



LUND UNIVERSITY

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Master in Economic Development

The Decline of Patriarchy in High-Tech Economies: Economic Growth and the Gender Wage Gap in the East Asian Tigers, 1980-2010

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Abstract: Previous research suggests that gender wage discrimination contributes to economic growth in the context of female-dominated low-tech manufacturing and patriarchal employment systems, such as the ones found in the East Asian Tigers in the 1960s to 1980s. In a panel data analysis, this thesis investigates the relationship between the gender wage gap and economic growth in the four East Asian Tigers from 1980 to 2010. It thereby assesses whether findings of previous research hold throughout the countries' later structural transformation. The findings suggest that in economies experiencing the decline of typically female-dominated low-tech sectors, gender wage discrimination is negatively related to economic growth. In economies who do not experience the decline of such sectors, the relationship remains positive. This implies that economies with large female-dominated low-tech sectors may consider reducing gender wage discrimination in favour of economic growth in the course of structural transformation.

Key words: Gender wage gap, structural transformation, East Asian Tigers

EKHS21

Master thesis, First Year (15 credits ECTS)

June 2018

Supervisor: Jutta Bolt, Luka Miladinovic

Examiner: Christer Gunnarsson

Word Count: 13,587

Acknowledgements

I would like to thank my supervisors Jutta and Luka for their amazing support, their very constructive feedback and enriching ideas. Thank you for making so much time for me and enabling me to realize my ideas in the best possible way.

Then I would like to thank Jonathan for giving me access to Stata so that I did not have to spend those sunny past months in the dungeons of the Alpha-building, and for taking up the tedious task of proof reading. But more importantly, thank you for your endless patience and acceptance in bearing with my moodiness, as well as the countless comforting hugs and pancakes.

Moreover, I would like to thank the girls for forgiving my absence, when you were stuck in the Alpha-dungeons, and always having an encouraging word for me, when I did make my way down there.

Finally, thank you to my parents for enabling me to pursue my aims and follow my beliefs, and always being there and ready to help me removing whatever obstacle from my path.

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I. Introduction

In 2015, the United Nations adopted the 2030 Agenda for Development including the seventeen Sustainable Development Goals (SDGs). Amongst them is SDG 5, to achieve gender equality and empower all women and girls, and aiming to “end all forms of discrimination against all women and girls everywhere” (United Nations, 2015). One important form of gender discrimination consists in unequal participation in and remuneration of economic activities. This results in the gender wage gap, which remains a global problem up to the present (World Economic Forum, 2017). Ending this discrimination is not only considered a moral obligation by important development actors (European Commission, 2015; Plan International, 2017), but could also increase world GDP by USD 12 trillion according to a McKinsey Global Institute study (2015).

Since the 1950s, the East Asian Tigers, namely Hong Kong, Singapore, South Korea and Taiwan, have experienced remarkable economic growth transforming from agricultural to high-tech manufacturing and service economies within half a century (World Bank, 1993). The four countries share a similar growth experience based on low-skill export-oriented sectors during early industrialisation, at a similar point in time. Moreover, they are characterized by a patriarchal employment system allowing for the employment of female labour at very low cost, typically in the textiles, apparel and footwear sectors (Cheng & Hsiung, 1994; Deyo, 1989; Seguino, 2000a; Ward, 1990). The study of the East Asian Tigers’ gender wage gaps in relationship to their economic growth has thus attracted the interest of many scholars (Berik, 2000; Berik, Rodgers & Zveglic, 2004; Schober & Winter-Ebmer, 2011; Seguino, 2000a; Zveglic & van der Meulen Rodgers, 2004). However, none of these scholars have investigated a time period extending beyond the year 2000, which is when the above-mentioned female-dominated sectors lost their importance in the East Asian Tigers. The gap in the literature thus raises the question how the gender wage gap and its relationship to economic growth have evolved in more recent years when the East Asian Tigers transformed towards high-tech manufacturing and service economies.

More precisely, this research contributes to the literature by investigating *how the gender wage gap and economic growth were related in the East Asian Tigers during their structural transformation towards high-tech manufacturing and service economies from 1980 to 2010*. This will be done in four different panel estimation models. Previous research revealed that, due to patriarchal employment conditions facilitating female exploitation, the gender wage gap was positively related to economic growth in these countries when the economy was dominated by low-skill export-oriented sectors (e.g. Berik, Rodgers & Zveglic, 2004; Seguino, 2000b). However, a structural transformation towards a technology-intensive economy requires considerable human capital improvements and eliminates female-dominated low-skill sectors, thus setting limits to the economic exploitation of women. Moreover, as will be shown throughout this thesis, the four East Asian Tigers’ structural transformation was accompanied by increases in the female labour share and female years of education. Hence, this research hypothesises that, *when transforming to high-tech*

manufacturing and service economies, the relationship between the gender wage gap and economic growth in the East Asian Tigers becomes insignificant or negative.

In addition to extending the time period studied in the literature, this research contributes to the debate in the literature between Seguino (2000b, 2011) and Schober and Winter-Ebmer (2011) on the effect of the gender wage gap on economic growth in the East Asian Tigers and other countries. While Seguino (2000b) found a negative relationship between the two variables during the time period from 1975 to 1990 using aggregate manufacturing wage data, Schober and Winter-Ebmer (2011) did not find the same effect when using micro-level wage data from various sectors. Seguino (2011) criticized their work for not applying solely manufacturing data, which was crucial to economic growth and female employment at the investigated time. This research contributes to this debate by reaching a compromise between the two data selection methods. Similarly to Seguino, it applies aggregate rather than micro-level wage data. However, in contrast to Seguino's data, this thesis applies data comprising all non-agricultural sectors, as in Schober and Winter-Ebmer's study. The choice to use wage data from various sectors rather than just manufacturing is justified, since the manufacturing sector loses its relative importance in the time periods investigated in this research. Finally, this thesis extends Seguino's (2000a) methodology from considering only years of secondary education to including all years of education when accounting for differences between male and female education, thus enabling the usage of more information.

Some usage of terminology in this thesis requires clarification.¹ First, while there are several definitions of the gender wage gap, this research applies a wage gap variable and methodology that is based on Seguino (2000a). The gender wage gap as used in this thesis describes the difference in pay between men and women that remains after controlling for the differences in years of education and male and female relative labour shares, and is often associated with gender wage discrimination. By applying GDP per capita growth as its outcome variable, the model moreover partly controls for the effect of changes in fertility rate on the gender wage gap, since GDP per capita accounts for population size. However, the model used in this thesis does not account for wage differentials stemming from job segregation, the number of working hours or labour market experience. Second, by using the term structural transformation, this thesis describes the process during which low-skill manufacturing sectors lose their relative importance, while high-tech manufacturing and service sectors come to dominate the economy.

This thesis proceeds by first, presenting a review of the main literature on the gender wage gap and its relation to economic growth, both globally and in the East Asian Tigers. Thereafter, this research's methodology and data are explained, and the structural transformation in the East Asian Tigers is empirically established. Finally, the analysis' results suggest that economic growth during an economy's structural transformation from low-tech manufacturing to high-tech manufacturing and services is related to decreases in gender wage discrimination, thus confirming this thesis' hypothesis. This is however only

¹ The term gender refers to as men and women in a biological sense, while acknowledging that other genders exist. This restriction is meaningful considering the geographical and historical context of this research as well as the availability of data.

applicable to economies whose initial low-tech economies comprised those sectors known as typically female-dominated, such as the textiles, apparel and footwear sectors (International Labour Organization, 2014). The thesis' limitations are explained throughout the text.

II. Literature Review

This research focusses on the gender wage gap as an indicator for gender inequality, while acknowledging that other indicators such as the education gap or the labour share also have important explanatory power in assessing gender inequality. The gender wage gap is chosen for two reasons: First, gender wage equality seems to be hardest to achieve, while education and labour share gaps are consistently reduced by many countries worldwide (World Economic Forum, 2017). The East Asian economies have been particularly successful in closing the education gap and increasing female labour shares (Zveglic & van der Meulen Rodgers, 2004). Second, the gender wage gap is influenced by the gaps in education and labour market experience (Gayle & Golan, 2012; Mihaila, 2016). If controlling for the two latter indicators, the wage gap can shed light on gender wage inequality that remains unexplained and thus comes closer to determining the impact of gender discrimination (Berik, Rodgers & Zveglic, 2004; Goldin & Polachek, 1987).

The literature review is structured as follows: First, literature on the gender wage gap and its causes is presented. Second, research on the relationship between the gender wage gap and economic growth is introduced. Finally, the literature review is narrowed down to the geographical focus of this research: The countries of Hong Kong, Singapore, South Korea and Taiwan, known for their remarkable and relatively similar growth experience as the four East Asian Tigers.

2.1 The Gender Wage Gap

In the literature, the term gender wage gap has been used to refer to the wage differences between men and women in several ways, ranging from the mere difference in aggregate economy-wide wages to the wage differentials between women and men in the same industries, occupations or positions, with the same educational background, labour market experience and number of working hours. Research has found several factors that partly explain the wage discrepancies between men and women and which are accounted for to different extents. The residual wage gap, meaning the unexplained part of the wage gap, is commonly attributed to gender discrimination (Berik, Rodgers & Zveglic, 2004).

2.1.1 Explanatory Factors

The most common factors used to explain the gender wage gap are related to gender differences in human capital and demographic changes. In their United States micro-data study from 1980 to 2010, Blau and Kahn (2017) find that educational human capital lost explanatory power over time, as women's and men's education levels assimilated. However, human capital related to labour market experience remains an important factor. Women's workforce interruptions and shorter working hours, usually conditioned by having children, affect the gender wage gap, as men typically gain more labour market experience than women (Blau & Kahn, 2017). Similarly, Mihaila (2016) finds that human capital acquired in the labour market is the most influential factor in determining the wage gap. Furthermore, in their study of the United States labour market from 1968 to 1997, Gayle and Golan (2012) relate increases in the female labour share, caused by technological changes, declining costs of producing home goods, higher education levels, and demographic changes in marriage and fertility trends, to declines in the gender wage gap. The importance of demographic changes is moreover shown by Loughran and Zissimopoulos (2009). In their cross-sectional study of household in the United States in 1976 and 2004, they find that, while marriage has negative effects on both male and female wages, childbearing affects only female wages negatively, thus increasing the gender wage gap.²

More recently, researchers considered psychological dissimilarities between men and women. For instance, Niederle and Vesterlund (2007) have shown in an experiment that women tend to avoid competition, while men have a tendency to embrace it. Such differences in behaviour would also be reflected in the gender wage gap. Furthermore, in a longitudinal study of a 1972 high school class cohort in the United States, Daymont and Andrisani (1984) found that the gender wage gap among college graduates is explained by 33 to 66 percent by different preferences for occupational roles and different choices of study fields. However, it is important to note that while different preferences could be related to purely psychological factors, they could as well be influenced by the predominant gender norms in society, which are closely related to gender discrimination. This is reflected by Blau and Kahn's (2017) finding that gender differences in occupation and industries partly explain the gender wage gap but then again stem from gender norms, gender roles and the gender division of labour in society. They thus conclude that discrimination still matters.

2.1.2 Gender Discrimination

Wage discrimination has first been theoretically delineated by Gary Becker (1959) in his influential book called *The Economics of Discrimination*. Accordingly, the magnitude of every monetary transaction, that is every wage or price paid, is composed of the actual price and a percentage determined by the discrimination coefficient. The discrimination coefficient

² Fertility rates in the East Asian Tigers have been declining at a very high rate during the past fifty years (Frejka, Jones & Sardon, 2010). This thesis acknowledges that changes in fertility rates may have had an important impact on their gender wage gaps. However, it does not include this factor in its analysis, as its methodology is based on Seguino (2000a). Fertility rates are only partly and indirectly accounted for by the GDP per capita growth variable, which controls for population size.

in turn “depends on the social and physical distance between the discriminator and the discriminated and on their relative socioeconomic status” (p.8). Moreover, it is influenced by the relative number of the discriminated. The more numerous they are, the more power they have and the more knowledge about them exists, resulting in less discrimination, according to Becker (1959).

While Becker (1959) referred himself mostly to the discrimination of coloured people by white people in the setting of a closed economy, Berik, Rodgers and Zveglic (2004) extend his neo-classical reasoning to the context of gender discrimination in open economies. Accordingly, gender wage discrimination should not persist in the context of rising competitiveness: If discrimination results in female labour being cheaper, competition in an open economy will result in the employment of more women. The higher demand for female labour will thus cause female wages to rise. However, in their analysis of Taiwan and Korea from 1980 to 1999, Berik, Rodgers and Zveglic (2004) find that this theory does not hold and discrimination persisted despite international competition.

Another theoretical approach to gender wage discrimination, is Goldin's (2014) *Pollution Theory of Discrimination*. It is based on the assumption that the gender wage gap emerges mostly due to occupational segregation, with men working in higher-paid sectors than women. According to Goldin, the gender wage gap persists because women are prevented from entering typically male-dominated sectors by male employers who fear to risk their occupation's prestige. Male employers fear that, when women enter a men-dominated occupation, observing men who consider women as less qualified could interpret this as an indicator for altered admission standards in the occupation. Hence, women would “pollute” the occupation's prestige, even if they have the required qualifications to enter the occupation. Consequently, men would discriminate women because they fear to lose their occupational prestige. According to Goldin, this mechanism could explain the rise and persistence of gender wage discrimination. However, this thesis does not account for this mechanism in its explanation of the gender wage gap, as this would require conducting time-intensive in-depth interviews.

2.2 The Gender Wage Gap and Economic Growth

Several scholars have studied the relationship between the gender wage gap and economic growth. This section provides an overview of some of these studies, before narrowing down the geographical focus to the four East Asian Tigers in the following section. While only few studies find a positive relationship between the gender wage gap and economic growth, meaning a larger gap being related to higher growth, some studies obtain the exact opposite picture of their relationship. Finally, several researchers conclude that there is a mixed relationship between the gender wage gap and economic growth, as presented here below.

2.2.1 A Positive Relationship Between the Gender Wage Gap and Economic Growth

Out of the few studies finding a positive relationship between the gender wage gap and economic growth, Seguino's (2000b) research provides an important basis for the study at hand. For her cross-country study of the gender wage gap covering different time periods ranging from 1975 to 1995, she selected twenty semi-industrialized lower- and middle-income countries with export-oriented economies whose exporting sectors employ women by the majority. Due to the structure of these economies, her analysis is specifically limited to the gender wage gap in the manufacturing sectors. Applying an education-adjusted gender wage gap to account for differences in education between men and women, she finds that the wage gap variable is significantly and positively related to growth and investment. In her interpretation, patriarchal systems in the studied countries allow employers to pay women particularly low wages without compromising on their productivity or risking any opposition. Due to the high productivity at low cost, the female-dominated manufacturing industries become attractive to investment, which in turn results in higher growth. As will be presented in Section 2.3.1, Seguino (2000a) narrows her analysis down to Asian economies in another study.

In a slightly different context, Doepke and Tertilt (2014) also come to the conclusion that gender discrimination can be beneficial for economic growth. They challenge the assumption commonly made in the fields of conditional cash transfers and micro-finance that more money in the hands of women leads to more child-related spending, which in turn benefits economic development. In development aid, it is often assumed that women spend their money in a way that is more beneficial to their children than men's expenditure behaviour. This is attributed to a women's sense for family responsibility. However, Doepke and Tertilt (2014) claim that long-term increases in female incomes would imply a higher number of hours worked by women. Even though this could increase spending on child goods, it would also result in less time spent with children, thereby hindering children's and thus economic development in the long-term. Moreover, Doepke and Tertilt (2014) suggest that a women's expenditure behaviour is not solely attributable to her gender and sense for family responsibility, but could also be a result of the discrimination against her. Consequently, reducing female labour discrimination could change women's behaviour towards what is typically considered a male consumption behaviour: Women would start to consume more private rather than public goods and less child-related goods, and they would save less money. Overall, their behavioural changes resulting from higher incomes would not benefit economic development, as less money would be saved or spent on child-related goods. Thus, Doepke and Tertilt (2014) argue that a reduced gender wage gap resulting from women empowerment could have negative implications on women's expenditure behaviour and thus for economic growth, while a large gender wage gap results in women's behaviour being beneficial for economic growth.

2.2.2 Negative and Mixed Findings on the Relationship Between the Gender Wage Gap and Economic Growth

Some studies have found a negative relationship between the gender wage gap and economic growth, mostly in developed economies, concluding that gender inequality is an impediment to growth. For instance, Cavalcanti and Tavares (2016) find that a 50 percent increase in the gender wage gap leads to a 35 percent decrease in income per capita in the United States. Similarly, Kennedy et al. (2017), having studied the Australian economy from 1986 to 2013, find that a reduction of the gender wage gap by 10 percent can boost per capita output by up to 3 percent.

Overall, most scholars agree that the relationship of the gender wage gap and economic growth depends on the context determined by the country sample, the examined time period, the type of occupational gender segregation that is predominant in a country, the structure of an economy and other country-specific factors (Kabeer & Natali, 2013). For instance, Seguino (2010) compares the relationship between the gender wage gap and economic growth in semi-industrialized economies and low-income agriculturally dependent economies. While confirming her earlier finding that a larger wage gap can attract investment and gender equality worsens the balance of payments in semi-industrialized economies, she finds the opposite to hold true for low-income agriculturally dependent economies. Here, according to Seguino (2010), wage equality promotes economic growth in the short- and long-term.

Similarly, Oostendorp (2009) finds differing effects on within-occupation gender wage gaps for poor and rich countries. Whereas in richer countries, economic development, trade and foreign direct investment tend to decrease the gender wage gap, he finds no evidence for such effect in poorer countries. Finally, in a review of various studies conducted on the topic, Kabeer and Natali (2013) conclude that most studies find a positive effect of gender equality in education and employment on economic growth. However, they find that the opposite direction of effect does not hold true: Economic growth in itself does not result in higher gender equality. They thus suggest that gender equality enhancing measures could create a win-win situation for women and economic growth.

To situate this thesis in the existing literature on the gender wage gap, it is important to understand the debate between Seguino (2000b, 2011) and Schober and Winter-Ebmer (2011). In a response to the above-presented study by Seguino (2000b), Schober and Winter-Ebmer (2011) refute her finding of a positive relationship between the gender wage gap and economic growth. The two authors apply an international dataset of meta wage information drawn from 263 micro-level national studies covering several sectors instead of aggregate wage data on the manufacturing sector, as done by Seguino. As a result, the authors claim that differences in productivity between individuals become comparable. Applying the meta data, they run Seguino's (2000b) model for the same country sample, as well as for two extended country samples comprising up to 54 countries. Overall, Schober and Winter-Ebmer (2011) find no evidence for a positive relationship between the gender wage gap and economic growth. However, as Seguino (2011) points out in a reply to Schober and Winter-Ebmer, their results differ from hers, as they used wage data from the whole economy rather than just the

manufacturing sector. For her analysis, the manufacturing sector is most relevant, as it mainly constituted the export sector in the studied countries at the studied time periods.

With regard to the methodology of this thesis, the debate between Seguino and Schober and Winter-Ebmer points to important considerations. As will be further shown in this thesis's methodology and data sections (Sections 3 and 4), this research applies Seguino's (2000a) model with aggregate wage data, similarly to her research. However, as this research studies a later time period than both Seguino (2000a) and Schober and Winter-Ebmer (2011), the studied economies reveal a different structure, and other sectors than the female-dominated manufacturing industry become more relevant to this study. The declining relevance of the female-dominated low-tech manufacturing sector in particular will be further explained in Section 4.1. Despite Seguino's (2011) criticism of Schober and Winter-Ebmer's (2011) methodology, this research thus applies wage data from all non-agricultural sectors and not only manufacturing. Through the study of a later time period with different economic structures in the East Asian Tigers, this research thus contributes to the debate by reaching a compromise between Seguino's and Schober and Winter-Ebmer's data selection methods.

2.3 The Gender Wage Gap and Economic Growth in the East Asian Tigers

Having presented literature on the gender wage gap and its relationship to economic growth, this section of the literature review introduces literature on the relationship between the gender wage gap and economic growth in the East Asian Tigers specifically. These countries, namely Hong Kong, Singapore, South Korea and Taiwan, constitute the cases studied in the research at hand and are thus of particular interest. This section proceeds by, first, presenting studies on the period of the East Asian Tigers' early industrial growth in the 1960s and 1970s, followed by literature on the period of early structural transformation in the 1980s and 1990s.

2.3.1 The East Asian Tigers' Gender Wage Gap During Early Industrial Growth

There is agreement in the literature that the gender wage gap did not decrease, but rather increased during the East Asian Tigers' early industrial growth period. As Deyo (1989) describes, these countries' economies were particularly competitive due to the mobilization of productive, low-cost and disciplined labour. In general, political controls impeded political and union organisation. Strikes barely occurred in Singapore and Taiwan and were easily suppressed in Hong Kong. Whereas South Korea did experience some violent collective action in factories, their impact on labour rights legislation was minimal (Deyo, 1989). In these "patriarchal, paternalistic, and patrimonial systems of labour control", especially young women could be employed at low pay, with no career mobility and minimal job security without creating any risk for employers (p.8).

In their study of Taiwan, Cheng and Hsiung (1994) agree that particularly the female labour force, being numerous, flexible and inexpensive, met the requirements for labour-intensive, export-oriented growth. They find a higher fluctuation in female than in male labour and female employment rates corresponding to Taiwan's business cycles, indicating that women were more easily dismissed during economic recessions. Moreover, since entering employment constituted an additional burden to the solely female household work, Cheng and Hsiung (1994) point out that increased female labour shares did not imply improvements in gender equality, but rather a worsened exploitation of women. This finding underlines the importance of applying the gender wage gap indicator rather than the female labour share to measure gender discrimination. However, while Cheng and Hsiung (1994) criticize gender discrimination, they confirm that this discriminatory system has contributed to the competitiveness of Taiwan in the world market. Similar observations on the worsening effect of economic growth on gender equality in the East Asian Tigers were made by Ward (1990), Blecker and Seguino (2002) and Seguino (2000b).

Using a gendered version of the Solow Growth model (Solow, 1956), Seguino (2000b) conducts a regression analysis of the gender wage gap's effect on economic growth in the Asian economies from 1975 to 1990. This approach constitutes the methodological basis for this thesis' analysis, as will be further explained in Section 3. By using an education-adjusted gender wage gap variable, she accounts for differences in male and female years of secondary education (for a more detailed specification, see Section 3). As mentioned above, while Seguino (2000b) applies wage data restricted to the manufacturing sector, this research will use more comprehensive data to capture the economic structural transformation. Moreover, this thesis' model accounts for all years of education rather than just secondary education to enable the usage of more information. In her analysis, Seguino (2000b) finds a positive relationship between the education-adjusted gender wage gap and economic growth. The patriarchal employment system in Asian economies leads her to interpret this positive relationship as positive effect of the gender wage gap on economic growth. However, she does not prove this direction of causality statistically.

This research contributes to her study by extending her analysis timewise to the period of 1980 to 2010 and thereby revealing possible changes in the relationship between the gender wage gap and economic growth, possibly owing to the economies' structural transformation. It is however important to note the problem of endogeneity in Seguino's (2000b) model: While the gender wage gap could benefit economic growth, the direction of causality may as well be opposite, with economic growth resulting in a larger gender wage gap. Seguino (2000b) attempts to qualitatively establish the direction of impact by referring to the context of patriarchal norms and nevertheless increasing female labour shares in export sectors, suggesting that women were exploited. Moreover, she refers to the logical link between cheap female labour and the attraction of investment, resulting in economic growth. While her account of causal links seems convincing, she cannot solve the statistical problem of endogeneity. This research attempts to statistically contribute to the solution of the endogeneity problem by including a time-lagged education-adjusted gender wage gap variable.

In a later paper, based on macroeconomic models on gendered job segregation between the domestic and the export markets, Blecker and Seguino (2002) rather pessimistically conclude that “altering the policy environment [...] can relieve some of the trade-offs between women’s wage gains and export competitiveness”, albeit under very limiting conditions (p.116). The literature thus suggests few other options than female exploitation in the particular context of labour-intensive, export-oriented economic growth in the East Asian Tigers.

2.3.2 The East Asian Tigers’ Gender Wage Gap During Structural Transformation to High-tech Manufacturing and Service Economies

Scholars studying the East Asian Tigers in later time periods up to the year 2000 have barely revealed improvements regarding gender discrimination in Taiwan and South Korea (Berik, 2000; Berik, Rodgers & Zveglic, 2004; Zveglic & van der Meulen Rodgers, 2004; Zveglic, Van Der Meulen Rodgers & Rodgers, 1997). Studying a time period up to 1992, Zveglic, Van Der Meulen Rodgers and Rodgers (1997) find that wage discrimination even worsened, as Taiwan’s economy shifted towards a high-tech manufacturing and service economy. Even though women rapidly closed the skills and education gap, the average gender earnings ratio persisted at 65 percent during the period from 1978 to 1992. Zveglic and van der Meulen Rodgers (2004) confirm that, while nominal wages rose, they were reduced relative to women’s increased experience and education, resulting in growing discrimination among women and men doing similar work. In a similar study of Taiwan covering a period from 1984 to 1993, Berik (2000) confirms that the gender wage gap increased during early structural transformation, especially because women suffered most from employment loss. Moreover, Zveglic and van der Meulen Rodgers (2004) find that within-occupation wage gaps explain a large part of Taiwan’s gender wage gap, whereas job segregation only plays a minor role. Hence, Taiwan’s 1984 Labour Law prohibiting gender wage discrimination for equal work and productivity is apparently not being enforced. Finally, a study of Taiwan and South Korea from 1980 to 1999 by Berik, Rodgers and Zveglic (2004) reconfirms that, contrary to what neoclassical theory suggests, foreign trade competition is positively related to gender wage discrimination.

Overall, studies on gender wage discrimination in the East Asian Tigers covering time periods up to the year 2000 agree that gender wage discrimination was positively related to economic growth and has not declined in the course of structural transformation. If the same holds true for the time period up to the year 2010, this thesis’ hypothesis that the relationship between the gender wage gap and economic growth shifts from a positive to an insignificant or negative one during the countries’ structural transformation, would need to be rejected. In contrast, the opposite finding would contradict previous studies and suggest that, even in patriarchal systems, an economy’s structural transformation is associated with decreases in gender wage discrimination. This thesis thus investigates whether a time extension of the study to the year 2010 changes previous results on the relationship between the gender wage gap and economic growth.

III. Methods

Based on the literature review on the gender wage gap and its relation to economic growth globally, and in the East Asian Tigers specifically, the following section proceeds to present this research's methodology in a more detailed manner. As previously explained, it draws upon Seguino's (2000b) panel estimation, which it extends timewise. It moreover, contributes to the debate between Schober and Winter-Ebmer (2011) and Seguino (2011) by applying wage data from all non-agricultural sectors. This is justified by the investigation of a later time period, during which the examined economies reveal a different sectoral structure. Furthermore, data on all years of education rather than just secondary school years are considered to account for those years, during which most people in the respective countries did not enjoy secondary education. Finally, a time-lagged wage gap variable is included to address the statistical problem of endogeneity between the gender wage gap and economic growth.

In answering the research question, how the gender wage gap and economic growth are related in the East Asian Tigers during their structural transformation towards high-tech manufacturing and service economies from 1980 to 2010, GDP per capita growth is chosen as an indicator for economic growth. To account for differences in male and female education, an education-adjusted wage gap variable is computed as the main explanatory variable, following Seguino's methodology. However, the thesis acknowledges that these indicators cannot fully explain the very complex phenomena of gender discrimination and economic growth. More research beyond the scope of this thesis would be required to arrive at a more comprehensive analysis.

A fixed-effects panel estimation covering the four East Asian Tigers over a time period from 1980 to 2010 will serve to analyse the relationship between the education-adjusted gender wage gap and GDP per capita growth. The model is specified as previously done by Seguino (2000a, 2000b). While Seguino used GDP growth as her dependent variable, this study applies GDP per capita growth as its dependent variable, to account for the different population sizes of the examined economies. The model's main explanatory variable is the education-adjusted gender wage gap, measuring the log-transformed wage ratio of women and men with similar education levels. Accounting for differences in human capital allows to draw conclusions on the extent to which the gender wage gap remains unexplained, thus indicating gender wage discrimination. However, this variable does not account for other factors influencing the wage gap, such as sectoral and occupational job segregation, job positions or the number of weekly working hours. These will need to be inquired in further research. While Seguino (2000a) considers years of secondary education in her calculation of the education-adjusted gender wage gap variable, this research uses the full years of education to avoid generating zero values and thereby losing information. The education-adjusted gender wage gap is hence calculated as follows:

$$WGAP = \ln\left(\frac{wages_{male}}{years\ of\ education_{male}}\right) - \ln\left(\frac{wages_{female}}{years\ of\ education_{female}}\right)$$

Where the fractions represent the male and female monthly wages per year of education, that is the male and female return to education. To facilitate the interpretation of the education-adjusted gender wage gap, the formula can be rephrased as follows:

$$WGAP = \ln\left(\frac{\frac{wages_{male}}{years\ of\ education_{male}}}{\frac{wages_{female}}{years\ of\ education_{female}}}\right)$$

Where the numerator of the fraction represents the return to education for men; and the denominator constitutes the return to education for women. The more equal the return to education for both genders becomes, the smaller the education-adjusted gender wage gap will be. If the return to education was equal for both genders, the ratio between their returns would equal one. Since the natural logarithm of one equals zero, the education-adjusted gender wage gap would hence be zero.

Based on Seguino's methodology (2000a), the full panel estimation model is derived from the Cobb-Douglas production function (equation 1):

$$(1) Y = A * K^\alpha * L^\beta$$

Where Y equals output measured in GDP in Seguino's study or GDP per capita in this research. A represents total factor productivity, and K and L are capital and labour inputs to production. Based on Seguino (2000a), the Cobb-Douglas production function is log-transformed and differentiated, resulting in an estimable model of GDP growth or GDP per capita growth (equation 2):

$$(2) d \ln Y = d \ln A + \alpha * d \ln K + \beta * d \ln L$$

Where d constitutes the difference operator and \ln indicates the natural logarithm. Due to the differentiation and log-transformation of the variables, their growth rates rather than their absolute values are considered. To make the Cobb-Douglas production function gender-specific, the labour input variable is disaggregated into three components: human capital, and the shares of the female and male labour forces. Finally, Seguino (2000a) adds the education-adjusted wage gap variable as main explanatory variable (equation 3):

$$(3) d \ln Y_{it} = \varphi + \Sigma \lambda_i + \alpha_1 WGAP_{it} + \alpha_2 d \ln K_{it} + \alpha_3 d \ln LFF_{it} + \alpha_4 d \ln LFM_{it} + \alpha_5 d \ln HK_{it} + \varepsilon$$

where φ represents technological change, $\Sigma \lambda_i$ indicates the usage of the fixed-effects option, WGAP is the education-adjusted wage gap variable computed with the above presented formula, $d \ln K$ is a proximate variable for changes in capital input, $d \ln LFF$ and $d \ln LFM$ are the changes in female and male shares of the labour force, $d \ln HK$ is a proximate variable for changes in human capital, and ε is the error term, which is assumed to be normally distributed. This model constitutes the basis for the four models applied in this thesis' analysis that will be presented in Section 3.1.

Regarding the model's limitations, several points require consideration. First, by controlling for both the female labour share and female education, this model allows for drawing some conclusions on the residual wage gap which indicates gender wage discrimination. However,

other factors such as sectoral and occupational segregation, job positions and the number of working hours are not considered and require further research with more disaggregate data. Second, the model does not allow for any conclusions on causality but is limited to the mere statement of relations between GDP per capita growth and the independent variables. This is related to the problem of endogeneity in Seguíno's (2000a) model: It is not possible to determine whether the education-adjusted gender wage gap influences GDP per capita growth, or the direction of impact is opposite. To statistically address this problem, a time-lag of the education-adjusted gender wage gap is included in extended versions of the model (see Section 3.1). It is thus tested whether the education-adjusted gender wage gap of the preceding year influences GDP per capita growth of a given year. While more research is needed to establish further proof for causality, time-lags constitute a first step to determining which variable influences the other and partly solves the statistical problem of endogeneity. Another major shortcoming of this model is its inability to account for changes in total factor productivity, meaning technological change. Modern economic growth theories have attempted to explain technological change by spending on research and development, education and infrastructure, as well as trade policies and institutional factors (Seguíno, 2000a). However, these considerations are beyond the scope of this research and require further investigation.

Regarding the statistics, further considerations and limitations arise. There could be multicollinearity between the human capital variable and the education-adjusted wage gap variable, as both consider years of education. However, this should not be problematic, due to the specification of the wage gap variable as a ratio. Still, their correlation will be tested in Section 4.3, Table 2, to ensure that multicollinearity is no problem. Finally, the limited availability of data restricts the number of variables to be included in the model, as including too many variables would result in an inefficient model. To reach a sufficient number of observations, the models are run in a panel of all four countries. The number of observations does not allow for individual country models. While certain other explanatory variables, as well as country dummy and time dummy variables, and interactions between them and other variables would be interesting to consider combined in one larger model, their investigation would require a larger data set.

To solve this problem, two additional, extended models are run separately (see Section 3.1). The first of them includes three country dummy variables' interactions with the education-adjusted gender wage gap. The fourth country dummy variable interaction is omitted and serves as a reference variable. This allows to assess the relationship between the education-adjusted gender wage gap and economic growth in the included countries as compared to the omitted country. Second, a model including two decade dummy variables' interactions with the education-adjusted gender wage is run. Again, the omitted interaction of the third decade dummy variable with the education-adjusted gender wage gap serves as reference variable. These models will thus allow for conclusions on the effect of the education-adjusted gender wage gap on GDP per capita growth in each of the East Asian Tigers and during each investigated decade.

3.1 Specification of the Models

Overall, four models will thus be presented, with the first model following Seguino's (2000a) model, and the second model including a time-lagged education-adjusted wage gap. The third model accounts for the interactions between the country dummy variables and the education-adjusted gender wage gap. Finally, the fourth model controls for the interactions between the decade dummy variables and the education-adjusted gender wage gap.

As will be shown in Section 4.3.1, Table 1, the data requires a change in specification of the education-adjusted gender wage gap variable. To ensure the variable's stationarity and the statistically correct interpretation of its coefficient, it will be differentiated. The models thus read as follows:

$$(1) \ d \ln Y_{it} = \varphi + \alpha_1 d \text{WGAP}_{it} + \alpha_2 d \ln K_{it} + \alpha_3 d \ln \text{LFF}_{it} + \alpha_4 d \ln \text{LFM}_{it} + \alpha_5 d \ln \text{HK}_{it} + \varepsilon$$

Where d is the difference operator, Y is GDP per capita, φ is the rate of technological change absorbed by the constant, WGAP is the education-adjusted gender wage gap, K is approximated by the share of gross capital formation in GDP, LFF and LFM are the shares of the female and male labour forces, and HK equals the average years of education. To ensure homoskedasticity of the error term, the robust option is applied in this model. Due to the differentiation and log-transformation of all variables, the variables express growth rates rather than absolute values. As will be shown by the Hausman test (Section 5, Table 4), the fixed-effects option is applied for Model 1.

$$(2) \ d \ln Y_{it} = \varphi + \alpha_1 d \text{WGAP}_{it} + \alpha_2 d \text{WGAP}_{it-1} + \alpha_3 d \ln K_{it} + \alpha_4 d \ln \text{LFF}_{it} + \alpha_5 d \ln \text{LFM}_{it} + \alpha_6 d \ln \text{HK}_{it} + \varepsilon$$

Where WGAP_{it-1} is the time-lagged education-adjusted gender wage gap, which attempts to reveal insights on the time-wise causality in the relationship between GDP per capita growth and the education-adjusted gender wage gap. Again, the Hausman test indicates the appropriate usage of the fixed-effects option (Section 5, Table 4).

$$(3) \ d \ln Y_{it} = \varphi + \alpha_1 d \text{WGAP}_{it} + \alpha_2 d \text{WGAP}_{it-1} + \alpha_3 d \ln K_{it} + \alpha_4 d \ln \text{LFF}_{it} + \alpha_5 d \ln \text{LFM}_{it} + \alpha_6 d \ln \text{HK}_{it} + \alpha_7 d \text{WGAP} * \text{Hong Kong}_{it} + \alpha_8 d \text{WGAP} * \text{South Korea}_{it} + \alpha_9 d \text{WGAP} * \text{Taiwan}_{it} + \varepsilon$$

Where the interactions between the differentiated education-adjusted gender wage gap and the country dummy variables reveal insights on the relationship between GDP per capita growth and the education-adjusted gender wage gap in each country individually. The interaction of the country dummy for Singapore and the education-adjusted gender wage gap is omitted from the model, and thus constitutes a reference variable to which the effect in the other countries is compared. Singapore is chosen as reference variable, since its sectoral transformation reveals a different pattern than the transformation in the other three countries where the typically female-dominated sectors of textiles, apparel and footwear were more important during the 1980s (see Section 4.1, Figure 2). For Model 3, the Hausman test reveals that the random-effects option shall be applied (Section 5, Table 4).

$$(4) d \ln Y_{it} = \varphi + \alpha_1 d \text{WGAP}_{it} + \alpha_2 d \text{WGAP}_{it-1} + \alpha_3 d \ln K_{it} + \alpha_4 d \ln \text{LFF}_{it} \\ + \alpha_5 d \ln \text{LFM}_{it} + \alpha_6 d \ln \text{HK}_{it} + \alpha_7 d \text{WGAP} * \mathbf{1980s}_{it} \\ + \alpha_8 d \text{WGAP} * \mathbf{1990s}_{it} + \varepsilon$$

Where the interactions between the differentiated education-adjusted gender wage gap and the decade dummy variables reveal insights on how the relationship between the education-adjusted gender wage gap and GDP per capita growth changed over time. The interaction of the 2000s dummy variable is omitted and serves as reference variable to which the other interaction variables are compared. According to this thesis' hypothesis, the two decade dummy interaction variables should be positively related to GDP per capita growth, as the relationship between the two variables is expected to weaken or reverse from a positive to a negative one over time. Being compared to the variables' relationship in the 2000s, the relationship for the 1980s and 1990s should thus be more positive. Similarly to Model 3, Model 4 will be run applying the random-effects option as indicated by the Hausman test (Section 5, Table 4).

Before presenting the results of these models, this thesis proceeds to present the data applied in this research, as well as to empirically establish the structural transformation in the East Asian Tigers, which is a main underlying assumption of this research.

IV. Data

As explained above, this research's model applies a panel dataset covering the four countries of Hong Kong, South Korea, Singapore and Taiwan over a time period of thirty years from 1980 to 2010. The data on GDP per capita is derived from The Conference Board (2017) and is converted to 2016 USD price levels with updated 2011 purchasing power parity (PPP). The wage information stems from the International Labour Organization Statistical Yearbooks as well as the National Statistics Bureau of Taiwan. As explained above, the wage information is aggregate and refers to all non-agricultural sectors to capture the effect of the structural transformation away from manufacturing to the service sector, which will be further motivated in the following descriptive analysis of the countries' structural transformations. To arrive at comparable wage data, the daily, hourly and weekly wage figures were assimilated to a monthly wage level using the ILO Statistical Yearbook's information on average numbers of working hours.

Data on education is derived from the Barro-Lee Education Attainment Dataset (Barro & Lee, 2013) and is given in five-year intervals. To complete the dataset and be able to use data from all years rather than only five-year intervals, the missing educational data was calculated assuming a linear development in between the five-year intervals. Educational data by gender is used to calculate the education-adjusted gender wage gap, while an average of male and female years of education constitutes a proximate variable for human capital. The information on male and female employment shares stems from the ILO Statistical Yearbooks as well as the ILO Online Database ILOSTAT (International Labour Organization, 2018). Finally, capital input is measured by the share of gross capital formation of GDP using data from the

National Statistics Bureau of Taiwan and the World Bank. A summary table of all variables and their descriptive statistics is presented in Appendix A.

The following presentation of this research's data starts with a detailed presentation of the four East Asian Tigers' structural transformations from low-tech manufacturing to high-tech manufacturing and services, thereby establishing the foundation for the upcoming analysis. Subsequently, descriptive statistics of this research's dependent variable, GDP per capita growth, and gender equality indicators are introduced. Finally, stationarity and collinearity test results are presented. As homoskedasticity of the error term is ensured by applying the robust option, testing for heteroskedasticity is not required.

4.1 Descriptive Statistics: The Structural Transformation

This thesis premises that the East Asian Tigers have undergone a structural transformation from low-tech manufacturing toward services and high-tech manufacturing. The following descriptive analysis of the East Asian Tigers' economic structure scrutinizes this premise. Figure 1 pictures the sectoral contributions to GDP in each of the four countries. It is important to note that where both the manufacturing and industry sectors are depicted, manufacturing is seen as a component of the industry sector rather than a separate sector.

The structural transformation is most visible in Hong Kong, where the share of manufacturing in GDP decreased from 22.5 percent in 1980 to 1.8 percent in 2010. In contrast, the service sector made up 68.7 percent of GDP in 1980 and rose to a share of 93 percent in 2010. Half of these services comprise the financing, insurance and real estate, as well as trade services sectors (The Government of the Hong Kong Special Administrative Region, 2018). The little importance of agriculture is conditioned by geographical factors, since Hong Kong comprises an area of only 1,106.42 km² (Survey and Mapping Office/ Lands Department, 2018).

In the other countries, the structural transformation is less evident, although all of them have experienced increases in the share of services in GDP. In Taiwan, services made up 48.45 percent of GDP in 1980, which increased to a share of 64.63 percent in 2010. In South Korea, the share of services in GDP increased from 48.66 percent in 1980 to 59.26 percent in 2010. Finally, in Singapore, it rose from 62.2 percent in 1980 to 72.3 percent in 2010, which constitutes the smallest increase of only 10.1 percentage points. This is most likely due to the already very high initial share of services in Singapore in 1980, almost equalling Taiwan's share of services in 2010.

Regarding the manufacturing sectors, interestingly, the share of manufacturing in South Korea rose from 24.28 percent in 1980 to 30.72 percent in 2010. In Singapore and Taiwan, it remained relatively stable, fluctuating between 21 and 27.5 percent in Singapore, and 24 and 37 percent in Taiwan. To investigate whether a structural transformation has taken place, it is thus necessary to assess the composition of the manufacturing sector, regarding low- and high-tech industries. According to the World Bank, the share of high-technology exports among manufactured exports almost doubled from 15.9 percent in 1988 to 29.5 percent in

2010 in South Korea. In Singapore, it increased from 36.4 percent in 1989 to 49.9 percent in 2010. As regards Taiwan, the country has become known as “global leader in high-tech sectors such as consumer electronics and semiconductors” (McKinsey China, 2017). Its transformation towards high-tech sectors started in the early 1980s: From 1981 to 1986, the value of Taiwan’s high-tech exports multiplied twenty-fold from USD 104 million to USD 2 billion (Pang & Lim, 1989).

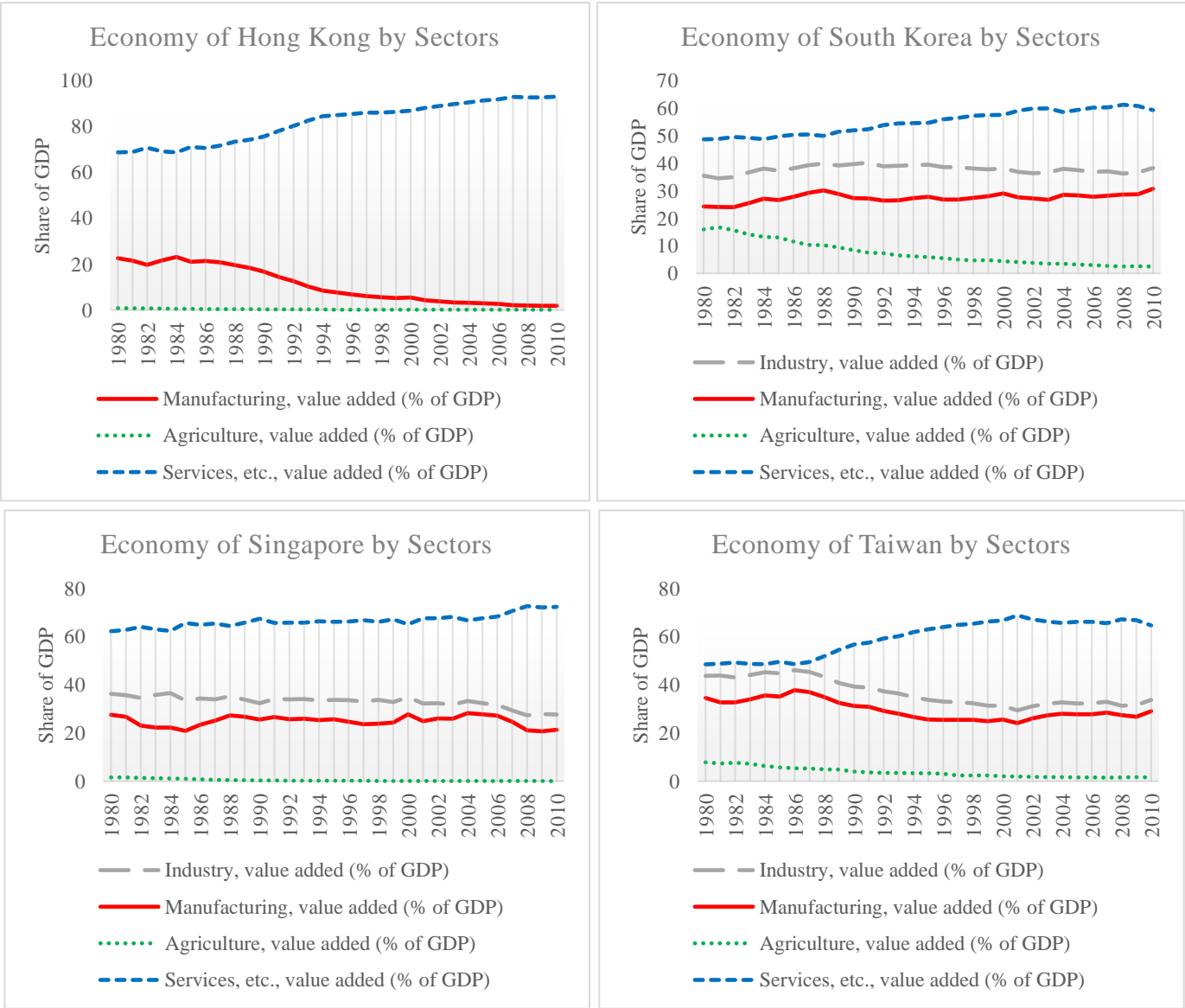


Figure 1: Economy of the East Asian Tigers by Sectors, 1980-2010 (Data from the World Bank, the National Statistics Bureau of Taiwan and the National Statistics Bureau of Hong Kong)

While Figure 1 demonstrated the increasing relevance of the service sector in the East Asian Tigers, Figure 2 more clearly depicts the shift from low-tech to high-tech manufacturing that occurred within the manufacturing sectors of the four countries. The presented low-tech and high-tech sectors are chosen based on their relevance to this thesis, thus including female-dominated sectors such as the textiles, footwear and apparel industries, as well as their

importance for the examined countries, assessed by the size of their shares in total exports of goods.

In Hong Kong, the female-dominated low-tech sectors comprised a total of 34.72 percent of exported goods in 1980. By 2010, their share in exported goods had diminished to 10.63 percent, equalling less than a third of their initial share. At the same time, the share in exported goods of the depicted high-tech sectors multiplied threefold from 14.45 percent in 1980 to 43 percent in 2010. Similarly, in Singapore, the share of the selected low-tech sectors almost halved from 36.51 percent in 1980 to 17.45 percent in 2010, while the share of the selected high-tech sectors more than doubled from 16.3 percent in 1980 to 38.53 percent in 2010. However, it is important to note that Singapore's low-tech sector is dominated by the petroleum industry, which is not known as particularly labour-intensive or female-dominated and thus not particularly relevant to this thesis' focus on gender discrimination. Singapore's female-dominated labour-intensive sectors comprise a maximum share of only 4.12 percent in 1980. It could thus be, that Singapore's female labour force was not exploited to the same extent as in the other countries or gender discrimination took place in other sectors than the textiles, apparel or footwear sectors.

Third, in South Korea, the most impressive shrinkage of the female-dominated labour-intensive sectors occurs. Their share in exported goods decreases from 40.48 percent in 1980 to only 2.85 percent in 2010. In contrast, the share in exported goods of the selected high-tech goods increases fourfold from 14.06 percent in 1980 to 57.61 percent in 2010. Finally, in Taiwan, the structural transformation is similar to that of South Korea. The share of female-dominated labour-intensive sectors diminishes from 35.56 percent in 1980 to 4.68 percent in 2010, while the share of high-tech sectors increases from 13.46 percent in 1980 to 50.17 percent in 2010.

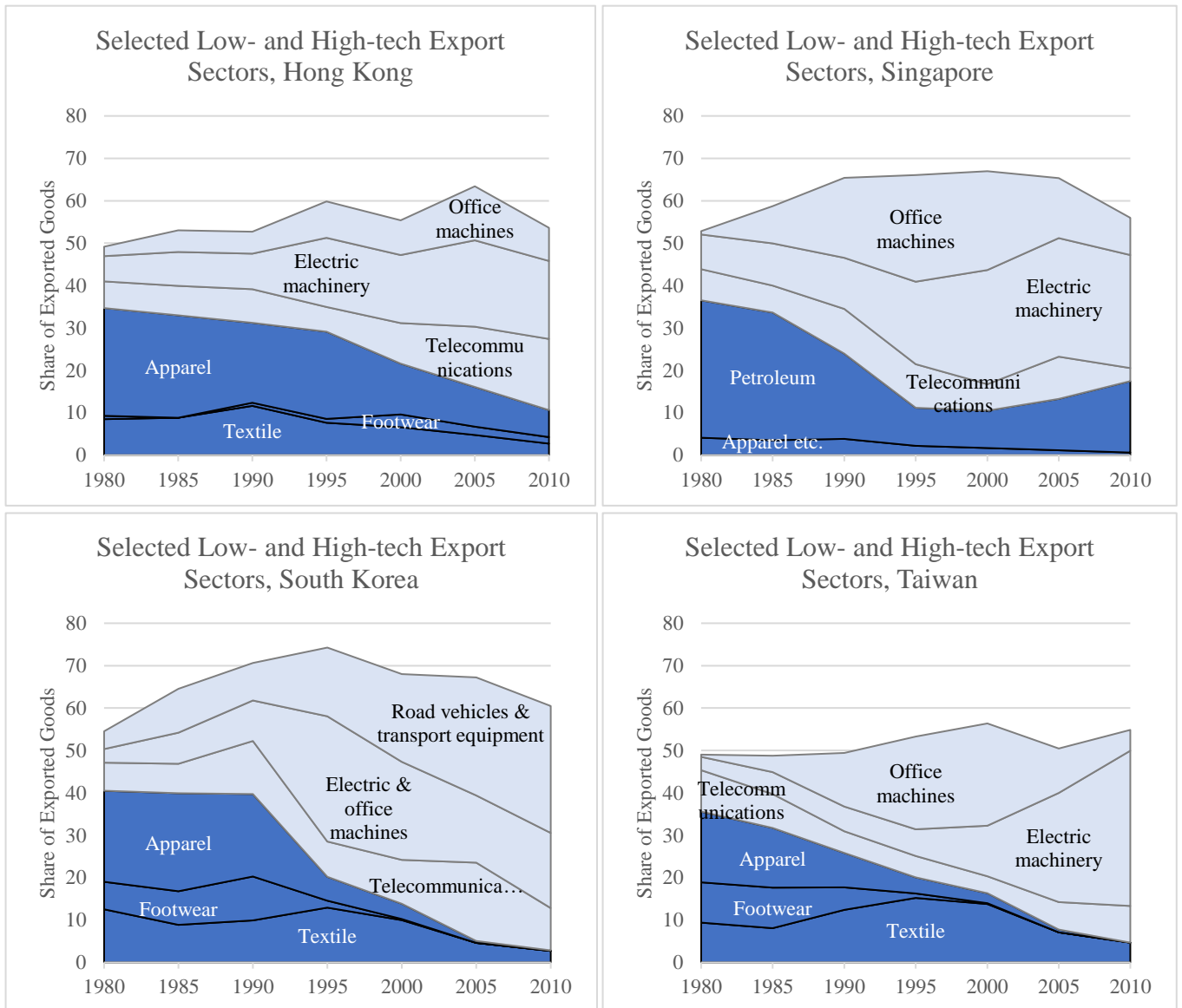


Figure 2: Selected Low- and High-tech Export Sectors in the East Asian Tigers, 1980-2010 (Data from the Harvard Center for International Development, 2018)

Overall, this section has demonstrated that all four East Asian Tigers have undergone a structural transformation from low-skill manufacturing to high-tech manufacturing and services. In all examined countries except for Singapore, this has resulted in an important decline of female-dominated low-tech sectors. In Singapore, the share of these sectors was relatively small from the start. Considering this development, the investigation of gender equality indicators and the gender wage gap during the structural transformation and economic growth in the East Asian Tigers becomes particularly relevant, as it gives insights to how the female labour force experienced this time period.

4.2 Descriptive Statistics: Growth and Gender Equality

Having confirmed that all four investigated countries have undergone a structural transformation from low-tech manufacturing to high-tech manufacturing and services, this section investigates the data applied in Seguino's (2000a) model, to give a descriptive impression of the development of GDP per capita growth and various gender equality indicators in the East Asian Tigers from 1980 to 2010.

Figure 3 gives an overview of the development of the East Asian Tigers' GDP per capita and its growth in the examined time period. As previously mentioned, GDP per capita growth is chosen as dependent variable, as it allows for a more direct comparison of the four countries' economic growth by accounting for the size of their populations. In general, all four economies experience a steady increase in GDP per capita, as shown by the nearly linear course of the graphs in figure 3a and the mainly positive values in figure 3b. While short-term effects of the 1997/98 and 2008 economic crises are clearly visible in both figures, they do not seem to have a long-lasting impact on the overall trend of GDP per capita growth in the East Asian Tigers. In absolute values, Singapore constantly has the highest GDP per capita ranging from 23,596 US\$ in 1980 to 76,824 US\$ in 2010. It is followed by Hong Kong, with a GDP per capita of 18,295 US\$ in 1980 increasing to 52,646 US\$ in 2010. Third, Taiwan follows with a GDP per capita ranging from 8,977 US\$ in 1980 to 42,973 US\$ in 2010. Finally, South Korea has the lowest GDP per capita of 5,931 US\$ in 1980, rising to 32,742 US\$ in 2010.

While South Korea's GDP per capita in absolute values makes up only less than half of Singapore's GDP per capita in 2010, indicating that the four countries are difficult to compare in terms of absolute GDP per capita, the trajectories of graph 3a and 3b reveal that GDP per capita growth is relatively comparable among the East Asian Tigers. Out of all depicted countries, Taiwan reaches the highest GDP per capita growth rate of 14.98 percent in 1987, while Hong Kong notifies the overall lowest growth rate of -6.8% in 1998. In general, the GDP per capita growth trajectories of the East Asian Tigers however follow a similar pattern.

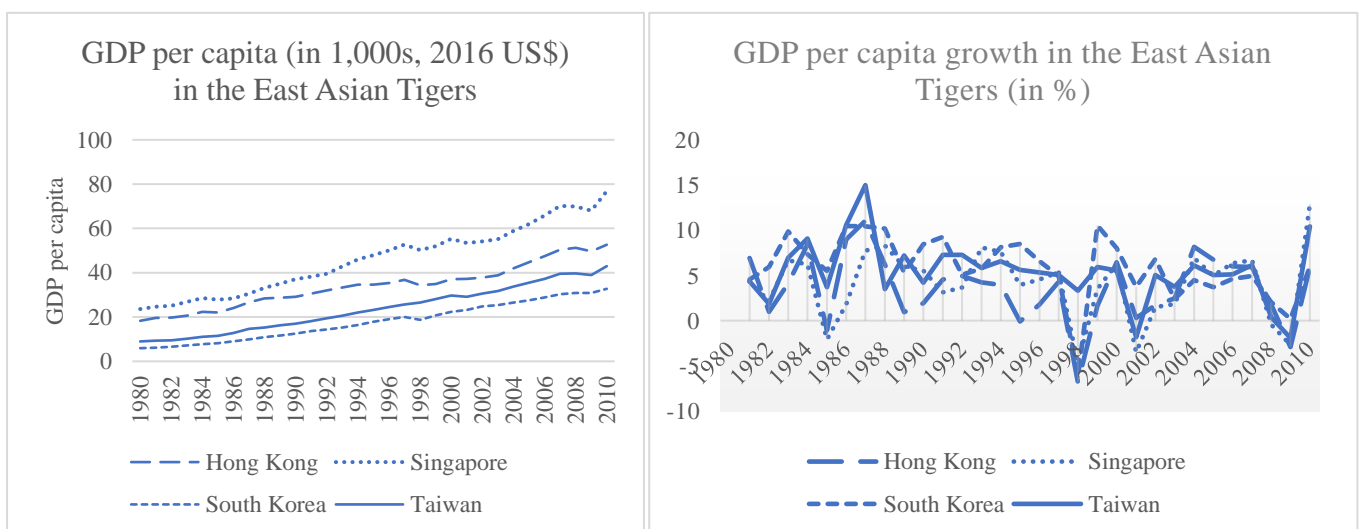


Figure 3: GDP per Capita and GDP per Capita Growth in the East Asian Tigers, 1980-2010 (Data from The Conference Board Total Economy Database)

Given the remarkable growth experience of the East Asian Tigers, a descriptive investigation of their gender equality indicators' developments during the same period may give first insights on the relation between economic growth and the gender wage gap, the female labour share and women's years of education (Figure 4). It is important to note that, for the sake of meaningfulness, the graphs do not display the log-transformed education-adjusted gender wage gap that will be used during the analysis. Instead, the mere ratio of female to male earnings in percentages is displayed.

The graphical inspection of gender equality indicators reveals interesting insights. First, all countries share a relatively steady increase in women's years of education. While Singapore and Taiwan start off at comparably few years of female education, with 4.65 and 5.88 years respectively, South Korea and Hong Kong display relatively high levels of female education in 1980 already, with 7.13 and 7.3 years respectively. By 2010, all countries reach a similarly high level of female education, with the length of female education ranging from 10.34 years in Singapore to 11.45 years in South Korea.

Regarding their female labour shares, the East Asian Tigers again display relatively stable developments. Hong Kong displays the most significant increases in the female labour share ranging from 35.51 percent in 1980 to 46.82 percent in 2010, thus rising by 11.31 percentage points. In Taiwan, the female labour share rises by 10.09 percentage points, ranging from 33.52 percent in 1980 to 43.61 percent in 2010. Singapore's female labour share increases by 8.63 percentage points from 35.12 percent in 1980 to 43.75 percent in 1980. Finally, South Korea's female labour share, ranging from 37.59 percent in 1980 to 41.44 percent in 2010, displays the smallest increase of only 3.85 percentage points.

Lastly, the ratio of female-to-male earnings displays most fluctuation among the gender equality indicators. Interestingly, while Cheng and Hsiung (1994) found that the female labour share fluctuated with business cycles during Taiwan's early industrial growth, in later years this seems to be true for female earnings rather than their labour share. This would imply that an economic recession does not result in employment losses for women anymore but in worsened wage discrimination. For instance, in South Korea, women earned 62.08 percent of male earnings in 1997. After the 1997 economic crisis, the ratio dropped to 54.69 percent in 1998 and 53.42 percent in 1999 and did not substantially increase again until the end of the 2008 economic crisis. In Hong Kong, the female-to-male earnings ratio steadily declined from 75.88 percent in 1980 to 55.74 percent in 1998, after which it began to rise again. This decline is in line with Berik's (2000) finding that women relatively suffer from structural transformation in patriarchal systems, as male wages increase more than female wages.

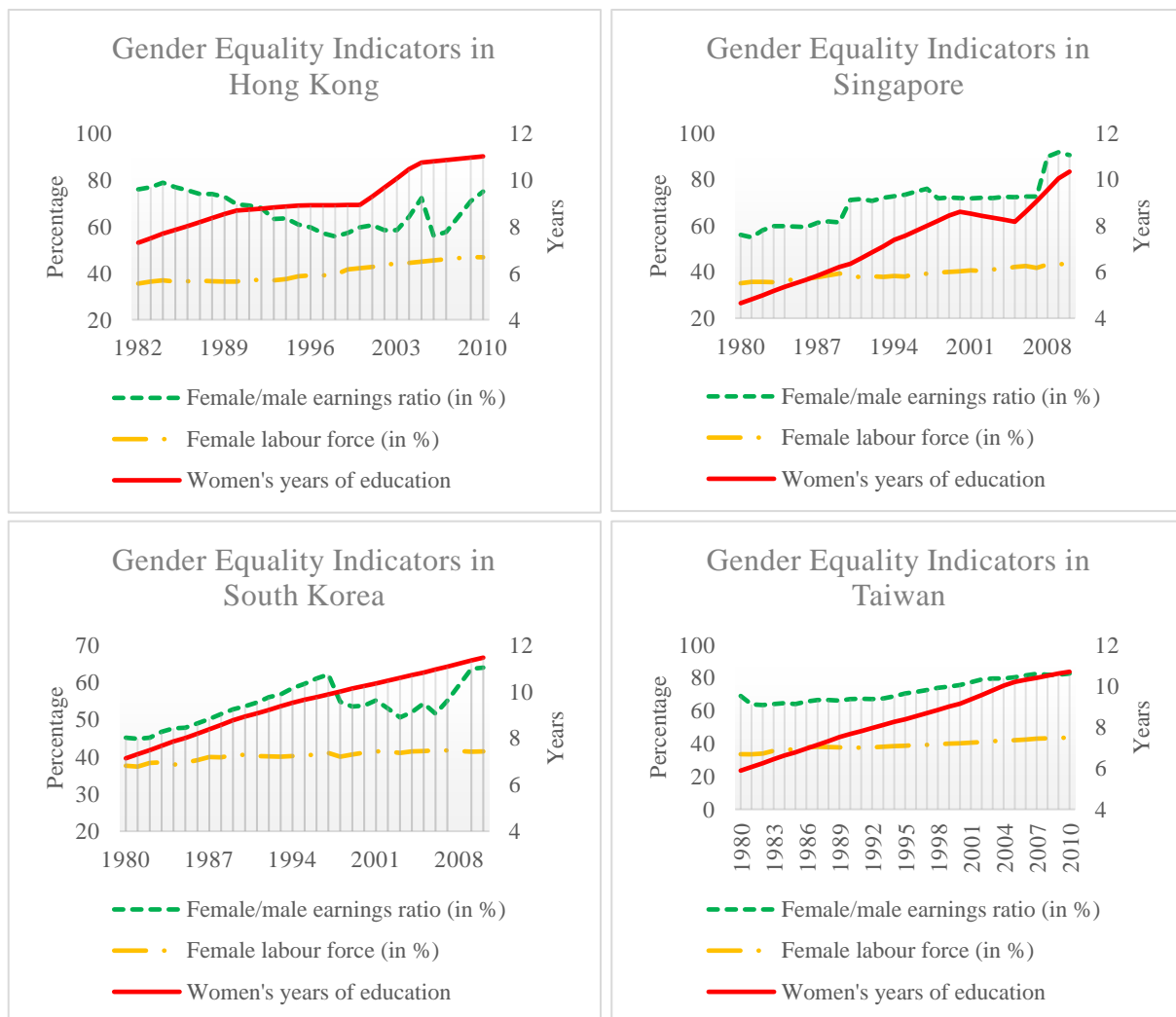


Figure 4: Gender Equality Indicators in the East Asian Tigers, 1980-2010 (Data from the ILO Statistical Yearbooks 1980-2010, ILOSTAT, the Barro-Lee Education Attainment Dataset and the National Statistics Bureau of Taiwan)

In contrast, Singapore and Taiwan experience more steadily rising female-to-male earnings ratios. In Singapore, women earned 56.08 percent of what men earned in 1980, which increased to 72.62 percent in 2007. The causes behind the following sudden jump to around 90 percent during the years 2008 to 2010 require further investigation. Finally, Taiwan's female-to-male ratio rose steadily from 68.99 percent in 1980 to 82.55 percent in 2010, which could either imply that the 1984 Labour Law provision for equal pay was increasingly enforced, or that in the case of Taiwan, economic growth is indeed related to decreasing gender wage discrimination.

Finally, having presented the structural transformation and gender equality indicators of the East Asian Tigers, Figure 5 brings together the two elements. The graphs show that the general trend of the decline in gender wage gap coincides with increases in general and female high-tech employment. From a graphical inspection, a negative relationship between the two variables would be expected. While the gender wage gap in Hong Kong reached a peak of 27.27 percent in 1989, it then rapidly declined to only 6.33 percent in 2007.

Meanwhile, the number of high-tech employees rose from 138,000 (female: 61,000) in 1980 to 911,000 (female: 388,000) in 2010. While Singapore experienced similar increases in overall and female high-tech employment, its gender wage gap did not decline to the same extent, reaching its low-point of 23.97 percent in 1997 and stabilizing around a relatively high value of 28 percent thereafter. This could be related to the initial sectoral composition of Singapore's economy, in which the typically female-dominated low-tech sectors such as textiles, apparel and footwear played only a minor role. Gender (wage) discrimination in Singapore seems to be practiced in other sectors.

In South Korea, while overall and general high-tech employment was rising from 549,000 (female: 176,000) employees in 1980 to 4,571,000 (female: 2,030,000) employees in 2010, the gender wage gap declined from a very high initial value of 54.9 percent in 1980 to 36.1 percent in 2010. Among the four East Asian Tigers, the most severe gender wage discrimination seems to be practiced in South Korea. Finally, Taiwan's gender wage gap decreased from its peak of 36.6 percent in 1982 to 17.4 percent in 2010. High-tech employment data for Taiwan is only available as of the year 2001, however, the trend of rises in overall and female high-tech employment is equally visible. As it seems, the structural transformation of the East Asian Tigers benefitted the four countries' female labour force, or the reduced gender wage discrimination contributed to the countries' structural transformation.

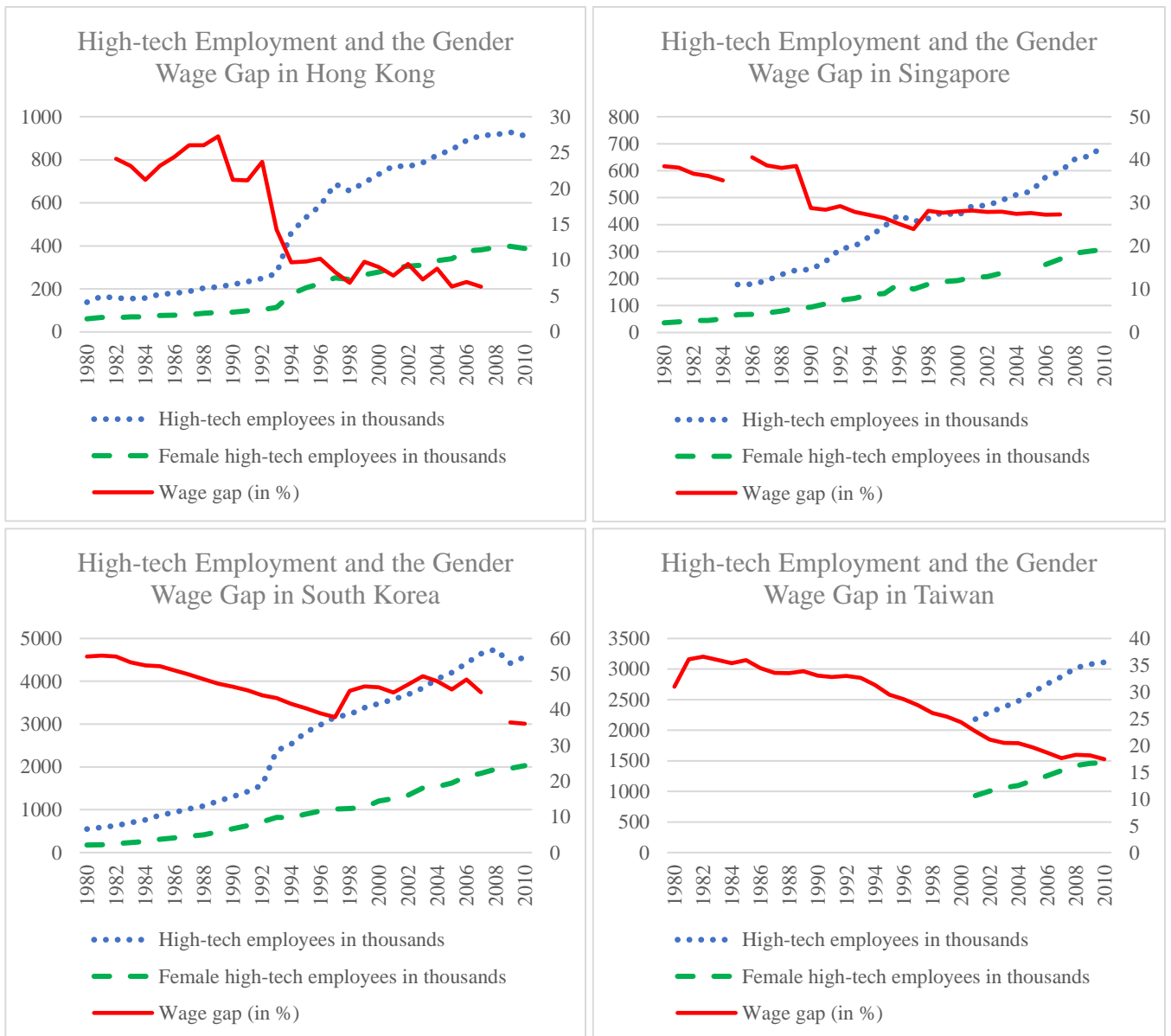


Figure 5: High-tech Employment and the Gender Wage Gap in the East Asian Tigers, 1980-2010 (Employment data from ILOSTAT; occupation categories 0/1 from ISCO-68, 2/3 from ISCO-88 and 2/3 from ISCO-08 are considered as high-tech)

Overall, a graphical inspection of the descriptive statistics reveals a general improvement in gender equality indicators in a period of structural transformation and steady GDP per capita growth. The panel estimation results presented in Section 5 will give further insights as to the statistical relation between the examined variables. Prior to that, the following section presents tests on the data applied in this research.

4.3 Tests on the Data

To become familiar with the nature of the data applied in this model, tests on the data are presented in this section, before preceding to the model's results. First, stationarity tests on the model's variables are presented, resulting in a change in specification of the education-adjusted gender wage gap variable, which is differentiated to ensure stationarity. Second, pairwise correlations between all variables are presented to give first insights into their relationships and ensure there is no problem of multicollinearity. As regards post-estimation tests, testing for homoskedasticity is not required due to the application of the robust option. The appropriate usage of the fixed-effects option for Models 1 and 2, and the random-effects option for Models 3 and 4 is indicated by the Hausman test, which is presented in further detail in Section 5, Table 4.

4.3.1 Stationarity

This section proceeds to present stationarity tests for all variables included in the model. Table 1 displays the p-values of the Levin-Lin-Chu, Harris-Tzavalis, Fisher (based on Augmented Dickey-Fuller test) and Im-Pesaran-Shin unit root tests for panel data for all variables. It is important to note that the Levin-Lin-Chu and Harris-Tzavalis tests give more precise results on whether the data contains unit roots, while the Fisher and Im-Pesaran-Shin tests only indicate whether all panels contain unit roots. Rejecting the null hypothesis can thus imply that some panels exhibit a unit root, which remains unknown. However, the two latter tests serve to assess stationarity for the education-adjusted gender wage gap variable, which is unbalanced due to missing values and hence cannot be tested for unit root by the two former tests.

The tests' null hypotheses that the data contains a unit root can be rejected at a 1 percent significance level in all tests for all variables except for the education-adjusted gender wage gap and average years of education. Average years of education can only be considered stationary at a 1 percent significance level in the Harris-Tzavalis test. If testing at a 10 percent significance level, it can also be considered stationary in the Levin-Lin-Chu test. However, in the other two tests, the null hypothesis that all panels contain a unit root cannot be rejected. Still, following the test results of the first two unit root tests, this thesis treats the average years of education variable as stationary. Regarding the education-adjusted gender wage gap, the tests indicate that all panels contain a unit root. When testing for trend stationarity, this null hypothesis can be rejected. This could however imply that not all, but some of the four panels contain a unit root. The overall results indicate that the education-adjusted gender wage gap variable is most likely to be stationary in all panels if tested in first differences.

Although Seguino (2000a) did not differentiate the education-adjusted gender wage gap variable in her model, this research will do so to ensure that meaningful conclusions on its relationship with GDP per capita growth can be drawn. Regressing a non-stationary variable on a stationary variable should be avoided, as the results can be misleading due to the

unpredictability of the non-stationary variable. For the sake of statistical correctness, the differentiation of the education-adjusted gender wage gap is hence justified.

Table 1: Unit Root Test Results

Variable/ Unit Root Test	Levin-Lin-Chu p-value*	Harris-Tzavalis p-value*	Fisher (ADF) p-values**	Im-Pesaran- Shin p-value**	Conclusion
GDP per Capita Growth	0.0	0.0	0.0	0.0	Stationary
Ed.-Adj. Gender Wage Gap	-	-	0.93, 0.86, 0.84, 0.89	0.8081	Unit root
Ed.-Adj. Gender Wage Gap (including a trend)	-	-	0.0, 0.03, 0.0007, 0.0	0.0272	Stationary (unclear)
Ed.-Adj. Gender Wage Gap (in first differences)	-	-	0.0	0.0	Stationary
Share of Gross Capital Formation in GDP (log-transformed, in first differences)	0.0	0.0	0.0	0.0	Stationary
Female Labour Share (log-transformed, in first differences)	0.0	0.0	0.0	0.0	Stationary
Male Labour Share (log-transformed, in first differences)	0.0	0.0	0.0	0.0	Stationary
Average Years of Education (log-transformed, in first differences)	0.0660	0.0006	0.46, 0.31, 0.33, 0.53	0.2655	Unit root (unclear)

*Null hypothesis: the data contains unit roots; test can only be performed with strongly balanced panels, which the education-adjusted gender wage gap variable is not. ** Null hypothesis: All panels contain unit roots.

4.3.2 Correlations

Having tested the data for stationarity, this section proceeds to test for correlations. To ensure that there is no problem of multicollinearity in the data, table 2 presents the pairwise correlation coefficients of all examined variables. The mostly small coefficients prove that multicollinearity is not a problem in the model. Solely the correlation between GDP per capita growth and the change in share of gross capital formation in GDP, as well as the correlation between the changes in female and male labour shares reveal coefficients larger than 0.4. These correlations were to be expected, as gross capital formation is an integral component of GDP, and the relative shares of female and male labour shares condition each other. Since the differentiated education-adjusted gender wage gap is computed with education data, it could

be highly correlation with the average years of education. However, the relatively small correlation coefficient of -0.2031 proves that this is not the case. Overall, the presented correlation coefficients show that the applied dataset does not reveal any problems of multicollinearity.

Table 2: Pairwise Correlations of all Variables

	GDP per capita growth	Ed.-adj. gender wage gap (dif.)	Share of Gross Capital Formation in GDP (log-transf., dif.)	Female labour share (log-transf., dif.)	Male labour share (log-transf., dif.)	Average years of education (log-transf., dif.)
GDP per capita growth	1.0000					
No. of obs.	120					
Ed.-adj. gender wage gap (dif.)	-0.1466	1.0000				
p-value	0.1230					
No. of obs.	112	112				
Share of Gross Capital Formation in GDP (log-transf., dif.)	0.4610	-0.2446	1.0000			
p-value	0.0000	0.0094				
No. of obs.	120	112	120			
Female labour share (log-transf., dif.)	0.1002	-0.0974	-0.0008	1.0000		
p-value	0.2764	0.3070	0.9934			
No. of obs.	120	112	120	120		
Male labour share (log-transf., dif.)	-0.1637	0.0477	-0.1158	-0.4867	1.0000	
p-value	0.0740	0.6176	0.2077	0.0000		
No. of obs.	120	112	120	120	120	
Average years of education (log-transf., dif.)	0.1086	-0.2031	0.0433	-0.0028	0.0078	1.0000
p-value	0.2379	0.0318	0.6383	0.9756	0.933	
No. of obs.	120	112	120	120	120	120

Further on, the relationship between GDP per capita growth and the main explanatory variable, the differentiated education-adjusted gender wage gap, is examined for each country individually. Table 3 shows the correlation coefficients of the differentiated education-

adjusted gender wage gap and GDP per capita growth in the four East Asian Tigers. The correlation coefficients do not exhibit a unifying pattern, ranging from -0.3490 for the case of South Korea to 0.0202 for Hong Kong. From the inspection of the correlations between the differentiated education-adjusted gender wage gap and GDP per capita growth in each of the East Asian Tigers individually, a negative overall relationship between the two variables can be expected. However, this is further analysed in the analysis of the models' results in Section 5.

Table 3: Correlation Coefficients of the Differentiated Education-Adjusted Gender Wage Gap and GDP per Capita Growth by Country

Country	Correlation Coefficients of the Education-Adjusted Gender Wage Gap (differentiated) and GDP per Capita Growth
Hong Kong	0.0202
Singapore	-0.0866
South Korea	-0.3490
Taiwan	-0.0430

V. Results

Following the demonstration of the methodology and data applied in this research, this section presents the analysis of the model's results. First, to confirm the appropriate usage of the fixed-effects option in Models 1 and 2 and the random-effects option in Models 3 and 4, table 4 presents the Hausman test p-values for all models.

Table 4: Results of the Hausman Test, Models 1-4

Model	Hausman Test p-value*	Conclusion
1	0.0362	Fixed effects
2	0.0344	Fixed effects
3	0.1172	Random effects
4	0.0503	Random effects

*Null hypothesis: the difference between fixed and random effects coefficients is not systematic

Models 1 and 2 are analysed for the relationship between GDP per capita growth and the actual and time-lagged education-adjusted gender wage gap, as well as the other explanatory

variables in the region of the East Asian Tigers. Thereafter, Model 3 is assessed for the relationship between the education-adjusted gender wage gap and GDP per capita growth in each of the four countries individually. Finally, Model 4 is analysed for the change over time in the relationship between GDP per capita growth and the education-adjusted gender wage gap.

Model 1 shows that, if measuring all four countries together, there is no effect of the education-adjusted gender wage gap on GDP per capita growth (Table 5). The variable's coefficient is -0.0004599, indicating that a one percent increase in the education-adjusted gender wage gap is related to a 0.0004599 percent decrease in GDP per capita. There is thus very little economic significance of the variable, and it has no statistical significance either (p-value: 0.996). In comparison, Seguino (2000a) had estimated a coefficient for the non-differentiated education-adjusted gender wage gap of 0.014 that was significant at a 5 percent significance level. The different specifications of the education-adjusted gender wage gap complicate a direct comparison of Seguino's and Model 1's coefficients. Still, Model 1's results indicate that Seguino's (2000a) finding of a positive relationship between the education-adjusted gender wage gap and GDP per capita growth for the time period from 1975 to 1990 cannot be reconfirmed for the later time period from 1980 to 2010. While this may be influenced by the different specifications of the variables, it can as well indicate that the education-adjusted gender wage gap loses its relevance for economic growth in the course of structural transformation. This finding confirms this thesis' hypothesis that the relationship between GDP per capita growth and the education-adjusted gender wage gap becomes insignificant during an economy's structural transformation.

In Model 2, similarly, no effect of the time-lagged education-adjusted gender wage gap is visible (Table 5). The economic significance of the coefficient of 0.0276798 is small, indicating that a one percent increase in the education-adjusted gender wage gap is related to a 0.0276798 increase in GDP per capita. Its positive sign indicates that gender wage discrimination in the previous year positively impacts economic growth in the tested year, thus reconfirming Seguino's findings from the earlier time period and contradicting this thesis' hypothesis. However, statistically, the coefficient is not significant (p-value: 0.705).

Models 1 and 2 thus provide evidence for this research's hypothesis that, in the course of the East Asian Tigers' structural transformation, the relationship between GDP per capita growth and the education-adjusted gender wage gap becomes insignificant (or negative). However, the models do not seem to adequately explain GDP per capita growth, as only the share of gross capital formation in GDP is significantly related to GDP per capita growth in Model 1. As previously explained, this relationship arises, since gross capital formation is a component of GDP and thus closely related to GDP per capita growth. Applying a larger sample and including other explanatory factors would improve the model's explanatory power. This could be subject to further research.

Table 5: Results of Models 1 and 2

Variables	Model 1	Model 2
	GDP per capita growth	GDP per capita growth
Ed.-adj. gender wage gap (differentiated)	-0.0004599 (0.0819)	0.0082774 (0.0979)
Time-lag: Ed.-adj. gender wage gap (differentiated)		0.0276798 (0.0665)
Share of Gross Capital Formation in GDP (log-transformed, differentiated)	0.1504* (0.05707)	0.152 (0.0667)
Female labour share (log-transformed, differentiated)	0.177 (0.3515)	0.14449 (0.407)
Male labour share (log-transformed, differentiated)	-0.3214 (0.2861)	-0.3269776 (0.3059)
Average years of education (log-transformed, differentiated)	0.3133 (0.2307)	0.338795 (0.1471)
Constant	0.04158*** (0.005015)	0.0411*** (0.00382)
Observations	112	105
Number of countries	4	4
R-squared (within)	0.243	0.2452

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

In Model 3, the relationship of GDP per capita growth and the education-adjusted gender wage gap in each country individually is assessed by adding interaction variables of country dummies and the education-adjusted gender wage gap to the model (table 6). The interaction variable for Singapore is omitted and serves as reference variable, to which the other interaction variables are compared. Singapore's interaction variable is chosen as omitted variable, since Singapore exhibits a different pattern in its structural transformation than the other three countries (see Section 4.1, Figure 2). This allows to compare the relationship between GDP per capita growth and the education-adjusted gender wage gap in Hong Kong, South Korea and Taiwan, where the importance of female-dominated low-tech sectors declined, to Singapore's case, where these sectors were not important from the start. As these female-dominated low-tech sectors such as the textiles, apparel and footwear industries are known to exert discriminatory practices towards women, the decline of these sectors is expected to result in reduced gender wage discrimination in the overall economy (International Labour Organization, 2014). Hence, the education-adjusted gender wage gap in

Hong Kong, South Korea and Taiwan is expected to be more negatively related to economic growth than it is the case in Singapore.

Strikingly, the coefficient for the education-adjusted gender wage gap in Model 3, which speaks only for the country of Singapore as the other countries are accounted for by the interaction variables, is positive and statistically significant at a one percent level. It indicates that a one percent increase in the education-adjusted gender wage gap in Singapore is related to a 0.4071 percent increase in GDP per capita in Singapore. The positive relationship between the two contradicts this thesis' hypothesis, while confirming Seguino's (2000a) findings from an earlier time period. As it seems, gender wage discrimination in Singapore still contributes to economic growth. This may be related to the sectoral composition of the economy, as explained above.

In contrast, all interaction coefficients of the education-adjusted gender wage gap and the country dummies are negative. As the interaction coefficients are relative to the coefficient for Singapore, the two coefficients are added to each other to reach a meaningful interpretation. For the case of Hong Kong, adding the interactions' coefficient of -0.54856 to the coefficient of the education-adjusted gender wage gap (0.4071) results in a coefficient of -0.14146. This coefficient's statistical significance is determined by testing whether the sum of the constant, the education-adjusted gender wage gap's coefficient and the interaction's coefficient is statistically different from zero. As shown in Table 7, the coefficient is significant at a one percent significance level. This indicates that, in Hong Kong, a one percent increase in the education-adjusted gender wage gap is related to a 0.14146 percent decrease in GDP per capita. In Hong Kong, the relationship between the two variables is thus negative, which confirms this thesis' hypothesis.

In South Korea, adding the interaction's coefficient of -0.693176 to the coefficient of the education-adjusted gender wage gap (0.4071) results in a coefficient of -0.286076. This coefficient is significant at a five percent significance level (Table 7). This implies that, in South Korea, a one percent increase in the education-adjusted gender wage gap is related to a 0.286076 percent decrease in GDP per capita. Similarly to the case of Hong Kong, the relationship between the two variables is thus negative, which confirms this thesis' hypothesis.

Finally, in Taiwan, adding the interaction's coefficient of -0.560738 to the coefficient of the education-adjusted gender wage gap (0.4071) results in a coefficient of -0.153638. Consequently, in Taiwan, a one percent increase in the education-adjusted gender wage gap is related to a 0.153638 percent decrease in GDP per capita. However, this coefficient is statistically not significant (Table 7). Still, it confirms this thesis' hypothesis that the relationship between gender wage discrimination and economic growth is insignificant (or negative).

As it seems, the decline of typically female-dominated low-tech sectors such as the textiles, apparel and footwear sectors in Hong Kong, South Korea and Taiwan results in a significant reversal of the relationship between gender wage discrimination and economic growth from a positive to a negative or insignificant one in these countries. In contrast, in Singapore, where

other sectors dominated the economy in the 1980s, the relationship between the two variables remains positive.

Table 6: Results of Models 3 and 4

Variables	Model 3	Model 4
	GDP per capita growth	GDP per capita growth
Ed.-adj. gender wage gap (differentiated)	0.4071*** (0.1034)	0.14952 (0.20725)
Time-lag: Ed.-adj. gender wage gap (differentiated)	0.00735 (0.08498)	0.059695 (0.05856)
Share of Gross Capital Formation in GDP (log-transformed, differentiated)	0.18778*** (0.0624)	0.14055*** (0.051)
Female labour share (log-transformed, differentiated)	0.0928154 (0.39747)	0.080334 (0.2396)
Male labour share (log-transformed, differentiated)	-0.0921425 (0.20355)	-0.35525 (0.30317)
Average years of education (log-transformed, differentiated)	0.15935 (0.19358)	0.17064 (0.12376)
Interaction: Hong Kong (dummy), ed.-adj. gender wage gap (differentiated)	-0.54856*** (0.125956)	
Interaction: South Korea (dummy), ed.-adj. gender wage gap (differentiated)	-0.693176*** (0.0326965)	
Interaction: Taiwan (dummy), ed.-adj. gender wage gap (differentiated)	-0.560738*** (0.0823)	
Interaction: 1980s (dummy), ed.-adj. gender wage gap (differentiated)		-0.52749 (0.46996)
Interaction: 1990s (dummy), ed.-adj. gender wage gap (differentiated)		-0.51481*** (0.163397)
Constant	0.04762*** (0.0064244)	0.0448*** (0.00547)
Observations	105	105
Number of countries	4	4
R-squared (overall)	0.3332	0.3136

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 7: Significance of the Interaction Variables, Models 3 and 4

Model	Interaction variable	P-value	Conclusion
3	Hong Kong (dummy), ed.-adj. gender wage gap (differentiated)	0.0004	Significant at 1%
3	South Korea (dummy), ed.-adj. gender wage gap (differentiated)	0.0341	Significant at 5%
3	Taiwan (dummy), ed.-adj. gender wage gap (differentiated)	0.4336	Insignificant
4	1980s (dummy), ed.-adj. gender wage gap (differentiated)	0.4754	Insignificant
4	1990s (dummy), ed.-adj. gender wage gap (differentiated)	0.0000	Significant at 1%

*Null hypothesis: the joint coefficient equals zero.

Finally, Model 4 includes interaction variables of decade dummy variables and the differentiated education-adjusted gender wage gap. The 2000s dummy variable interaction is omitted and serves as a reference variable to the other two interaction variables. In line with this thesis' hypothesis, the relationship between the GDP per capita growth and the education-adjusted gender wage gap in the 1980s and 1990s should be stronger or more positive than in the 2000s. As they are compared to the 2000s coefficient, they should thus be positive in both cases. However, Model 4 reveals different results. In fact, neither the coefficient of the education-adjusted gender wage gap, measuring the effect during the 2000s in this model, nor the 1980s interaction variable's coefficient are statistically significant. During the 1980s and 2000s, the two variables' relationship was thus insignificant. The coefficient for the 1990s interaction variable is negative and statistically significant at a 1 percent level (Table 7). Adding the 1990s coefficient of -0.51481 to the 2000s coefficient of 0.14952 indicates that, in the 1990s, a one percent increase in the education-adjusted gender wage gap in the East Asian Tigers was related to a 0.36529 decrease in GDP. There was thus a clearly negative relationship between the two variables in the 1990s.

Model 4's results imply that the relationship gender wage discrimination and economic growth was insignificant during the 1980s, then reversed to a negative one during the 1990s, but shifted back to an insignificant one in the 2000s. This finding would be in line with previous research revealing that gender wage discrimination did not improve throughout the course of structural transformation in the East Asian Tigers (Berik, 2000; Berik, Rodgers & Zveglic, 2004; Zveglic & van der Meulen Rodgers, 2004; Zveglic, Van Der Meulen Rodgers & Rodgers, 1997). The unexpected development of the relationship between the education-adjusted gender wage gap and economic growth over time could be related to the 1997/98 economic crisis. Further research is required to explain this phenomenon.

One important limitation of this analysis regards the models' error terms, which are assumed to be normally distributed in panel estimations. The residuals of Models 1 and 2 are not normally distributed, and those of Models 3 and 4 cannot be tested for normality due to the application of the random-effects option. Table 7 shows the results of the Skewness-Kurtosis

Test for Normality. The p-values clearly suggest rejecting the null hypothesis of normality. However, the graphical depiction of the models' residual distribution shows that the divergence from a normal distribution is not very pronounced (Appendix B). While violating the normality assumption does not contribute to a bias or inefficiency in the model, it may influence the calculation of the p-values for significance in small samples such as the one used in this thesis.

Table 8: Results of the Skewness-Kurtosis Test, Models 1-4

Model	Skewness-Kurtosis Test p-value*	Conclusion
1	0.0007	No normality
2	0.0024	No normality
3	-	Error term cannot be estimated due to random-effects option
4	-	Error term cannot be estimated due to random-effects option

*Null hypothesis: the residuals are normally distributed.

Overall, the results of Models 1, 2 and 3 provide evidence for this thesis' hypothesis that the relationship between GDP per capita growth and the education-adjusted gender wage gap in the East Asian Tigers becomes insignificant or negative throughout the course of the economies' structural transformation. However, Model 4 contradicts this hypothesis, suggesting that the relationship between economic growth and gender wage discrimination changed in the beginning of the East Asian Tigers' structural transformation and reversed to its initial relationship thereafter. Further research needs to be done to explain the phenomenon detected in Model 4. Model 3's results indicate that the sectoral composition of an economy matters in determining the relationship between GDP per capita growth and the education-adjusted gender wage gap. In fact, the relationship between gender wage discrimination and economic growth reverses from a positive to a negative one if the structural transformation implies the decline of typically female-dominated low-tech sectors.

VI. Implications

The above-presented analysis reveals that, while gender wage discrimination may have contributed to economic growth in the specific context of low-skill manufacturing and export-oriented growth in the patriarchal systems of the East Asian Tigers, this relationship changes during the countries' structural transformation towards high-tech manufacturing and services. This effect is conditioned by the sectoral composition of the investigated economies. Countries such as Hong Kong, South Korea and Taiwan, where typically female-dominated

low-tech sectors such as the textiles, apparel and footwear industries importantly contributed to economic growth in the 1980s, experienced decreases in gender wage discrimination as the economy grew and transformed towards other sectors. However, in Singapore, where these sectors were not important from the start, gender wage discrimination does not seem to have decreased to the same extent. Moving away from typically female-dominated low-tech sectors is thus a crucial factor in reducing gender wage discrimination during economic growth.

These findings mostly confirm this thesis' hypothesis that in the course of the East Asian Tigers' structural transformation from 1980 to 2010, the relationship between the gender wage gap and economic growth becomes negative or insignificant. They thus contradict the findings of previous research on earlier time periods up to the year 2000. While Seguino (2000a) found a positive relationship between gender wage discrimination in all East Asian Tigers for the time period from 1975 to 1990, this conclusion is contradicted by this research's findings on the cases of Hong Kong, South Korea and Taiwan. Moreover, Models 1 and 2 confirm Schober and Winter-Ebmer's (2011) finding that there is no significant effect of the education-adjusted gender wage gap on economic growth, if assessing the whole country sample. A lot of the previous literature has focussed on the case of Taiwan, revealing that gender wage discrimination worsened during the country's structural transformation (e.g. Berik, 2000; Zveglic, Van Der Meulen Rodgers & Rodgers, 1997). In contrast, this research's findings reveal that the gender wage discrimination is negatively related to economic growth in Taiwan in the time period from 1980 to 2010.

More practically, this study's findings may be relevant for other countries with patriarchal employment systems and large female-dominated low-skill, export-oriented sectors. While their economies may be profiting from gender wage discrimination during the current development phase, reducing gender wage discrimination may be associated with economic growth during their structural transformation towards high-tech manufacturing and service economies. However, this needs to be interpreted with caution, as the direct of causality cannot be established.

Countries, to which these results may be relevant, could for instance be Bangladesh, China and India, who were among the world's top 15 textiles and clothes exporters in 2012 and have been found to practice problematic gender wage discrimination (International Labour Organization, 2014; Kapsos, 2008; Menon & Rodgers, 2009; Zhang et al., 2008). The textiles and clothing sector is particularly challenging for young women, who constitute a majority of its employees, as it exposes them to long and unpredictable working hours, safety risks, wage discrimination and other forms of exploitation such as harassment and abuse (International Labour Organization, 2014). According to this research's results, decreasing gender wage discrimination in these countries is not only of great ethical importance but could also be associated with economic growth during their structural transformation. In contrast, the case of Vietnam constitutes an example of efficient policy reform resulting in a significantly narrowed gender wage gap during the years 1993-2002 (Pham & Reilly, 2007). Legislation can thus constitute an efficient tool to counter gender wage discrimination in a patriarchal employment system with a large female-dominated low-skill, export-oriented sector. However, whether Vietnam's narrowed gender wage gap can be related to its economic performance and structural transformation is subject to further research.

VII. Conclusion

This thesis has investigated the relationship between the gender wage gap and economic growth in the East Asian Tigers during their structural transformation towards technology-intensive economies from 1980 to 2010. Basing its methodology on Seguino (2000a), it found that the relationship between the two variables reversed from a positive to a negative one in countries where typically female-dominated sectors such as textiles, apparel and footwear declined in importance. Hence, in Hong Kong, South Korea and Taiwan, where these sectors were prominent in the 1980s and declined throughout the following decades, the relationship between the gender wage gap and economic growth is negative. In contrast, in Singapore, where those sectors were not important at any point in the examined time period, the relationship between gender wage discrimination and GDP per capita growth is still positive. This thesis' hypothesis that, when transforming to high-tech manufacturing and service economies, the relationship between the gender wage gap and economic growth in the East Asian Tigers reverses from a positive to a negative or insignificant relationship, can thus be confirmed for three out of four examined cases. This result seems to be conditioned by the sectoral composition of the economies.

This research contributes to the existing body of literature first and foremost by extending the studied time period to the year 2010. Second, by including a time-lagged education-adjusted gender wage gap variable into the model, it adds to the debate on direction of impact between gender wage discrimination and economic growth and partly solves the statistical problem of endogeneity between the two variables. Moreover, it extends Seguino's (2000a) methodology by including educational data on all years of education to make use of more information. Finally, it contributes to the debate between Seguino (2000b, 2011) and Schober and Winter-Ebmer (2011) by reaching a compromise in their data selection methods.

The implications of this research suggest that, in the context of a declining female-dominated low-tech manufacturing sector, policy-makers may consider measures to reduce gender wage discrimination as a tool to promote economic growth throughout their countries' structural transformation towards high-tech manufacturing and service economies. However, further research needs to be done on the direction of causality and other possibly influential factors to the gender wage gap and economic growth than those considered in this study.

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Appendix A

The following table shows the summary descriptive statistics of the variables applied in this thesis.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
GDP per capita growth	120	0.0459	0.03596	-0.070708	0.13968
Ed.-Adj. Gender Wage Gap (in first differences)	112	-0.00052	0.045569	-0.192	0.258
Share of Gross Capital Formation in GDP (log-transformed, in first differences)	120	-0.01149	0.10033	-0.388706	0.35999
Female Labour Share (log-transformed, in first differences)	120	0.00731	0.013154	-0.025333	0.057612
Male Labour Share (log-transformed, in first differences)	120	-0.00479	0.01119	-0.085884	0.038759
Average Years of Education (log-transformed, in first differences)	120	0.01649	0.01137	-0.006293	0.04042

Appendix B

The following graphs show the residual distribution of Models 1 and 2, as well as the normal distribution line for reference.

