Democratic Consolidation, Unionization, and Growth-Enhancing Structural Change: Evidence from South Korea and Taiwan*

Nam Seok Kim†

November 29, 2022

Abstract

Re-allocation of labor from less productive sectors to more productive sectors is essential for economic growth. Since only some developing countries achieve productive labor re-allocation, it is important to address its determinants. This paper focuses on the role of unionization in structural change in South Korea and Taiwan whose unionization proceeded rapidly after democratization. I provide detailed dynamics by constructing an index for the degree of unionization for each sector in each region of these two East Asian democracies. The magnitude of growth-enhancing structural change was lower when a sector in a region had a higher degree of unionization. In other words, if a sector had higher labor unionization, the size of the increase in its employment share from the productivity premium was lower. These findings suggest that the institutional properties represented by unionization can affect the dynamics and growth implications of structural change.

Keywords: structural change, productivity, growth, labor union, democratization, democratic consolidation, South Korea, Taiwan
JEL Codes: D72, J5, O4

*I am extremely grateful to Devashish Mitra, Badi Baltagi, Leyla Karakas, Abdulaziz Shifa, and Gary Engelhardt for their very helpful comments and suggestions. I have also benefited from constructive comments by Eli Berman, Kristy Buzard, Almas Heshmati, Priyaranjan Jha, Mary Lovely, Ryan Monarch, and Peter Morrow. Seminar participants at Cornell 100 Years of Economic Development, Jönköping University, KIEP, Corvinus University of Budapest, KLI, and KDI allowed me to improve this paper. All errors are my own. The standard disclaimer applies.

†Korea Institute for International Economic Policy (KIEP) and Global Labor Organization (GLO). Email: nskim@kiep.go.kr or namseok19kim@gmail.com

1 Introduction

A fundamental challenge in achieving rapid and sustained economic growth is ensuring that labor flows rapidly from sectors with lower productivity levels to sectors with higher productivity levels. Rodrik et al. (2017) termed this challenge a 'structural transformation challenge'. Some countries succeeded in overcoming this challenge during their development period. However, many other countries were not successful in attaining productive re-allocation of labor. Understanding what decides the success and the failure in handling this challenge is very important because it can explain the cross-country heterogeneity. This paper suggests that labor unionization is related to the speed and magnitude of productive labor re-allocation.

Labor unions' increased bargaining powers affect the rigidity of the labor market through multiple channels, including wage levels, wage dispersion, and employment levels. As section 2 discusses, there have been ample theoretical elaborations and empirical clarifications which support the relationship between unionization and labor market outcomes. However, despite its significance, unionization has received limited attention in existing empirical literature on structural change. Among many possible reasons for this, two main difficulties have been preventing economists from studying this aspect. First, for most countries, information on sector-specific rigidity, such as sector-level union density or collective bargaining coverage, is often not available. Second, most measures are from recent periods for fully developed countries, and they have limited variation in union density and collective bargaining coverage across different periods and sectors.

This paper overcomes these empirical difficulties by quantifying the degree of unionization for each sector in each region of two East Asian new democracies. I focus on the Republic of Korea (South Korea) and the Republic of China (Taiwan), whose democratization was followed by a significant increase in the labor's bargaining power. In particular, labor unions had both quantitative and qualitative growth in the two countries during the democratic consolidation process. Labor unions have gradually attained more bargaining power in rep-

resenting workers since the political democratization in the two nations. In addition to time-series variations in unionization, there were also both sectoral and geographical variations in the degree of unionization during the democratic consolidation process. These variations in unionization in multiple dimensions allow me to identify the marginal effect of unionization clearly. To exploit this variation in labor rigidity and bargaining power, I construct sector- and region-specific indices for the degree of unionization in both countries. I use the variations in these indices to empirically examine the dynamics of structural change by following the analytic framework suggested by McMillan and Rodrik (2011) and Rodrik et al. (2017). If a sector with higher productivity attracted a greater employment share, then we can say that the economy went through growth-enhancing structural change. On the other hand, if a sector with lower productivity attracted a greater employment share, it can be termed growth-reducing structural change. This paper finds that labor rigidity, represented by the degree of unionization, explains the heterogeneous magnitude of growth-enhancing structural change.

This paper specifically considers 7 sectors in 17 regions of South Korea and 10 sectors in 25 regions of Taiwan. The analysis covers all geographic provinces of South Korea and Taiwan. Data for South Korea starts in 1989, while that for Taiwan starts in 1992, both immediately after democratization in the two countries. The sample for South Korea ends in 2019, and that for Taiwan ends in 2018. Government reports used for constructing this paper's unionization index are published by the Ministry of Employment and Labor of South Korea and the Ministry of Labor of Taiwan. For Taiwan, the regional distribution of labor union members is tracked by every local government. Sectoral value-added and employment in each region are used for measuring productivity, which varies across both sectors and regions, where productivity is defined by the real value-added per worker. Both countries' official national accounts and sectoral surveys are primary sources of data on value-added and employment in this paper. As Taiwan's official statistics are not announced annually, I interpolate annual variation using the Economic Transformation Database (De Vries et al.

2021) constructed by the University of Groningen.

Using the geographically disaggregated sectoral data from two East Asian new democracies, this paper tests two key hypotheses. First, I test whether South Korea and Taiwan went through growth-enhancing structural change. McMillan and Rodrik (2011) and Rodrik et al. (2017) suggest some stylized facts on country-specific experiences related to growth-enhancing and growth-reducing structural change. However, while they provide an overall conceptual framework and present aggregated trends using cross-country data, they do not fully explore the dynamic nature and path dependence of structural change. Therefore, to provide much more robust empirical findings, this paper uses geographically disaggregated sectoral data and implements dynamic panel data estimation in testing this first key hypothesis. The second key hypothesis is whether the degree of unionization explains the heterogeneous magnitude and speed of structural change. This is a novel contribution of this paper. By using dynamic panel data estimators, I estimate that the magnitude of growth-enhancing structural change vary with different degrees of unionization.

I find that both South Korea and Taiwan experienced growth-enhancing structural change during the sample period. In other words, a sector with higher productivity attracted more labor share in both nations. This finding from the first hypothesis is consistent with the stylized facts about the economic growth of South Korea and Taiwan suggested by Rodrik et al. (2017). Efficient re-allocation of labor allowed South Korea and Taiwan to sustain rapid economic growth till recently. However, the size of growth-enhancing structural change was smaller for sectors with higher unionization. In other words, the increase in the employment share coming from the productivity premium became smaller if a sector in a region encountered higher bargaining powers of labor. Higher labor rigidity due to stronger bargaining powers of labor decelerated the growth-enhancing structural change in South Korea and Taiwan. According to these findings of the second hypothesis, the institutional characteristics of the labor market represented by the degree of unionization can affect the speed and magnitude of a productive re-allocation of labor.

One of the main implications of these findings is that, after a fundamental regime change in the bargaining power of labor attained by democratization, the two countries no longer enjoyed quick and immediate labor re-allocation as per productivity. Given that their authoritarian regimes tried to maintain the high flexibility of labor market till democratization, my findings suggest that the lower rigidity of labor can be recognized as one of the critical determinants of rapid economic growth during authoritarian periods in the two countries. In addition, because quick labor re-allocations according to the growth-enhancing structural change became slower after democratization, it was natural for these new democracies to focus more on within-sector growth rather than structural growth. This transition to the more significant share of within-sector growth is supported by productivity growth decomposition using the sample from South Korea and Taiwan.

The rest of the paper is organized as follows. The next section discusses related literature. It clarifies the relationship between unionization and labor rigidity by providing vital mechanisms for interpreting the empirical findings. Section 3 introduces the background of the labor unions and labor movements in South Korea and Taiwan. It focuses on how labor unions evolved along with the democratic transition in these two countries. Section 4 and 5 introduce my data and econometric specification, respectively. Then I interpret my estimation results and robustness checks in section 6 and 7. This paper concludes after I extend the analysis to labor productivity growth decomposition in section 8.

2 Related Literature

This paper studies structural change as a change in employment share across different sectors in an economy. The conceptual framework of structural change analysis and its implications for economic growth are suggested in McMillan and Rodrik (2011), McMillan et al. (2014), Rodrik et al. (2017), and Diao et al. (2019). A structural change is defined as a growth-enhancing structural change if the relative productivity of a sector is positively correlated

with a change its employment share, that is, if a sector with higher productivity attracts a bigger employment share, then an economy goes through a growth-enhancing structural change. Symmetrically, a structural change is defined as growth-reducing structural change if the relative productivity of a sector is negatively correlated with the change in its employment share. Based on this definition, McMillan and Rodrik (2011) and Rodrik et al. (2017) classified country-specific cases.[1] If a growth-enhancing structural change happened during economic growth, it meant that the labor force re-allocation was consistent with the sectoral distribution of productivity. By having a larger employment share, a sector with more productivity was able to accelerate its expansion to contribute more to the national economic growth.

De Vries et al. (2015) applied this framework of structural change on cross-country evidence from African nations. Ahsan and Mitra (2017) studied determinants of sectoral change in employment share in Indian states. Mcaig and Pavcnik (2017) and Firpo and Pieri (2017) discuss the overall trends in structural change and their growth implication in Vietnam and Brazil, respectively. Mueller et al. (2019) and Atta-Ankomah and Osei (2021) focus on evidence from Ghana. Relatively, there has not been any exclusive focus on East Asian countries in literature. Also, stylized facts on countries in different continents are largely based on highly aggregated and limited information. My detailed analysis with disaggregated panel data from South Korea and Taiwan provides a further dimension for understanding this aspect. [2]

Diao et al. (2019) developed a simple two-sector general equilibrium model to explain differences in the growth implications of structural change between African and Asian nations. Martinez-Bravo and Wantchekon (2021) conducted a comprehensive literature review on

[1]They focused on the growth-enhancing structural change in Hong Kong, Thailand, and India. The works also discussed the growth-reducing structural changes in Argentina, Brazil, Nigeria, and Zambia.

[2]McMillan and Rodrik (2011) found that, in South Korea and Singapore, the structural changes were not growth-enhancing during 1990 - 2005. However, they suggest that the very rapid 'within' productivity growth was big enough to offset the negative role of structural change in making economic growth. My geographically decomposed analysis of data on labor unionization suggests one of the possible mechanisms behind this. This is discussed in detail in Section 8.

the relationship between structural changes and political institutions. Martinez-Bravo and Wantchekon (2021) emphasized why institutional distortions can explain the misallocation of resources and consequent differences in sectoral productivity, which is the main driving force of structural changes. My analysis makes a relevant contribution by articulating the role of labor unionization in explaining the direction and magnitude of structural change.

Unionization affects wage levels, changes in employment, and wage dispersions. Consequent labor market outcomes due to unionization can determine the acceleration or deceleration of structural changes. Seminal theoretical predictions are made in literature on the collective bargaining of labor unions. Nickell and Andrews (1983) considered a labor union that represents all workers in the labor pool. Nickell and Andrews (1983) suggest a contract curve whose wage is an increasing function of bargaining powers of labor while the employment level decreases when bargaining powers increase. McDonald and Solow (1981) derived equilibrium where wage and employment are decided simultaneously. Booth (1995a) expanded the discussion towards a broader contract, which includes wage and unemployment benefits. Both McDonald and Solow (1981) and Booth (1995a) predict that the wages will be increased whenever the labor's bargaining power is strengthened. McDonald and Solow (1981) clarified that employment levels increase when the unions' bargaining powers increase, while Booth (1995a) expected that the employment level is not affected by the bargaining powers of the labor unions. The insider-outsider approach relaxes the assumption on labor unions' representation so that it can accommodate more realistic circumstances. As unemployed workers are usually excluded from the bargaining process, it assumes that the unions only represent the utility of employed workers. Building on this assumption, Lindbeck and Snower (1988) consider bargaining whose contract includes the wages of union members (insiders) and the wages of future entrants (outsiders).[3]

[3]The insider-outsider approach also accommodates the case when the median voter in a democratic union is a worker with relatively high seniority. Senior workers' preference is likely to be different from that of newly hired workers with less seniority, especially in terms of attitudes towards additional hiring. Newly hired workers can actually be regarded as outsiders when the union's median voter has considerable seniority. Therefore, the interests of newly hired workers will not be reflected in the negotiated contract. Lindbeck and Snower (2001) provide a broader survey on this.

Along with this theoretical elaboration of the effect of unionization on wages and employment, empirical approaches have also discussed stylized facts. A large group of empirical studies support the wage premium of unionized workers predicted by theoretical literature.[4] Recent developments in the regression discontinuity allowed DiNardo and Lee (2004), Sojourner et al. (2012), and Freandsen (2012) to quantify the causal impact of unionization. Even though narrowly elected labor unions do not always have a significant impact on wages according to the regression discontinuity analysis, stronger unions with broader support have an explicit impact on wages. Explicit impact on wages means that when workers are more unionized, firms encounter a higher barrier in hiring more workers because of the existence of the union wage premium. In addition, firms are no longer free to discriminate against workers by suggesting different levels of wages. Consequently, immediate expansion in hiring coming from higher business profitability is less likely to happen when the bargaining power of the labor unions improves with higher unionization.

Like theories expected mixed directions of the change in employment levels after unionization, empirical evidence also provides a mixed impact of unionization on employment. The negative relationship between unionization and employment has been identified in Brown and Ashenfelter (1986), Card (1986, 1990), Abowd and Kramarz (1993), Kahn (2000), Sojourner et al. (2012), and Frandsen (2012). However, a positive relationship between unionization and employment level is found by Abowd (1989) and Maloney (1994).[5] Along with these empirical findings on wage and employment levels, a notable pattern is that the wage variance in a sector decreases when the sector has higher unionization. This is often interpreted as reduced wage inequalities because of unionization. Freeman and Medoff (1984), Blau and Kahn (1999), and Frandsen (2012) all identified that unions compressed the wage distribu-

[4]According to Lewis (1963, 1986), Card (1996), Hirsch (2004), and Sojourner et al. (2012) unionized workers enjoy statistically significant wage premium in the United States. Booth (1995b) identified union wage premium in the United Kingdom. Dell'Aringa and Lucifora (1994) and Lemieux (1998) found a positive impact of unionization on wages in Italy and Canada, respectively. Blanchflower and Freeman (1992) and Blanchflower and Bryson (2003) studied cross-country evidence of union wage premium. Blanchflower and Bryson (2003) found that the union wage premium was around 12 percent on average in 17 countries.

[5]Nickell and Wadhwani (1990), Boal and Pencavel (1994), and DiNardo and Lee (2004) did not find any systematic patterns between unionization and employment levels.

tion in the United States. Rowthorn (1992), Blau and Kahn (1996), and Kahn (1998, 2000) found that wage inequalities were negatively correlated to the labor union density using cross-country data from OECD countries.

The concept of the 'development state' (or the developmental state) has been widely used in explaining the economic success of two East Asian countries during the late 20th century. A development state is a regime that could sacrifice many aspects to guarantee economic growth. Political freedom or civil society were sacrificed for economic development in these two East Asian countries. In addition, sacrificing a specific sector in terms of resource allocations was also done to boost another sector. The manufacturing sector enjoyed abundant resources, including both labor and capital, because the key mechanism in the two nations' growth strategies was promoting exports in the manufacturing sector (Wade, 1990 and Haggard, 1990). The manufacturing sector got the most attention from authoritarian politicians in both South Korea and Taiwan. Thanks to rapid economic growth due to successful implementation of this development strategy, authoritarian politicians were able to justify their rules for decades.[6] In addition to the political economy approach, macroeconomists also contributed to an understanding of country-specific cases in East Asia. Lucas (1988, 1993) emphasized the importance of human capital accumulation through learning by doing. The channel of learning by doing was highly correlated with industrial policies of South Korea and Taiwan. At the beginning of their industrialization, if it were not for the government's interventions, the manufacturing sector would not have been able to attract enough economic factors of production. Even though workers in the manufacturing sector were not productive enough initially, learning by doing which became feasible due to government interventions,

[6]Amsden (1989) and Woo and Woo-Cummings (1991) elaborate on the experience from South Korea. Woo and Woo-Cummings (1991) revisited the role of financial interventions by the Korean government that allowed the manufacturing sector to get a stable capital allocation. Wade (1990) provides a Taiwan-specific understanding which focuses on the synergy between public administration and the market. Even though it is hard to classify the Japanese government during its rapid economic growth as an authoritarian regime, Japan's experience is also similar to the experience of its neighbors. Johnson (1982) suggests that Japanese economic growth can be largely explained by Japan's efficient utilization of the Ministry of International Trade and Industry (MITI). MITI had a strong influence on the financial sector to mandate resource allocation according to the country's industrial policy.

improved their productivity.[7] Feenstra et al. (1999) tested endogenous growth in South Korea and Taiwan. The authors support endogenous growth mainly in secondary industries while endogenous growth is weakly identified in primary industries.

The overall relationship between institutional properties and the economic outcome has been widely studied by both theoretical approaches and empirical approaches. Among them, the role of democracy (or democratization) on economic outcomes became a testable topic since the methodological developments on longitudinal panel data. Barro (1996, 1997), and Tavares and Wacziarg (2001) pointed out the possible negative relationship between democracy and economic growth. Recent empirical findings are more accumulated on the positive relationship between democracy and economic development. Preworski and Limongi (1997), Rodrik and Wacziarg (2005), Persson and Tabellini (2007), Papaioannou and Siourounis (2008), and Acemoglu et al. (2019) focused on economic growth as the left-hand-side variable.[8] They all estimated the positive relationship between the two, which can be considered empirical support to Lipset (1960)'s discussion on modernization theory.

However, these findings in the previous paragraph should be understood as an overall static pattern across different continents and different periods, which can be dissimilar to the country-specific dynamic trend. The concept of democratization in existing cross-country panel data findings does not successfully imply the dynamics of democracy. In new democracies, even though democratization is attained, it takes several decades or more for them to make a democracy consolidated. For example, in the case of labor representation which this paper focuses on, the legalization of democratic labor union confederation was attained 12 years after the democratization in South Korea, and it was 9 years after the democratization in Taiwan. [9]. Therefore, when and how the democratic political process is consolidated after

[7]Both countries had a fragile foundation for manufacturing after their independence. Therefore, considerable reliance on the agricultural sector was an underlying feature till they started industrialization. Even though it was evident that the two countries' comparative advantages did not lie in the manufacturing sector, their governments decided to specialize in manufacturing to attain comparative advantage in manufacturing within a few decades.

[8]Acemoglu et al. (2019) go further to the causal relationship by implementing both dynamic panel estimation and causal inference.

[9]In line with this, Samuel Huntington's democratic consolidation criteria point out the second power

democratization needs to be considered if an economist wants to do a detailed analysis of the impact of democratization. Some new democracies consolidate democratic institutions sooner while others do not.[10] This paper incorporates this aspect by considering the dynamic process of structural change after democratization. Because the development of labor unions was one of the important aspects of the democratic consolidation in South Korea and Taiwan, identifying how unionization is related to sectoral re-allocation provides some implications which have not been discussed in detail yet.

3 Democratization and Labor Unions in South Korea and Taiwan

In this section, I add the country-specific surroundings of labor unions in South Korea and Taiwan. By doing so, I elaborate that the increased bargaining power of labor unions after the democratization can be interpreted as increased rigidity of labor in two countries. Along with the two countries' institutional backgrounds, detailed descriptive statistics such as labor union density and labor-management dispute cases will be suggested. Most importantly, how the power of labor unions evolved during the democratic consolidation process provides the key motivation for this paper.

Two countries went through democratization after they started rapid economic growth. The average annual real gross domestic product (GDP) growth rate in the 1970s of South Korea is 10.3 percent. During the same period, Taiwan's average annual real GDP growth rate was 10.8 percent.[11] If we consider the first direct and democratic election for the

shift as the critical point of democratic consolidation because new democracies gradually make progress towards well-functioning democracy throughout at least several decades. It is often called the two-turn-over test for democratic consolidation (Huntington (1991)). Preworski (1991) defined that a democratic system is consolidated when the democratic political process is considered as the unique, accessible process for taking political power.

[10]It is also true that we can see some reversals of new democracies towards the non-democratic regime. Acemoglu et al. (2019)'s dichotomous democracy measure contains both democratization and its reversal.

[11]Source : Penn World Table, RGDPNA.

presidency (or general election in the parliamentary government system) as the critical point of democratization, South Korea was democratized in 1987, and Taiwan was democratized in 1996. But many researchers consider earlier years (mostly 1991 or 1994) as Taiwan's critical point of democratization. This is mainly because Taiwan's transition towards a democratic political system was relatively gradual compared to the case of South Korea. The oppressive political system managed by authoritarian regimes became no longer sustainable in the 1980s for both countries with accumulated wealth and human capital. [12]

Protests toward labor rights and the labor movement provided the main impetus throughout the democratization and its consolidation in both countries. Labor unions were under the direct control of the government during the authoritarian regimes in South Korea and Taiwan. There were many trials to establish autonomous and non-authoritarian labor union confederations during the rule of dictators. However, it was not attained until democratization. Even after the democratization, the most prominent representative and autonomous labor union confederations were not legalized during the earlier years of democratic governments. The legalization of those confederations is finally accomplished in 1999 in South Korea and in 2000 in Taiwan, and these years are critical years for the liberalization of the labor movement in two countries.

Even though the two nations share many similarities in institutional backgrounds and economic reforms, differences in the role of labor unions in the labor market of each country should be considered carefully. In addition, labor unions acted differently in the process of democratization movements. During the authoritarian regime, the labor movement in South Korea was much more militant and radical than that of Taiwan. This is linked to the fact that the dictatorial regime of Taiwan was much more responsive and strategically sophisticated so that the ruling power could control the demand of citizens flexibly. Dictators in South Korea kept oppressive attitudes towards democratization camps and labor unions during most of their authoritarian periods. The below subsections elaborate on the link

[12] Among recent reviews on East Asian democratization, Yap (2011) and Slater and Wong (2013) provide a comprehensive comparison between the South Korean case and the Taiwanese case.

between democratic transition and the labor union movement in the two East Asian new democracies.

3.1 Labor Union and its Development in South Korea

During the South Korean authoritarian period until 1987, there was only one representative and comprehensive federation of labor unions in the nation. Federation of Korean Trade Unions (KFTU) was the unique labor union confederation that was legally identified by the South Korean authoritarian regime. Even though it served as the channel between employees and employers in Korea during that period, it is evidently true that the KFTU can be understood as a government-organized labor union confederation. Therefore, during this authoritarian period, the labor movements through KFTU were considerably far from those in fully democratized nations. It was natural for many activists and motivated workers to request an independent labor union confederation which is supposed to be free from authoritarian regime's control. Even though the labor movement outside of the KFTU channel is regarded as illegal activity, efforts towards independent labor union confederation were broadly supported by many citizens and workers. These efforts towards an independent and democratic union federation are often called as 'Democratic Union Movement', and it was finally institutionalized in 1988 after the political democratization is attained[13].

The newly-organized democratic confederation of the labor union, the Korean Confederation of Trade Unions (KCTU), was first organized in 1988 as a representative confederation of democratic labor unions[14]. KCTU became the new center for radical and progressive labor movements even though it was not legally accepted when it was first organized. KCTU was recognized by the labor union law in 1999, and it gained equal status with KFTU. After the political democratization had been attained, KFTU also went through considerable change and reforms in their movement and transparency. Even though it is still true that KFTU

[13]South Korea joined the International Labour Organization (ILO) in 1991.

[14]It started from a different name (National Committee for Camps in Labor Union Movement) in 1988 and changed its name in 1990 (National Committee for Labor Union Movement). The current name, KCTU, became the official name in 1995, and it is used until current days.

was not that radical compared to KCTU, KFTU became democratic and independent from government pressure by the time its counterpart, KCTU, was consolidated. In 2019, KFTU accounted for 40 percent of labor union members in South Korea, while KCTU had 41 percent of labor union members.

The legitimation of KCTU allowed the progressive labor movement in South Korea to be liberalized and protected by law since 1999. Official statistics on labor-management dispute cases reflect that the legalization had considerable impacts on workers' claims toward employers. The 3-year annual average of labor-management dispute cases right before the legalization of KCTU (1996 - 1998) is 97. However, the 3-year annual average of labor-management dispute cases right after the legalization (1999 - 2001) is 227. Employees had to take the risk of joining illegal confederations for progressive movements before the legalization. Incorporating KCTU in the legal system removed the risk, and employees began actively pursuing basic and fundamental rights as workers in 1999.

As KFTU used to be under the direct and indirect control of authoritarian power until democratization, KCTU served as the center of the radical and active labor movement. However, as it was not legalized until 1999, it was not easy for KCTU to attract motivated members and pursue popular agenda. As soon as it is officially recognized by the labor union law of South Korea, thanks to KCTU's updated legal status, many members became able to join its movement without fear of getting scrutinized by law enforcement. It became easier for KCTU to attract more members and organize bigger movements since its legalization.

3.2 Labor Union and its Development in Taiwan

Similar to the case of South Korea, in Taiwan, only one umbrella confederation of labor unions monopolized legal status during the authoritarian regime. The Chinese Federation of Labor (CFL) served as the unique legitimate confederation which aggregates county-level (or city-level) federation of unions. Even though the CFL did not have a direct impact on industrial and occupational unions within a county-level federation of unions (Huang

(2002)), regional-level federations had very close ties to the ruling party (Kuo Min Tang, KMT) during the authoritarian regime.[15] Therefore, the formation and legalization of a new autonomous labor union confederation was the main goal of labor movement activists during this period. One of the main strategies of this 'new labor confederation movement' which turned out to be efficient in Taiwan, was having a close connection with politicians of opposing parties (Democratic Progressive Party (DPP), for example). This enabled them to be active in regions where DPP had broader support than KMT. And also, this made the main politicians of the DPP, such as Shui-bian Chen, promise the legalization of a new independent and legal labor union confederation. Shui-bian Chen finally became the winner of the presidential election after the democratization in 2000 and implemented the new trade union law in 2000.

Following the new trade union law, since 2000, there have been three labor union umbrella confederations. Along with CFL, there are the Taiwan Confederation of Trade Unions (TCTU) and the National Federation of Labor (NFL). TCTU was established in 1999, and it explicitly opposed the former trade union law. Compared to CFL's close tie to the former authoritarian party KMT, TCTU has a close tie to DPP. The new trade union law recognized this autonomous and independent confederation that was free from KMT's rule in 2000. The NFL was also organized in 2000. CFL's pro-KMT activists left CFL after they lost power in CFL and then organized NFL. Based on these dynamics and the evolution of Taiwanese labor confederations, we can say that Taiwanese labor unions after 2000 can do a lot more than those before 2000. The 3-year annual average of labor-management dispute cases right before the legalization of TCTU (1997 - 1999) is 4214. However, the 3-year annual average of labor-management dispute cases right after the legalization (2000 - 2002) is 10999. The more active and liberal labor movement has become available since 2000 because members of TCTU were no longer under legal constraints after its legalization.

[15]Elected union officials usually belonged to occupational unions whose leaders tended to be members of (or have close ties with) the KMT. See Huang (2002) for more details.

3.3 Variation in the Unionization

Even though Taiwan was able to attain democratization a little bit later than South Korea, the two countries share almost the same year (1999 and 2000 for South Korea and Taiwan, respectively) as the critical point of labor union liberalization. Since the rapid economic growth of the two countries, Taiwan has been keeping a considerably higher union density rate than South Korea. For example, in 1990, which is near the beginning point of my sample of baseline analysis, South Korea's overall labor union density rate was 17.4 percent, while that of Taiwan was 43.3 percent. In 2000 and 2015, South Korean density rates were 11.4 percent and 10 percent, respectively, which are still similar to that of 1990. South Korean labor union density steeply increased right after the democratization in 1987, but it decreased again during the economic reform caused by its economic crisis in 1997. On the other hand, the Taiwanese overall labor union density rate in 2000 was 38.5 percent, and it was 33.4 in 2015. Even though Taiwan's labor union density also decreased considerably after 1990, the gap between those two countries remained relatively constant until recent years.

Even though the density rate may indicate that Taiwan has been managing more motivated and active labor unions compared to South Korea, we cannot directly compare the labor union density between these two countries. Even with Taiwan's higher aggregate labor union density rate, it is well known that the labor union movements in South Korea have been very militant and well-organized compared to those in Taiwan. Since the early 1980s, the Taiwanese government significantly relaxed the process of licensing newly established occupational unions. And many Taiwanese citizens, working or not, joined an occupational union to acquire health insurance because unions acted as the main platform for health insurance. For these reasons, the comparatively higher density rate of Taiwan may not be the best measure for cross-country comparisons. Researchers cannot be assured to say that the labor movement of Taiwan has stronger organizational power than other democracies based on a higher density rate. This is the main reason for my separate estimations for the Korean

sample and Taiwanese sample. Implementing two samples together in a single estimation will contain the systematic differences in unionization rate between the two countries, leading researchers to get misleading variation.

However, within a nation, variation in the labor union density does represent heterogeneity in unionization. There are two sources of heterogeneous unionization in South Korea and Taiwan. First, spatial heterogeneity exists across different provinces and regions in both countries. In South Korea, labor movements have been keeping close ties with left-wing political parties. Regions with broader support towards left-wing parties have been making systematically higher participation in labor unions. Given the fact that South Korea has deep-rooted regionalism in politics, labor unions in left-wing dominant regions accumulated their organizational foundation even since the authoritarian regimes. Similarly, in Taiwan, regions with more left-wing support had higher participation in labor movements and consequent higher union density. Southern regions centered by the Kaohsiung area started to be the hub of left-wing activities in the late 1970s. It was natural for activists to gather together in the southern area and work together under the goal of the democratic labor union confederation. The southern area's broader support towards the anti-authoritarian party, DPP, helped the labor movement thrive faster in the region than in other parts of the nation. Second, sectoral heterogeneity is explicit within each country. Different sectors have different circumstances for the labor movement. Especially in the formation of the labor union, some sectors have more favorable conditions while others do not. Sectors whose workers work together within an indoor workplace, such as the manufacturing sector, are likely to have a faster and broader formation of unions. As both countries experienced a rapid expansion of the economy through the manufacturing giant firms with huge production complexes, manufacturing sectors led the unionization. On the other hand, the agricultural and service sectors have a systematically lower density rate than the manufacturing sectors. My unionization index successfully catches these natures of heterogeneity, and they will be introduced in the section for the data.

4 Data

This section describes data sources and variables that I use in the empirical analysis. The first subsection describes how I construct the index for the degree of unionization, which varies across different regions and sectors. The second subsection includes information on the spatial and sectoral distribution of workers. Value-added data for deriving productivity is also handled in the second subsection. The third subsection discusses descriptive statistics.

4.1 Degree of Unionization

The degree of unionization is one of the key variables which allows this paper to study the consequence of democratic consolidation in labor institutions. Throughout the empirical analysis of this paper, the degree of unionization explains the structural change measured by the change in employment share. The best measure without any measurement error can be constructed by the population list of every labor union in a nation with its magnitude, location, and sectoral affiliation. However, most developed countries are not sharing the population list mainly due to the related privacy laws. Instead, South Korea and Taiwan are providing an annual report with sector-level aggregates of labor unions (both number of members and number of unions). Yearly reports of South Korea further contain the geographical distribution of the number of labor union members. In the case of Taiwan, local governments share their total number of unions and members so that I can construct the geographical distribution of labor union members. The publisher of this annual report is the Ministry of Employment and Labor in South Korea. For Taiwan, the Ministry of Labor and each local government provide related information.

Using the above publicly available information, I consider the degree of unionization, $Unionize_{ijt}$, for each industry i in the region j in year t as below.

$$Unionize_{ijt} = \left\{ \frac{L^u_{jt}}{L^u_t} \times L^u_{it} \right\} \Big/ L_{ijt} \tag{1}$$

where L^u stands for the number of members in the labor union. L^u_{jt}/L^u_t quantifies the region j's share of labor union members among the total number of labor union members in year t. L^u_{it} is the sectoral level of labor union members. It is aggregated based on the number of members in industrial labor union confederations of South Korea and Taiwan. Industrial labor union confederations are umbrella confederations according to each industry which is more disaggregated than the concept of the sector. For example, there are confederations for the textile industry and car production industry which will be classified as the manufacturing sector. By multiplying L^u_{jt}/L^u_t and L^u_{it} each other, $Unionize_{ijt}$ can reflect both sector-level variation and geographical variation of the degree of unionization. Dividing by L_{ijt}, the total number of employees in each sector of the region in year t, leads us to get $Unionize_{ijt}$ which is a normalized proxy for the degree of unionization.

The $Unionize_{ijt}$ in equation (1) can be also understood as the penetration or permeation of the industrial labor union in region j. In $Unionize_{ijt}$, the aggregated sector-level distribution of union members (L^u_{it}) is distributed according to the region j's share of labor union members (L^u_{jt}/L^u_t). This means that, in constructing $Unionize_{ijt}$, I'm not making further adjustments based on region j's industrial structure. The national industrial structure reflected in the L^u_{it} is equally distributed based on the region j's share of labor union members in my index for the degree of unionization.

While it will not be exactly equal to the labor union density of each sector in each region[16], $Unionize_{ijt}$ successfully measures the within-country variation in the degree of unionization due to following reason. Note that the L^u_{it} is the sector-level aggregates of industrial labor union members, as I clarified in the previous paragraph. Industrial labor unions are forms of labor unions organized within an industrial affiliation so that their members can react efficiently to the industry-specific labor conflicts. Therefore, the quantitative and qualitative growth of industrial labor unions will be a positive shock to the welfare of every worker in the specific industry throughout all regions of a nation. Weighting L^u_{it} with the overall regional

[16]Under the assumption of $(L^u_{jt}/L^u_t) = (L^u_{ijt}/L^u_{it})$, equation (1) will be exactly equal to the actual labor union density (L^u_{ijt}/L_{ijt}).

unionization (L^u_{jt}/L^u_t) will be able to measure how the labor movement of industrial unions permeated in the region j. I implement various alternative measures to guarantee robustness. Those alternative measures for the degree of unionization are discussed in section 7.

In classifying 10 sectors i, I follow 10-sector classification in Table 1. However, due to the sectoral classifications in regional value-added information in South Korea, the actual number of sectors used in the estimation for the sample from South Korea will be 7 sectors (Table 2). For the same reason, the first 12 years of Taiwanese data will also use 9 sectors in the empirical analysis while later years since 2004 fully utilize all information in 10 sectors. $Unionize_{ijt}$ is available in Korea[17] since 1980 while it is available since 1992 in Taiwan[18].

4.2 Value Added and Employment

When I attain the productivity of each sector i in all regions j, the data on the value-added and employment should be decomposed into each sector-region pair. Statistics Korea, the statistics bureau funded by the government of South Korea, provides yearly decomposition. Korean Statistical Information Service (KOSIS) manages a data series[19] which includes the yearly sector-region decomposition of the real value-added. KOSIS also provides the Economically Active Population Survey that contains the annual number of employees in each sector of each province. Using these two data sources, I can obtain the annual panel time series of value-added and employment of 7 sectors in 17 regions from 1989 to 2019. 17 regions cover every geographical location of South Korea. The classification of sectors that I am using for Korean data is clarified in Table 1 and Table 2.

Taiwan makes sector-region decomposition of value-added and employment in every 5-

[17]South Korean 17 regions used in my estimations are Seoul, Taejeon, Taegu, Busan, Gwangju, Incheon, Ulsan, Kyeonggi, Kangwon, Chungbuk, Chungnam, Sejong, Jeonbuk, Jeonnam, Kyeongbuk, Kyeongnam, and Jeju. These regions form unbalanced panel data.

[18]Taiwanese 25 regions used in my estimations are Changhua county, Chiayi city, Chiayi county, Hsinchu country, Hualien county, Kaohsiung city, Kaohsiung county, Keelung city, Miaoli county, Nantou county, New Taipei city (Taipei county), Penghu county, Pingtung county, Taichung city, Taichung county, Tainan city, Tainan county, Taipei city, Taitung county, Taoyuan city, Yilan county, Yunlin county, Kinmen county, and Lienchiang county. These regions form unbalanced panel data.

[19]Regional Income

year. All sectors except the agricultural sector are covered by the Industry and Service Census of National Statistics of the Republic of China. Industry and Service Census includes the geo-sectoral distribution of both value-added and employment. During my period of analysis when $Unionize_{ijt}$ is available, the first Industry and Service Census was conducted in 1996. In the case of agricultural sectors, Agriculture, Forestry, Fishery and Animal Husbandry Census (AFFA census) contains the region-level employment. AFFA census is also conducted every 5-year and the first census within my period of analysis was conducted in 1995. As the AFFA census does not share the distribution of value-added, I use the distribution of cultivated land area in retrieving the geo-sectoral share of value-added.

Because the sector-region decomposition is only feasible every 5-year, proper interpolation is needed using attainable time-varying information. The Economic Transformation Database published by the University of Groningen suggests the yearly sum of sectoral real value-added and employment. As sector-level real value-added and employment vary across the year, multiplying with the sector-region share in national surveys allows me to get the sector-region level decomposition. The share of each census is implemented to four neighboring years so that I can fully interpolate. For example, the sector-region share of 2011's Industry and Service Census is utilized in interpolating for 2009, 2010, 2012, and 2013. The agricultural sector goes through the same interpolation process using the AFFA census.

4.3 Descriptive Statistics

The consequent descriptive statistics are suggested in Table 3. In order to correctly represent sample of my empirical estimation, observations in Table 3 is restricted to those used in the baseline estimation. The estimated sample will cover from 1989 to 2019 of the South Korean economy and from 1992 to 2018 of the Taiwanese economy. The $Unionize_{ijt}$ of South Korea has 7.9 percent as the sample average while that of Taiwan has 44.4 percent as the sample mean. According to the International Labour Organization (ILO), the average labor union density of South Korea during 2000 - 2015 was 10.36 percent. And Taiwan had 39.78

percent as average union density during the period when ILO covered Taiwanese information during 2004 - 2010. Based on these population means provided by ILO, we can see that the $Unionize_{ijt}$ is successful in reflecting the overall degree of unionization in both countries.

As I clarified in defining the equation (1), $Unionize_{ijt}$ is not exactly equal to the actual labor union density. It can be exactly equal to the actual labor union density only when the assumption $(L^u_{jt}/L^u_t) = (L^u_{ijt}/L^u_{it})$ holds. Due to the restrictions on the feasibility of data, I construct $Unionize_{ijt}$ by utilizing proxies which can cause $Unionize_{ijt} > 1$. The regional distribution of total labor union members is multiplied with national aggregates of industrial labor union members in order to measure the degree of penetration of industrial labor unions in each region. Higher values of $Unionize_{ijt}$ can be understood as descriptions of the higher impact of industrial unions in sector i and region j in year t. In the case of the sample for South Korea, less than 1 percent of observations have $Unionize_{ijt}$ which are bigger than one. On the other hand, in the Taiwanese sample, around 11 percents of observations have $Unionize_{ijt}$ which are bigger than one. As I also introduced in section 3, this stems from the fact that Taiwan has systematically higher union density due to the link with health insurance. Members of labor unions in Taiwan include unemployed workers because they still need union membership for their health insurance benefits. This fundamental factor is related to having quite big values of $Unionize_{ijt}$ for around 11 percent of Taiwanese observations. Even though $Unionize_{ijt}$ is still successfully measuring the within-country variation in unionization, I implement various alternative ways to fix these higher values of $Unionize_{ijt}$ in Taiwan. They are introduced in my section for robustness checks.

The variation of $Unionize_{ijt}$ within a nation is consistent with the geographical and political properties of the two nations. Gwangju has been the center of left-wing activities with continuous and steady support from citizens and voters. In 1996, for example, Gwangju's manufacturing sector had 0.21 as the value of $Unionize_{ijt}$. However, other major cities have significantly smaller values, such as 0.10 in Seoul and 0.08 in Taegu. Sectoral heterogeneity is also considerable. Trade services sector (WRT according to Table 1 and Table 2) in

Gwangju had 0.003 for the value of $Unionize_{ijt}$ in 1996, and government or personal services sector (PUBO according to Table 1 and Table 2) in Gwangju had 0.06 in the same year. Compared to the manufacturing sector's value (0.21), these two sectors have a significantly lower degree of unionization. Similar patterns with higher $Unionize_{ijt}$ for progressive area and manufacturing sector are observed across other sectors and other regions in South Korea. Likewise, $Unionize_{ijt}$ reflects geographical and political variation within Taiwan. Kaohsiung county has a systematically higher value of $Unionize_{ijt}$ compared to other regions such as New Taipei City. It reflects that Kaohsiung county has been hosting broader support for progressive political movements compared to its national average. The manufacturing sector in Taiwan also tends to have a higher degree of unionization measured by $Unionize_{ijt}$ compared to other sectors such as the trade services sector (WRT).

Notations in Table 3 will appear in all consequent sections of this paper. θ_{ijt} is the employment share of sector i of region j in year t ($\theta_{ijt} = L_{ijt}/L_{jt}$). The consequent first-difference ($\theta_{ijt} - \theta_{ijt-1}$) is denoted as $\Delta\theta_{ijt}$. p_{ijt} is the annual productivity measure of each sector-region pair ij. I simply quantify p_{ijt} by having $p_{ijt} = V_{ijt}/L_{ijt}$ where V_{ijt} stands for the real value added. V_{ijt} is represented by local currency unit in millions[20]. Therefore, p_{ijt} can be called as the real value added per worker of the sector i in region j in year t. I construct relative productivity using the overall productivity of region j, P_{jt}. Symmetrically, it can be expressed as $P_{jt} = V_{jt}/L_{jt}$. The relative productivity of sector-region pair, p_{ijt}/P_{jt}, indicates how each sector i in region j is relatively productive compared to the overall aggregated productivity of region j. In both South Korea in Taiwan, the sample avearge of p_{ijt}/P_{jt} is slightly bigger than 1 according to Table 3. The relative productivity can have negative value because the value added is sometimes measured as negative. The minimum value of p_{ijt}/P_{jt} is negative in Taiwan while it is positive in South Korea.

[20]Won in South Korea and Taiwan Dollar in Taiwan.

5 Econometric Specification

Based on the dynamic nature of structural change and institutional backgrounds of two countries, I suggest a dynamic panel data model which can test some key hypotheses. Two of them are the main interests of this paper. First, based on the conceptual framework suggested by Rodrik et al. (2017), I test whether structural changes in South Korea and Taiwan were growth-enhancing structural change or growth-reducing structural change. If the relative productivity has a positive marginal effect on the change in employment share, we can say that growth-enhancing structural change is identified. On the other hand, if the marginal effect is negative, it can be interpreted as the growth-reducing structural change during the sample period. The second hypothesis, which gives us the political-economic implication, is about the role of the degree of unionization in explaining the structural change. Unionization can accelerate the overall direction of the structural change while it can decelerate the speed of structural change. The interaction term between relative productivity and the unionization index allows me to test whether the unionization decelerates growth-enhancing structural change. Given these motivations, I consider following dynamic panel data estimation.

$$\begin{aligned}\Delta\theta_{ijt} = \beta_0 + \sum_{a=1}^{d}\beta_{1a}\Delta\theta_{ijt-a} + \beta_2\frac{p_{ijt-b}}{P_{jt-b}} + \beta_3 Unionize_{ijt} \\ +\beta_4\frac{p_{ijt-b}}{P_{jt-b}}\times Unionize_{ijt} + \mu_{ij} + \lambda_t + \nu_{ijt}\end{aligned} \tag{2}$$

where all of the key notations follow those of the previous section 4. Individual heterogeneity across sector-region pair ij is addressed by the fixed effect μ_{ij}. The time-specific effect is represented by λ_t while ν_{ijt} accounts for the remaining stochastic term.

The change in employment share in each sector i in region j, $\Delta\theta_{ijt}$, is explained by its lagged variables $\sum_{a=1}^{d}\beta_{1a}\Delta\theta_{ijt-a}$ in this framework. I sequentially add further lagged dependent variables based on the validity of instrumental variables for GMM where $1 \leq a \leq 4$. The key test statistics for model specification will be AR test and over-identification test

so that I can make sure that Arellano and Bond (1991)'s instrumental variables for the endogeneity coming from $\sum_{a=1}^{d}\beta_{1a}\Delta\theta_{ijt-a}$ are valid instruments. If the diagnostic tests give us satisfactory confidence on the validity of instrument, I implement $\Delta\theta_{ijt-a-1}$ and its further lags as instrumental variables. The first order AR tests such as AR(1) should reject their null hypotheses in order to justify the dynamic panel specification. At the same time, the higher order AR tests should not reject the null hypothesis. Because adding further lags as an instrumental variable in Arellano and Bond (1991) allows us to have an over-identification test, I follow Hansen-type robust test statistics.

By having a set of lagged dependent variables on the right-hand side of the equation (2), I can test the path dependence of structural change measured by the change in employment share. Also, unobserved determinants of $\Delta\theta_{ijt}$ will be able to be controlled by both lagged dependent variables and fixed effects. By following the transformation suggested by Arellano and Bond (1991), the first-difference method handles the heterogeneities of each sector-region pair. For the sample of South Korea, according to AR test statistics, the preferred value of d in equation (2) is $d = 1$ while it is $d = 4$ in the Taiwanese sample. As I discussed in the previous section for introducing data, every information of Korea and Taiwan varies across every year and every ij pair. However, in the case of Taiwan, the multiplied geographical shares for industry-level distribution of value-added and employment vary every 5-year. Therefore, in estimating the Taiwanese sample, having $d = 4$ as the preferred level of d is consistent with the nature of the Taiwanese sample used in this estimation. By having $d = 4$, instrumental variables are clearly satisfying the exogeneity requirement. It is supported by AR test statistics as well as over-identification test. The $d+1$th-year lag of the dependent variable and set of its further lags will be used as instrumental variables. Other types of dynamic panel estimators, including Anderson and Hsiao (1982)'s first-difference estimator, two-step GMM estimator, and system GMM estimator are handled in the section for the robustness checks.

The relative productivity is added as a lagged variable in the equation (2). This is mainly

due to the fact that the $\Delta\theta_{ijt}$ and p_{ijt}/P_{jt} may share simultaneity issue. The current relative productivity might be affected by the contemporary change in employment share because productivity can evolve based on the shifts in the employment magnitude of the labor force. In order to avoid issues related to simultaneity, I implement lagged relative productivity where $3 \leq b \leq 5$. Because the first or second year lag ($b = 1$ or $b = 2$) will not be enough to guarantee exogeneity, I start from the third year lag of the relative productivity. The current change in employment share in year t is less likely to be the key determinant of the relative productivity in year $t - b$ if $3 \leq b \leq 5$.

Along with the linear term of the degree of unionization, the interaction term between relative productivity and unionization is implemented in equation (2). Based on this specification, we can test whether the magnitude of growth-enhancing structural change in both countries can be explained by the degree of unionization. The marginal effect of relative productivity will determine the direction of structural change between growth-enhancing and growth-reducing. As the relative productivity appears in two terms, the partial derivative with the Delta Method standard error can test the null hypothesis of zero marginal effect. If the marginal effect of the relative productivity is positive ($\frac{\partial \Delta\theta_{ijt}}{\partial(p_{ijt}/P_{jt})} > 0$), the $\beta_4 > 0$ means that the degree of unionization accelerated the growth-enhancing structural change. On the other hand, when the marginal effect of the relative productivity is positive ($\frac{\partial \Delta\theta_{ijt}}{\partial(p_{ijt}/P_{jt})} > 0$), $\beta_4 < 0$ indicates that the unionization decelerated the growth-enhancing structural change[21]. McMillan and Rodrik (2011) and Rodrik et al. (2017) classified country-specific stylized facts without considering dynamic nature. They did not cover the possible heterogeneity which can be caused by variation in labor rigidity. I provide a more rigorous test on it with disaggregated dynamic estimation using the empirical partial derivative in terms of p_{ijt}/P_{jt}. I go further by identifying whether the institutional variation can accelerate or delay the growth-enhancing structural change. The partial derivative in terms of $Unionize_{ijt}$ will also

[21]Symmetrically, when $\frac{\partial \Delta\theta_{ijt}}{\partial(p_{ijt}/P_{jt})} < 0$, $\beta_4 < 0$ means that the unionization accelerated the growth-reducing structural change. On the other hand, $\beta_4 > 0$ means that the unionization decelerated the growth-reducing structural change when $\frac{\partial \Delta\theta_{ijt}}{\partial(p_{ijt}/P_{jt})} < 0$.

be handled by the Delta Method so that I can see the overall role of unionization in the dynamics of employment share.

6 Estimation Results

This section suggests empirical evidence on whether unionization can accelerate or decelerate the productive labor re-allocation across different sectors within an economy. My estimations will clarify how unionization can explain the heterogeneity in the magnitude of growth-enhancing structural change. As I introduced in the previous section with the backgrounds of labor unions in both countries, the gap in labor union density between the two countries does not reflect the actual gap in the organizational ability of the labor unions between the two countries. Therefore, putting two countries as a united sample might be misleading in interpreting the role of the labor union. I estimate the South Korean sample and Taiwanese sample separately so that I can avoid this problem. In the following subsections, I sequentially cover South Korea and Taiwan and see whether they share any qualitative similarities or country-specific distinctive features.

6.1 South Korea

Table 4 includes the estimation results of equation (2) with the sample from South Korean data. The first three columns cover the whole sample, while the other three columns estimate the sample after the legalization of KCTU in 1999. Hence, the left-side columns of Table 4 consider from 1989 to 2019, and the right-side columns of Table 4 cover from 2000 to 2019. As KCTU's being recognized by the labor law brought about a qualitative change in the labor union's role, sub-sample analysis can ensure whether the key coefficients vary across different regimes. Note that the beginning year of the sample period, 1989, is slightly after the democratization of South Korea (1987). My estimations will elaborate on whether unionization accelerates or decelerate productive labor re-allocation as a new democracy gets

consolidated.

As I clarified in the previous section for econometric specification, putting a single lag of the dependent variable satisfies the AR restrictions. As p-values of AR(1) and AR(2) tests reveal in the bottom rows in Table 4, the instrumental variables of Arellano and Bond (1991) can be considered valid instrumental variables. Also, Hansen's over-identification test after the heteroskedasticity and autocorrelation robust estimation supports its validity in all six columns. As we can expect, the path dependence of the change in employment share, $\Delta\theta_{ijt}$, exists with considerable magnitude. The estimated coefficients of the lagged dependent variable are positive and statistically significant in all six columns. It means that a sector in a region is likely to attract more employment share in year t when it experienced an increase in employment share in year $t-1$. This reveals the importance of implementing dynamic nature in analyzing the structural change with panel data.

The first column of the Table 4 is using relative productivity in year $t-3$, p_{ijt-3}/P_{jt-3}. And the second and the third columns are using p_{ijt-4}/P_{jt-4} and p_{ijt-5}/P_{jt-5}, respectively. The remaining three columns with sub-sample also deploy the same lagged variables of the relative productivity. Using lagged relative productivity variables, I can test the existence of growth-enhancing or growth-reducing structural change without endogeneity concern. As relative productivity interacts with the index of the degree of unionization, the marginal effect of relative productivity is supposed to be different from its estimated coefficient of the linear term. Therefore, I suggest an empirical marginal effect with the Delta Method standard error in the bottom part of Table 4. The suggested empirical marginal effect is calculated at the sample mean of observation. Symmetrically, as the degree of unionization, $Unionize_{ijt}$ also has both linear and interaction terms, I also suggest the empirical marginal effect at the mean of sample observation with the Delta Method standard error.

The marginal effect of relative productivity is positive and statistically significant in all six columns in Table 4. This elaborates that we can observe the growth-enhancing structural change in South Korea during the sample period. In other words, a sector in a region

with higher lagged relative productivity gained more employment share. Labor re-allocation occurred according to sectoral productivity in a growth-enhancing manner during this period in South Korea. At the same time, the marginal effect of $Unionize_{ijt}$ is not rejecting the null hypothesis of being zero in all six columns in Table 4.

Even though the overall marginal effect of $Unionize_{ijt}$ is statistically not different from zero, $Unionize_{ijt}$ does suggest an important aspect in understanding the structural change. We can see that in all columns except column (4) of Table 4, the interaction term between $Unionize_{ijt}$ and lag of relative productivity has a negative coefficient with statistical significance. This means that, during the growth-enhancing structural change in South Korea, a sector in a region with a higher degree of unionization had a smaller growth-enhancing structural change. More productive sectors attracted more employment share within a region. At the same time, however, this productive re-allocation is decelerated when a sector has a higher degree of unionization. This is consistent with both theoretical and empirical predictions on labor rigidity caused by a labor union. As the increased degree of unionization brings about decreased flexibility in pulling new workers, sectors have slower productive re-allocation than the optimal speed of adjustment.

Comparing the right-side columns (4), (5), and (6) of Table 4 with results coming from the earlier period (1989 - 1999) can also be an interesting analysis. In Appendix A, I add a table whose left-side three columns are coming from a sub-sample of 1989 - 1999 (Table A.1). Key findings and implications are maintained in Table A.1.

6.2 Taiwan

Symmetric to the previous subsection for South Korea, I cover the estimation with a whole sample of Taiwanese sector-region pairs and the estimation with a sub-sample divided according to the legalization of TCTU in 2000. Table 5 includes both estimations. The left-side columns of Table 5 study from 1992 to 2018, and the right-side columns of Table 5 study from 2001 to 2018. The starting year of my sample, 1992, is when Taiwan went through

a democratic transition after the martial law period was finished. Therefore, like the previous subsection on South Korea, this subsection elaborates on the role of unionization in structural change during democratic consolidation. By estimating both sample periods, I guarantee the robustness of key findings on the role of labor unions in structural change.

The difference between Table 5 and Table 4 is the number of lagged dependent variables on the right-hand side and consequent instrumental variables. Table 5 uses four lagged dependent variables as the explanatory variable. In estimating under the dynamic panel framework using Taiwanese data, implementing a smaller number of lagged dependent variables cannot satisfy the AR restrictions. This is closely linked to the characteristics of Taiwanese data, which is clarified in previous sections for introducing data and econometric specifications. Even though all observations vary across every year t and every pair ij, each sector's geographical distribution is interpolated between census years (every five years). Therefore, in order to guarantee fully exogenous instruments for lagged dependent variables, fifth-year and further lags are utilized. Correlation within interpolated years is controlled by adding four lagged dependent variables linearly on the right-hand side of the equation (2). The serial correlation tests using the first-differenced errors of equation (2) support that the fifth-year lagged variable is a valid instrument. Hansen's over-identification test after heteroskedasticity and autocorrelation robust estimation is also telling us that Arellano and Bond (1991)'s approach to my Taiwanese data is the proper treatment in columns (2), (4), and (5). Compared to dynamic panel estimations using South Korean data, Table 5's over-identification test became more sensitive to the selection of lagged relative productivity.

In each column of Table 5, every lagged dependent variable has negative and statistically significant estimated coefficients. It indicates that skipping the dynamic nature might be misleading in understanding the structural change in the Taiwanese economy. The overall marginal effect of relative productivity rejects the null hypothesis of being zero in columns (1), (2), and (4). In all three columns, the sign of the marginal effect was positive. This says that the structural change in the Taiwanese economy is also growth-enhancing. However,

it is less statistically explicit compared to the case of South Korea. On the other hand, the overall marginal effect of $Unionize_{ijt}$ is very explicit. In five columns from columns (1) to (5), we can see that the empirical marginal effects in the sample mean of observation with Delta Method standard errors are negative and statistically significant. A sector in a Taiwanese region with higher unionization is expected to have a negative gain in employment share. At the same time, in addition to these salient marginal effects, the interaction term between relative productivity and unionization suggests that unionization can explain the heterogeneous magnitude of growth-enhancing structural change. In columns from (2) to (5), estimated coefficients of interaction terms reject the null hypothesis of being zero with negative signs. This means that a sector in a region with higher unionization will have smaller growth-enhancing structural change. Increased rigidity in labor allocation is causing an economy to have slower adjustments according to sectoral productivity.

The absolute values of the estimated coefficients of the interaction terms in the right-side columns of Table 5 are notable. Columns (4), (5), and (6) have bigger absolute values of interaction terms between relative productivity and unionization index compared to each counterpart in the left-side columns of Table 5. When we only consider columns with proper diagnostic tests (columns (2), (4), and (5)), those on the right-side columns of the table have bigger absolute values in the estimated coefficients of the interaction terms. The role of unionization becomes more explicit when we restrict the sample period to the period after the legalization of the autonomous confederation, TCTU. The increased bargaining power of labor unions caused Taiwan to have a heterogeneous size of growth-enhancing structural change across the degree of unionization. Whenever a sector is more unionized, the speed of growth-enhancing structural change is decelerated.[22]

[22]The earlier period before the legalization of TCTU, from 1992 to 2000, can also be compared to the right-side columns of the Table 5. I add a table of this additional sub-sample analysis (Table A.2)to Appendix A as I did in the previous subsection of South Korea. The left-side columns of Table A.2) before the legalization of TCTU could not have more than one lagged dependent variable on the right-hand side due to the short sample period.

7 Robustness Checks

This section suggests some robustness checks in estimating equation (2). Even though Arellano and Bond (1991)'s approach is regarded as one of the most widely used frameworks for dynamic panel data analysis, there have been many alternative estimators for the linear dynamic model. Therefore, the first subsection suggests that my main findings using Arellano and Bond (1991)'s estimator are still maintained in a robust manner with alternative estimators. The second subsection considers alternative measures for $Unionize_{ijt}$. $Unionize_{ijt}$ successfully measures the permeation of the labor union movement across different sectors and regions within each of the two nations. However, especially in the sample of Taiwan, around eleven percent of observations had $Unionize_{ijt} > 1$, and some of those values are extreme. Even though we can still interpret those extreme values as being highly unionized, I suggest alternative measures for unionization, which are free from related issues caused by outlier observations.

7.1 Alternative Dynamic Estimators

Dynamic panel data estimation with proper coverage of the endogeneity from the lagged dependent variable has been actively developed since the early 1980s. The systematic bias, which is often called the Nickell bias (Nickell (1981)), will be explicit if we do not handle the endogeneity from the lagged dependent variable. Anderson and Hsiao (1982) suggested the first-difference estimation so that researchers can wipe out the individual fixed effects. Both lagged level and lagged difference of endogenous variables have been implemented as exogenous instrumental variables under proper conditions such as serial correlation criteria. Arellano (1989) pointed out that the estimation using instruments in levels is recommended due to its non-singularities and smaller variances. When I implement Anderson and Hsiao (1982)'s first-difference estimator, the estimated signs of key variables are kept robust.

I'm using Arellano and Bond (1991)'s estimator as my main estimator in section 5 and 6.

Suggested results in previous sections with Arellano and Bond (1991)'s estimator are based on the one-step GMM estimation. The two-step GMM estimation can be derived by updating weight with the differenced residuals. Even though the one-step and two-step estimators are asymptotically equivalent when the error follows the i.i.d. assumption, they provide different coefficients with different significance levels in practice. Two-step estimators of Arellano and Bond (1991) also give me qualitatively the same implications with section 6.

Along with Arellano and Bond (1991)'s GMM estimator, system GMM estimators have been widely used so that researchers can attain robust results under different assumptions. Arellano and Bover (1995) and Blundell and Bond (1998) showed that Arellano and Bond (1991)'s lagged level as instrumental variables might be invalid instruments, especially when the dependent variable follows the random walk process. By using the lagged difference along with lagged level, Arellano and Bover (1995) and Blundell and Bond (1998) minimize the system of equations so that they can get more efficient estimators. System GMM estimators also provide qualitatively similar implications compared to results in the previous section.

In Table 4, Hansen's over-identification test p-values are exactly equal to 1 in all columns. Also, in Table 5, four columns out of six columns have one as the p-values. Even though it supports the validity of instruments used in dynamic panel estimation, the concern of weak instrumental variables exists. Collapsing moment conditions can improve this in the estimations using South Korean data. P-values with collapsed moment conditions still do not reject the null hypothesis, and they are no longer equal to 1 when I estimate the South Korean sample. However, in estimations using Taiwanese data, collapsing still makes p-values that are exactly equal to 1.

7.2 Robustness of $Unionize_{ijt}$

The definition of $Unionize_{ijt}$ is exactly equal to the actual labor union density for each sector i in region j when the assumption of $(L^u_{jt}/L^u_t) = (L^u_{ijt}/L^u_{it})$ holds. In other words, if this assumption holds, $Unionize_{ijt}$ should be between 0 and 1. It is true that the assumption

of $(L^u_{jt}/L^u_t) = (L^u_{ijt}/L^u_{it})$ is a strong premise because it is considering uniform geographical distribution of union members across different sectors. Because government documents on labor unions that I digitize do not include the population list of labor unions which is required to construct actual density (L^u_{ijt}/L_{ijt}) for each sector-region pair ij, my $Unionize_{ijt}$ may have measurement error in expressing the actual disaggregated density L^u_{ijt}/L_{ijt}. Even though constructing $Unionize_{ijt}$ as in the equation (1) is very successful in reflecting the within-nation heterogeneity in unionization, some extreme values are too large, especially in the Taiwanese sample. Around 11 percent of observations in the Taiwanese sample have $Unionize_{ijt} > 1$, while it happens in less than 1 percent of observations in South Korea. Estimating equation (2) by excluding observations with $Unionize_{ijt} > 1$ does not make any qualitative change in the South Korean sample, while the significance level is largely affected in the Taiwanese sample. It can be mainly because eliminating observations with $Unionize_{ijt} > 1$ in the Taiwanese sample truncates more than 10 percent of observations. The smaller variation across the remaining sample after truncation is insufficient to identify the heterogeneous size of growth-enhancing structural change.

In order to handle possible concerns coming from the measurement error of $Unionize_{ijt}$ in the equation (1), I suggest alternative indices for the degree of unionization. Regardless of the specification of the index, the key findings of this paper remain robust. The first alternative index is $Unionize^*_{ijt}$ below.

$$Unionize^*_{ijt} = \left\{ \frac{L_{jt}}{L_t} \times L^u_{it} \right\} \Big/ L_{ijt} \tag{3}$$

where all notations are consistent with those in previous sections. The difference between $Unionize_{ijt}$ and $Unionize^*_{ijt}$ is that the employment share of region j $(\frac{L_{jt}}{L_t})$ is used in constructing $Unionize^*_{ijt}$ instead of the union member share of region j $(\frac{L^u_{jt}}{L^u_t})$. $Unionize^*_{ijt}$ distributes sector-level industrial labor union members, L^u_{it}, according to the regional distribution of total employees while $Unionize_{ijt}$ distributes it according to the regional distribu-

tion of union members. Shifting $Unionize_{ijt}$ to $Unionize^{*}_{ijt}$ improves the tail distribution in the Taiwanese sample. Around 7-percent of Taiwanese observations have $Unionize^{*}_{ijt} > 1$ while 11-percent of them had $Unionize_{ijt} > 1$. South Korean sample is almost not affected by shifting to $Unionize^{*}_{ijt}$ in terms of the tail distribution in the degree of unionization.

Table 6 replicates Table 4 by substituting $Unionize_{ijt} > 1$ with $Unionize^{*}_{ijt}$. We can see that the main finding of Table 4 is maintained in Table 6. Growth-enhancing structural change is identified while its magnitude is heterogeneous across unionization. In a sector with more unionization, growth-enhancing structural change is decelerated. Table 7 also estimates the equation (2) again by replacing $Unionize_{ijt} > 1$ to $Unionize^{*}_{ijt}$ using Taiwanese sample. Table 7 replicates Table 5. Hansen's over-identification tests are satisfied in all columns. AR test statistics are more supportive in the right-side columns of Table 7. The heterogeneous magnitude of growth-enhancing structural change is significantly explained by $Unionize^{*}_{ijt}$ in columns (2), (4), (5), and (6).

Both $Unionize_{ijt}$ and $Unionize^{*}_{ijt}$ may have some potential sources of measurement error because it transforms the sectoral distribution of union members (L^{u}_{it}) and regional distribution of union members (L^{u}_{jt}) to get an index for the degree of unionization which varies across each sector-region pair ij. If I use L^{u}_{it} and L^{u}_{jt} separately without transformation, those sources of measurement error can be avoided even though we no longer have an index varying across ij. Still, by implementing L^{u}_{it} and L^{u}_{jt} together, the estimation can reflect variation across i and j.

$$\begin{aligned}\Delta\theta_{ijt} = \beta_0 + \sum_{a=1}^{d}\beta_{1a}\Delta\theta_{ijt-a} + \beta_2\frac{p_{ijt-b}}{P_{jt-b}} + \beta_3\frac{L^{u}_{it}}{L_{it}} + \beta_4\frac{L^{u}_{jt}}{L_{jt}} \\ +\beta_5\frac{p_{ijt-b}}{P_{jt-b}}\times\frac{L^{u}_{it}}{L_{it}} + \beta_6\frac{p_{ijt-b}}{P_{jt-b}}\times\frac{L^{u}_{jt}}{L_{jt}} + \mu_{ij} + \lambda_t + \nu_{ijt}\end{aligned} \tag{4}$$

In the equation (4) above, instead of implementing $Unionize_{ijt}$ in the equation (2), I deploy sectoral density ($\frac{L^{u}_{it}}{L_{it}}$) and regional density ($\frac{L^{u}_{jt}}{L_{jt}}$) linearly together along with interaction terms. $\frac{L^{u}_{it}}{L_{it}}$ is between 0 and 1 in every observation of both countries. $\frac{L^{u}_{jt}}{L_{jt}}$ is also between 0 and 1

in both countries, except in the observations from Keelung city in Taiwan. Keelung city has $\frac{L^u_{jt}}{L_{jt}} > 1$ in nine years where its maximum is 1.17. Therefore, we can see that the concerns from extreme values are relieved when we estimate equation (4).

Using the above equation (4), I derive symmetric counterparts of Table 4 and 5. Consequent replication of Table 4 is Table 8. All diagnostic test statistics in Table 8, except the AR test in column (1), imply that the dynamic GMM estimation with instrumental variables suggested by Arellano and Bond (1991) can be properly implemented. The marginal effect of relative productivity identifies that South Korea went through a growth-enhancing structural change during the sample period. In line with Table 4, the magnitude of growth-enhancing structural change is heterogeneous across the degree of unionization. However, in Table 8, the degree of unionization is represented by two different measures, $\frac{L^u_{jt}}{L_{jt}}$ and $\frac{L^u_{it}}{L_{it}}$. The overall marginal effect of $\frac{L^u_{jt}}{L_{jt}}$ is not statistically significant while that of $\frac{L^u_{it}}{L_{it}}$ is positive and strongly significant. The interaction terms with $\frac{L^u_{jt}}{L_{jt}}$ is not rejecting the null hypotheses of having zero coefficients, while interaction terms with $\frac{L^u_{it}}{L_{it}}$ have negative and significant coefficients. This means that the heterogeneity of the magnitude of growth-enhancing structural change is mainly explained by sectoral unionization. However, regional unionization was not able to explain it. A sector with higher unionization had a slower growth-enhancing structural change in South Korea.

Estimating equation (4) with Taiwanese sample will make replication of Table 5 with two different unionization measures, $\frac{L^u_{jt}}{L_{jt}}$ and $\frac{L^u_{it}}{L_{it}}$. The deceleration of structural change caused by the unionization is not observed when equation (4) is estimated with the whole Taiwanese sample. However, sub-sample analysis on equation (4) still finds the statistically significant role of unionization in Taiwan. Table 9 includes the consequent estimation results. In the left-side columns of Table 9, which are for the whole sample period, AR 2 tests reject the null hypothesis, while all diagnostic tests are satisfied in the right-side columns. The regional unionization ($\frac{L^u_{jt}}{L_{jt}}$) explains the heterogeneous size of growth-enhancing structural change in columns (4), (5), and (6).

I further try the arithmetic mean of $\frac{L^u_{it}}{L_{it}}$ and $\frac{L^u_{jt}}{L_{jt}}$ to substitute $Unionize_{ijt}$. Geometric mean and the average of arithmetic mean and geometric mean are also implemented. In other words, $Unionize^{AM}_{ijt} = \left(\frac{L^u_{it}}{L_{it}} + \frac{L^u_{jt}}{L_{jt}}\right) \Big/ 2$ and $Unionize^{GM}_{ijt} = \sqrt{\frac{L^u_{it}}{L_{it}} \times \frac{L^u_{jt}}{L_{jt}}}$ can be considered as the arithmetic mean and geometric mean, respectively. $\{(Unionize^{AM}_{ijt} + Unionize^{GM}_{ijt})/2\}$ can take advantage of both arithmetic mean and geometric mean. All three types of alternative $Unionize_{ijt}$ yield similar estimation results for South Korea and Taiwan. The statistical significance is maintained with robustness in South Korea, while it is weakened in Taiwan. However, the estimated signs and consequent implications are still robust in estimations for both countries.

8 Discussion

The main implication of this paper suggests that the increased bargaining power of labor attained by democratic consolidation decelerates growth-enhancing structural change in both nations. Based on this finding, economists can think about the next question: If the increased bargaining power of labor is related to the magnitude of growth-enhancing structural change, did it also affect decomposed characteristics of economic growth? This paper is not providing a comprehensive answer to this further question. However, I suggest one of the possible explanations based on my analysis of South Korea and Taiwan. Equation (5) is the growth decomposition suggested by McMillan and Rodrik (2011) and Rodrik et al. (2017).

$$\Delta P_t = \sum_i^I \theta_{i,t-1} \Delta p_{i,t} + \sum_i^I p_{i,t} \Delta \theta_{i,t} \tag{5}$$

where notations are consistent with earlier sections of this paper. McMillan and Rodrik (2011) and Rodrik et al. (2017) considered decomposition with a general year gap in measuring the sectoral change in employment share ($\theta_{i,t-k}$). This section focuses on the annual decomposition with $\theta_{i,t-1}$ in order to be able to link annual change in employment share with an annual variation of unionization. P_t and $p_{i,t}$ refer to economywide and sectoral

labor productivity levels, respectively. The left-hand-side, ΔP_t, measures the overall labor productivity growth of an economy between two adjacent years t and $t-1$. The total labor productivity growth of an economy can be decomposed into two terms. The first term of the right-hand-side ($\sum_i^I \theta_{i,t-1}\Delta p_{i,t}$) is called a within-sector component of labor productivity growth (within growth). The second term ($\sum_i^I p_{i,t}\Delta\theta_{i,t}$) is called a structural change component of labor productivity growth (structural growth). The within-sector component captures how much of overall labor productivity growth can be attributed to changes within sectors. The structural change component quantifies how much overall labor productivity growth can be attributed to workers' movements across sectors.

Figure 1 describes the decomposition results of the South Korean economy from 1965 to 2018. The bar stands for the share of within growth among total growth, while the line indicates that of structural growth. It is evident that structural growth used to dominate within growth until the end of the 1980s. However, as the 1990s started, within growth dominated structural growth in most of the years. Figure 2 clarifies it more explicitly by considering the difference between two shares. The vertical axis of Figure 2 is the difference between the share of within growth and the share of structural growth. Therefore, if the vertical axis has a positive value, it means that within growth dominates structural growth in that year. Three vertical lines indicate reference years. They are democratization, the first power shift[23], and the second power shift[24], respectively. Before democratization, the vertical axis used to have negative values for many years, while it barely happened after the democratization. Furthermore, after the second power shift, which is a critical event according to Huntington (1991)'s consolidation test, within growth is dominating the structural growth in all years. Figure 3 and Figure 4 are symmetric counterparts of Figure 1 and Figure 2 coming from the Taiwanese economy. The dominance of within growth has been stable in Taiwan. However, Table Figure 3 still suggests that, in recent years, the share of structural

[23] 1997 presidential election (power shift from the right-wing to the left-wing.).
[24] 2007 presidential election (power shift from the left-wing to the right-wing.).

growth became considerably smaller compared to earlier years before 2000.[25]

Motivated by these patterns in labor productivity growth decomposition in South Korea and Taiwan, I can test whether the increased bargaining power can explain this pattern of reduced share of structural growth. I go through the above growth decomposition of each region in South Korea and Taiwan. After implementing the region subscript j, the decomposition equation will be $\Delta P_{jt} = \sum_i^I \theta_{ij,t-1} \Delta p_{ij,t} + \sum_i^I p_{ij,t} \Delta \theta_{ij,t}$ for each sector-region pair ij. After decomposing the within-sector component and structural change component of each region, I see whether the lagged union density of each region j can statistically explain the size of a decomposed component of productivity growth. I elaborate on the estimation in Appendix B rigorously.

The lagged regional unionization is negatively correlated with the magnitude of structural change component in South Korea with statistical significance. On the other hand, the lagged regional unionization is positively correlated with the magnitude of the within-sector component in South Korea, and this relationship is also statistically significant. In the estimation with the Taiwanese sample, lagged regional union density cannot explain both the structural change component and the within-sector component. McMillan and Rodrik (2011) used the labor rigidity index from World Development Indicators of the World Bank to see its cross-country[26] relationship with structural growth. They found a negative relationship between the labor rigidity index and structural growth term. My geographically decomposed sectoral analysis partially supports the finding of McMillan and Rodrik (2011). Results from South Korea are consistent with the aggregated pattern in McMillan and Rodrik (2011), while those from the Taiwanese sample are not.

The results in the previous paragraph give us some important points for future research. McMillan and Rodrik (2011) indicated that the structural change in South Korea and Singapore was not growth-enhancing during 1990 - 2005. However, at the same time, they found

[25] I am using Groningen's 10-sector Database and Economic Transformation Database for this national-level decomposition.

[26] 38 countries

that very rapid 'within' productivity growth was significant enough to offset the negative role of structural change in making economic growth. One of the potential mechanisms in South Korea can be considered in my growth decomposition analysis. The increase in unionization is related to a smaller magnitude of the structural growth during my sample period. On the other hand, the rise in unionization is related to a bigger magnitude of the within growth. As the sample period of McMillan and Rodrik (2011)'s analysis of South Korea (1990-2005) coincides with the period of labor unions' growth, my estimation after the productivity growth decomposition in the previous paragraph supports conflicting directions of structural growth and within growth. In South Korea, the decelerated growth-enhancing structural change caused by unionization is transmitted to the smaller magnitude of structural growth.

These understandings can imply that the two countries adjusted their economic development differently to the evolution of labor institutions after democratization. South Korean economy reacted to the change in unionization by attaining more growth through the within-sector channel. Identifying Taiwan's reaction requires further studies, given no significance between unionization and each decomposed growth component in this section. Two nations share the labor union's role in decelerating productive labor reallocation after democratization, which is strongly supported by my estimations of equation (2). Regarding the next question, whether unionization explains the decomposed growth pattern, however, the two countries do not share the same interpretation according to decomposition analysis in equation (5) and consequent estimations.

9 Conclusions

This paper finds that the magnitude of the growth-enhancing structural change in South Korea and Taiwan exhibits heterogeneity across sectoral unionization. Disaggregated data on 7 sectors in 17 regions in South Korea and 10 sectors in 25 regions in Taiwan during their democratic regimes (since 1989 and since 1992 for South Korea and Taiwan, respectively) is

analyzed. In both countries, growth-enhancing structural change is observed throughout my sample period. The productive sector was able to attract more employment share within a region. However, when a sector has higher unionization, the magnitude of growth-enhancing structural change decreases with statistical significance.

I link these findings to stylized facts established by unionization literature in labor economics. As higher unionization is related to higher rigidity in labor input through multiple channels, labor rigidity can be the main mechanism between unionization and structural change. Specifically, when labor's bargaining power increases, an economy no longer enjoys quick and immediate re-allocation of labor input as per productivity. As both South Korea and Taiwan experienced a considerable increase in the bargaining power of labor after the democratization, the variations in unionization were strong enough to be observed in my dynamic estimation.

Even though my study suggests a new interpretation of the economic development of new democracies, we have to be careful when considering democratization's overall impact. What I found here elaborates that the increased bargaining power of labor can delay the productive re-allocation of labor. However, I am not quantifying other aspects of increased bargaining power of labor, such as increased welfare of workers, improved safety of workers, and the consequent impact on the wellness of the labor force. Given the fact that a labor employee is likely to be the median voter of these two countries, the increased wellness of workers coming from the stronger union is a positive aspect that economists should consider. Also, my findings on growth-enhancing structural change do not go further toward predicting the economy's overall growth. These research agendas will require independent estimation with careful specification. My findings focus on the fact that institutional property represented by unionization should be regarded as a determinant of productive labor re-allocation and growth-enhancing structural change.

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Tables

Table 1: 10-Sector classification

Sectors	Sector Name	ISIC Rev. 3.1 Code	ISIC Rev. 3.1 Description
AGR	Agriculture	AtB	Agriculture, Hunting and Forestry, Fishing
MIN	Mining	C	Mining and Quarrying
MAN	Manufacturing	D	Manufacturing
WRT	Trade services	G+H	Wholesale and Retail trade; repair of motor vehicles, motorcycles and personal and household goods, Hotels and Restaurants
CON	Construction	F	Construction
PU	Utilities	E	Electricity, Gas, and Water Supply
TRA	Transport services	I	Transport, Storage and Communications
FIRE	Business services	J+K	Financial Intermediation, Renting and Business Activities (excluding owner occupied rents)
PUB	Government services	L, M, N	Public Administration and Defense, Education, Health and Social work
OTH	Personal services	O, P	Other Community, Social and Personal service activities, Activities of Private Households

Table 2: Sectors in South Korea and Taiwan

Sectors	Korea 1989 - 2019	Taiwan 1992 - 2003	Taiwan 2004 2012
AGR	AGR	AGR	AGR
MIN	MIN	MIN	MIN
MAN	MAN	MAN	MAN
WRT	WRT	WRT	WRT
CON	CON	CON	CON
PU	PTF	PU	PU
TRA		TRA	TRA
FIRE		FIRE	FIRE
PUB	PUBO	PUBO	PUB
OTH			OTH

Table 3: Descriptive statistics

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
		South Korea			
θ_{ijt}	0.158	0.105	0	0.479	2640
$\Delta\theta_{ijt}$	3.44e-06	0.01	-0.047	0.055	2640
p_{ijt}/P_{jt}	1.233	1.167	0.042	11.636	2640
$unionize_{ijt}$	0.079	0.16	0	2.411	2640
		Taiwan			
θ_{ijt}	0.109	0.11	0	0.551	2865
$\Delta\theta_{ijt}$	-0.0002014	0.009	-0.086	0.103	2865
p_{ijt}/P_{jt}	1.049	1.001	-1.53	18.952	2865
$unionize_{ijt}$	0.444	1.129	0.001	19.915	2865

Table 4: South Korea's 7 sectors in 17 regions.
Arellano-Bond estimator using unbalanced panel.
Whole sample and sub-sample analyses based on KCTU's legalization in 1999.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1989 - 2019			2000 - 2019		
$\Delta\theta_{ijt-1}$	0.112***	0.121***	0.121***	0.0798**	0.0809**	0.0838**
	(0.0237)	(0.0253)	(0.0276)	(0.0324)	(0.0323)	(0.0330)
p_{ijt-3}/P_{jt-3}	0.00236***			0.00198***		
	(0.000747)			(0.000686)		
p_{ijt-4}/P_{jt-4}		0.00166***			0.00157***	
		(0.000521)			(0.000529)	
p_{ijt-5}/P_{jt-5}			0.00130***			0.00103***
			(0.000410)			(0.000378)
$Unionize_{ijt}$	0.00229	0.00348*	0.00239	0.00292	0.00269	0.00150
	(0.00159)	(0.00196)	(0.00159)	(0.00274)	(0.00220)	(0.00151)
$(p_{ijt-3}/P_{jt-3})\times Unionize_{ijt}$	-0.00233***			-0.00254		
	(0.000813)			(0.00205)		
$(p_{ijt-4}/P_{jt-4})\times Unionize_{ijt}$		-0.00214**			-0.00225*	
		(0.000874)			(0.00125)	
$(p_{ijt-5}/P_{jt-5})\times Unionize_{ijt}$			-0.00134***			-0.000987**
			(0.000480)			(0.000398)
Observations	2640	2528	2416	1958	1948	1935
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00217***	0.00149***	0.00119***	0.00181***	0.00142***	0.00096***
(Delta Method)	(0.00069)	(0.00047)	(0.00038)	(0.00065)	(0.00048)	(0.00035)
M.E. of $Unionize_{ijt}$	-0.00057	0.00083	0.00072	-0.00011	-0.00005	0.00028
(Delta Method)	(0.00125)	(0.00143)	(0.00121)	(0.00157)	(0.00148)	(0.00126)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.189	0.646	0.913	0.651	0.733	0.790
Hansen's oid p-value	1.000	1.000	1.000	1.000	1.000	1.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Table 5: Taiwan's 10 sectors in 25 regions.
Arellano-Bond estimator using unbalanced panel.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1992 - 2018			2001 - 2018		
$\Delta\theta_{ijt-1}$	-0.144***	-0.141***	-0.161***	-0.0903***	-0.0909***	-0.101***
	(0.0183)	(0.0176)	(0.0203)	(0.0157)	(0.0155)	(0.0170)
$\Delta\theta_{ijt-2}$	-0.170***	-0.162***	-0.176***	-0.101***	-0.101***	-0.110***
	(0.0277)	(0.0273)	(0.0301)	(0.0119)	(0.0120)	(0.0139)
$\Delta\theta_{ijt-3}$	-0.119***	-0.116***	-0.124***	-0.0679***	-0.0680***	-0.0755***
	(0.0150)	(0.0156)	(0.0173)	(0.0139)	(0.0146)	(0.0152)
$\Delta\theta_{ijt-4}$	-0.0176**	-0.0171**	-0.0806***	-0.0138**	-0.0137**	-0.0597***
	(0.00755)	(0.00735)	(0.0179)	(0.00582)	(0.00583)	(0.0166)
p_{ijt-3}/P_{jt-3}	0.000290*			0.000396***		
	(0.000151)			(0.000134)		
p_{ijt-4}/P_{jt-4}		0.000472**			0.000433***	
		(0.000190)			(0.000152)	
p_{ijt-5}/P_{jt-5}			0.000340			0.000404**
			(0.000211)			(0.000197)
$Unionize_{ijt}$	-0.000625**	-0.000515**	-0.000694**	-0.000199	-0.000194*	-0.000272**
	(0.000292)	(0.000246)	(0.000328)	(0.000128)	(0.000107)	(0.000131)
$(p_{ijt-3}/P_{jt-3})\times Unionize_{ijt}$	-0.0000318			-0.000160**		
	(0.000160)			(0.0000656)		
$(p_{ijt-4}/P_{jt-4})\times Unionize_{ijt}$		-0.000188**			-0.000207***	
		(0.0000901)			(0.0000555)	
$(p_{ijt-5}/P_{jt-5})\times Unionize_{ijt}$			-0.000235*			-0.000253***
			(0.000128)			(0.0000941)
Observations	2939	2924	2913	2548	2533	2522
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00027**	0.00039**	0.00024	0.00032**	0.00034	0.00030
(Delta Method)	(0.00013)	(0.00017)	(0.00018)	(0.00012)	(0.00022)	(0.01079)
M.E. of $Unionize_{ijt}$	-0.00066***	-0.00072***	-0.00096***	-0.00037***	-0.00042**	-0.00055
(Delta Method)	(0.00022)	(0.00021)	(0.00023)	(0.00011)	(0.00018)	(0.00813)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.129	0.231	0.248	0.357	0.387	0.248
AR(5) p-value	0.528	0.523	0.287	0.577	0.579	0.672
Hansen's oid p-value	0.000	1.000	0.000	1.000	1.000	0.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Table 6: South Korea's 7 sectors in 17 regions.
Arellano-Bond estimator using unbalanced panel with $Unionize^*_{ijt}$.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1989 - 2019			2000 - 2019		
$\Delta\theta_{ijt-1}$	0.107***	0.118***	0.120***	0.0708**	0.0762**	0.0821**
	(0.0240)	(0.0258)	(0.0277)	(0.0324)	(0.0326)	(0.0331)
p_{ijt-3}/P_{jt-3}	0.00275***			0.00321***		
	(0.000836)			(0.00118)		
p_{ijt-4}/P_{jt-4}		0.00177***			0.00215***	
		(0.000561)			(0.000784)	
p_{ijt-5}/P_{jt-5}			0.00116***			0.00111**
			(0.000399)			(0.000433)
$Unionize_{ijt^*}$	0.000874	0.00309	0.000554	0.00819*	0.00521	-0.000837
	(0.00233)	(0.00241)	(0.00187)	(0.00475)	(0.00333)	(0.00274)
$(p_{ijt-3}/P_{jt-3})\times Unionize^*_{ijt}$	-0.00255**			-0.00839**		
	(0.00101)			(0.00332)		
$(p_{ijt-4}/P_{jt-4})\times Unionize^*_{ijt}$		-0.00244**			-0.00487**	
		(0.00105)			(0.00221)	
$(p_{ijt-5}/P_{jt-5})\times Unionize^*_{ijt}$			-0.00118**			-0.00119*
			(0.000518)			(0.000715)
Observations	2640	2528	2416	1958	1948	1935
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00250***	0.00153***	0.00104***	0.00248***	0.00172***	0.00100***
(Delta Method)	(0.00074)	(0.00047)	(0.00035)	(0.00091)	(0.00061)	(0.00038)
M.E. of $Unionize^*_{ijt}$	-0.00226	0.00006	-0.00090	-0.00187	-0.00073	-0.00230
(Delta Method)	(0.00266)	(0.00248)	(0.00190)	(0.00344)	(0.00297)	(0.00251)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.150	0.624	0.915	0.543	0.677	0.779
Hansen's oid p-value	1.000	1.000	1.000	1.000	1.000	1.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Table 7: Taiwan's 10 sectors in 25 regions.
Arellano-Bond estimator using unbalanced panel with $Unionize^*_{ijt}$.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1992 - 2018			2001 - 2018		
$\Delta\theta_{ijt-1}$	-0.0844***	-0.0720***	-0.0836***	-0.0363***	-0.0341**	-0.0408***
	(0.0156)	(0.0156)	(0.0173)	(0.0140)	(0.0141)	(0.0152)
$\Delta\theta_{ijt-2}$	-0.130***	-0.116***	-0.124***	-0.0668***	-0.0651***	-0.0726***
	(0.0238)	(0.0235)	(0.0252)	(0.0114)	(0.0116)	(0.0122)
$\Delta\theta_{ijt-3}$	-0.0935***	-0.0854***	-0.0815***	-0.0397***	-0.0386***	-0.0412***
	(0.0126)	(0.0131)	(0.0143)	(0.0115)	(0.0118)	(0.0124)
$\Delta\theta_{ijt-4}$	-0.0157**	-0.0156**	-0.0544***	-0.0121**	-0.0121**	-0.0414***
	(0.00650)	(0.00650)	(0.0152)	(0.00502)	(0.00503)	(0.0143)
p_{ijt-3}/P_{jt-3}	0.000324**			0.000332**		
	(0.000158)			(0.000137)		
p_{ijt-4}/P_{jt-4}		0.000399**			0.000269**	
		(0.000184)			(0.000108)	
p_{ijt-5}/P_{jt-5}			0.000182			0.000164*
			(0.000141)			(0.0000928)
$Unionize^*_{ijt}$	-0.000796**	-0.000714**	-0.00114***	-0.000152	-0.000240	-0.000430*
	(0.000359)	(0.000310)	(0.000353)	(0.000190)	(0.000178)	(0.000221)
$(p_{ijt-3}/P_{jt-3})\times Unionize^*_{ijt}$	-0.000125			-0.000303***		
	(0.000154)			(0.0000857)		
$(p_{ijt-4}/P_{jt-4})\times Unionize^*_{ijt}$		-0.000318*			-0.000323***	
		(0.000174)			(0.0000896)	
$(p_{ijt-5}/P_{jt-5})\times Unionize^*_{ijt}$			-0.000185			-0.000296***
			(0.000184)			(0.000109)
Observations	3842	3827	3816	3254	3239	3228
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00029**	0.00031*	0.00013	0.00025**	0.00018 *	0.00008
(Delta Method)	(0.00014)	(0.00016)	(0.00011)	(0.00012)	(0.00009)	(0.00007)
M.E. of $Unionize^*_{ijt}$	-0.00094***	-0.00109***	-0.00135***	-0.00049***	-0.00061***	-0.00077***
(Delta Method)	(0.00030)	(0.00028)	(0.00033)	(0.00016)	(0.00017)	(0.00022)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.189	0.289	0.150	0.299	0.300	0.083
AR(5) p-value	0.083	0.082	0.040	0.873	0.874	0.967
Hansen's oid p-value	1.000	0.926	1.000	1.000	1.000	1.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Table 8: South Korea's 7 sectors in 17 regions.
Arellano-Bond estimator using unbalanced panel with $\frac{L^u_{it}}{L_{it}}$ and $\frac{L^u_{jt}}{L_{jt}}$.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1989 - 2019			2000 - 2019		
$\Delta\theta_{ijt-1}$	0.0378	0.0702**	0.0779***	0.0567*	0.0647**	0.0696**
	(0.0267)	(0.0285)	(0.0302)	(0.0318)	(0.0317)	(0.0320)
p_{ijt-3}/P_{jt-3}	0.00506***			0.00524***		
	(0.00122)			(0.00110)		
p_{ijt-4}/P_{jt-4}		0.00398***			0.00351***	
		(0.000934)			(0.000985)	
p_{ijt-5}/P_{jt-5}			0.00317***			0.00277***
			(0.000852)			(0.000840)
$\frac{L^u_{jt}}{L_{jt}}$	0.000678	0.000910	-0.00245	-0.00460	-0.00685	-0.00857
	(0.0111)	(0.0108)	(0.0104)	(0.0112)	(0.0108)	(0.0104)
$\frac{L^u_{it}}{L_{it}}$	0.0349***	0.0367***	0.0366***	0.0479***	0.0367***	0.0337***
	(0.00957)	(0.00871)	(0.00944)	(0.0107)	(0.0102)	(0.0104)
$(p_{ijt-3}/P_{jt-3})\times\frac{L^u_{jt}}{L_{jt}}$	0.00318			0.00558		
	(0.00648)			(0.00667)		
$(p_{ijt-3}/P_{jt-3})\times\frac{L^u_{it}}{L_{it}}$	-0.0130***			-0.0158***		
	(0.00322)			(0.00317)		
$(p_{ijt-4}/P_{jt-4})\times\frac{L^u_{jt}}{L_{jt}}$		0.00161			0.00603	
		(0.00596)			(0.00572)	
$(p_{ijt-4}/P_{jt-4})\times\frac{L^u_{it}}{L_{it}}$		-0.0111***			-0.0105***	
		(0.00266)			(0.00291)	
$(p_{ijt-5}/P_{jt-5})\times\frac{L^u_{jt}}{L_{jt}}$			0.00374			0.00690
			(0.00522)			(0.00504)
$(p_{ijt-5}/P_{jt-5})\times\frac{L^u_{it}}{L_{it}}$			-0.00965***			-0.00891***
			(0.00252)			(0.00262)
Observations	2406	2299	2192	2010	2004	1996
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00410***	0.00312***	0.00254***	0.00426***	0.00296***	0.00238***
(Delta Method)	(0.00093)	(0.00068)	(0.00062)	(0.00087)	(0.00073)	(0.00064)
M.E. of $\frac{L^u_{jt}}{L_{jt}}$	0.00461	0.00292	0.00225	0.00223	0.00061	0.00007
(Delta Method)	(0.00745)	(0.00732)	(0.00725)	(0.00705)	(0.00701)	(0.00708)
M.E. of $\frac{L^u_{it}}{L_{it}}$	0.01882***	0.02282***	0.02442***	0.02853***	0.02372***	0.02249***
(Delta Method)	(0.00692)	(0.00649)	(0.00719)	(0.00762)	(0.00738)	(0.00790)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.024	0.380	0.463	0.318	0.557	0.644
Hansen's oid p-value	1.000	1.000	1.000	1.000	1.000	1.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Table 9: Taiwan's 10 sectors in 25 regions.
Arellano-Bond estimator using unbalanced panel with $\frac{L^u_{it}}{L_{it}}$ and $\frac{L^u_{jt}}{L_{jt}}$.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1992 - 2018			2001 - 2018		
$\Delta\theta_{ijt-1}$	-0.135***	-0.134***	-0.145***	-0.0864***	-0.0866***	-0.0936***
	(0.0193)	(0.0190)	(0.0199)	(0.0171)	(0.0171)	(0.0184)
$\Delta\theta_{ijt-2}$	-0.163***	-0.164***	-0.176***	-0.0951***	-0.0957***	-0.105***
	(0.0261)	(0.0257)	(0.0281)	(0.0129)	(0.0131)	(0.0149)
$\Delta\theta_{ijt-3}$	-0.109***	-0.116***	-0.123***	-0.0673***	-0.0727***	-0.0800***
	(0.0152)	(0.0153)	(0.0167)	(0.0124)	(0.0137)	(0.0148)
$\Delta\theta_{ijt-4}$	-0.0182**	-0.0180**	-0.0880***	-0.0148**	-0.0149**	-0.0700***
	(0.00787)	(0.00776)	(0.0156)	(0.00626)	(0.00631)	(0.0132)
p_{ijt-3}/P_{jt-3}	0.00119*			0.00144**		
	(0.000652)			(0.000625)		
p_{ijt-4}/P_{jt-4}		0.00131*			0.00128**	
		(0.000703)			(0.000574)	
p_{ijt-5}/P_{jt-5}			0.000628			0.000734
			(0.000585)			(0.000479)
$\frac{L^u_{jt}}{L_{jt}}$	-0.00250	-0.00358	-0.00328	0.00266	0.00250	0.00248
	(0.00736)	(0.00766)	(0.00830)	(0.00490)	(0.00503)	(0.00554)
$\frac{L^u_{it}}{L_{it}}$	-0.00162	0.0000882	-0.00343	-0.00342**	-0.00254	-0.00496***
	(0.00172)	(0.00204)	(0.00240)	(0.00146)	(0.00156)	(0.00191)
$(p_{ijt-3}/P_{jt-3})\times\frac{L^u_{jt}}{L_{jt}}$	-0.00176			-0.00266**		
	(0.00135)			(0.00119)		
$(p_{ijt-3}/P_{jt-3})\times\frac{L^u_{it}}{L_{it}}$	-0.000317			-0.000119		
	(0.000732)			(0.000546)		
$(p_{ijt-4}/P_{jt-4})\times\frac{L^u_{jt}}{L_{jt}}$		-0.00165			-0.00227**	
		(0.00148)			(0.00116)	
$(p_{ijt-4}/P_{jt-4})\times\frac{L^u_{it}}{L_{it}}$		-0.000950			-0.000464	
		(0.000837)			(0.000595)	
$(p_{ijt-5}/P_{jt-5})\times\frac{L^u_{jt}}{L_{jt}}$			-0.00129			-0.00199*
			(0.00151)			(0.00113)
$(p_{ijt-5}/P_{jt-5})\times\frac{L^u_{it}}{L_{it}}$			0.000347			0.000544
			(0.00101)			(0.000711)
Observations	2963	2956	2950	2570	2563	2557
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00051**	0.00060**	0.00020	0.00046**	0.00040*	0.00008
(Delta Method)	(0.00023)	(0.00026)	(0.00022)	(0.00022)	(0.00020)	(0.00034)
M.E. of $\frac{L^u_{jt}}{L_{jt}}$	-0.00449	-0.00547	-0.00479	-0.00025	-0.00004	0.00021
(Delta Method)	(0.00704)	(0.00718)	(0.00748)	(0.00490)	(0.00506)	(0.00576)
M.E. of $\frac{L^u_{it}}{L_{it}}$	-0.00197	-0.00100	-0.00302*	-0.00354***	-0.00305***	-0.00433
(Delta Method)	(0.00123)	(0.00139)	(0.00154)	(0.00115)	(0.00119)	(0.00330)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.042	0.053	0.038	0.709	0.773	0.516
AR(5) p-value	0.509	0.503	0.263	0.587	0.596	0.733
Hansen's oid p-value	1.000	1.000	1.000	1.000	1.000	1.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Figures

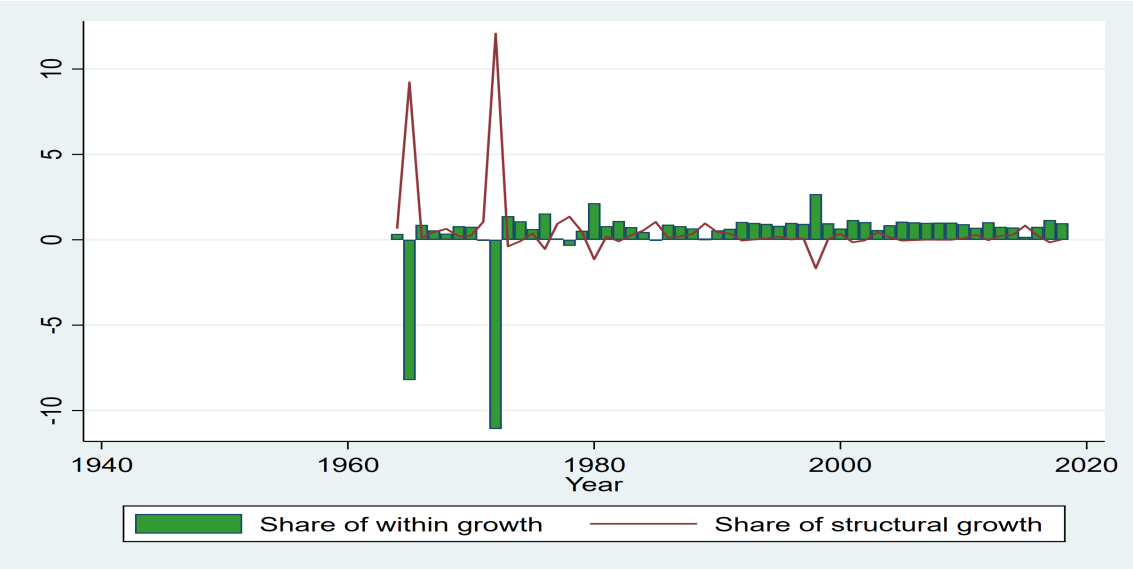

Figure 1: Growth Decomposition of South Korea

(Two extreme years are 1965 and 1972. As the 10-Sector Database ends in 2011, Economic Transformation Database is used since 2012.)

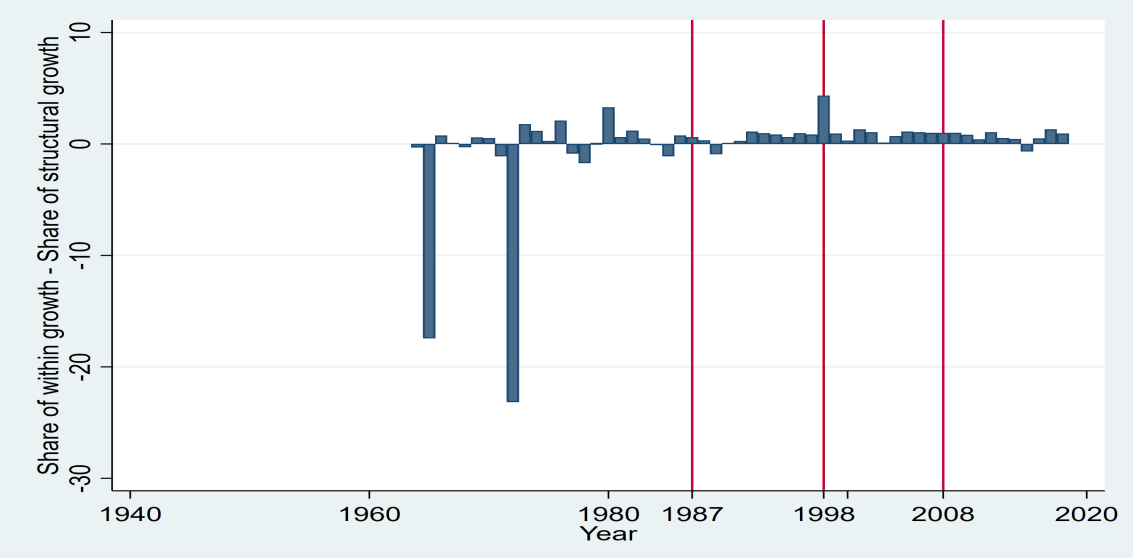

Figure 2: Share of within growth minus share of structural growth of South Korea.

(Two extreme years are 1965 and 1972. The positive value means that the within growth was bigger than the structural growth in according year. Vertical lines indicate the democratization (1987), 1st (1998) and 2nd (2008) power shifts, respectively.)

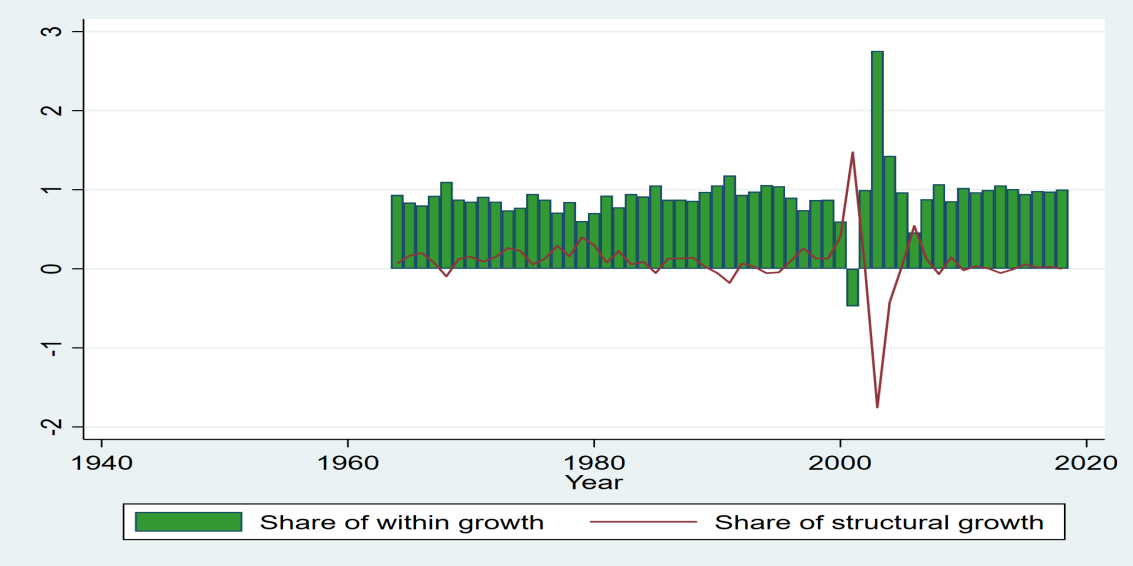

Figure 3: Growth Decomposition of Taiwan

(As the 10-Sector Database ends in 2012, Economic Transformation Database is used since 2013.)

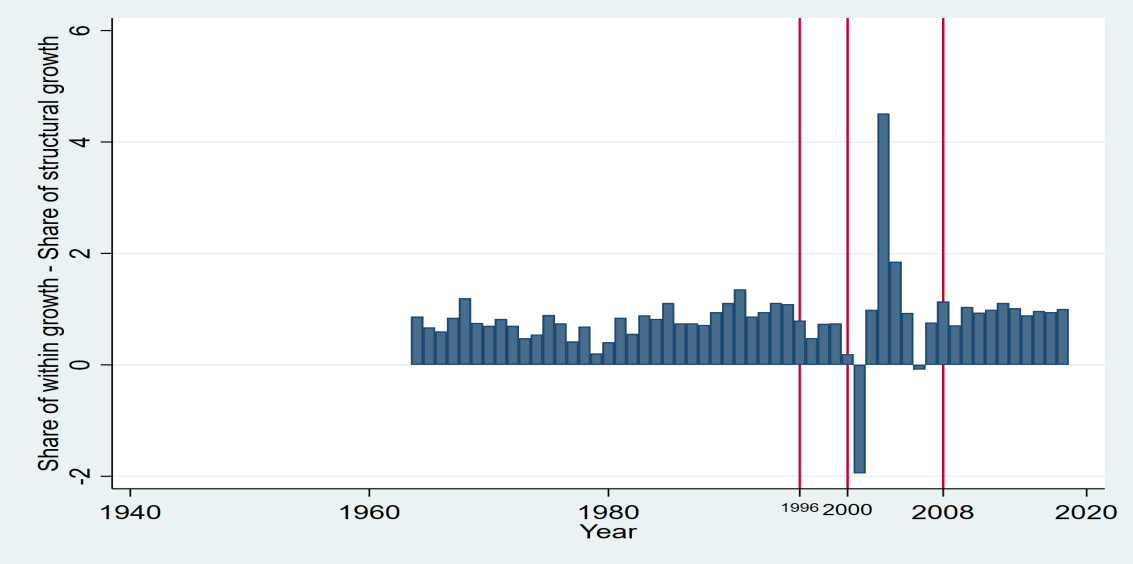

Figure 4: Share of within growth minus share of structural growth of Taiwan.

(The positive value means that the within growth was bigger than the structural growth in according year. Vertical lines indicate the democratization (1996), 1st (2000) and 2nd (2008) power shifts, respectively.)

Appendix A: Sub-sample Analysis between Before/After Legalization of Democratic Labor Union Confederation

Table A.1: South Korea's 7 sectors in 17 regions. Before and after the legalization of KCTU in 1999.
Arellano-Bond estimator using unbalanced panel.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1989 - 1999			2000 - 2019		
$\Delta\theta_{ijt-1}$	0.0483	0.0733	0.0615	0.0798**	0.0809**	0.0838**
	(0.0433)	(0.0522)	(0.0664)	(0.0324)	(0.0323)	(0.0330)
p_{ijt-3}/P_{jt-3}	0.00175			0.00198***		
	(0.00125)			(0.000686)		
p_{ijt-4}/P_{jt-4}		0.000815			0.00157***	
		(0.000628)			(0.000529)	
p_{ijt-5}/P_{jt-5}			0.00155*			0.00103***
			(0.000887)			(0.000378)
$Unionize_{ijt}$	-0.00119	0.00137	0.000887	0.00292	0.00269	0.00150
	(0.00286)	(0.00209)	(0.00181)	(0.00274)	(0.00220)	(0.00151)
$(p_{ijt-3}/P_{jt-3})\times Unionize_{ijt}$	-0.00145			-0.00254		
	(0.00114)			(0.00205)		
$(p_{ijt-4}/P_{jt-4})\times Unionize_{ijt}$		-0.00130			-0.00225*	
		(0.000889)			(0.00125)	
$(p_{ijt-5}/P_{jt-5})\times Unionize_{ijt}$			-0.00146*			-0.000987**
			(0.000848)			(0.000398)
Observations	682	580	481	1958	1948	1935
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00157	0.00066	0.00138*	0.00181***	0.00142***	0.00096***
(Delta Method)	(0.00113)	(0.00055)	(0.00080)	(0.00065)	(0.00048)	(0.00035)
M.E. of $Unionize_{ijt}$	-0.00309	-0.00031	-0.00098	-0.00011	-0.00005	0.00028
(Delta Method)	(0.00265)	(0.00194)	(0.00189)	(0.00157)	(0.00148)	(0.00126)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.015	0.161	0.606	0.651	0.733	0.790
Hansen's oid p-value	0.998	0.963	0.577	1.000	1.000	1.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Table A.2: Taiwan's 10 sectors in 25 regions. Before and after the legalization of TCTU in 2000. Arellano-Bond estimator using unbalanced panel.

	(1) $\Delta\theta_{ijt}$	(2) $\Delta\theta_{ijt}$	(3) $\Delta\theta_{ijt}$	(4) $\Delta\theta_{ijt}$	(5) $\Delta\theta_{ijt}$	(6) $\Delta\theta_{ijt}$
	1992 - 2000			2001 - 2018		
$\Delta\theta_{ijt-1}$	-0.269***	-0.330***	-0.351***	-0.0903***	-0.0909***	-0.101***
	(0.0249)	(0.0267)	(0.0312)	(0.0157)	(0.0155)	(0.0170)
$\Delta\theta_{ijt-2}$				-0.101***	-0.101***	-0.110***
				(0.0119)	(0.0120)	(0.0139)
$\Delta\theta_{ijt-3}$				-0.0679***	-0.0680***	-0.0755***
				(0.0139)	(0.0146)	(0.0152)
$\Delta\theta_{ijt-4}$				-0.0138**	-0.0137**	-0.0597***
				(0.00582)	(0.00583)	(0.0166)
p_{ijt-3}/P_{jt-3}	0.00375*			0.000396***		
	(0.00227)			(0.000134)		
p_{ijt-4}/P_{jt-4}		0.00590			0.000433***	
		(0.00397)			(0.000152)	
p_{ijt-5}/P_{jt-5}			-0.00840**			0.000404**
			(0.00357)			(0.000197)
$Unionize_{ijt}$	-0.00240	-0.00245	-0.00397	-0.000199	-0.000194*	-0.000272**
	(0.00178)	(0.00178)	(0.00281)	(0.000128)	(0.000107)	(0.000131)
$(p_{ijt-3}/P_{jt-3})\times Unionize_{ijt}$	-0.000484			-0.000160**		
	(0.000869)			(0.0000656)		
$(p_{ijt-4}/P_{jt-4})\times Unionize_{ijt}$		-0.001000			-0.000207***	
		(0.00161)			(0.0000555)	
$(p_{ijt-5}/P_{jt-5})\times Unionize_{ijt}$			0.000714			-0.000253***
			(0.00152)			(0.0000941)
Observations	630	515	391	2548	2533	2522
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
M.E. of p/P	0.00353	0.00541	-0.00799**	0.00032***	0.00034	0.00030
(Delta Method)	(0.00226)	(0.00397)	(0.00342)	(0.00012)	(0.00310)	(0.01028)
M.E. of $Unionize_{ijt}$	-0.00304*	-0.00380	-0.00299	-0.00037***	-0.00042	-0.00055
(Delta Method)	(0.00166)	(0.00268)	(0.00322)	(0.00011)	(0.00201)	(0.00790)
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.050	0.066	0.729	0.357	0.387	0.248
AR(5) p-value				0.577	0.579	0.672
Hansen's oid p-value	0.001	0.000	0.000	1.000	1.000	0.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

M.E. stands for marginal effect. Standard errors are calculated using the Delta Method.

Appendix B: Details on Estimations in Section 8 (Discussion)

Estimation equation below estimates whether a unionization of each region ($\frac{L^u_{jt}}{L_{jt}}$) can explain each region's structural growth term.

$$StructG_{jt} = \alpha_0 + \alpha_1 \frac{L^u_{jt-b}}{L_{jt-b}} + \mu_j + \lambda_t + \nu_{jt} \tag{6}$$

where $StructG_{jt}$ is the structural growth term ($\sum_i^I p_{ij,t}\Delta\theta_{ij,t}$) of regional growth decomposition. μ_j and λ_t represent the region-specific and year-specific effects, respectively. In order to relieve the possible endogeneity issue, the regional level unionization is lagged with enough gaps ($4 \leq b \leq 6$). In addition, if we replace $StructG_{jt}$ with $WithinG_{jt}$ which stands for the within growth term $\sum_i^I \theta_{ij,t-1}\Delta p_{ij,t}$, we have symmetric equation below.

$$WithinG_{jt} = \alpha_0 + \alpha_1 \frac{L^u_{jt-b}}{L_{jt-b}} + \mu_j + \lambda_t + \nu_{jt} \tag{7}$$

Table B.1 and B.2 include consequent estimation results from the South Korean economy and the Taiwanese economy, respectively. Left three columns of Table B.1 and B.2 are estimation results from equation (6). The right three columns of them are estimation results from equation (7). The difference of magnitudes in estimated coefficients between Table B.1 and B.2 comes from the local currency of each nation. The real value-added for retrieving the productivity is represented by the local currency in millions (Won in South Korea and Taiwan Dollar in Taiwan). We can clearly see that, in Table B.1, regional lagged unionization is negatively correlated with the magnitude of structural growth in South Korea. The inverse relationship is found between the within growth and regional unionization. However, according to Table B.2, there is not any statistically significant relationship between decomposed growth and regional unionization in Taiwan.

Table B.1: Geographically decomposed growth and unionization in South Korea, 1989-2019

	(1) $StructG_{jt}$	(2) $StructG_{jt}$	(3) $StructG_{jt}$	(4) $WithinG_{jt}$	(5) $WithinG_{jt}$	(6) $WithinG_{jt}$
L^u_{jt-4}/L_{jt-4}	-11931.8**			10828.1		
	(4657.8)			(6929.8)		
L^u_{jt-5}/L_{jt-5}		-15391.1***			17174.9**	
		(4877.6)			(7271.6)	
L^u_{jt-6}/L_{jt-6}			-13511.5***			23717.7***
			(5109.1)			(7504.6)
Constant	186.6	746.6	865.9	1461.7	913.0	1121.7
	(609.2)	(627.4)	(650.5)	(906.3)	(935.3)	(955.5)
Observations	358	341	324	358	341	324
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Geographically decomposed growth and unionization in Taiwan, 1992-2018

	(1) $StructG_{jt}$	(2) $StructG_{jt}$	(3) $StructG_{jt}$	(4) $WithinG_{jt}$	(5) $WithinG_{jt}$	(6) $WithinG_{jt}$
L^u_{jt-4}/L_{jt-4}	14.39			-76.59		
	(38.37)			(145.9)		
L^u_{jt-5}/L_{jt-5}		5.916			-118.4	
		(42.72)			(162.1)	
L^u_{jt-6}/L_{jt-6}			52.81			-111.1
			(47.98)			(182.1)
Constant	0.973	0.0568	-17.73	56.73	63.37	57.55
	(18.43)	(20.21)	(22.35)	(70.08)	(76.66)	(84.81)
Observations	340	314	288	340	314	288
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$