.35)	-0.110 ^{***} (-3.37)	-0.108 ^{***} (-3.35)
Lagged growth of GDP per capita $(gdpp_{i,t-1})$	0.212 (0.93)	0.253 (1.03)	0.264 (1.08)	0.264 (1.07)	0.259 (1.05)
Short term interest rates (short_ $r_{i,t}$)	-0.008 (-1.01)	-0.005 (-0.61)	-0.000 (-0.02)	0.001 (0.07)	0.001 (0.06)
Long term interest rates $(long_r_{i,t})$	-0.004 (-0.021)	-0.037 (-1.62)	-0.057 [*] (-1.96)	-0.052 [*] (-1.80)	-0.052 [*] (-1.80)
<i>Credit ratio to GDP</i> (M2 _{i,t})	-0.006 (-0.38)	-0.015 (-0.94)	0.020 (0.79)	0.006 (0.26)	0.005 (0.21)
$Uncertainty_Forecasting$ $(Uncert_F_{i,t})$	-0.024 ^{***} (-5.13)				
Political Uncertainty (Political_U _{i,t})		-0.030 ^{**} (-2.26)	-0.036 ^{***} (-2.65)	-0.030 ^{**} (-2.31)	-0.030 ^{**} (-2.29)
Stock market Volatility $(Stock_U_{i,t})$		-0.019 [*] (-1.67)	-0.017 (-1.52)	-0.020 [*] (-1.78)	-0.020 [*] (-1.77)
<i>Trade partner's aging</i> (<i>Ne_Ag__{i,t}</i>)			-0.083 [*] (-1.92)		
Trade partner's inequality (Ne_Ie_ _{i,t})_net				-0.035* (-1.67)	
Trade partner's inequality (Ne_Ie_ _{i,t})_market					-0.036 [*] (-1.66)
$Export \\ (Exp_{i,t})$			-0.006 (-1.16)	-0.003 (-0.69)	-0.003 (-0.64)
No.countries/observations Specification tests (p-values)	10/185	9/170	9/170	9/168	9/168
Sargan test	0.082	0.260	0.210	0.154	0.156
First-order	0.000	0.021	0.039	0.026	0.028
Second-order	0.254	0.840	0.897	0.861	0.859

_ _

.

Note: The estimation methodology is one-step system GMM with small sample robust correction. Standard errors are in the parentheses. *, **, and *** indicate significance at the 10, 5, and 1-percent levels, respectively. Dependent variable is the ratio of nominal business investment to GDP.

in the number of firms (employees) in the service sector relative to manufacturing reduces the investment-GDP ratio by 0.74%p and a 10%p increase in people aged older than 64 per 100 working age population (old-age dependency ratio) decreases business investment by 0.68%p. As for the income inequality, investment drops by 0.38%p to a 10%p increase in Gini-net indicator, which is not statistically significant. But when I use the Gini-market indicator that does not consider the public redistribution, the result becomes significant and the magnitude of elasticity is slightly increased. A 10%p up in Gini-market cuts investment by 0.39%p. The role of the lagged investment is highly persistent. This implies that a shock to variables in the equation could have long-run effects on investment in steady state. That is why the relatively small size of estimated coefficients could not moderate the importance of the outcomes.

The result underlines that *the demand side approach is important to boost investment* given that such megatrends as a shift toward service economy, ageing population and increasing inequality have subdued the aggregate demands in long term. It strongly supports the role of inclusiveness in investment policy. As for the transition to the service economy which accounts for investment demand directly, however, the negative coefficient of the variable could mask positive firm dynamics and employment effects in the service sector.

Composition of the Sectoral Shift: the Role of Sector-Dependent Firm Dynamics

Price effects I argue that the shift-to-service driven investment fall is the price-dominant effect during the transition. One of the main contributions of this study is to attempt to quantify the price effects of sector-dependent firm dynamics on investment. Borrowing the idea of export (import) unit value index developed in trade, I generate *a firm unit investment value index* by dividing the total business investment in current local currency by total number of firms in the manufacturing and service sectors. As a benchmark, the study compares these indices for the US and Korea. As in Figure 6, the firm unit investment

value in the service sector is substantially lower than in manufacturing. In the US (2013), the unit value in the service sector takes only 20% of the value in manufacturing, while this ratio is much lower, 11% in Korea (2013). This price channel could reduce business investment during the transition, but it could also make the economy unjustly believe that business dynamics has been suppressed. That is the reason we need to look at the firm dynamics across sectors.



Figure 6. Firm Unit Investment Value Indices: Manufacturing vs Service

Note: normalized to 1 of the simple average firm unit investment value in the manufacturing sector, the points in the figure present the ratio of simple average firm unit investment value in the service sector to that in the manufacturing in Korea and the US for year 2000(the base year for the US), 2006(the base year for Korea) and 2013.

Source: a. Korea: the Bank of Korea (the GFCF in machinery & transportation), Statistics Korea (establishment numbers) b. the US: OECD National Accounts (the GFCF in machinery & transportation), US Census Bureau (Business Dynamics Statistics, establishment numbers), author's calculation.

Quantity effects Figure 7.(A) shows the substantial structural change in the US. Relative to the firm share in manufacturing, the establishment share of each subsector in service relative to manufacturing has substantially increased. Compared to the ratio in 2006 (2000), the relative firm share in educational services grows by 35% (75%) in 2013, that in health care and social assistance by

25% (55%), professional, scientific and technical services and management by 17% (45%). Except for four subsectors including information, all nine subsectors have already taken higher firm share relative to manufacturing's in 2000, while most of subsectors' firm unit investment value is much lower than manufacturing's except for information. The price-dominant effect over quantity is observed during the industrial shift to the service economy. The empirical part of the study confirmed this effect with the estimation result as in Table 3 that an increasing firm (employee) share in the service sector relative to the manufacturing decreases business investment. Korea is a very contrasting case. Compared to the US, the industrial shift toward the service economy has not proceeded much in Korea (see Figure 7.(B)). The ratio of enterprises share across sectors looks almost identical through 2006-2013, although we observe some firm entries in the health care and social assistance, professional service & management and information sectors.²⁰Still, seven out of ten subsectors in service see their firm numbers smaller than manufacturing's. In terms of level, the relative ratios of firm share in service industry subsectors to manufacturing's in Korea is much lower, compared to the US.

Given this price dominant effect during the transition, a fall in investment in number does not necessarily have to discourage the market. Rather, stimulating firm dynamics could be one line of policy recommendation. A rise in firm entry in the service sector is likely to boost business investment through two channels: via an increase in firms' investment demand and in aggregate demand through the quality job creation which would reduce inequality by increasing labor force participation. To make this cycle work, the main challenge facing Korea is to reshape the overall firm distribution in the service sector toward high quality job creation sectors which are mostly high value added sectors.

²⁰ Compared to the records in 2006, the firm share increases relatively to manufacturing by 35% in the health sector, 34 % in professional, scientific and technical services and management in 2013. But in terms of level, the firm share ratio in these sectors in Korea only accounts for about 10% of the US'.

Figure 7. (A) Firm Share and Unit Investment Value Indices by Sector: the US



Note: (rhs) normalized to 1 of the simple average firm unit investment value in the manufacturing sector, the bars in the figure present the ratio of simple average firm unit investment value in the service industry sub sectors to that in manufacturing. (lhs) normalized to 1 of the number of enterprises in the manufacturing sector, the lines in the figure show the ratios of the number of enterprises in the service industry subsectors to that in manufacturing in the US.

Source: OECD National Accounts (the GFCF in machinery & transportation) and US Census Bureau (Business Dynamics Statistics, establishment numbers), author's calculation.

Compared to the US (see Figure A. (A)), the composition of the service sector in Korea is highly skewed to low value added subsectors such as whole sale and retail trade and restaurants (see Figure A. (B)), where business security is substantially sensitive to business cycles and where most of vulnerable selfemployed in the economy concentrate. On the other hand, the high value added subsectors such as information, professional, scientific service & management and finance & insurance sectors have a relatively high employment share per firm, which indicates a small number of firms that are big in size. Removing entry barriers, promoting a new firm-friendly business environment and more competition and providing high skills & education to transform the sector distribution toward high value added would be a priority for creating quality jobs in the service sector.

Figure 7. (B) Firm Share and Unit Investment Value Indices by Sector: Korea



Note: (rhs) normalized to 1 of the simple average firm unit investment value in the manufacturing sector, the bars in the figure present the ratios of simple average firm unit investment value in the service industry subsectors to that in manufacturing. (lhs) normalized to 1 of the number of enterprises in the manufacturing sector, the lines in the figure show the ratios of the number of enterprises in the service industry subsectors in Korea.

Source: the Bank of Korea (the GFCF in machinery & transportation) and Statistics Korea (establishment numbers), author's calculation.

Second, the empirical evidence shows that population ageing and inequality reduce investment. This implies that government fiscal policy could be closely linked to investment policy. This study suggests that, to stimulate the inclusivedemand-investment cycle but to control the public debt in manageable criteria at the same time, government fiscal policies could exploit the relatively high propensity to consume in economic groups. For instance, social transfers to youth and low income households would maximize the effects of public spending in the short-term and during recession periods, while developing business opportunities targeted to the needs of elderly population is a necessary and positive option to cope with the long period of ageing.

Uncertainty and Financing Condition

Similar to the former empirical literatures, financing conditions play a minor

role. The relationship between (short-term) financing conditions and investment is negative in the results but not statistically significant. On the other hand, uncertainty explains business investment behavior substantially well in statistics terms, though the scale of coefficients is relatively small compared to the variables for the structural changes. A 10%p rise in political uncertainty (stock market volatility) decreases business investment by 0.3%p (0.2%p). This study also confirms that managing uncertainty and financial stability is critical to encourage business investment.

2. Open Economy

Trade Partners' Ageing

The columns (3)-(5) report the empirical results for the open economy version of the model by trade channel. The neighboring (spillover) effects variables for the megatrends in the presence of export present statistically significant coefficients. The column (3) shows that a 10%p increase in trade partners' ageing decreases a country's own business investment by 0.83%p, while a 10%p increase in a country's own old-age dependency ratio drops investment by 1.2%p. This implies that when population ageing is a global megatrend, not only ageing in one's own country but also ageing in trade partners affects a country's own business investment by shrinking its domestic and foreign demand. The evidence warns against the reciprocal protectionism in the pool of ageing (aged) countries. Rather, enhancing trade and development cooperation with developing economies would be a win-win policy to diversify a foreign demand risk from ageing.

The main results are similar to those of the closed economy model, with more scaled-up elasticity of investment. A 10%p increase in firm (employee) share in the service sector relative to manufacturing decreases business investment by 1%p and a 10%p rise in Gini-net indicator reduces business investment by 0.85%p. The investment effect of long-term interest rates becomes statistically significant in the open economy framework. A 10%p decrease in long-term government bond yields increases investment by 0.58%p, still relatively smaller in scale compared to demand driving variables but robust. Policy uncertainty still has an explanatory power.²¹

Trade Partners' Inequality

Columns (4) and (5) report that trade partners' income inequality could stifle a country's own investment. A 10 %p increase in trade partners' income inequality (in disposable income base) decreases a country's own business investment by 0.35% p. In the absence of government social intervention, the negative impact of income inequality is slightly increasing, as observed in column (5). Apart from previous specifications, the negative relationship between domestic income inequality and business investment is not robust in the presence of trade partners' inequality. I speculate the role of the US for the result; the US could drive the relationship, the deterioration in its inequality dominating other countries' when averaged out, weighted by economic size for the spillover index. The result implies that countries of small open economy could be more exposed to foreign demand loss in worsening inequality abroad than domestic loss in increasing inequality at home²². A rise in trade partners' income inequality could discourage business investment at home. This empirical outcome supports collective and coordinated efforts toward inclusiveness at the global level to spur global business investment.

²¹ A 10%p increase in the indicator drops investment by 0.36%p.

²² This empirical exercise and the interpretation of the results need to be more tested with different datasets and by modifying the weighting strategy for the megatrend spillover index.

V. Conclusion

This paper investigates empirically the roots of the investment puzzle. As its novel contribution to the recent literature, the empirical model in the paper augmented the uncertainty-finance accelerator investment model with global megatrend variables such as a transition to service economy, population ageing and a rise in income inequality, which I assume have persistently affected the aggregate demands and had a long-term effect on private investment. The empirical analysis of the study confirms that such structural changes play a significant role to account for the fall in business investment from demand side. The study found that the transition to service industry (and population ageing in the open economy version) is a main factor to drive the private investment. A 10% p rise in the number of firms (employees) in the service sector relative to manufacturing drags down the investment-GDP ratio by 0.74%p (1%p) in closed model (open economy). This verifies the dominant price effect over quantity by sector-dependent firm dynamics during the shift, which could not be a simple sign of the recession and still is not necessarily so given the dominant job creation in the service sector. On the contrary, ageing population and an increase in income inequality are substantial warning indicators for private investment. A 10%p increase in old-age dependency ratio decreases business investment by 0.68%p (1.2%p) in closed economy (open), while a 10%p up in Gini-market cuts investment by 0.39%p. In addition, the empirical study presents the significant negative spillover effects of trade partners' ageing and income inequality. A 10%p increase in trade partners' ageing (trade partners' income inequality based on Gini-net) decreases a country's own business investment by 0.83%p (0.35%p). However, I admit that the latter results need to be checked in more elaborate empirical strategies and data for the future research.

The main empirical results strongly support the role of inclusiveness for the investment policy. I argue that a rise in firm entry in service will encourage business investment via an increase in firms' investment demand and by the channel of increasing the aggregate consumption through quality job creation in the service sector, which would reduce inequality through increasing labor force participation. As for Korea, the service sector is a main linkage to make the inclusive-demand-investment cycle work. The challenge facing Korea is to reshape the overall firm distribution in the service sector toward high quality job creation sectors. Removing entry barriers, enhancing a new firm-friendly business environment and more competition and providing high skills training & education would be a priority for generating quality jobs in service sector.

Concerning the negative spillover effects of trade partners' ageing and given how ageing is a global megatrend among advanced economies, reciprocal protectionism among the pool of aged countries would be ineffective. Enhancing trade and development cooperation with developing economies would diversify the foreign and domestic demand risks from ageing. A rise in trade partners' income inequality (in a country's own) could discourage business investment at home. This empirical result sends a strong message to the G20 countries. As agreed at the G20 Hangzhou Summit 2016²³ and the recent G20 finance ministers meeting 2017 in Baden-Baden and Washington D.C.²⁴, developing proper indicators that assess the G20's efforts in inclusiveness with structural reforms and further improving them are expected to stimulate global business investment.

²³ Annexed to G20 Leaders' communique Hangzhou Summit which announced that "Inclusiveness. We will work to ensure that our economic growth serves the needs of everyone,,, generating more quality jobs, addressing inequalities and eradicating poverty,,,"(www.g20chn.org), the G20 Enhanced Structural Reform Agenda, prepared by the G20 Framework Working Group, identified nine areas as structural reform priorities including "promoting inclusive growth". It suggested guiding principles for each priority and indicators as quantitative framework to evaluate and monitor the progress of structural reform efforts at the G20 level. As for the inclusive growth area, the Agenda proposed Shared Prosperity Premium from the World Bank or Gini coefficient from the OECD (www.g20.utoronto.ca).

²⁴ Besides "economic resilience", the G20 finance ministers meetings under the German Presidency underlined "inclusiveness" in the communiques (www.g20.utoronto.ca). The international organizations such as the IMF and the OECD will deliver policy analysis reports to achieve the goal of inclusive growth as preparation for the Leaders' Summit in July 2017 (Press release (April 22, 2017), the Ministry of Strategy and Finance of Korea).

Appendix

Figure A. (A) Firm Share and Unit Employment Indices by Sector: the US



- Note: (rhs) normalized to 1 of the simple average firm unit employment in the manufacturing sector, the bars in the figure present the ratios of simple average firm unit employment in the service industry subsectors to that in the manufacturing. (lhs) normalized to 1 of the number of enterprises in the manufacturing, the lines in the figure show the ratios of the number of enterprises in the service industry subsectors to that in manufacturing.
- Source: OECD National Accounts (the GFCF in machinery & transportation) and US Census Bureau (Business Dynamics Statistics, establishment numbers), author's calculation.





- Note: (rhs) normalized to 1 of the simple average firm unit employment in the manufacturing sector, the bars in the figure present the ratios of simple average firm unit employment in the service industry subsectors to that in manufacturing. (lhs) normalized to 1 of the number of enterprises in the manufacturing sector, the lines in the figure show the ratios of the number of enterprises in the service industry subsectors to that in manufacturing.
- Source: the Bank of Korea (the GFCF in machinery & transportation) and Statistics Korea (establishment numbers and employees), author's calculation.

Table A. 1: Country List*

Australia(AUS), Canada(CAN), France(FRA), Germany(GER), Italy(ITA), Japan(JPN), Korea(KOR), Switzerland(CHE), United Kingdom(GBR), United States(USA)

Table A. 2: Data Source			
Variable	1980-2014	Source	
Dependent Variable			
Business Investment : $(I_{i,t})$	All (1980-2015)	OECD	
the ratio of business investment to GDP			
Explanatory Variables			
Age dependency ratio : $(Ag_{i,t})$ the ratio of older dependents (people older than 64) to the working-age population (aged 15-64)	All (1960-2015)	World Devel- opment Indica- tors	
Income Inequality : (<i>Ie_{i,t}</i>) Gini market (pre-tax, pre-transfer) Gini net (post-tax, post-transfer)	AUS (1967-2014), CAN (1967-2013), FRA (1962-2013), GER (1965-2013), ITA (1968-2013), JPN (1961-2011), KOR (1966-2013), CHE (1980-2013), GBR (1961-2015), USA (1960-2014)	SWIID : F.Solt (2016)	
Shift to service sector : $(SM_{i,t})$ the ratio of employment in service to manufacturing sector	AUS (1966-2013), CAN (1970-2008), FRA (1960-2015), GER (1991-2015), ITA (1960-2015), JPN (1970-2014), KOR (1980-2015), CHE (1991-2015), GBR (1979-2015), USA (1960-2015)	AMECO12	

Megatrend Spillover Effects

The demonstrate of a second second	GDP weighted average of trade part-	Own calculation
I rade partner's aging	ners' old dependency ratio	
$(Ne_Ag_{-i,t})$		

Table A. 2. Continued

Variable	1980-2014	Source
Trade partner's inequality $(Ne_{Ie_{-i,t}})$	GDP weighted average of trade part- ners' Gini coefficients	
Other Control Variables	lagged dependent variable, gdp per capita growth, capital market volatility, economic forecast uncertainty, political uncertainty, short and long term rates, credit volume (M2 ratio to GDP), export	

References

- Alichi, A., K. Kantenga and Juan Solé. 2016. "Income polarization in the United States." IMF Working paper WP/16/121.
- Arellano, M. and Bond, S. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *The Review of Economic Studies*, 58(2), p. 277.
- Arellano, M. and O. Bover. 1995. "Another look at instrumental variables estimation of error-component models." *Journal of Econometrics* 68, pp. 29-51.
- Baker, S., N. Bloom and S. Davis. 2016. Measuring Economic Policy Uncertainty. *The Quarteryly Journal of Economics* 2016, 131(4), pp. 1593-1636.
- Banerjee, R., J. Kearns and M. Lombardi. 2015. "(Why) Is investment weak?" BIS Quartely Review(March).
- Blundell, R., and S. Bond. 1998. "Initial conditions and moment restrictions in dynamic panel-data models." *Journal of Econometrics* 87, pp. 115-143.
- Bussière, M., L. Ferrara and J. Milovich. 2015. "Explaining the recent slump in investment: the role of expected demand and uncertainty." Banque de France Working Paper No. 571.
- Carroll, C. D., J. Slacalek and K. Tokuoka. 2014. "The distribution of wealth and the MPC: Implications of new European data." ECB Working Paper Series, No. 1648.
- Carvalho, L. and Armon Rezai. 2016. "Personal income inequality and aggregate demand." *Cambridge J Econ*, 40(2), pp. 491-505.
- Cho, S. 2007. "The effect of income inequality on household consumption." Korea Review of Applied Economics, Vol. 9, No. 3.
- Clark, J. M. 1917. "Business acceleration and the law of demand: a technical

factor in economic cycles." *Journal of Political Economy*, Vol. 25, No.1, pp. 217-235.

- Eichengreen, B. 2015. "Secular Stagnation: The long view." American Economic Review: Papers & Proceedings 2015, 105(5), pp. 66-70.
- Gallegati, M., Landini S., and Stiglitz J. E. 2016. "The inequality multiplier." Columbia business school research paper No. 16-29.
- Huefner, F. and K. Morkunaite. 2014. "Business investment in the G7: coming out of the doldrums?" Institute of International Finance Research Note.
- Hock, Heinrich and David N. Weil. 2012. "On the dynamics of the age structure, dependency, and consumption." J Popul Econ(2012) 25, pp. 1019-1043.
- International Monetary Fund (IMF). 2015. "Private investment: what's the holdup?" *World Economic Outlook* Chapter 4, pp. 111-43.
- Jeon, S. and Y. Shin. 2009. "Structure of household consumption, conusmption inequality, changes in marginal propencity to consume and policy implications (in Korean)." National Assembly Budget Office.
- Joo, S. 2013. "The effects of labor income share on domestic demand." *Journal of Korean Economic Development*, Vol. 19, No. 2, pp. 151-182.
- Jorgenson, D. W. 1971. "Econometric studies of investment behavior: A survey." Journal of Economic Literature, Vol. 9, No. 4, pp. 1111-1147.
- Jorgenson, D. W. and C. D. Siebert. 1968. "A comparison of alternative theories of corporate investment behavior." *The American Economic Review*, Vol. 58, No.4, pp. 681-712.
- Karabounis, L. and B. Neiman. 2014. "The global decline of the labor share." *The Quartely Journal of Economics* 129(1), pp. 61-103.
- Kwon, Kyooho. 2016. "Increase in life expectancy: macroeconomic impact and policy implications." KDI Feature Article 2016 1st Half, 1-11.
- Leboeuf, M. and B. Fay. 2016. "What is behind the weakness in global investment?" Bank of Canada Staff Disussion Paper 2016-5.
- Lewis, C., N. Pain and J. Strasky. 2014. "Investment gaps after the crisis." OECD Economics Department Working Paper No. 1168.

- Mileva, Elitza. 2008. "The impact of capital flows on domestic investment in transition economies." European Central Bank Working Paper No. 871.
- Organisation for Economic Co-operation and Development (OECD). 2015. "Megatrends, Multilateralism and OECD's future role in a Chaing World." GSG(2015)1, p. 4.
- O'Farrell, R., Ł. Rawdanowicz and K.I. Inaba. 2016. "Monetary policy and inequality." OECD Working paper, ECO/WKP(2016)5
- Solt, Frederick. 2016. "The Standardized World Income Inequality Database." *Social Sciences Quarterly* 97. SWIID Version 5.1, July 2016.
- Stockhammer, E. and Rafael Wildauer. 2016. "Debt-driven growth? Wealth, distribution and demand in OECD countries." *Cambridge Journal of Economics* 2016, 40, pp.1609-1634.
- Summers, Lawrence H. 2014. "U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound." *Busness Economics* 49(2), pp. 65-73.
- Thwaites, G. 2015. "Why are real interst rates so low?: secular stagnation and the relative price of investment goods." Bank of England Staff Working Paper No. 564.
- Unated Nations. 2015. World Population Ageing.
- Weil, David N. 1999. "Population growth, dependency and consumption." American Economic Review, Vol. 89, No. 2, pp. 251-255.
- Yellen, J. L. 2016. Macroeconomic Research After the Crisis: a speech at "The Elusive 'Great' Recovery: Causes and Implications for Future Business Cycle Dynamics." 60th annual economic conference, the Federal Reserve Bank of Boston.

KIEP List of KIEP Working Papers (2013-17. 4)

■2017	17-01	Determinants and Consequences of Corporate Social Re- sponsibility: Evidence from the Revision of the Company Act in India LEE Woong
■2016	16-06	Labor Market Flexibility and FDI: Evidence from OECD Countries CHOI Hyelim
	16-05	International Transmission of U.S. Monetary Policy Surpris- es KIM Kyunghun
	16-04	The Impact of Chinese Economic Structural Changes on Korea's Export to China
		SHIN Kotbee and CHOI Bo-Young
	16-03	A Predictive System for International Trade Growth
		CHON Sora
	16-02	A Short-term Export Forecasting Model using Input- Output Tables PYO Hak K. and OH Soo Hyun
■2015	16-01	Access to Credit and Quality of Education in Vietnam HUR Yoon Sun
	15-03	Estimating Regional Matching Efficiencies in the Indian Labor Market: State-level Panel Data for 1999-2011 LEE Woong
	15-02	The Distribution of Optimal Liquidity for Economic Growth and Stability
		PYO Hak K. and SONG Saerang
■2014	15-01	Income Distribution and Growth under A Synthesis Model of Endogenous and Neoclassical Growth KIM Se-Jik
	14-05	Regional Financial Arrangement in East Asia: Policy Pro- posal for Strengthening the Chiang Mai Initiative Multilat- eralization
		Pravin Krishna, Jiyoung Choi, and Tae-Hoon Lim

	14-04	Labor Market Flexibility and Different Job-Matching Tech- nologies across Regions in India: An Analysis of State- Level Disaggregate Matching Functions Woong Lee
	14-03	Rising Income Inequality and Competition: Evidence Minsoo Han
	14-02	Inequality and Fiscal Policy Effectiveness Ju Hyun Pyun and Dong-Eun Rhee
	14-01	Inequality and Growth: Nonlinear Evidence from Hetero- geneous Panel Data
		Dooyeon Cho, Bo Min Kim, and Dong-Eun Rhee
■2013	13-09	Gains from Trade Liberalization: CUSFTA
		Soohyun Oh and Gihoon Hong
	13-08	Determinants of International Labor Migration to Korea Yoon Ah Oh and Jione Jung
	13-07	European Affiliations or National Interests? Analyses of Voting Patterns on Trade Policy in European Parliament Yoo-Duk Kang
	13-06	The Causal Relationship between Trade and FDI: Implica- tion for India and East Asian Countries Choongjae Cho
	13-05	Nonlinear Effects of Government Debt on Private Con- sumption in OECD Countries
		Dooyeon Cho and Dong-Eun Rhee
	13-04	Anti-DumpingDutyandFirmHeterogeneity:Evidencefrom KoreaSeungrae Lee and JooYeon Sun
	13-03	Regional Borders and Trade in Asia
		Woong Lee and Chankwon Bae
	13-02	Joining Pre-existing Production Networks: An Implication for South-East Asian Economic Integration
	10.01	
	13-01	Measurement and Determinants of Trade in Value Added Nakgyoon Choi

국문요약

글로벌 금융위기 이후 유례없는 장·단기금리 하락에도 불구하고 주요 선진국 들의 민간투자 침체가 장기화되었다. 본 연구는 이와 같이 유동성과 실물투자 사이의 연 결이 약화된 현상을 투자퍼즐로 정의하고, 글로벌 투자부진의 원인을 선진국에서 공 통적으로 관찰되어온 (글로벌) 메가트렌드란 구조적 측면에서 설명한다. 총수요 채널 을 통해 투자부진의 원인을 분석한 기존 투자 가속모형에 투자수요를 결정짓는 총내 수의 설명변수로 서비스 산업으로의 이행, 고령화, 소득불평등을 추가하여 분석했다. 분석결과, 메가트렌드 변수는 민간투자와 뚜렷한 음의 관계가 있음이 발견되었다. 이 들 가운데 서비스 산업으로의 구조변화와 고령화가 민간투자 부진을 주요하게 견인 한 것으로 나타났다. 그러나 서비스산업으로의 이행이 민간투자 부진에 미치는 영향 은 구조변화 시 나타나는 가격지배현상으로, 부정적으로 해석될 필요가 없는 반면, 고령화와 소득불평등의 영향은 민간투자 촉진차원에서 적극적인 정책대응이 요구된 다. 또한 개방경제 모형에서 무역상대국의 고령화와 소득불평등이 자국 민간투자에 미치는 전이효과가 유효하게 나타난바, G20 등 국제협의체 차원의 성공적인 거시정 책공조가 글로벌 민간투자증진에 기여할 것으로 전망한다.

핵심용어: 투자, 메가트렌드, 총수요, G20, 포용성

김수진(金秀珍)

서울대학교 독어교육과 학사 서울대학교 국제대학원 유럽학 석사 Humboldt University of Berlin 경제학 석사 The Graduate Institute, Geneva 국제경제학 박사과정 수료 대외경제정책연구원 G20연구지원단 · 국제거시금융본부 금융팀 (現, E-mail: sujinkim@kiep.go.kr)



Call for Papers for the East Asian **E**conomic **R**eview

With great pleasure, the East Asian Economic Review is welcoming submissions.

NWW.eaerweb.org

• AIMS and SCOPE

The East Asian Economic Review is an economic journal, for the promotion of interdisciplinary research on international economics. Published as a guarterly by the Korea Institute for International Economic Policy, a Korean government-funded economic thinktank, the Journal is global in perspective and covers both theory and

The Journal aims to facilitate greater understanding of all issues pertinent to diverse economies of East Asia through publication of rigorous analyses by renowned experts in the field. The EAER connects policy and theory, providing empirical analyses and practical policy suggestions for the economies in the region.

O TOPICS COVERED

The East Asian Economic Review brings together articles from many different realms of economics at both regional and global levels. Issues relevant to Esat Asia's diverse economy are the major focuses. Specific areas of interest include, but are not limited to:

• Trade and Investment Issues • Economic Integration • APEC ASEAN • ASEM • International Finance • Liberalization of Financial Services and Capital • International Cooperation for Korean

O EAER Abstracting and Indexing Services

The Fast Asian Economic Review is indexed and abstracted in EconLit, e-JEL, JEL on CD, OCLC WorldCat, ProQuest, Google Scholar, ECONIS, EconBiz, EBSCO, British Library and SSRN, Emerging Sources Citation Index (ESCI) and registered to Ulrichsweb, ITS-MARC, CrossRef and Korea Citation Index.

O NOTE FOR AUTHORS

SUBMISSION GUIDELINE:

Refer to our website www.eaerweb.org and Click "Submission" menu at the top of the main page.

SUBMISSION DEADLINE:

The Journal is published every March, June, September and December of each year and submissions are accepted for review on an ongoing basis (No specific deadline).

REVIEW PROCESS:

We have introduced a "fast-track" system, which takes four to five weeks on average from submission to the first round review in order to provide quick and authoritative decisions to the authors. In general, the Journal's manuscript decision process includes submission, editorial decision on whether the paper should be reviewed, peer review, decisions after review, revision, acceptance in principle, final submission and acceptance, proofs.

For further information regarding submission, [30147] 3rd Floor, Building C, Sejong National Research Complex, 370 Sicheong-daero, Sejong-si, Korea. Tel: 82-44-414-1171/1251 FAX: 82-44-414-1044 Email: eaer@kiep.go.kr

O AWARD FOR EAER

The East Asian Economic Review Award is given annually to articles that have made exemplary contributions to advance the public as well as academic understanding of international economics. Every article published in the Journal is given an honorarium of noteworthy articles include KRW 5,000,000 prize and a detailed nomination statement describing how the selected papers have contributed to the knowledge of international economics



Investment puzzle: Deeper roots

KIM Sujin

This paper investigates empirically the roots of the investment puzzle from the global megatrend perspective. The empirical model of this study augmented the uncertainty-finance accelerator investment model with megatrend variables of a transition to service industry, ageing population and a rise in income inequality. The main estimation results show that they have affected negatively the business investment over the period 1980-2014. The shift-to-service driven investment fall is the price-dominant effect during the transition, which is not necessarily pessimistic news, while the suppressing effects from ageing and a rise in income inequality require adequate policy reactions. In addition, the analysis finds significant negative spillover effects of trade partners' ageing and income inequality on a country's own private investment. Based on the empirical results, the G20's efforts in inclusiveness with structural reforms are expected to stimulate global business investment.



ISBN 978-89-322-4268-2 978-89-322-4026-8(set)

Building C, Sejong National Research Complex, 370, Sicheong-daero, Sejong-si, Korea Tel. 82-44-414-1251 Fax. 82-44-414-1144 www.kieo.go.kr

Korea Institute for International Economic Policy

Price USD 3