Dissertation

The Gender Dynamics of Public Finance: A Chinese and Cross-Country Analysis

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Tabitha Knight

Department of Economics

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Doctoral Committee:

Advisor: Elissa Braunstein

Daniele Tavani
Stephanie Seguino
Sue Ellen Charlton

Abstract

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This dissertation consists of four chapters, integrated with the goal of increasing the knowledge of ways in which fiscal policies affect women's welfare worldwide. First, we provide an overview of the literature relating fiscal policies, gendered employment, and growth, contribute a conceptual model of employment based on these relationships, and propose areas for future work. While we consider the direct relationship between fiscal policy and gendered employment, we also consider two indirect relationships where fiscal policy influences employment through its effect on growth and the unpaid labor burden. Next, we direct our focus towards the Chinese economy as we present a synopsis of women's position in the labor market and discuss the historical patterns of production and social norms, the evolving structure of the Chinese economy, and the ways in which these changes influence women's relative wages, employment opportunities, and mobility; we also include an examination of possible future Chinese growth policies and their potential impacts on women's relative welfare. Using the knowledge obtained in the first two parts of this dissertation, we provide an empirical study of gendered employment in China with a focus on public spending on social infrastructure. We find that public spending on education is associated with increases in gender equality in employment as well short-run economic growth via upward harmonization. Finally, we further extend our work to a world-wide analysis of the same and find that public spending on healthcare and education are positively related to

women's relative employment via upward harmonization. In this dissertation we aim to increase the understanding of the relationship between public sector spending, specifically on social infrastructure, and women's relative welfare, and encourage future work to evaluate other development policies through a gendered lens in order to provide policy options for those aiming to increase economic development in a gender-sensitive manner.

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Introduction

It is often the case that women take on two roles in society, one in which they bear the burden of unpaid labor in household production, and one of paid labor in the labor market. Alternatively, men more typically take on one role, that of paid labor. As such, development policies aimed at increasing overall standards of living may not increase women's welfare if they fail to account for gender differences in paid and unpaid labor. Thus, from the perspective of a proponent of gender-sensitive development, the following questions may arise: How might public policies, in particular fiscal policy prescriptions which aim to increase development and growth, influence women's relative outcomes? What other macro-development strategies may influence women to a different extent than men? How might economic growth itself affect women's welfare? While we focus on measuring gendered outcomes in terms of employment, how else can women's relative welfare be measured, and would different measures lead to different policy recommendations? These questions provide the motivation for this dissertation and are therefore addressed in it.

The main objective of the four chapters of this dissertation is to create a framework from which to view gendered employment and to use it to further the study of public spending through a gendered lens. In the first chapter, we provide an in-depth discussion of the current work on the relationships between employment, economic development, and the public sector and use these works to identify three pathways by which public spending may influence employment: first, directly via labor demand as public sector spending employs workers; second, indirectly via labor supply as public spending reduces household constraints thereby influencing employment; and third, indirectly as the public sector influences economic development which subsequently affects employment via labor supply.

We begin by evaluating this relationship generally, and subsequently by gender where the literature indicates that the above relationships may be stronger for women's employment than men's. Next, we present public spending and other employment determinants visually in a conceptual model of employment before finally identifying gaps in the literature, putting forth questions about the relationship between public spending and employment that remain unanswered, and providing guidance regarding several areas for future work.

In the second chapter, we provide an overview of the social, political, and institutional factors that determine women's relative status and opportunities in the People's Republic of China, hereafter China, by presenting a historical synopsis of the three main time frames in recent Chinese history, namely the pre-Maoist era, the Mao era, and the era of economic transitions, with a focus on the changing roles of women and production under each regime. Second, we investigate women's employment patterns with a focus on gendered occupational segregation and advancement opportunities. Next, we discuss the studies of gender wage inequality during China's transition period and identify the consensus among these works. Finally, evaluating the literature on possible future Chinese growth policies, we discuss how such potential strategies may alter the structure of Chinese production and thus affect women's relative labor market outcomes. In this chapter we emphasize the interconnections between women's role in the paid labor market in China and the social norms, institutions, and structures that influence it.

In the third chapter, we apply the knowledge gleaned in the previous chapters to an econometric analysis of women's relative employment in China. Drawing from the conceptual model presented in chapter 1, we estimate employment as a function of public spending

controlling for demand, structural change, and capabilities, as well as the endogeneity of economic growth and human capital accumulation. We use multiple econometric methodologies to estimate the following three specifications of gendered employment: 1) gender equality in employment measured as the gap between the ratio of female employment to the female population and male employment to the male population; 2) the growth rate of women's employment; and 3) the growth rate of men's employment. The goal of this chapter is to provide policy makers with knowledge of a public spending tool that satisfies our three criteria in that it should be correlated with an increase in women's relative employment, do so in such a way as to avoid declines in men's employment, and be positively associated with economic growth. Our results indicate that while spending on healthcare does not satisfy the three criteria above, spending on education does. Thus, we are able to confirm the theorized relationship between gendered employment and education spending presented in chapter 1 in the case of women in the Chinese economy. The positive association between the two may indicate that increasing the allocation of spending on this category of social infrastructure could increase women's relative employment in China via upward harmonization, as well as economic growth.

In the fourth chapter, we use a theoretical approach similar to that of the previous chapter to analyze public spending on social infrastructure and its implications for gender equality in employment in a world-wide study utilizing multiple econometric techniques. Gender equality in employment, as well as employment rates for both genders, are estimated as functions of public spending on social infrastructure, controlling for regional differences, demand determinants, human capital accumulation, and structural change. The results found in this study are consistent with those of the Chinese study in regards to the effects of education

spending on gendered employment. Furthermore, we find support for the theoretical relationship between public spending on healthcare and gendered employment not found in the Chinese study, in that such spending is also positively associated with gender equality in employment via upward harmonization.

Throughout this dissertation, we contribute to the macro, gender, and development literatures in several ways. First, we provide an extensive survey of the recent work which relates employment, fiscal policy, and economic growth and use it to create a unique conceptual model of employment. Second, we deliver an expansive overview of women's role in the Chinese economy connecting the historical and cultural factors to women's labor market outcomes and additionally include an evaluation of future growth strategies from a gendered lens. Third, we present two unique empirical studies of gendered employment and identify the employment determinants that have the strongest association with women's relative employment.

CHAPTER 1

Women, Public Spending, and Growth: A Survey of Prior Literature, A Conceptual Model of Employment, and Paths for Future Work

1.1. Introduction

Women in the developing world not only experience the lowest standards of living in terms of income, but are also inadequately represented in the paid labor market, receive lower levels of education and investments in healthcare than their male counterparts, and lack access to economic resources, increasing their vulnerability to economic downturns (Dollar and Gatti, 1999; United Nations, 2010; Çağatay and Ertürk, 2004; Benería, 2007). Women's relative welfare, measured as equality in any of the above, is a good that should be given priority in the developing world for intrinsic reasons, while extrinsically, evidence purports that increasing women's relative welfare is positively associated with economic growth and thus can lead to a virtuous cycle of growth and equality (Dollar and Gatti, 1999; Klasen, 2002; Seguino and Were, 2013; Klasen and Lamanna, 2009). However, it may be difficult to identify the means by which such goals can be achieved.

Of the many possible measurements for gender equality—including wage, employment, education, time poverty, and mortality, among others—we focus exclusively on employment for two main reasons. First, employment measures the level of integration into paid labor and thus may indicate the extent by which an economy values and incorporates women's work. Second, employment provides women with access to external income, which even if lower than that of their male counterparts, increases their provisioning capacity and thus their relative

bargaining power within the household. Given that bargaining power is positively correlated with voice, agency, autonomy, and control over household resources, employment represents the first step in the movement towards equality in relative welfare (United Nations, 2013; Braunstein, 2008). Thus, while employment may not be a sufficient condition for increasing women's welfare, it is a necessary one and as such, is our chosen measure of gender equality.

Policy makers continuously search among the multitude of policy options for the most effective ways to achieve economic development, often without the consideration that their chosen policies may be inherently gendered. Many such policies are currently utilized across the world. Thus, identifying which policies may increase women's relative welfare while also reaching for development goals—such as increasing economic growth—would provide policy makers with knowledge of the level of gender-sensitivity inherent in their policies and this knowledge could be used to increase gender equality. While many macro policies are available to chose from, our gendered analysis focuses exclusively on the public sector because of its unique relationship with economic development, household constraints, and women's employment. Consequently, public spending, and more specifically, the composition of public expenditures, may be a critical tool for influencing gender equality in employment.

Given that our focus is on the role of public spending and its influence on gender inequality in employment, we must consider the other half of the duality between the macroeconomy and gender equality where gender equality affects macro variables. The literature on this duality tends to focus on the effects of gender equality on the macroeconomy where recent work has found that movements towards gender equality, measured in education and employment, can affect economic growth through reductions in fertility and child mortality, and increases in the human capital attainment of the next generation (Klasen and Lamanna, 2009; Dollar

and Gatti, 1999; Klasen, 2002; Hill and King, 1995). Alternatively, in this study we analyze the opposite chain of causality where macro variables, such as economic growth and public sector spending, may influence gender equality in employment. It may be the case that he public sector may foster a productive environment and thereby stimulate economic growth (Kneller, Bleaney, and Gemmell, 1999; Aschauer, 1988; Agénor, 2010). Furthermore, the connection between growth and employment creation may be inherently gendered such that one gender receives larger relative employment gains than the other. These are several of the chains of causality we consider here.

In this chapter, we first discuss and critique the literature on the connections between public spending, employment, and growth (section 1.2), then provide a gender analysis of the same (section 1.3). We next present a unique conceptual model of employment from which we can view the employment determinants with a focus on fiscal policy choices (section 1.4). Lastly, we identify gaps in the literature and provide a road map for future work (section 1.5).

1.2. Fiscal Policy, Growth, and Employment

Historically, effectively designed and managed public expenditure programs have been crucial for economic growth and employment (Chang and Grabel, 2004; Aschauer, 1988; Munnell, 1992). This is especially true when considering several categories of public spending which are found to be particularly productive contributors to growth and employment, namely, investments in infrastructure such as public investments in education, healthcare, transportation and communications (Kneller, Bleaney, and Gemmell, 1999; Easterly and Rebelo, 1993; Heintz, Pollin, and Garrett-Peltier, 2009). In this section, we discuss the literature on the three ways in which fiscal policy can influence employment and provide figure

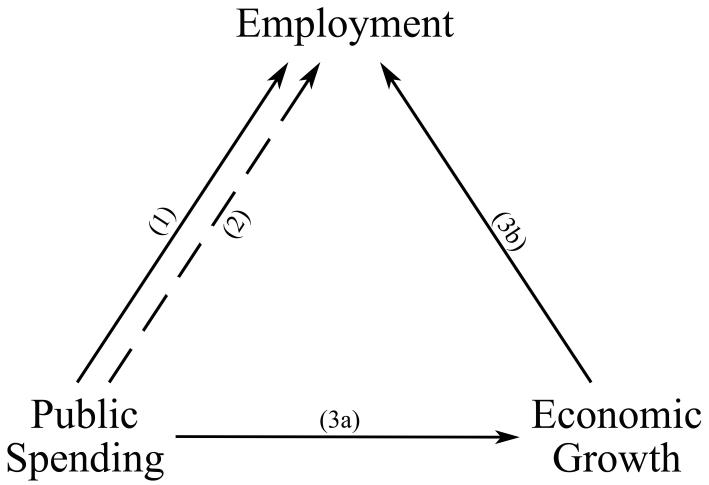

Figure 1.1. Paths of Influence: Public Spending, Employment and Growth

Notes: Dashed (solid) lines indicate transmissions via labor supply (demand).
Path (1): Direct employment effects of public spending
Path (2): Indirect effect of public spending on employment via household constraints
Path (3a): The influence of public spending on economic growth
Path (3b): Economic growth and employment creation

1.1 in order to illustrate these relationships. In path 1, public spending directly influences employment as the public sector employs workers to complete the project/task at hand, thus influencing labor demand. In path 2, the public sector indirectly creates employment when public spending enables further employment opportunities by reducing household constraints, thereby inducing labor supply. In path 3, the public sector is indirectly related to employment as public spending increases overall economic activity (path 3a), which subsequently results in additional labor demand (path 3b). Next, we discuss the literature which evaluates each of these chains of causality in turn.

In their analysis of public spending and its impacts on growth and employment in the U.S., Heintz, Pollin, and Garrett-Peltier (2009) find the total employment created by public spending by summing the direct effect of job creation (path 1) and the indirect effect as public spending creates additional economic activity, which subsequently turns into further

employment gains (path 3). They argue that infrastructure investments are an effective engine for stimulating productivity, economic growth, and job creation, however, if capacity and labor constraints are significant, the relationships may be muted. Controlling for the effects on growth, Dalenberg and Partridge (1995) also find a positive relationship between public spending on education and employment in their metropolitan study of multiple sectors across the U.S. economy.

Similarly, in analyzing the direct (path 1) and indirect (path 3) employment effects in Latin America and the Caribbean, Schwartz, Andres, and Dragoiu (2009) find that infrastructure investments have notable potential to generate employment and long-term economic growth. Alternatively, Ianchovichina, Estache, Foucart, Garsous, and Yepes (2013) find a largely varying relationship between employment and public infrastructure investments across the Middle-East and North Africa, where governance and training may provide significant barriers to the transmission of this relationship. These studies provide support for paths 1 and 3, though notably, specific institutional considerations may influence the strength of the relationship.

Analyzing reductions in public expenditures and their impacts on employment, Toye (1995) finds that employment reductions are an unfortunate and unnecessary consequence of fiscal restraint often prescribed by structural adjustment policies (SAPs). Fan and Rao (2003) and Weissman (1990) find similar results in their studies of the reductions in healthcare and agriculture spending in seventeen African economies, and Ghana and Senegal, respectively. While these three studies do not control for the indirect effect of public spending on employment as it works through economic growth, and hence do not explicitly specify the path by which public spending influences employment, they do confirm that in the case

of reductions in the public sector at least one of the transmission mechanisms in figure 1.1 are functioning adequately.

Public spending may also indirectly influence employment via a reduction in constraints (path 2). This may occur through multiple channels and is especially true when regarding physical infrastructure investments, such as transportation, communications, sanitation, electricity, and water systems, and social infrastructure spending which includes spending on education and healthcare (Elson, 1993). Public spending on these categories can reduce the time required to obtain daily necessities and produce goods in the household, thus increasing the time that can be allocated to other productive activities, such as paid labor (Agénor and Canuto, 2012; Wamboye and Seguino, 2012; Elson, 1995b; Braunstein, 2008; Antonopoulos, 2008).[1] Therefore, public spending may indirectly increase employment as it reduces household constraints and increases workers' abilities to supply their labor to the paid labor market.

Next, we present the literature which supports the indirect relationship between public spending and employment via the ability of public-spending induced growth to create employment opportunities (path 3). We begin by discussing the manner in which public spending influences growth (path 3a) before presenting the work evaluating the relationship between growth and employment (path 3b).

Aschauer (1988) and Munnell (1990) present a few of the first analyses of the effects of fiscal policies on economic growth in the context of the U.S. economy and find that aggregate public spending has significant positive impacts on economic growth. Using data from OECD countries, Kneller, Bleaney, and Gemmell (1999) calibrate an endogenous growth

[1]As these empirics are presented along gendered lines, details on these empirical studies are presented in full in section 1.3.

model with a government budget constraint and find that "productive" public expenditures, including spending on healthcare, education, defense, housing, transportation, and communication, have positive impacts on economic growth. Employing a slightly altered definition of productive public spending, "core spending", which additionally includes fuel and energy and excludes defense spending, Bayraktar and Moreno-Didson (2010) analyze the composition of public spending and its effectiveness in producing economic growth. Disaggregating a sub-sample of developing countries into two groups—those with similar growth rates and those with mixed—they find core spending positively associated with real GDP per capita growth in the former group only. They conclude that the policy environment present in the first group, where inflation reduction, private investment, and trade openness are consistently present, provides the structure from which core spending can contribute significantly to economic growth.

Utilizing data on 118 countries from 1975 to 2000, Baldacci, Clements, Gupta, and Cui (2008) find that public spending on several core components, including healthcare and education, are indirectly positively related to economic growth through enhanced productivity. However, these results are contingent upon the two measures of quality of governance: the anti-corruption and democratic accountability index and the level of fiscal deficits. In economies deemed to display poor governance, the positive relationship between growth and education spending diminishes, whereas the positive relationship between growth and healthcare spending disappears. They conclude that public spending on these core (or productive) components can be beneficial to growth, but in order to reach their full potential they must be implemented in concert with anti-corruption policies and fiscal prudence, a result which

is echoed by Rajkumar and Swaroop (2008).[2] Furthermore, the effects differ drastically by a country's income level and region where these positive effects are strongest in low-income and sub-Saharan African countries.

In a case study of India, Fan, Hazell, and Thorat (2000) find that public spending on roads, agricultural research, and education provide the greatest positive impacts on poverty reduction and productivity growth while other categories of public spending, including health, water, and community development, are only slightly productivity enhancing. Their results indicate that these policies may positively influence economic growth through increased productivity, but that if institutions are insufficient, the positive results may fail to appear.

The culmination of this literature provides empirical support for path 3a as it implies that public spending may be growth enhancing if it is implemented in concert with other supporting policies. Next, we present the literature which relates growth and employment creation (path 3b) to complete the chain of causality where public spending is indirectly related to employment via economic growth.

The relationship between economic growth and employment is a historical tenet in the economics literature and provides the basis for the Keynesian stimulus methodology where positive shocks to aggregate demand increase production and create economic growth and employment (Schwartz, Andres, and Dragoiu, 2009). However, in today's economic climate it may not always be the case that growth creates employment opportunities if growth is achieved via shocks to technological change or capital-intensive production processes, the main drivers of economic growth in the basic neoclassical growth models (Solow, 1956;

[2]Rajkumar and Swaroop (2008) find similar results in their analysis of the linkages between public spending, outcomes, and governance.

Blinder, 1997; Pianta, 2005). Thus, we cannot assume that any positive shock to economic growth would increase employment and must instead evaluate the paths by which this goal can be achieved.

In an empirical evaluation of European countries in the 1990s, Döpke (2001) argues that growth is a powerful job-creator, though this relationship depends on the relevant labor market conditions. Similarly, Padalino and Vivarelli (1997) find strong evidence that economic growth is a powerful job creator in G-7 economies from 1960 to 1994. Using cross-country data from 1980 to 1995, Islam and Majeres (2001) find that growth, achieved via investments in infrastructure, can generate substantial employment opportunities in Asian and African economies. These empirics indicate that growth may be transmitted into positive employment opportunities (path 3b) and that the job losses associated with technological change and capital intensity may in fact, be counteracted with alternative employment opportunities. Given the empirical support that growth is positively related to employment, and that, according to Jorgenson and Vu (2005), capital-deepening is the main source of growth across seven regions from 1989 to 2003, the theory outlined above is contradicted by the empirical findings. That is, capital intensity and an increase in production capacity may require additional labor, even as the capital-labor ratio falls, and thus recent growth patterns appear to create significant employment opportunities even though they occur via shocks to capital-intensive production processes and technological change (path 3b).

1.3. Fiscal Policy in Gendered Analyses

Having empirically established the relationships illustrated in figure 1.1 in a general sense, we next focus on the ways in which considering *gendered* employment may add an additional dimension to the transmission mechanisms, and thus the extent by which the public sector

can influence gender equality in employment. We begin with the literature on the direct relationship between public spending and gendered employment (path 1), then move onto that of the indirect relationships (paths 2 and 3 in turn).

Given that women constitute a large share of public sector employment and that women's employment is largely associated with this sector (Standing, 1999; Ibrahim, 1989; Razavi, Arza, Braunstein, Goulding, and Cook, 2012), public spending may exhibit an even closer connection with women's employment than men's. Further, as women tend to dominate employment in healthcare and education, often denoted as 'care' sectors (Razavi, Arza, Braunstein, Goulding, and Cook, 2012; Braunstein, van Staveren, and Tavani, 2011), public spending on these categories may directly increase women's relative welfare to an even greater extent than spending on other categories.

In their evaluation of the aggregate public sector, Ding, Dong, and Li (2009) argue that as public spending fell during the economic transition period in China in the late 1990's, women's relative employment was significantly reduced due to the state-directed contraction in employment along gendered lines. They argue that the declining fiscal space and privatization imitated the SAPs of the 1980's where the associated losses in women's employment were much greater than those of men's (path 1).

Wanjala and Were (2009) analyze public policies and their implications for women's relative employment in the context of Kenya where policy reforms altered investments in agriculture, manufacturing, and services. Using a social accounting matrix multiplier analysis, Wanjala and Were (2009) simulate the effects of public investment choices on gendered employment and find that manufacturing investments provide the greatest increase in employment, particularly for women, though such employment is often temporary and lacks

benefits and employment protections. Their results indicate that investments in manufacturing directly increase women's employment (path 1) but should be accompanied by additional labor protections in order to decrease their associated precariousness.

The indirect chain of causality where public spending reduces household time constraints, and therefore increases employment (path 2), may also be significantly gendered. Allocating public spending towards specific categories which reduce the time required to complete household production may increase women's employment, given that social norms often dictate that women are responsible for such tasks (Elson, 1999; Mehra and Gammage, 1999). Public spending on physical infrastructure, for example, should increase women's access to clean water, electricity, and transportation, thereby reducing the time required to perform related activities in the home (Ibrahim, 1989). Furthermore, physical infrastructure may reduce the physical barriers which prevent women from safely and speedily transporting themselves to the workplace (Agénor and Canuto, 2012). In both cases physical infrastructure spending may significantly increase women's ability to supply labor to the paid labor market.

Fontana and Natali (2008) evaluate the impacts of physical infrastructure spending on the time spent on related activities using a time-use survey for Tanzania. They find that when funding for physical infrastructure is limited, women bear the burden in terms of unpaid labor time as they spend many hours collecting water and fuel and preparing food without electricity; such time requirements limit their ability to participate in paid labor.

In their study of the relationships between time-use and spending on physical infrastructure in the context of Sub-Saharan Africa, Wamboye and Seguino (2012) find that public spending on infrastructure, specifically, sanitation and communications, is associated with

declines in women's unpaid work burden and maternal mortality, and increases in their access to schooling, all of which increase women's relative paid employment. These results lead Wamboye and Seguino to conclude that physical infrastructure spending may be positively related with women's relative and absolute employment through the unpaid work burden.

Calibrating an over-lapping generations model with cross-country data from developing economies, Agénor and Canuto (2012) relate women's time allocation and spending on several categories of physical infrastructure, including spending on sanitation, water, and transportation. They find that poor infrastructure increases women's unpaid labor, decreases their ability to obtain paid employment, and reduces economic growth. They also argue that poor sanitation is associated with lower educational achievement for girls as they often drop out of school when they are required to work in the household, thus reducing their future employment opportunities. The main result of their work is that growth and development policies may not be effective in stimulating women's employment if significant constraints on women's time and resources prevent them from supplying their labor to the market. In order for such policies to be effective in promoting long-run sustainable growth, women must be able to reallocate their time and the unpaid labor burden should be shared across genders. Consequently, relieving infrastructure constraints and providing public goods which decrease women's unpaid labor burden may be a necessary condition for movements toward gender equality.

On the other hand, increasing social infrastructure spending—and thus women's access to childcare and health services—theoretically should reduce the time required to care for children and the ill and subsequently increase women's relative labor supply (Elson, 1995b; Braunstein, 2008; Klasen and Lamanna, 2009; Antonopoulos, 2008). Additionally, when

public spending on social infrastructure is reduced, women and girls may be removed from the paid labor market and/or taken out of school to care for children and the ill, thus reducing their relative employment opportunities (Elson, 1995a; Çağatay and Ertürk, 2004).

Seguino, Berik, and van der Meulen Rodgers (2010) discuss the case of declining public spending on healthcare in Trinidad and Tobago in the early 1990s. They argue that this decline in social infrastructure represented a shift of the burden of the ill from hospitals to women in the homes where the final result was a substantial increase in women's unpaid labor burden. Consequently, this additional unpaid labor burden may limit women's ability to participate in paid labor if the burden becomes too great and women find themselves unable to balance it with paid labor.

Analyzing 16 industrialized economies from 1963 through 1987, Huber and Stephens (2000) find that women's labor force participation is positively associated with non-transfer government expenditures, their proxy for public spending on welfare. Despite their aggregate measure of public spending—which includes defense spending, administration, and numerous other public spending categories—they argue that their results imply that the relationship also holds specifically for welfare spending categories, namely education, health, and social welfare. They argue that this correlation is due to the demands working women make on the public sector. Given that female labor force participation grew consistently in 15 of 16 economies, the opposite chain of causality is just as plausible, and strongly supported in the literature if public sector provisions reduce household responsibilities and thus allow women to participate in paid labor. Furthermore, by treating female labor force participation and economic growth as exogenous, Huber and Stephens do not capture the other relationships that may influence their findings.

In a cross-country study of 19 advanced industrialized economies in the mid-1990s, Pettit and Hook (2005) find a positive relationship between public provisions for children and women's employment. They conclude that further evaluations of women's labor supply would be remiss if they failed to include the role of the public sector in determining gendered employment. However, they do not present a chain of causality in their work. This being the case, they could be duplicating the argument made by Huber and Stephens (2000), or providing support for the theory put forth in this chapter where the public sector is responsible for reducing household constraints, and thus increasing employment opportunities.

The empirical literature presented above provides support for the theory illustrated by path 2, where public spending is positively associated with women's relative employment via time constraints and the burden of household production. However, the empirical support for the relationship between public spending on physical infrastructure and women's relative employment is much more prevalent and robust than that of social infrastructure spending.

Regarding path 3b,[3] where growth and gendered employment are related, there are many studies of the effects of gender inequality on economic growth (Dollar and Gatti, 1999; Klasen and Lamanna, 2009). However, while studies of the opposite chain of causality are few and far between, the patterns of occupational segregation provide some evidence regarding this relationship. Since employment is strongly segregated along gendered lines (England, 2005; Meng, 1998), when women in the developing world are concentrated in temporary positions which are more vulnerable to economic conditions, women's relative employment tends to fall during contractions and rise during expansions (Chen, Vanek, Lund, Heintz, Jhabvala, and Bonner, 2005). Conversely, when women are employed in the least vulnerable sectors (often evident in OECD countries), their relationships with

[3]The literature in the previous section is sufficient for addressing path 3a since it is non-gendered.

macroeconomic conditions may be less strong than men's (Rives and Sosin, 2002). That is, whether or not women's employment is more strongly related to economic growth than men's depends on their employment status, be it temporary or permanent, and the sectors in which they are employed. Thus the relationship may be country, region, and/or development-level specific such that individual circumstances determine whether women experience a relative improvement or decline in their relative employment in adverse economic conditions. Additional studies on the relationship between gendered employment and economic growth may better illuminate the nature of this relationship and can help inform policy makers about the consequences for gendered employment of economic upswings and downswings.

1.4. Modeling Employment

While figure 1.1 represents a basic framework from which public spending may influence employment, figure 1.2 provides a comprehensive model of the determinants of employment. In this model public infrastructure spending,[4] population, structural change, and human capital influence employment via labor supply (dashed lines), whereas public spending, structural change, economic growth, investments, and trade influence employment via labor demand (solid lines). Furthermore, human capital and economic growth are themselves endogenous variables in that they are determined by other variables in the model. Next we use the previous literature to discuss each employment determinant in general, and then from a gendered perspective, given that labor markets are inherently gendered institutions (Elson, 1999).

[4]Public spending on infrastructure refers to both physical and social infrastructure as they relate to employment through the same channels; separating out the components of infrastructure would not alter the mechanisms by which they influence employment.

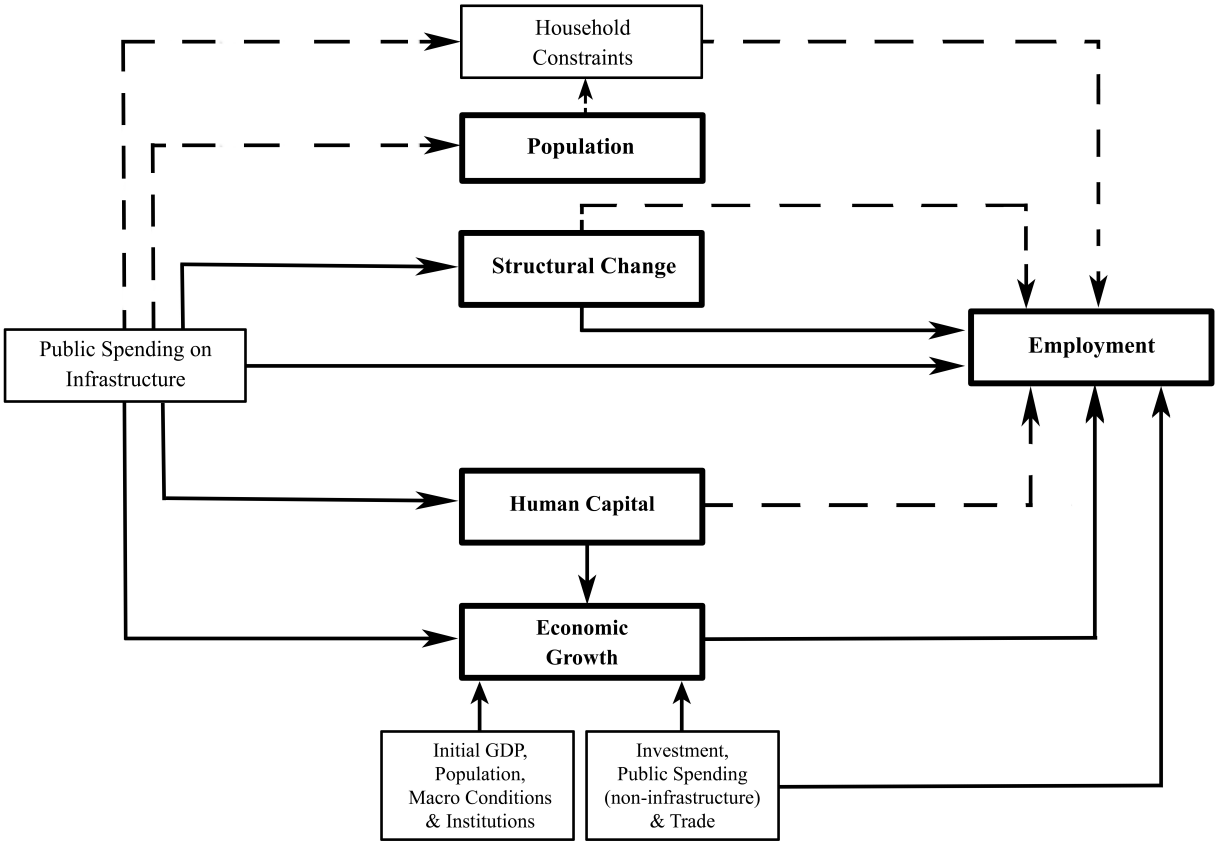

Figure 1.2. Conceptual Model of Employment

Note: Dashed lines indicate transmissions via labor supply while solid lines refer to dissemination through labor demand. **Bold** indicates endogeneity.

1.4.1. Employment Determinants. Public spending, both in aggregate and specific to infrastructure spending, can influence labor demand directly as public sector funding directly employs workers (Heintz, Pollin, and Garrett-Peltier, 2009; Schwartz, Andres, and Dragoiu, 2009; Dalenberg and Partridge, 1995). Such spending may be associated with women's employment to a greater extent than men's given the gendered composition of public spending, and more specifically, spending on care sectors (Ding, Dong, and Li, 2009; Wanjala and Were, 2009).

Public spending on infrastructure also indirectly influences employment as it provides the funds for educational opportunities which in turn, influences human capital, and subsequently, labor supply (Glomm and Ravikumar, 1998; Pettit and Hook, 2005). When such funding falls and monetary constraints lead to selection distortion effects, families choose to educate those with the highest return (male children) and consequently, public infrastructure spending can result in depressed future human capital and employment, especially for girls (Boschini, 2003; Wang and Cai, 2008; Sabir and Abdullah, 2002).

Public spending on infrastructure also indirectly influences employment via labor supply through reductions in household constraints and the time required to complete household production. Given that social norms dictate that such work be allocated along gendered lines (Mehra and Gammage, 1999), infrastructure spending affects household production such that women's employment is affected to a greater extent than men's (Fontana and Natali, 2008; Wamboye and Seguino, 2012; Agénor, Canuto, and Da Silva, 2012; Seguino, Berik, and van der Meulen Rodgers, 2010). Along similar lines, the size of the population is also influenced by public spending on infrastructure as such investments may affect population dynamics such as infant mortality, fertility rates, and life expectancy (Nixon and Ulmann, 2006); these healthcare outcomes indirectly affect employment via household constraints given that the size of the household determines the extent of household production requirements (Pettit and Hook, 2005).

Furthermore, public spending on infrastructure indirectly impacts labor demand through its effect on economic growth (Eberts and Stone, 1992), which subsequently influences employment (Döpke, 2001; Padalino and Vivarelli, 1997). This relationship may be stronger for women's relative employment if growth occurs in sectors where women are more prominent

than men, or in economies where men's employment is more permanent than women's. In this way, employment is also indirectly influenced by the other determinants of economic growth.

Additionally, public spending on infrastructure may influence structural change given that such investments facilitate the accumulation and mobility of physical capital which aids in shifting the patterns of production (Agénor and Moreno-Dodson, 2006). Consequently, public infrastructure spending indirectly influences labor demand and supply via structural change given that such change includes alterations in the process, location, and intensity of production in such a manner as to uniquely influence gendered employment (Humphries, 1988). Such macroeconomic shocks impact the labor market outcomes of men and women to different extents (Berik and van der Meulen Rodgers, 2008; Berik, 2000); specifically, shifting production patterns may influence women's employment to a greater extent than men's, given that women tend to be associated with temporary positions and have less seniority and education. Thus, women's employment may be more vulnerable to changes in the patterns of production than men's (Berik and van der Meulen Rodgers, 2008; Çağatay and Özler, 1995).

Finally, investments, non-infrastructure public spending, and trade directly influence employment as they employ workers in order to produce goods. These may also be gendered as investment goods, trade, and the public sector may demand employment along gendered lines (Braunstein and Brenner, 2007; Seguino, 2000; Çağatay and Özler, 1995; Razavi, Arza, Braunstein, Goulding, and Cook, 2012). On the supply side, the size of the population is related to employment via household constraints (Hunt, 2006).

1.4.2. Growth Determinants. Similarly to that of Barro (2001) and Aghion and Howitt (2009), the derivation of our growth model begins with traditional growth theory where economic growth is a function of the initial level of GDP and capital investments, which account for convergence and production capacity, respectively, and then expands with the subsequent extensions to the model to account for new growth theory. Throughout the literature, the concept of capital investments is broadened beyond investments in fixed assets to also include investments in health and education (Bloom, Canning, and Sevilla, 2001; Banerjee and Duflo, 2005). In further extensions, technological progress—the production of ideas which increase productivity—is a main determinant of economic growth, where productivity-enhancing human capital can serve as a proxy for such innovation (Glomm and Ravikumar, 1998; Vandenbussche, Aghion, and Meghir, 2006). Following Barro (1998), we incorporate the role of fertility, proxied with population growth, where theoretically, higher rates of population growth (and thus the choice to have more children per adult) may be accompanied by lower rates of GDP per capita growth. We further incorporate the extensions of this model which account for cross-country differences in growth rates where macroeconomic conditions, institutional factors, international orientation, and government spending policies influence economic growth (Dutt, 2006; Rodrik, Subramanian, and Trebbi, 2004; Acemoglu, Johnson, and Robinson, 2005; Barro and Sala-i Martin, 1995).

It is also important to note that employment is itself an input into production and a determinant of economic growth (Aghion and Howitt, 2009). Since the focus of this analysis is on the determinants of employment, we limit our employment model to this chain of causality, and thus refrain from including the effects of employment on economic growth in figure 1.2.

1.5. Areas for Future Work

While the theoretical chains of causality are well drawn up in the literature, there is a need for further empirical work on the direct relationship between public spending and gendered employment (path 1) in country-specific cases. It may be the case that specific social and/or cultural conditions may reduce the effectiveness of such policies, or worse, cause these policies to reduce women's relative employment. Uncovering such limitations could help policy makers avoid these pitfalls and greatly increase the effectiveness and applicability of public policy prescriptions.

There are several studies on the indirect relationship between public spending on physical infrastructure and gendered employment via the impact on household constraints (path 2), though further country-specific studies would be beneficial. Furthermore, despite the theoretical indirect relationship between social infrastructure spending and women's relative employment, there is little empirical literature evaluating these connections. Future work in this area would provide a wider range of gender-sensitive public policies available to policy makers as they aim to stimulate the economy in such a manner as to create job opportunities for women on par with men. Additionally, further knowledge of the extent to which growth determinants transmit to employment (path 3b) would be of great use to policy makers. Future evaluations of public policies—and fiscal policies in particular—through a gendered lens may enable us to identify a productive combination of these policy options which could be used to increase women's relative employment, both directly and indirectly, and allow for a more equitable division of the unpaid labor burden.

There is also concern over the level and speed of public sector outsourcing and informalization (Razavi, Arza, Braunstein, Goulding, and Cook, 2012). Given the aforementioned

concentration of women in public sector employment, this institutional shift may have strong negative implications for women's relative employment. Future work could determine the degree of state-sector outsourcing, ascertain if this shift is occurring along gendered lines, and identify avenues to avoid losses to women's relative employment.

The need to create social welfare policies which advocate for a sharing system of unpaid labor between women and men in the household is critical for the future of the gender-development literature (Elson, 2009). Thus, further knowledge of the relationship between gender, the unpaid labor burden, and social protections would provide economists with a greater level of understanding of household dynamics and their relationship with the aggregate economy. To that end, future work should look at the ways in which social protections and insurance programs influence the allocation of the unpaid labor burden. While this relationship may be assessed empirically, the enigmatic nature of dynamic social norms and institutions, which help to determine the distribution of unpaid labor, is difficult to capture empirically. Instead, a theoretical model of the evolution of social norms may be able to capture the power relations that influence the share of the unpaid labor burden and subsequently, women's access to paid employment (path 2). Fontana and Wood (2000) provide a computable general equilibrium model which works as an example of such a model in that it includes the market economy, the reproduction of the labor force, and gendered leisure time. While Fontana and Wood provide an original perspective on time poverty and paid labor, their model is rather simplistic in that it specifies that the sole determinants of time poverty and paid labor are the prices in the markets for the reproduction of the labor force and gendered leisure, as determined by demand and supply. That is, price changes in these

"markets" influence the time spent on related activities. Furthermore, social norms and institutions are absent, and gender-power relations and resources are considered exogenous.

By way of a household model, one could account for the dynamic nature of social norms and their role in household production with the inclusion of the reproduction of the labor force, paid labor, and the unpaid labor burden, subject to social norms and institutions. An example of a similar model, though with an alternative aim, is that of Braunstein, van Staveren, and Tavani (2011) who provide a macro-structuralist growth model incorporating both paid and unpaid production sectors in two separate economies: one populated by individuals who are altruistic and one with those who are selfish. In this model, the altruistically-motivated unpaid care sector is gendered and determines current and future allocations of labor and produces workers who are themselves inputs into production. From this approach, they are able to explore the social aspects of production and the gender norms inherent in the division of labor between the paid and unpaid sectors. They find that when there is greater sharing of the burden of unpaid labor, the altruistic economy is more likely to emerge. This model identifies the sharing rule of the unpaid sector and accounts for more appropriate determinants of the reproduction of the labor force than that of Fontana and Wood. The authors diverge from the dynamic model of social norms previously discussed in that the share of the unpaid labor burden is exogenous, as opposed to being determined by changes in social norms and institutions. However, this work provides an excellent guide for future work in this area through its combination of a macro model and a model of family structure.

It is our hope that additional research on the relationship between women and the macroeconomy will help identify growth strategies for developing economies which would lead to sustainable increases in women's relative welfare and overall standards of living.

1.6. Conclusion

There are significant intrinsic and extrinsic reasons for addressing the imbalances between women's and men's welfare across the world. Notably, implementing gender-sensitive policies is not only possible, but is crucial for any sustainable growth strategy in the developing world. The literature discussed in this chapter indicates that allocating funds to certain categories of public sector spending may support gender-sensitive development strategies. However, additional empirical support in this area would greatly increase the knowledge and strength of the theoretical arguments on the connections illustrated in figure 1.1.

The literature presented in the first section supports the relationships between the public sector, employment, and growth. Here the empirical results indicate that public spending influences employment both directly (path 1 of figure 1.1) and indirectly as such spending reduces household constraints (path 2 of figure 1.1) and increases overall economic activity (path 3 of figure 1.1). The literature in the subsequent section provides empirical support for the idea that at least the first two pathways may be stronger for women than men. Next, we provide an extended conceptual framework from which to view the relationship between fiscal policy and employment. In this model, public spending, particularly on infrastructure, plays a crucial role in determining employment through multiple avenues. Lastly, we indicate which connections in this framework could be strengthened with future empirical work.

The extent of the literature presented here should not indicate that we entirely understand the relationship between employment, economic development, and the public sector; rather

it should draw attention to the questions left unanswered and work still to be done in this area. It is hoped that in answering some of these questions we can impart an even greater depth of understanding regarding women's employment and the effects of public spending, both directly and indirectly and thus can equip policy makers with an expanded guide for the usage of gender-sensitive public policies.

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CHAPTER 2

Women and the Chinese Labor Market: Recent Patterns and Future Possibilities

2.1. Introduction

The status and value of women's work shifted drastically and rapidly with changes to the state sector, social norms, and institutions in the People's Republic of China (hereafter China) during the economic transition from a centrally-planned economy towards market-orientation (Ding, Dong, and Li, 2009; Liu, 2007). Despite the shift away from complete centralized control, the state sector remained strongly woven throughout the economy during the transition with critical consequences for women's relative welfare (Lu and Song, 2006; Fan and Li, 2002). While the socialist regime necessitated the incorporation of women's work into paid labor (Jacka, 2005; Fan, 2003; Riley, 1996), the transition period, implemented in order to incorporate market incentives, brought with it changes in women's relative welfare, gendered occupational segregation, and wage inequality (Bauer, Feng, Riley, and Xiaohua, 1992; Maurer-Fazio, Rawski, and Zhang, 1999).

In order to evaluate the role of public sector spending in the process of gendered employment creation in China, as will appear in the next chapter, it is imperative that we first consider the changing social consciousness, patterns of production, and institutions in the Chinese economy. To that end, in this chapter we discuss how Chinese history (section 2.2) provides a framework from which to view the relative position of women in the Chinese labor market in terms of their representation (section 2.3), remuneration (section 2.4), and mobility (section 2.5). Lastly, we discuss how several of the options for future

Chinese growth strategies may influence women's labor market outcomes as well as long-run economic growth (section 2.6).

2.2. Gender in a Historical Context

Recent Chinese history can be split into three basic time frames: pre 1949, known as the pre-Maoist era, 1949 to 1978, the Maoist era, and 1979 to present, the era of economic reforms (Naughton, 2007). As the Chinese economy transitioned from one era to the next, many aspects of Chinese life transitioned with it, including social ideologies, norms, views of employment, and modes of production.

In the pre-Maoist era, Confucian beliefs dominated the cultural milieu and their strong patriarchal presence largely influenced the roles and responsibilities of women in society. More often than not, during this era women contributed mostly to household production and the reproduction of the labor force, whereas work outside of the household was almost entirely populated by men (Fan, 2003). Consequently, women's labor force participation was very low and the gap between women and men's paid employment was extensive in this era (Bauer, Feng, Riley, and Xiaohua, 1992).

Throughout the era of Mao, however, these norms changed swiftly. In order for the command economy to function adequately, it was necessary to acquire a large and growing labor force and thus it was no longer sufficient to include men, almost exclusively, in the paid labor force (Jacka, 2005). During the early years of Mao, the 'iron rice bowl' characterized labor where all Chinese citizens were entitled to lifetime employment via assigned positions provided by the department of labor (Ghose, 2005; Wang and Cai, 2006). Under this system, the official policy called for 'equal pay for equal work', regardless of gender, productivity, effort or performance (Maurer-Fazio and Hughes, 2002; Ding, Dong, and Li, 2009). With

the advent of this new system, significant efforts were made, not only to bring women into the labor force, but also to transform the cultural view of women's work from one of being out of place in paid labor to being just as important as men's (Fan, 2003; Riley, 1996).

The onset of the era of economic reforms again entirely changed the gender composition of labor due to the social and structural changes inherent in the reform process. Top-down reforms, implemented in order to initiate, and subsequently intensify, the shift from a command to a market economy, began with slow and steady reductions in public sector spending and the removal of lifetime employment guarantees, followed by state-owned enterprise (SOE) privatization and liberalization policies (National Bureau of Statistics of China, 2010; Wong, 2000; Fan, Hai, and Woo, 1996). The gradual restructuring of the state, which was completed in a slow, carefully controlled process, introduced markets where possible, eased the pressure off of the agricultural system, focused on industrialization, and scaled down the size of the state sector and public spending (Ding, Dong, and Li, 2009). This last element of the reform process can be seen in Figure 2.1 as the ratio of public sector spending to gross domestic product (GDP) fell from a height of 31% in 1978 to a low of 11% in 1995.[1] Prior to the introduction of markets and new private firms, SOEs were able to capture monopoly revenues which acted as the primary financing tool for public expenditures (Naughton, 2007). However, as profits in SOEs fell due to private enterprise competition, downward pressure on market prices forced inefficient SOEs out of business, and budgetary revenues and consequently, public expenditures, fell substantially (Wong, 2000).

In light of the failure of inefficient firms and the entrance of private enterprises, the state passed a law permitting worker layoffs for the first time since the creation of the People's Republic of China in order to increase market incentives (Solinger, 2002; Cai and Wang,

[1]Wong (2000) finds a similar fall in public revenues from their height of 35% in 1978 to under 12% in 1995.

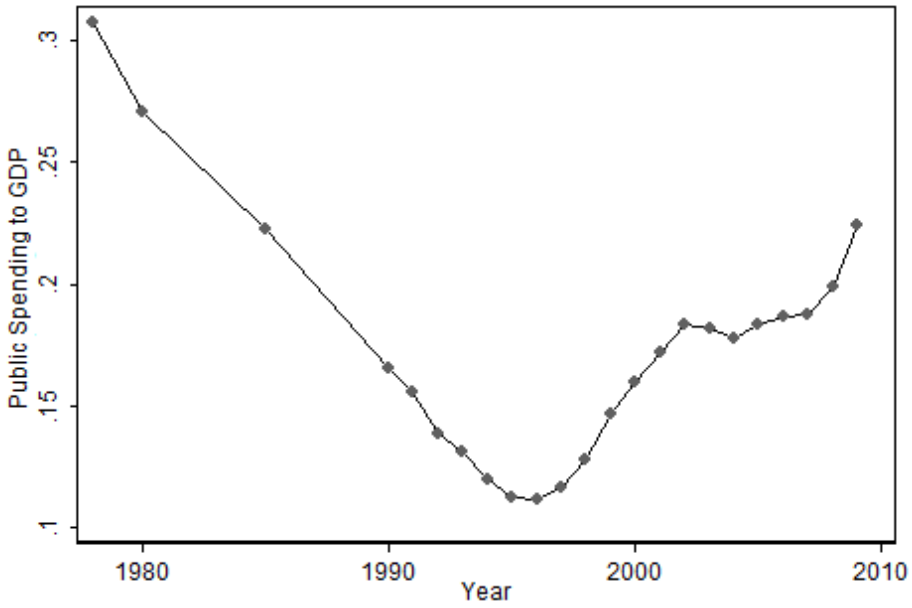

Figure 2.1. Public Expenditure as a Proportion of GDP (1978 to 2009)

Note: Public expenditures include expenses accrued from local, provincial, and central sources. Source: *China Statistical Yearbook* (2010).

2010). Consequently, labor demand was no longer solely determined by the state, though the state continued to employ a vast majority of urban citizens (Fan, 2003). The Chinese labor force began to experience employment uncertainty for the first time as ailing SOEs exploited this law by laying off workers in order to remove existing labor redundancies (Burns, 2003; Ding, Dong, and Li, 2009). SOE employment declined from 76 to 47 million workers from 1993 to 1999, effectively ending the longstanding tradition of lifetime job guarantees; by 2009, state employment had fallen to 51% of all urban employees (National Bureau of Statistics of China, State Statistical Bureau, 2010). However, these layoffs were not performed equally along gendered lines. The increasing presence of private enterprises, in concert with the declining prevalence of communist ideals, brought about the reemergence of patriarchal values and with it, gender discrimination in wages and employment (Ding, Dong, and Li, 2009). As unemployment began to climb for both genders, the public discourse at the

time strongly encouraged women to voluntarily leave paid labor and return to the household in order to ease the male unemployment problem. These social pressures emerged despite the fact that, relatively speaking, women's unemployment was growing faster than men's (Liu, 2007). For all these reasons, gender inequality in employment intensified during the economic reforms.

Subsequently, tax reforms and increased efficiency in SOEs increased the fiscal status of the state sector, providing it with the revenue needed to build infrastructure and administer social relief (Wong, 2000). This rebuilding is also illustrated in Figure 2.1 where public spending rose from its low of 11% in 1995 to 22% by 2009; however, women's relative employment was not to recover as quickly.

2.3. Gender and Employment in the Reform Era

During the reform period, 'expendable' workers—primarily older, less educated, married women—were the first forced out of the labor market as SOEs attempted to reduce costs and increase profitability (Ding, Dong, and Li, 2009; Liu, 2007).[2] Furthermore, the enforcement of a mandatory early retirement program, where blue collar men were required to retire at 50 years of age and blue collar women at 45 years of age, exacerbated the emerging gender inequality in employment (Ding, Dong, and Li, 2009). In concert with the gender inequality implicit in the early retirement laws, Liu (2007) argues that the removal of the communist philosophy and the reemergence of the male-breadwinner ideology resulted in women constituting approximately 60% of the layoffs during this era, despite the fact that they comprised only 40% of the workforce at the time.

[2]Ding, Dong, and Li (2009) find this gender bias in layoffs in their micro analysis of married women in China using data from the Chinese Household Income Surveys (three separate surveys from 1988, 1995, 2002), consisting of married individuals from 11 different provinces while Liu (2007) reports similar results using a qualitative micro analysis using interviews of women in the Nanjing province.

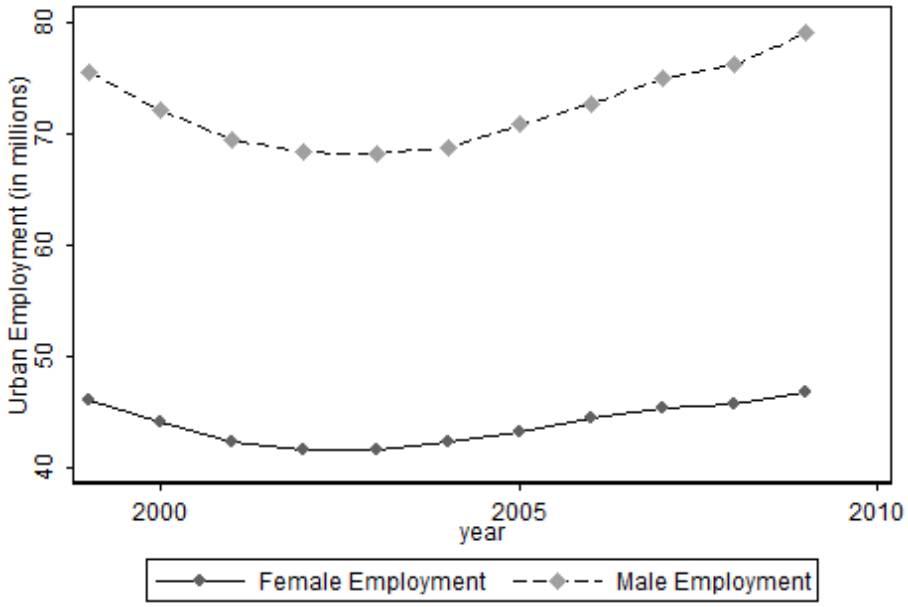

Figure 2.2. Annual Gendered Employment in China (1999 to 2009)

Note: Urban employment figures include only formal employees working in an urban area at years' end. Source: *China Labour Statistical Yearbook* (2000-2010).

These layoffs can be seen in Figure 2.2 which illustrates urban gendered employment patterns from 1999 to 2009.[3] Urban employment fell from 1999 to 2003 for both genders where men's employment had recovered (and surpassed) its 1999 level by 2008 and women's by 2009. The highest levels of employment occur in 2009 for both genders where women's and men's urban employment reached 46.8 million and 78.9 million, respectively. Urban employment reaches its low in 2003 for both women (41.6 million) and men (68.1 million). It's important to note here that our data, and thus our discussions of these figures, are limited to formal urban sector employment only due to the lack of availability of macro-level gender-disaggregated urban and informal employment data.

Not only have employment *levels* been altered by the economic restructuring, the structural change and production shifts inherent in transitioning China from a socialist to a

[3]Due to changes in the definition of employment, gender-disaggregated data is limited to that of the 2000 publication of the China Labour Statistical Yearbook (NBS, 2000) and beyond.

market-oriented economy also substantially affected patterns of occupational segregation by gender (Fan, 2003). Further, the extent of occupational segregation in the urban Chinese labor market significantly influenced the patterns of employment layoffs and recoveries. Women, often employed in *light* industries, such as textiles, with temporary positions and low relative wages, experience relatively greater levels of unemployment vulnerability compared to their male counterparts, likely employed in *heavy* industries, such as construction, with permanent positions and higher relative wages (Liu, 2007; Maurer-Fazio, Rawski, and Zhang, 1999).

Table 2.1 demonstrates the extent of gendered occupational segregation in the urban Chinese labor market as it lists female employment as a percentage of total employment in selected sectors. An interesting trend that is illustrated in this table is the fact that segregation increased from 1998 to 2010;[4] those sectors which are strongly dominated by women (those above the 'average' row) are becoming more so while those strongly dominated by men (those below the 'average' row), with the exception of Party Management and Organization, are also becoming more so. That is, the separation of women and men in Chinese urban labor markets became more extensive over this time frame.

[4]Data availability limits this time frame as extensive sector decomposition was not published prior to the 1999 publication of the Chinese Labour Statistical Yearbook.

Table 2.1. Female Employment as a Proportion of Total Employment in Urban China

Sector	(% in 1998)	(% in 2010)
Textile & Apparel Manufacturing	NA	68.7
Sanitation, Social Security & Social Welfare	51.4	60.0
Retail & Trade	51.7	55.1
Accommodation & Restaurants	44.6	54.1
Finance	NA	50.6
Education	43.5	50.3
Entertainment	37.5	49.3
Banking	42.0	47.4
Average	**37.9**	**38.0**
Real Estate	36.0	34.2
Scientific Research	33.8	31.5
Party Management & Organization	21.3	24.2
Traffic and Transportation	27.2	26.8
Mining	25.7	18.8
Architecture	NA	17.1
Construction	18.5	13.1

Notes: Data obtained from the China Labour Statistical Yearbook, a publication of National Bureau of Statistics of China (NBS, 1999; NBS, 2011). NA indicates that the data was not available in the relevant yearbook. Urban employment figures include only formal employees working in an urban area at years' end.

In addition to a clear-cut divide between women's and men's work, there are distinct gender differences in access to vertical and horizontal mobility in the Chinese labor force where women, unlike men, are often prevented from obtaining occupational advancements and higher standards of living (Liu, 2007). This combination of occupational segregation and restrictions on horizontal and vertical movements has resulted in a great deal of gender stratification where men are prevalent in high status positions and are able to capitalize on educational attainment, while women do not hold such positions and thus cannot capitalize equally (Bauer, Feng, Riley, and Xiaohua, 1992).[5] The combination of these gendered elements of the restructuring process resulted in increased gender inequality in employment, measured in both outcomes and opportunities, during this period.

[5]Bauer, Feng, Riley, and Xiaohua (1992) use cross-sectional data consisting of a sub-sample (10% of the total survey which consists of 1% of the national population) of the 1987 census to analyze gendered employment and the relative status of women and men in the labor force.

Occupational segregation occurs not as a coincidence, or even via the influence of market forces where women and men chose sectors which maximize their benefits, but instead by direction of the state, which largely influences employment patterns so as to reach their own goals (Ghose, 2005). For example, employment in export sectors, such as textile and apparel manufacturing, is strongly dominated by women (see table 2.1) and the lower relative wages in this sector may act as a stimulant for growth (Seguino, 2000). In this manner, women's lower relative wages can stimulate economic growth when such wages result in increased international export competitiveness (Blecker and Seguino, 2002). This implies that an analysis of women's relative welfare in the Chinese economy should include a discussion of access to employment in addition to the level of occupational segregation and the status of relative wages as is provided in the next section.

2.4. Gender and Wage Inequality

While the mantra of equal pay for equal work influenced the cultural views of women's role in economic activity during the command economy, analyses of wage inequalities during the reform period illustrate the general social and cultural trends regarding the relative status of women's work in Chinese society of late. Below, we describe in detail many of the key papers in the literature, discuss where they agree and disagree, and present the reasoning/methodologies that may lead them to these conclusions. The rest of the section is divided into two parts: first, a discussion of the literature on the evolution of gender inequality in wages over time, and second, works which evaluate the gender wage gap across the extent of liberalization/marketization.[6] Here, the portion of the wage gap attributed to labor market discrimination is that which is unexplained by other wage determinants.

Maurer-Fazio, Rawski, and Zhang (1997) analyze gender wage differentials controlling for province, industry, and ownership type, and find that the ratio of female-to-male wages declined from 94% in 1991 to 75% by 1994.[7] While the lack of individual-level data prevents

[6]Here, liberalization/marketization refers to the privatization of SOEs and the removal of constraints in the command structure that prevent market incentives from promoting efficiency.

[7]Maurer-Fazio, Rawski, and Zhang (1997) estimate gendered wages by weighting total wages with the ratio of female employees in each sector using data from the National Bureau of Statistics (NBS) of China.

Maurer-Fazio, Rawski, and Zhang from estimating gender discrimination via the unexplained portion of the wage gap, their results imply that gender inequality in wages increased significantly in just a few years. They also find a negative relationship between the proportion of female workers in an industry and the industry's average wages. Since employment is significantly guided by the state, this implies that women are often designated to sectors with the lowest relative wages. As a result, targeting employment alone may not be sufficient to increase gender equality if women are segregated into sectors with lower average earnings and a significant lack of advancement opportunities—an argument also brought forth by Bauer, Feng, Riley, and Xiaohua (1992). However, providing women with opportunities in paid labor, where at least some wages are earned, increases gender equality when the alternative is no income at all.

In an effort to estimate the gender wage gap of urban workers, Gustafsson and Li (2000) use Oaxaca-decomposition of sampling data from 10 provinces and find that the earnings ratio fell from 84.4% in 1988 to 82.5% in 1995. They also conclude that the gender wage gap increased over time during the early portion of the reform period. Diverging from Maurer-Fazio, Rawski, and Zhang (1997), Gustafsson and Li, use micro-level data to estimate that about half of the gap is due to gender differences in characteristics such as education and industry, while the other half cannot be explained by their data. They cautiously argue that the unexplained portion may be an estimate of the magnitude of gender discrimination, though they consider that these differences may be driven by unobservable differences in productivity levels. While the direction of movement of the gender wage gap is consistent with those of Maurer-Fazio, Rawski, and Zhang, the magnitude of the ratio is drastically different for several reasons: first, Maurer-Fazio, Rawski, and Zhang use macro-level data of the entire country while Gustafsson and Li use micro-level data sampled from 10 of the then 30 provinces illustrating major differences in their samples; second, the data used by Gustafsson and Li includes wages *and* subsidies, which played a large part in living standards, especially earlier in the reform period, while Maurer-Fazio, Rawski, and Zhang's data includes only wages; third, Maurer-Fazio, Rawski, and Zhang include migrant workers

in their analysis, thus incorporating a great deal of variation in earnings (discussed in detail in the next section) while Gustafsson and Li do not capture such individuals.

Bishop, Luo, and Wang (2005) use identical data as that of Gustafsson and Li and also find that the gender wage gap increased in urban China from 1988 to 1995, though they argue that the 'unexplained' portion of the gap decreased over time. Employing quantile regressions with a modified Oaxaca-decomposition, Bishop, Luo, and Wang argue that they are better able to capture the unexplained portion of the gender wage gap and find that while more than half of the gap (about 61%) remains unexplained by their model, the ratio of the unexplained to the total wage gap fell by about 10% during this period; they conclude that during this time, the gender wage gap increased whereby discrimination decreased.

Similarly, in a static analysis, Wang and Cai (2006) find significant gender differences in wages which they largely attribute to discrimination.[8] The general consensus among this literature is that the gender wage gap rose during the emergence of the reform period and that the gap is fairly evenly split between discrimination and differences in observable factors, such as human capital attainment. Next, we move on to the literature which evaluates the relationship between marketization and the gender wage gap.

Meng (1998) utilizes a standard wage equation and Blinder decomposition to estimate gender wage differentials using survey data spanning 49 firms to analyze township and village enterprise (TVE)[9] wages disaggregated by gender. Meng finds that since marketization began in 1978, gender-based wage discrimination in TVEs declined. However, as this study includes data solely from TVEs, it can only reflect gender wage differentials within one segment of the Chinese economy which is constrained in its ability to liberalize. Additionally, this work

[8]Wang and Cai (2006) use macro data from the National Bureau of Statistics of China and micro data from the China Urban Labour Survey which conducted a survey in 2001 across five Chinese cities, namely, Fuzhou, Shanghai, Shenyang, Wuhan, and Xian.

[9]TVEs are entities which are situated between private and state-owned enterprises in terms of ownership and management. TVEs are managed by township and village governments in order to maintain the present political authority and provide the resources private citizens may be unable to acquire. Despite the government control of TVEs, the distributional effects of the local ownership of TVEs provide economic incentives that increase profitability, thus providing these entities with the resources and incentives needed to maintain profitability and government control simultaneously (Chang and Wang, 1994).

tends to under-emphasize the result that the gender wage gap is increasing in the extent of marketization.

Liu, Meng, and Zhang (2000) use a Binder-Oaxaca decomposition methodology and two surveys spanning the provinces of Shanghai (1996) and Jinan (1995) to estimate gendered wages and find a positive association between the level of marketization and gendered wage differentials when controlling for sector differences in employment. Liu, Meng, and Zhang conclude that liberalizing more sectors would increase gender inequality in wages. That is, assuming marketization has increased over time since the advent of the era of economic reforms, these results imply that gender wage inequality has increased over time as well.

Using an identical methodology with survey data spanning 12 provinces in 1992, Maurer-Fazio and Hughes (2002) find that the gender wage gap increased with the extent of liberalization/marketization where the state sector exhibited the smallest gender wage gap and the most liberalized sectors, the largest. They conclude that liberalization tends to precede the reemergence of wage discrimination.

Finally, using nationally representative data for 1987, 1996, and 2004, Chi and Li (2008) decompose gender wage differentials across the distribution of earnings by utilizing an influence function regression and find that the gender wage gap substantially increased over time. They also find that the unexplained portion of the wage gap is larger for those with the least education. The amalgamation of this literature, in concordance with the previous literature, indicates that gender inequality in wages increased with the extent of liberalization/marketization during the era of economic reforms.

As the fraction of public spending on education is positively associated with women's relative human capital and employment (see Chapter 4), increasing such spending may reduce the explained portion of the gap which is in a great part due to the differences in human capital attainment (Bishop, Luo, and Wang, 2005; Chi and Li, 2008). Additionally, insofar as this policy would increase women's employment in education and thus the state-sector—generally male-dominated, with the smallest level of discrimination (Maurer-Fazio, Rawski, and Zhang, 1999)—expanding the allotment of education spending may reduce wage

discrimination (the unexplained portion of the wage gap), increase women's relative wages, and reduce occupational segregation.

While literature above attests to the importance of considering the level of liberalization in determining gender wage inequality, labor market mobility, as discussed in the next section, is also crucial given the role of the state in the process of migration, especially in China.

2.5. Gender and Migration

With one of the fastest growing income inequalities in the world (Knight, 2013),[10] the rural and urban areas in China exhibit drastically different standards of living, as evidenced by the fact that wages in the urban sector are more than three times that of their rural counterparts (Lu and Song, 2006; Cao, 1995).[11] Complicating these dynamics, movement between sectors is restricted by the system of household registration, known domestically as *hukou*, which requires that each person be assigned either rural or urban household registration (Fan, 2003). This system prevents the level of migration expected to equalize (or at least diminish) the rural-urban divide as prescribed by the Lewis model (Lewis, 1954), and additionally, has added repercussions for women's relative employment.

While it is not impossible for an urban business to hire rural workers, these workers must remain 'temporary' and businesses found attempting to maintain prolonged migrant employees may be assessed monetary penalties by the state (Solinger, 1999; Jacka, 2005). Urban businesses account for this possible penalty by paying lower wages to migrant workers where compensation is further stratified along gendered lines—migrant women earn about 83% of that of migrant men, on average (Lu and Song, 2006). Since migrant workers (both male and female) earn a premium over their rural, non-migrant counterparts, migration remains advantageous for the rural worker.

Reduced compensation for migrant workers is not the only repercussion of the system of *hukou*; individuals are only granted state-prescribed benefits, such as healthcare services,

[10]Knight (2013) calculates the growth in GINI coefficients for the 15 largest developing countries and finds that only the Russian Federation outstrips China in terms of inequality growth from 1988 to 2007.

[11]Lu and Song (2006) present results from a 2003 survey conducted in the province of Tianjin which describes the many factors that drive migration; they find that wages top the list. They also find that when controlling for sectors, urban workers earn two times that of their rural migrant counterparts.

education, and other public goods, in the sectors where they are officially registered (Fan, 2003; Solinger, 1999). If a rural family migrates to the urban area and an illness strikes the family, they must return to the rural area (often at great expense) in order to obtain care (Fan, 2003). Given the higher relative premium for male migrant workers, in such circumstances migrant families often choose to send women back to the rural area to care for the ill and obtain healthcare. Further, when a family includes children, migration is even more difficult as migrant workers' children are denied access to education in urban areas (Solinger, 1999). Thus, rural families often choose to send only the men to the urban area while the women remain in the rural area so as to provide education for the children (Fan and Li, 2002).

Nonetheless, given the migration premium, migrant families in many urban areas have implemented a system of illegal schools, run by migrant women and paid for with wages from participating migrant families which allows them to supply their labor to the urban market while also providing daily care for their children (Yan, 2005). These schools allow families to avoid some of the restrictions of *hukou* by providing a safe and supportive environment for their children during normal work hours which allows both parents to obtain urban paid employment. However, responding to legal-urban residents' pressure to remove migrant workers, the state has established a pattern of cutting off migrant workers' access to illegal education in many urban areas (Jacobs, 2011). Under the pretense that buildings from which the illegal schools are run are not state-sanctioned, and therefore must be unsafe for habitation, the state has been known to employ bulldozers to remove the illegal schools under the assumption that if such schools are removed, migrant workers will be forced to return to their rural households to provide education for their children (Jacobs, 2011). Following such events, women are often forced to do just that; they tend to return home to both provide education for their children and supply their family with at least some wages (rural), even if they are lower than urban migrant wages (Wang and Fan, 2006; Fan, 2003).

It follows that the migrant workforce consists mostly of male workers (men comprise of approximately 72% of migrant workers) whereas women are often left to maintain the land

and care for their families (Fan, 2003; Lu and Song, 2006). Consequently, rural women bear the burden of the double duty work day as they function as the only parent in the household responsible for both household production and rural labor (Riley, 1996). In essence, the combination of Chinese gender norms, gendered wage inequalities, and the system of *hukou* result in entirely divergent outcomes for women's and men's employment opportunities, wages, and workload.

Migration also contributes significantly to the gender division of labor in urban China as migrant men are regularly employed in construction and other forms of manual labor, while migrant women are often marginalized to factory and export-sector labor (Fan, 2003); this segregation is so extensive that as many as 99% of assembly-line workers are women (Tam, 2000). As factory and export sector employment is generally granted temporary status with lower relative compensation than other sectors, gendered migration patterns also influence the tenuous position of women's employment relative to men's, thereby increasing the volatility and precariousness of women's work (Liu, 2007). Thus, export-centered growth strategies, which exacerbate gendered occupational segregation with significant implications for women's relative welfare, may not be the ideal future development strategy for the Chinese economy, as discussed in the next section.

2.6. Gender and the Future of Chinese Growth Policies

Export promotion and inward-directed foreign direct investment (FDI) have arguably been the driving forces behind Chinese growth policies for the last several decades (Branstetter and Lardy, 2006; Prasad, 2009; Zheng, Bigsten, and Hu, 2009). If knowledge spillovers from foreign capital are exhaustible and export sector production relies on continued demand from abroad, these strategies may not be sustainable in the long run (Kuo and Yang, 2008; Liang, 2012). According to Liang (2012), if Chinese leadership was to implement an alternative growth strategy by shifting focus from capital-intensive textile and apparel export industries to labor-intensive service sectors, the subsequent structural change may provide long-run sustainable growth. Given the sectoral composition of female employment

presented in Table 2.1, switching to service-centered growth policies may negatively affect women's employment in the female dominated export sectors (textile and apparel manufacturing). However, this result may be at least somewhat offset by greater levels of female employment in service sectors (such as accommodation and restaurants, finance, banking, and social welfare) as women constitute a greater proportion of employment in these sectors than on average.

Conversely, in analyzing Chinese production of tradable and non-tradable goods, Rodrik (2010) argues that if growth is presently promoted by the production of tradable goods rather than export promotion and currency undervaluation, China's current growth strategy may in fact be sustainable. That is, if it's the production of industrial manufacturing tradables, as opposed to the location of the final consumer that is creating economic growth, re-directing industrial output from one group of buyers (foreign consumers) to another (domestic consumers) should not slow growth. In that event, Rodrik argues that appreciating the Chinese renminbi and encouraging the shift from industrial manufacturing towards service industries may adversely affect the growth rate of the Chinese economy. Rodrik argued instead that reducing export demand via currency appreciation and countering with subsidized domestic demand would allow the Chinese economy to maintain their current growth rate while also appeasing the international community and their call for global balance of payment adjustments. However, this shift away from export to domestic production may reduce women's labor demand if domestic production fails to integrate women into the manufacturing process to the same extent as export production.

In their study of the determinants of total factor productivity in China, Fleisher, Li, and Zhao (2010) find that FDI knowledge spillovers are becoming less influential of late, infrastructure capital is growth promoting, and human capital is the most effective policy to reduce regional inequalities and promote economic growth. Fleisher, Li, and Zhao's education-led growth strategy would have a powerful impact on women's relative employment in view of the fact that women constitute approximately 50.3% of employment in education (Table 2.1)—much greater than the average. However, if human capital accumulation is

directed towards science and technology, as is suggested by Zheng, Bigsten, and Hu (2009), women may lose out in terms of employment opportunities as evidenced by the fact that they constitute only 32.3% of employment in that sector.

Since economic reforms will continue to progress, so will liberalization and gender inequality in wages, which are a function of discrimination and differences in human capital attainment and sectors of employment. It stands to reason that in order to raise gender equality in wages, attention should be paid to increasing women's human capital attainment, reducing occupational segregation, and increasing the social status of women's work. Increasing women's human capital will allow them to capitalize on the associated returns to labor which are increasing with liberalization as evidenced by the decrease in the unexplained portion of the gender wage gap. However, families tend to have a general preference for investing in boys' education[12] which may be due to a culmination of factors. For one, once they enter the labor force, boys receive relatively higher wages and thus parents receive greater belated compensation for their investments in boys' education than girls'. Second, social norms in the Chinese marriage market discourage parental investments in girls' education; upon marriage, women are to provide labor for their in-laws' household and thus parents may view their returns from girls' education as temporary (Fan, 2003). For these reasons, the state sector may be required to incentivize families to invest in their girls' education or finance such an increase in human capital themselves, at least in the short-term. However, this expenditure may shrink over time as increases in women's human capital would increase the returns to household investments in girls' education in the future. Reducing occupational segregation would allow women to obtain employment in the same sectors as men and provide them with the opportunity to vie for positions with higher wages and opportunities for advancement. Given the relatively lower wages in sectors dominated by women (Seguino, 2000), reducing occupational segregating should decrease the gender wage gap. While these strategies may reduce the explained portion of the gap, re-emphasizing the importance of

[12]Women's human capital attainment is approximately 80% of that of their male counterparts (National Bureau of Statistics of China, 2010)

women's work in paid labor (as occurred in the era of Mao), should reduce the unexplained portion of the gap.

2.7. Conclusion

The transitioning Chinese economy possesses distinct attributes and characteristics of socialism—such as state-directed employment and residency—and market economies—such as gender wage discrimination and market incentives. This complicated mix of traits imposes pronounced restrictions on women's presence in the labor market with serious repercussions for their relative welfare.

Several public policies and state-led initiatives, such as reducing the presence of the household registration system, shifting production towards service sectors, and increasing education spending could aid in the process of raising women's relative standards of living in China. Reducing the prevalence of the household registration system, which currently limits labor mobility from the rural to the urban areas, would increase women's relative welfare as women are presently often unable to obtain higher wages in the urban sector due to the lack of education and healthcare services available to migrants (Lu and Song, 2006; Fan, 2003; Solinger, 1999). Finally, shifting from an export-led growth strategy to a service or education centered one may increase women's relative employment, reduce occupational segregation, and possibly increase long-run economic growth (Liang, 2012; Maurer-Fazio et al., 1999; Chi and Li, 2008; Fleisher et al., 2010).

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CHAPTER 3

Gendered Employment and Public Spending in China

3.1. Introduction

In the mid-to-late 1990s, women in the People's Republic of China (hereafter China) appeared perfectly positioned to experience significant gains in their relative livelihoods as China's high growth rate was accompanied by one of the world's highest rates of female labor force participation (Maurer-Fazio, Hughes, and Zhang, 2005). Instead, however, Chinese scholars urged urban women to voluntarily leave paid labor and return to the home to make room for men in the workplace (Liu, 2007). Many factors could have caused this apparent preference for male labor: reform-induced structural change, the evolving role of the state, dynamic trading patterns, or the reemergence of a cultural ideology. These cultural and structural shifts, all consequences of the economic reforms, implemented to initiate the transition from socialism to a market economy, may affect men and women to different extents (Fan, 2003; Ding, Dong, and Li, 2009). Therefore, bringing to light their distinct relationships with gendered employment would provide valuable information to policy makers.

For much of the 1990s and early 2000s, urban employment fell for both genders in such a way as to reduce women's employment to a greater extent than men's (Ding et al., 2009); figure 3.1 illustrates the growth rate of gendered employment from 1999 to 2009 where employment fell for the first five years. During the recovery period, from 2004 to 2009, the growth rate of men's employment was often greater than women's, indicating that overall, women's relative employment fell during this time period.[1] The Chinese economic reforms

[1]Significant differences in growth rates exist in six of the ten years presented in Figure 3.1; in five of those six observations men's employment growth was greater than women's.

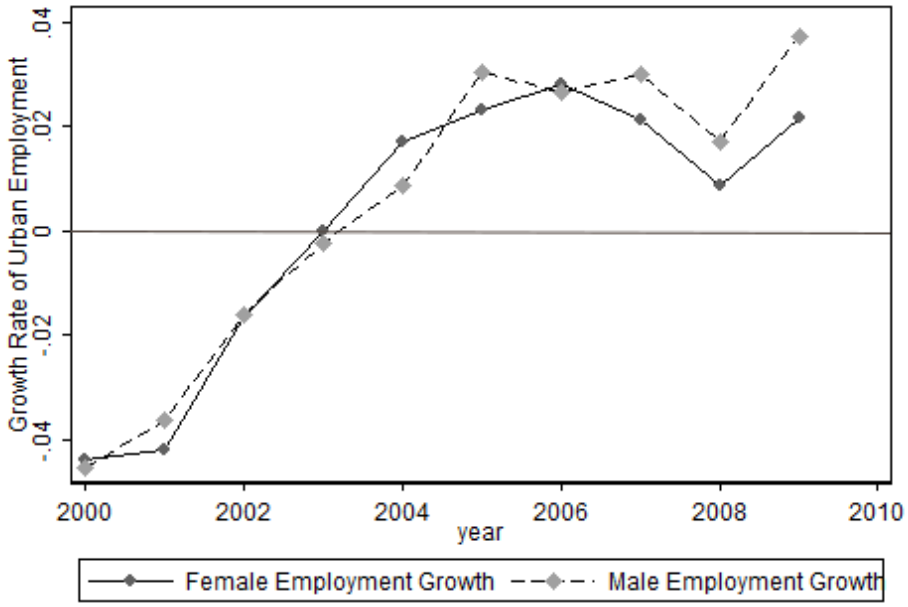

Figure 3.1. Annual Gendered Employment Growth

Note: Urban employment figures include only formal employees working in an urban area at years' end. Source: *China Labour Statistical Yearbook* (2000-2010).

(and the associated decreasing role of the state), liberalization, and state-owned enterprises (SOEs) privatization, are often blamed for these employment losses, whereas the easing of SOE restructuring and rising public sector spending are seen as possible determinants of the employment recovery (Naughton, 2007; Ding, Dong, and Li, 2009; Liu, 2007).

The complexity of the economic reforms, evidenced by the many shifting patterns of production and the co-existence of socialist and capitalist characteristics, turn empirical studies attempting to evaluate the relationship between gender equality and the transitionary period in China, into a vast undertaking. However, by separating out a component of the reforms, a specific element of public spending, we provide a unique analysis of its relationship with gender equality so as to discover what role public spending may have played in the lack of significant advancement in women's relative welfare from 1999 to 2009, and what role it can play in the future.

In this work, we endeavor to determine what role public spending on social infrastructure, that is, spending on education and healthcare, plays in creating economic growth and gendered employment in China by answering the following questions: Are the categories of social infrastructure spending positively correlated with 1) women's employment growth to a greater extent than men's? 2) employment growth for both genders? 3) economic growth? In answering these questions, we aim to test the accuracy of our conceptual model of employment and the possibility of a "win-win" situation as proposed by Seguino, Berik, and van der Meulen Rodgers (2010) who argue that infrastructure spending may enable policy makers to reach development goals while also increasing gender equality. Controlling for demand, structural change, and human capabilities, we estimate gendered employment growth as a function of social infrastructure spending using multiple econometric techniques including ordinary least squares, instrumental variable, generalized method of moments, and a three-stage least squares estimate of a system of simultaneous equations. We also include economic significance calculations and discuss the policy implications of the results in which we offer a new perspective on the relationships between gendered employment, social infrastructure spending, structural change, and economic growth in China during the period of economic reforms.

Given the recent literature advocating for gender-sensitivity in public policy decisions and the unique position of China in the world economy, this paper provides an original, timely analysis of Chinese public policy and its effects on gendered employment and economic growth. Our results indicate that spending on education may provide a win-win scenario for policy makers—it is positively associated with employment growth for both genders, women's relative employment, and economic growth in the short-run. Thus, it may be the case that

education spending is a policy lever that can be used in China to achieve development goals in a gender-sensitive manner. These results, consistent with the aforementioned conceptual model and applicable to many similar developing countries, can provide key insights into the potential ramifications of public policies on gendered employment and short-run economic growth and may encourage future work which relates gender equality and public spending on education in other developing economies.

Our study contributes to the literature in several ways. First, we focus on social infrastructure spending while most similar studies focus on physical infrastructure spending. Second, we control for structural change, a variable often ignored in employment estimations. Third, given the difficulty of locating reliable, consistent, and gendered data on the Chinese economy, our unique study details our data sources and descriptions which may help others acquire data for future work on gender in China. Fourth, we add policy guidelines to the literature which can aid in the decision-making process of those in power, particularly in developing countries.

The remainder of the paper is organized as follows. In section two, we build our theoretical model for gendered employment; also, given their endogeneity, we outline our approach for estimating equations for economic growth and human capital accumulation. In section three, we describe the data and our econometric tests while in section four, we present our results and economic significance estimations. Finally, we discuss the policy implications of the results in section five and conclude the paper in section six.

3.2. Theoretical Approach

In this section, we build the functional form used to estimate gendered employment as a function of public investments in social infrastructure controlling for demand, structural

change, and individual capabilities. This section will proceed as follows: First, we specify our employment equation; then, we detail our solutions to potential endogeneity issues; next, we discuss the need to control for structural change; and finally, we compare our model to that of the literature.

Gendered employment is estimated with both demand and supply factors. As outlined in the theoretical model presented in chapter 1, social infrastructure spending is a determinant of both labor demand and supply, as is structural change. We control for the effects of structural change on gendered employment by using industrialization—that is, the shift of resources and production from the rural, labor-intensive agricultural sector to the urban, capital-intensive manufacturing sector—as its proxy. Given the severity of gendered employment segregation in China, where men (women) are more prominent in industries which may expand (contract) with industrialization, on the demand side, women's employment may be disproportionately harmed by the process of industrialization (Liu, 2007; Seguino and Were, 2013). Additionally, since industrialization includes a re-allocation of labor demand from rural to urban sectors, a movement which is relatively less available to women, our proxy for structural change also captures gendered migration patterns and thus the amount by which industrialization influences labor supply.[2]

Other determinants of labor demand include the growth rate of gross provincial production (GPP) per capita (economic growth), investments disaggregated by funding source,

[2]As detailed in chapter 2, the urban household registration system, known domestically as *hukou*, discourages individuals with rural household registration from obtaining employment in many urban sectors through fines and additional taxes on businesses who hire such individuals, or the withholding of services to workers who migrate (Fan, 2003; Sicular, Ximing, Gustafsson, and Shi, 2007; Jacobs, 2011). Despite these restrictions, migration appears significant as evidenced by an increase in the flow of 'permanent' rural-to-urban migrants (workers with rural household registration who have maintained employment in the urban sector for longer than 6 months) from 80 million in 2001 to 137 million in 2007 (National Bureau of Statistics of China, State Statistical Bureau, 2010b), the majority of whom are male (Fan, 2003).

public spending, and trade. Economic growth should increase economic activity and consequently influence employment, whereas investments, public spending, and trade may directly require employment. Population growth and human capital accumulation round out the supply-side determinants. By its very nature, population growth increases the supply of labor but in our short-run specification, we focus on the effect population growth has on the additional work required of women in the home (limiting women's labor supply). Increasing human capital attainment may increase wages and thus the opportunity cost for not supplying labor, while also delaying workers from entering the labor force.

Our equation for estimating employment, Emp_{pt}, is

$$\begin{aligned} Emp_{pt} = \beta_p + \beta_1 Health_{p,t-1} + \beta_2 Educ_{p,t-1} + \beta_3 Gr_{p,t-1} + \beta_4 FInv_{p,t-1} + \beta_5 DInv_{p,t-1} \\ + \beta_6 G_{p,t-1} + \beta_7 Trade_{p,t-1} + \beta_8 Pop_{p,t-1} + \beta_9 HC_{p,t-1} + \beta_{10} Ind_{p,t-1} + \epsilon^1_{pt} \end{aligned} \tag{1}$$

where $Health$ and $Educ$ are public spending on health and education as percentages of GPP, respectively, Gr is economic growth measured as the growth rate of real gross provincial production (GPP) per capita, $FInv$ and $DInv$ are foreign and domestic investments, respectively, as percentages of GPP, G is public spending less spending on social infrastructure as a share of GPP, $Trade$ is the sum of exports and imports as a share of GPP, Pop is the growth rate of population, HC is gendered human capital attainment of at least the secondary level, Ind is industrial output as a percentage of GPP, ϵ^1_{pt} are typical disturbance terms, β_p are time-invariant provincial fixed-effects, and β terms are unknown parameters we wish to estimate, for all provinces, p, in time, t. Employment is estimated with lagged values of all independent variables under the assumption that they take time to effectively

stimulate employment growth. Each dependent variable is estimated with its associated gendered secondary school human capital variable.

This equation is used to estimate three separate dependent variables: the growth rate of urban female employment, the growth rate of urban male employment, and equality in employment. Our proxy for gender equality in employment, henceforth "the gap," is estimated such that

$$Emp^{gap} = \frac{Employment^{f}}{Population^{f}} - \frac{Employment^{m}}{Population^{m}}$$

where positive correlations with the gap imply increases in gender equality measured in employment opportunities, and vice versa (Seguino and Were, 2013).[3]

A prospective complication with the specification of gendered employment given in equation 1 is the presence of several explanatory variables which may themselves be endogenous, namely, economic growth and human capital accumulation, as they themselves are determined by other factors (see figure 1.2 in chapter 1 for a full model specification). Thus, regressing growth and human capital on employment would violate basic ordinary least squares assumptions as the endogenous variables would be correlated with the equations' error terms. Below, we rectify this potential endogeneity problem by building functional forms for each endogenous variable which will then be used, in concert with our gendered employment equations, to estimate a system of simultaneous equations (section 3.4).

In deriving a basic model of short-run economic growth, we begin with a traditional neoclassical growth model where GDP growth is modeled as a function of the current level

[3]While Seguino and Were (2013) estimate the gap using the log of the gendered employment-to-population ratios, we estimate the gap without logs. As our estimates of the gap and the gendered employment ratios exhibit normal distributions, we find no need to transform the data with logarithms. Furthermore, since we include economic significance calculations later in this chapter, there is no need to transform our data to provide easy interpretations of the coefficient estimates.

of GDP and investments in capital in order to account for convergence and production capacity, respectively. Subsequently, new growth theory expands the basic model by including other types of investments, such as those of social infrastructure, spending on healthcare and education, as well as human capital—specifically secondary school attainment—which may be correlated with technological progress (Glomm and Ravikumar, 1998). We also incorporate the role population growth plays in the process of creating economic growth; according to (Barro, 1998), population growth may be negatively related to economic growth. Furthermore, we incorporate extensions of the new growth theory which argue that other macroeconomic conditions, such as government spending policies and international orientation, also influence economic growth (Acemoglu, Johnson, and Robinson, 2005; Barro and Sala-i Martin, 1995). Thus, our equation for the growth rate of real GPP per capita, Gr, is

(2)

$$\begin{aligned} Gr_{pt} = {} & \eta_1 GPPpc_{p,t=0} + \eta_2 FInv_{p,t-1} + \eta_3 DInv_{p,t-1} + \eta_4 Trade_{p,t-1} + \eta_5 Pop_{p,t-1} + \eta_6 HC_{p,t-1} \\ & + \eta_7 Health_{p,t-1} + \eta_8 Educ_{p,t-1} + \eta_9 Sci_{p,t-1} + \eta_{10} Trans_{p,t-1} + \eta_{11} Admin_{p,t-1} \\ & + \eta_{12} Proj_{p,t-1} + \epsilon^g_{pt} \end{aligned}$$

where HC is the ratio of female-to-male secondary school attainment, $GPPpc_{t=0}$ is the natural log of GPP per capita in 1999, Sci, $Trans$, $Proj$, and $Admin$ are public spending on science, transportation, community projects, and administration as percentages of GPP respectively, ϵ^g_{pt} are disturbance terms with usual properties, and η terms are unknown parameters.[4] As this is a short-run model, all independent variables are lagged one period

[4]This formulation is similar to that of Gramlich (1994), who analyzes the impact of public infrastructure on output in the US. It is also consistent with the Chinese growth literature (Zhang and Zou, 1998; Lin and Song, 2002; Wei and Hao, 2010).

under the assumption that these determinants take one year to effectively stimulate growth. This assumptions limits the interpretations of the results in that we are only capturing the short-term effects of each determinant and not, for example, the implications government spending on education will have on the quality of the labor force of the next generation.

Following Mankiw, Romer, and Weil (1992), the growth rate of gendered human capital, gHC, our control for individual capabilities and our other endogenous regressor, is modeled as a function of the current stock of, and net investment in, human capital such that

$$gHC_{pt} = \alpha_p + \alpha_1 HC_{pt} + \alpha_2 Educ_{p,t-1} + \epsilon_{pt}^{hc} \tag{3}$$

where α_p are provincial fixed-effects, ϵ_{pt}^{hc} are typical disturbance terms, and α terms are unknown parameters we wish to estimate. This model is used to estimate all three dependent variables of human capital accumulation: the growth rate of female attainment of secondary education, the growth rate of male attainment of secondary education, and the ratio of female-to-male attainment.

Our employment model is similar to that of Braunstein and Grown (2011) in which taxation, state control variables, and fixed effects determine state-level gendered employment in the US. We incorporate similar control variables, though we additionally include measurements of trade and capital. While these additional controls may not be appropriate for a US state-level analysis, they are appropriate for a provincial-level analysis of the Chinese economy.[5] The main difference between our model and theirs is the focus on revenue collection and public spending, respectively. In this format, our model is similar to that of Mendoza,

[5]Mean Gross capital formation as a percentage of GDP in China during the time period of our analysis (1999 to 2009) is almost 40% and has been steadily increasing (National Bureau of Statistics of China, State Statistical Bureau, 2010b), while in the US it averages just over 18% and has been steadily declining (The World Bank, 2010).

Milesi-Ferretti, and Asea (1997) in that we test the hypothesized positive effects of public spending on gendered employment, net of the anticipated negative tax effects (Dalenberg and Partridge, 1995). Our model is also similar to the recent study by Seguino and Were (2013) who analyze physical infrastructure and its influence on the gap in Sub-Saharan Africa. Using similar control variables, our work additionally includes separate estimations of gendered employment growth for each gender.

3.3. Data

Our panel data, originating from three National Bureau of Statistics of China (NBS) publications, namely, *China Statistical Yearbook* (CSY), *China Labour Statistical Yearbook* (CLSY), and *China Population and Employment Statistics Yearbook* (CPESY), includes data from all 31 Chinese provinces for the period 1999 to 2009 (see Appendix 3B for detailed descriptions and sources).

In our data, employment is determined by the number of individuals employed—those physically present and actively working either part or full-time—at year's end in urban units (CLSY). This includes foreign and domestic workers with either urban or rural household registration; employees with rural household registration must be employed in their urban unit for a time period exceeding six months at year's end to be counted as employed. The reporting agency for CLSY, the Labor Ministry, provides the most narrow definition of 'urban,' referring to cities only while NBS, the reporting agency for CSY, defines 'urban' as including both cities and larger township and village enterprises (National Bureau of Statistics of China, State Statistical Bureau, 2010b).[6] The term 'employed' also adds complexity to this analysis as the definition changed in the 1999 NBS publication when 'not-on-post'

[6]See Bauer, Feng, Riley, and Xiaohua (1992) and Ghose (2005) for further discussions of the many differing definitions of 'urban' in the reporting of Chinese data.

workers—laid off individuals still associated with their urban employment unit despite not actively working at year's end—became excluded from the definition of employed.[7] Finally, this data includes only formal workers as data on informal workers is unavailable. Thus the implications and conclusions should be considered solely within the context of formal employment.

Referring to the descriptive statistics in Table 3.1, mean formal female employment in urban units is approximately 1.4 million employees per province, just over half that of mean formal male employment in urban units estimated at 2.3 million; the ratio of female-to-male employment is 0.60. With a mean of -11.9%, the gap indicates that urban male employment as a ratio of the urban male population is 11.9 percentage points higher than that of the ratio of urban female employment to the urban female population.

[7]See Banister (2005) and Maurer-Fazio, Rawski, and Zhang (1999) for a discussion of the different definitions of employment provided by the NBS and the Labor Ministry. While it is possible to sum the figures of employment in urban units and not-on-post workers to obtain a consistent employment estimation for years prior and post 1999, data for not-on-post employment in urban units is not disaggregated by gender.

Table 3.1. Descriptive Statistics

	Mean	Standard Deviation
Growth	11.7%	7.7%
Population	39.4 million	25.1 million
F-to-M population	96.3%	3.3%
Urban population	19.0 million	14.1 million
F-to-M urban population	95.5%	2.5%
Public spending as % of GPP	8.2%	6.7%
Science as % of GPP	0.2%	0.1%
Transportation as % of GPP	0.4%	1.0%
Community projects as % of GPP	0.6%	0.8%
Administration as % of GPP	4.6%	4.6%
Health as % of GPP	0.8%	0.6%
Education as % of GPP	2.6%	1.2%
Foreign investment as % of GPP	1.5%	1.3%
Domestic investment as % of GPP	22.7%	10.8%
Trade as % of GPP	29.0%	38.2%
Industrialization as % of GPP	87.3%	39.5%
Female employment	1.4 million	0.9 million
Female HC as % of female employees	19.2%	12.1%
Male employment	2.3 million	1.3 million
Male HC as % of male employees	22.9%	10.1%
F-to-M human capital	80.0%	15.7%
F-to-M employment	59.5%	7.1%
Gap	-11.9%	7.8%

Notes: Means and standard deviations calculated as annual averages from 1999 to 2009, and across all 31 provinces. Public spending (including aggregate and disaggregated spending categories), fixed assets, trade, and industry measured in billions of Yuan. Source: *China Labour Statistical Yearbook*, *China Statistical Yearbook*, and *China Population and Employment Statistics Yearbook* (2000-2010).

Using CPI data (reported by NBS, as is all future data unless otherwise specified), we create a provincial CPI index and deflate all monetary variables to 1999 yuan. GPP data is calculated using the income approach at current prices while economic growth is calculated as the growth rate of real GPP with a mean of 11.7% per year. In the aggregate, provincial-level public spending, net of spending on social infrastructure, is calculated as the sum of public expenditures on science, transportation, finance, security, social welfare, community projects, government administration, and agriculture with a mean of 8.2% of GPP. Education and health expenditures account for approximately 2.6% and 0.8% of GPP, respectively. These public expenditures include spending from local, provincial, and central sources and are

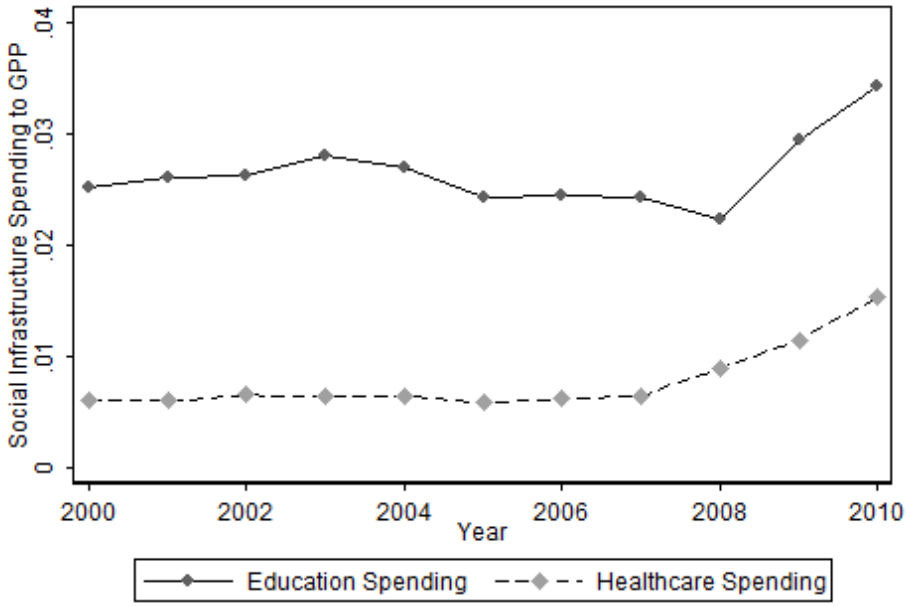

Figure 3.2. Average Public Spending on Social Infrastructure

Note: Public expenditures include expenses accrued from local, provincial, and central sources. Source: *China Statistical Yearbook* (2010).

not specific to a certain ownership type.[8] Figure 3.2 illustrates the general trends of social infrastructure spending from 2000 to 2010 measured as the provincial averages of healthcare and education spending. While spending on healthcare as a percentage of GPP remains quite steady, it begins to rise slowly in 2007. On the other hand, spending on education is more erratic and rises and falls across this time frame where it is lowest in 2008 and highest in 2010.

Fixed assets, a flow variable which captures the volume of construction activities and purchases of equipment, materials, and technology that adds to its current stock, is commonly used throughout the Chinese growth literature as a proxy for investments (Chen and Fleisher, 1996; Lin and Liu, 2000a). Braunstein and Brenner (2007) find that foreign investments exhibit gender-specific employment effects, providing the motivation for separating fixed assets by funding sources, namely, foreign and domestically-funded, with means of 1.5%

[8]The 'Brief Introduction' to Section 8 (Government Finance) of National Bureau of Statistics of China, State Statistical Bureau (2010) details the data collection techniques of the Ministry of Finance, the reporting unit for public expenditure data.

and 22.7% of GPP, respectively.[9] Structural change, measured as industrial output as a proportion of GPP, has a mean of 87.3%, while the mean of trade, calculated as the sum of exports and imports, is about 29.0% of GPP. Human capital, measured as the completion of at least secondary-level formal education, is disaggregated by gender with means of 19.2% and 22.9% for female and male employees, respectively. Provincial-level population, including both rural and urban residents, has a mean of approximately 39 million people per province, while the mean of the urban population is about 19 million.

Due to the nature of panel data, we employ the Levin-Lin-Chu panel unit root test which utilizes a pooled Dickey-Fuller t-statistic under the null hypothesis of nonstationarity (Levin, Lin, and James Chu, 2002). We reject the null for the gap, population, trade, completion of secondary school, and growth but cannot reject the null for the remaining variables. After first differencing the nonstationary variables and applying the Levin-Lin-Chu test once more, we are able to reject the null for all the previously nonstationary variables. All further estimations include first-differenced variables for all the initially nonstationary variables, as well as population.

Next, testing for overidentifying restrictions in our panel data with null hypotheses of consistency between the random and fixed-effects estimators, we execute Hausman tests on all three models and find sufficient evidence to reject the null only in the estimation of the gap. We therefore estimate the gap with the unbiased ordinary least squares (OLS-FE) estimator only. While there is not sufficient evidence to reject the null in either of the other estimations, since there is adequate reason to believe the fixed-effects estimator may be appropriate, we use both fixed and random-effects OLS estimators.[10]

[9]Braunstein and Brenner (2007) find that when skill requirements increase in the sectors funded by foreign investments, women employed in these sectors are often replaced by men; in 1995, FDI was positively associated with employment and wages such that women experienced relatively larger gains than men, however by 2002, this pattern had reversed as FDI shifted to sectors with higher productivity.

[10]The fixed-effects estimator provides coefficient estimates under the assumption that the dependent variable is partially determined by time-invariant effects—in our case, provincial-level fixed-effects where each province has a unique, time-invariant intercept—whereas the alternative estimator (random-effects) provides estimations under the assumption that the cross-province variations are random and uncorrelated with the independent variables.

Following Greene (1997), we calculate a modified Wald statistic for group-wise heteroskedasticity for each model and find that we are able to reject the null of homoskedasticity at the 5% significance level in all three cases. Using the Pesaran cross-sectional dependence test with a null of non-correlated residuals (De Hoyos and Sarafidis, 2006), we find evidence to reject the null at the 5% significance level for all three estimations, and conclude that our estimations exhibit cross-sectional dependence across provinces. To compensate for both heteroskedasticity and cross-sectional dependence, we provide panel-corrected standard errors in our estimations.

We provide correlation matrices in Appendix 3C in order to help us identify the presence of potential collinearity in our estimations. We find trade positively correlated with initial GPP, and female and male secondary school attainment with correlation coefficients of 0.81, 0.74, and 0.76, respectively. Public spending is somewhat correlated with health expenditure with a correlation coefficient of 0.66. Other administrative expenses are correlated with spending on transportation, health, and community projects, with correlation coefficients 0.76, 0.70, and 0.65, respectively, while spending on transportation and health are correlated with a coefficient of 0.75. Absolute values of all other correlation coefficients are less than 0.60. According to Kennedy (2003), two variables should be considered collinear if the absolute value of their correlation coefficient is greater than 0.80 or 0.90. Therefore, the relationship between trade and initial GPP may cast doubt on the validity of their coefficient estimates given that only the variation unique to that variable is used to estimate their coefficients. Thus, given the anticipated high variances related to these coefficients—confirmed with a higher than acceptable variance inflation factor for initial GPP—related results should be viewed with caution.

Due to the possible endogeneity of economic growth in our employment estimations, we instrument for growth in our two-stage least squares instrumental variable (2SLS-IV) and generalized method of moments (GMM) estimations. Similar to that of Hausmann, Hwang, and Rodrik (2007) and Blundell and Bond (1998), we use provincial land area as one instrument for growth while we utilize inflation as the other instrument for economic

growth given its common usage in the literature (Easterly, 1999; Barro, 1996). We consider land area and inflation as appropriate instruments for economic growth in our employment estimations due to the fact that they may be directly correlated with economic growth but not employment growth. In the context of the Chinese economy, inflation and economic growth may be highly positively correlated due to the presence of significant expansionary macroeconomic policies in the reform area (Lin and Liu, 2000b; Brandt and Zhu, 2001). On the other hand, land area and economic growth may be negatively related since the largest provinces tend to be dominated by agricultural production and lower relative growth while the smallest provinces tend to be coastal, contain large cities, and focus more significantly on manufacturing production. Regarding the econometric tests of the appropriateness of our instruments, we find that our Cragg-Donald Wald F statistics exceed the Stock and Yogo (2005) critical values, and thus we can conclude that our instruments are satisfactorily strong. Additionally, utilizing a Sargan-Hansen test of overidentifying restrictions with a null hypothesis of instrument validity, we are unable to reject the null at the 5% significance level in our female and male employment growth estimations, signifying that in these cases, the chosen instruments are uncorrelated with the error terms. However, the null is rejected in the estimation of the gap, implying that in this regression the instruments are at least somewhat correlated with the error terms and therefore the results from our 2SLS-IV estimation of the gap should be viewed with appropriate caution.

Following Drukker (2003) and Wooldridge (2001), we test for the possibility of serial correlation in our panel data with a null of no serial correlation. Using a Wald test of this hypothesis, we do not find evidence to reject the null and conclude that there does not exist significant serial correlation in any of the three estimations. Lastly, in testing the simultaneous equation system for identification using Baum (2007), we find that the system satisfies both the rank and order conditions necessary for identification and thus we are confident that our derived structural coefficients are unique.

3.4. Results and Economic Significance Estimations

Our OLS, 2SLS-IV, and GMM results with dependent variables of the gap, female employment growth, and male employment growth, are presented in Tables 3.2, 3.3, and 3.4, respectively. Although the OLS estimation ignores the potential endogeneity in our employment regressions, our 2SLS-IV and GMM estimations instrument for the endogenous variables, while the latter additionally includes a lagged dependent variable. These results are presented to provide robustness to the results of the simultaneous equation estimation found in Table 3.5. Specifically, we use a three-stage least squares (3SLS) instrumental variable estimation in which all three gendered employment equations and the equations for growth and human capital accumulation are estimated simultaneously. Unlike the other estimators, 3SLS accounts for the potential inter-equation correlation between the error terms and thus, is the most efficient estimator for our model.

In this section, we briefly provide an overview of the results before estimating their economic significance and delving into the relative magnitudes of the results. Several important relationships emerge from these results, including positive and statistically significant relationships between the gap and economic growth, public spending on education, and trade in several estimations (Tables 3.2 and 3.5), and statistically significant negative relationships emerge between the gap and domestically-funded fixed assets, spending on health, and structural change as percentages of GPP in several estimations. Given our formulation of the gap, where positive coefficients imply greater gender equality, and vice-versa, these results may indicate gender-equality promoting policies in economic growth and public spending on education. However, it is imperative to specify that a movement toward gender equality in employment (an increase in the gap) is only desirable if it occurs via a rise in women's employment (upward harmonization), while strictly avoiding reductions in male employment (downward harmonization). In order to determine the direction of harmonization, we estimate the growth rates of female and male employment separately.

As Tables 3.3 and 3.5 illustrate, economic growth, trade, health and education expenditure are positively correlated with female employment growth at statistically significant

levels across almost all specifications. The single exception is the relationship between female employment growth and health expenditure in the GMM estimation; while the coefficient is positive, it is not statistically significant. We also find that domestically-funded fixed assets and industrialization are positively correlated with female employment growth at statistically significant levels in several estimations.

The growth rate of male employment is positively correlated with economic growth and public spending on education, trade, and industrial output as percentages of GPP across all specifications (Tables 3.4 and 3.5). Additionally, in several estimations, domestically-funded fixed assets and public spending on health are positively related to the growth rate of male employment at statistically significant levels. Since economic growth, spending on education, and trade are all positively associated with employment growth for both genders, we can conclude that these variables increase gender equality in employment via upward harmonization.

Using a Wald test for equality between coefficient estimates in the female and male employment growth estimations, we find evidence to reject the null of equality at the 10% significance level for education spending (in all but the OLS-FE estimation), healthcare spending, growth (in all but the OLS-FE estimation), domestic investments (in the OLS-FE and 2SLS-IV estimations), and industrialization in all estimations.

Table 3.2. Gap Estimations: OLS, 2SLS-IV, and GMM

Dep Var: $Gap = \frac{Employment^f}{Population^f} - \frac{Employment^m}{Population^m}$	(1) OLS - FE	(2) 2SLS - IV	(3) GMM
Growth	0.056	0.075	-0.013
	(0.028)**	(0.057)	(0.027)
Foreign investments as % of GPP	0.178	0.167	0.190
	(0.180)	(0.194)	(0.208)
Domestic investments as % of GPP	-0.079	-0.077	0.017
	(0.063)	(0.041)*	(0.024)
Public spending as % of GPP	0.171	0.167	0.147
	(0.168)	(0.063)***	(0.032)***
Population growth	0.007	0.030	-0.016
	(0.055)	(0.065)	(0.038)
Female-to-Male HC	0.017	0.017	-0.001
	(0.025)	(0.018)	(0.004)
Health as % of GPP	-1.906	-1.634	-3.260
	(1.832)	(1.052)	(0.468)**
Education as % of GPP	1.583	1.751	1.018
	(0.826)*	(1.218)	(0.468)**
Trade as % of GPP	0.014	0.014	0.001
	(0.013)	(0.018)	(0.001)
Industry as % of GPP	-0.011	-0.007	-0.036
	(0.020)	(0.020)	(0.011)***
Lagged F-to-M employment growth			0.946
			(0.008)***
R2	0.950	0.950	0.950
Observations	279	279	279

Notes: All independent variables are lagged one period. Foreign and domestic investments, public spending, health, education, science, transportation, community projects, administration, trade, and industry are all first differenced. Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Growth is instrumented by provincial land area and inflation in the 2SLS and the GMM estimations.

Table 3.3. Female Employment Growth Estimations: OLS, 2SLS-IV, and GMM

Dep Var: Female employment growth	(1) OLS - FE	(2) OLS - RE	(3) 2SLS - IV	(4) GMM
Growth	0.227	0.242	0.354	0.195
	(0.056)***	(0.063)***	(0.074)***	(0.102)*
Foreign investments as % of GPP	0.210	0.433	0.132	0.422
	(0.432)	(0.468)	(0.299)	(0.349)
Domestic investments as % of GPP	0.178	-0.038	0.189	0.033
	(0.009)*	(0.118)	(0.108)*	(0.089)
Public spending as % of GPP	0.074	0.025	0.047	-0.143
	(0.130)	(0.143)	(0.100)	(0.113)
Population growth	-0.083	-0.045	0.075	-0.007
	(0.096)	(0.106)	(0.095)	(0.112)
Female HC	0.002	-0.001	0.002	0.000
	(0.001)*	(0.000)	(0.001)*	(0.000)
Health as % of GPP	3.609	5.171	5.527	4.367
	(1.966)*	(1.991)***	(1.977)***	(2.677)
Education as % of GPP	2.799	3.269	3.976	3.422
	(0.856)***	(0.983)***	(0.961)***	(1.089)***
Trade as % of GPP	0.095	0.056	0.098	0.035
	(0.027)***	(0.008)***	(0.031)***	(0.009)***
Industry as % of GPP	0.038	0.079	0.067	0.019
	(0.040)	(0.043)*	(0.047)	(0.031)
Lagged female employment growth				0.408
				(0.119)***
R^2	0.50	0.29	0.48	0.40
Observations	279	279	279	279

Notes: All independent variables are lagged one period. Foreign and domestic investments, public spending, health, education, science, transportation, community projects, administration, trade, and industry are all first differenced. Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Growth is instrumented by provincial land area and inflation in the 2SLS and the GMM estimations.

Table 3.4. Male Employment Growth Estimations: OLS, 2SLS-IV, and GMM

Dep Var: Male employment growth	(1) OLS - FE	(2) OLS - RE	(3) 2SLS - IV	(4) GMM
Growth	0.204	0.178	0.290	0.090
	(0.062)***	(0.062)***	(0.076)***	(0.087)***
Foreign investments as % of GPP	-0.534	-0.226	-0.593	-0.363
	(0.253)**	(0.309)	(0.372)	(0.374)
Domestic investments as % of GPP	0.205	-0.018	0.213	0.055
	(0.073)***	(0.096)	(0.077)***	(0.045)
Public spending as % of GPP	-0.001	-0.060	-0.019	-0.207
	(0.134)	(0.149)	(0.078)	(0.104)**
Population growth	-0.053	-0.093	0.054	-0.108
	(0.103)	(0.101)	(0.095)	(0.105)
Male HC	0.002	-0.001	0.002	0.000
	(0.001)**	(0.000)***	(0.001)***	(0.000)*
Health as % of GPP	2.407	3.447	3.724	1.969
	(2.116)	(2.096)	(1.842)**	(2.326)
Education as % of GPP	1.829	1.884	2.638	1.914
	(0.810)**	(0.838)**	(0.800)***	(0.926)**
Trade as % of GPP	0.099	0.048	0.099	0.020
	(0.019)***	(0.008)***	(0.037)***	(0.006)***
Industry as % of GPP	0.119	0.154	0.139	0.076
	(0.040)***	(0.043)***	(0.039)***	(0.035)**
Lagged male employment growth				0.427
				(0.094)***
R2	0.52	0.30	0.52	0.47
Observations	279	279	279	279

Notes: All independent variables are lagged one period. Foreign and domestic investments, public spending, health, education, science, transportation, community projects, administration, trade, and industry are all first differenced. Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Growth is instrumented by provincial land area and inflation in the 2SLS and the GMM estimations.

Table 3.5. Simultaneous Equation Estimation

	Female employment growth	Male employment growth	Gap	Economic Growth
Growth	0.236	0.210	0.060	
	(0.046)***	(0.041)***	(0.024)**	
Foreign investments as % of GPP	0.265	-0.564	0.176	1.694
	(0.367)	(0.321)*	(0.193)	(0.639)***
Domestic investments as % of GPP	0.161	0.201	-0.068	0.057
	(0.087)*	(0.076)***	(0.046)	(0.149)
Public spending as % of GPP	0.095	-0.015	0.184	
	(0.127)	(0.111)	(0.067)***	
Population growth	-0.060	-0.047	0.008	-0.252
	(0.085)	(0.075)	(0.045)	(0.118)**
Gendered HC	0.002	0.002	0.011	0.221
	(0.001)*	(0.001)***	(0.021)	(0.076)***
Health as % of GPP	3.989	2.940	-1.968	-14.437
	(1.868)**	(1.647)*	(0.996)**	(3.765)***
Education as % of GPP	2.866	1.966	1.614	4.861
	(0.720)***	(0.637)***	(0.379)***	(1.117)***
Trade as % of GPP	0.100	0.096	0.011	-0.090
	(0.026)***	(0.023)***	(0.014)	(0.045)**
Industry as % of GPP	0.040	0.120	-0.015	
	(0.032)	(0.028)***	(0.017)	
Initial GPP per capita				0.304
				(0.111)***
Science as % of GPP				21.791
				(7.163)***
Transportation as % of GPP				6.446
				(1.800)***
Community projects as % of GPP				-6.536
				(1.205)***
Administration as % of GPP				-2.107
				(0.555)***
Observations	279	279	279	279
R2	0.50	0.52	0.95	0.47

Notes: All independent variables are lagged one period. Foreign and domestic investments, public spending, health, education, science, transportation, community projects, administration, trade, and industry are all first differenced. Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%.

Table 3.6. Simultaneous Equation Estimation (continued)

	Female HC growth	Male HC growth	F-to-M HC growth
Education as % of GPP	6.051	3.54121	2.49296
	(2.698)**	(1.901)*	(1.220)**
Female Human Capital	0.001		
	(0.001)***		
Male Human Capital		0.001	
		(0.000)**	
Female-to-Male Human Capital			0.020
			(0.011)*
Observations	279	279	279
R2	0.04	0.04	0.04

Notes: Public spending on education is lagged one period and first differenced. Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%.

The growth rates of female, male, and female-to-male secondary school attainment are positively related to the level of attainment as well as public spending on education at statistically significant levels. Furthermore, using a Wald test for equality between the coefficients estimates in the estimates of the growth rates of female and male educational attainment, we find significant evidence to reject the null of equality at the 5% significance level for public spending on education. Thus, the results indicate that public spending on education may have a relatively larger impact on women's completion of secondary school than men's.

Estimates of economic significance allow us to compare the relative magnitudes of our results across independent variables; while some variables may exhibit statistical significance, their economic impact may be inconsequential. Using a slight alteration of the process outlined by Miller and van der Meulen Rodgers (2008), we calculate economic significance as the product of one standard deviation in the independent variable, the estimated coefficient in the simultaneous equation estimation, and gendered mean employment. Each entry in Table 3.7 can be viewed as the number of additional employed persons (or the change the

gendered employment gap), given a one standard deviation increase in the independent variable.[11]

Using path analysis similar to that of Klasen and Lamanna (2009) and Dollar and Gatti (1999), our economic significance estimates include the direct, indirect, and total effects (the sum of the direct and indirect effects) of each independent variable.[12] For example, the direct effect of a one standard deviation increase in spending on healthcare is about 11,400 female employees, and is calculated as the product of 0.202% (one standard deviation, found in Appendix 3A), 3.989 (the coefficient on healthcare found in Table 3.5), and 1.42 million employees (mean female employees, found in Table 3.1).

While direct effects illuminate the relationship between the dependent variable and gendered employment growth/the gap (Table 3.5, columns 1-3), indirect effects illustrate how the dependent variables relate to economic growth (Table 3.5, column 4), which in turn relates to employment growth/the gap. To calculate these effects, we first compute the direct effect of each dependent variable on growth (the product of the variable's estimated coefficient in the economic growth estimation and a one standard deviation increase in the variable) and then calculate how this increase in economic growth affects gendered employment. For example, a one standard deviation increase in science expenditures is correlated with economic growth in the amount of 1.56% (the product of the coefficient on science expenditure in the economic growth model, 21.79, and a one standard deviation change in the variable, 0.072%), which is associated with an additional 5,200 female employees (the product of the 1.56% increase in economic growth, the coefficient on growth in the female employment model, 0.236, and mean female employment, 1.42 million)—the indirect impact of a one standard deviation increase in science expenditure. Next, we discuss the economic significance of the results beginning with our controls, specifically, demand, capabilities, and structural change, before analyzing our area of interest, the social infrastructure variables.

[11]Standard deviations of the transformed variables (including logs and differences) can be found in the Appendix.

[12]Consistent with other studies of path analysis, we use the term "effects" though our usage does not imply causation, but instead, correlation.

Table 3.7. Economic Significance

1 std. dev. change in:	Female employment (increase in employees)			Male employment (increase in employees)			Gap (change in the gap)		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Growth	**25,714**		**25,714**	**37,634**		**37,634**	**0.5%**		**0.5%**
For. inv. as % of GPP	2,025	**3,055**	5,080	**(7,088)**	**4,471**	**(2,617)**	0.1%	**0.1%**	0.1%
Dom. inv. as % of GPP	**7,429**	(1,623)	5,806	**15,254**	(2,375)	12,880	(0.2%)	0.0%	(0.3%)
Trade as % of GPP	**54,222**	**(11,517)**	**42,705**	**85,615**	**(16,855)**	**68,759**	0.4%	**(0.2%)**	0.2%
Industry as % of GPP	5,333		5,333	**26,315**		26,315	(0.1%)		(0.1%)
Public as % of GPP	2,943		2,943	(764)		(764)	**0.4%**		**0.4%**
Gendered HC	**343**	**11,603**	**11,946**	**286**	**16,982**	**17,267**	0.2%	**0.7%**	0.9%
Health as % of GPP	**11,452**	**(9,781)**	**1,670**	**8,440**	**(14,316)**	**(5,875)**	**(0.4%)**	**(0.2%)**	**(0.6%)**
Education as % of GPP	**17,315**	**6,931**	**24,245**	**11,877**	**10,143**	**22,021**	**0.7%**	**0.1%**	**0.8%**
Science as % of GPP		**5,225**	**5,225**		**7,647**	**7,647**		**0.1%**	**0.1%**
Trans. as % of GPP		**11,422**	**11,422**		**16,717**	**16,717**		**0.2%**	**0.2%**
Com. proj. as % of GPP		**(10,319)**	**(10,319)**		**(15,102)**	**(15,102)**		**(0.2%)**	**(0.2%)**
Admin. as % of GPP		**(11,236)**	**(11,236)**		**(16,445)**	**(16,445)**		**(0.2%)**	**(0.2%)**

Notes: Entries in **bold** indicate statistical significance. Parentheses indicate negative values.

As illustrated in Table 3.7, economic growth is positively related to employment for both genders where a one standard deviation increase in economic growth is associated with an additional 25,700 and 37,600 female and male employees, respectively, and raises gender equality in employment by 0.5%. The positive associations with the gap, female, and male employment growth indicate that this variable is positively related to gender equality via upward harmonization.

We find that a one standard deviation increase in trade as a share of GPP is directly correlated with an additional 54,200 and 85,600 female and male employees, respectively and a 0.4% increase in gender equality in employment. While the indirect effects are negative due to the relationship between trade and economic growth, the total effects are positive implying that trade may represent an avenue which increases gender equality, through upward harmonization. While our chosen measure of gender equality indicates a positive relationship between gender equality and trade, we acknowledge that trade may be negatively associated with gender equality when measured by relative wages (Seguino, 2000). These results illustrate how the relationship between macro variables and gender equality can be dependent on the economy's structure (the level of employment segregation, wages, and discrimination) and the chosen measurement of equality (employment or wages). While future research may aim to test the direct effect of trade on women's wages, our conclusions—based on gender equality in employment—indicate that trade is positively associated with gender equality in employment generation.

In analyzing the gendered employment effects of the categories of public spending, we find that a one standard deviation increase in spending on science is indirectly correlated with an additional 5,200 and 7,600 female and male employees, respectively, and an increase in the employment gap of 0.1%. Spending on transportation, on the other hand, is indirectly correlated with approximately 11,400 and 16,700 female and male employees, respectively, and a 0.2% increase in the gap. Indirectly, gender equality in education, measured as the ratio of female-to-male secondary school attainment, is positively correlated with economic growth, employment for both genders, and the gap. A one standard deviation increase in

gender equality in education is correlated with an additional 11,600 and 17,000 female and male employees, respectively, and a 0.7% increase in the gap. These results imply that while not tested directly, physical infrastructure spending and gender equality in education may be growth enhancing which in turn, increase gender equality in employment via upward harmonization.

Conversely, the process of industrialization exhibits a stronger association with male employment than female, as evidenced by the fact that structural change is correlated with an additional 5,300 female urban employees, 26,300 male employees, and a fall in the gap of approximately 1.0%. This robust result, in combination with the intense gendered occupational segregation in China, supports the argument that the de-feminization of the workforce may be a consequence of industrialization (Ghosh, 2002; Fussell, 2000). Along similar lines, domestic investment as a share of GPP is positively related to gendered employment growth and negatively related to the gap at statistically significant levels.

We find a one standard deviation increase in public spending on healthcare directly correlated with an additional 11,400 and 8,400 female and male employees, respectively. While the impact appears larger for women's employment, the direct effect on the gap is negative—public spending on health is associated with decreasing gender equality in employment. These conflicting results indicate that the relationship between this element of social infrastructure and gender equality is inconclusive.[13]

Alternatively, education spending is associated with increases in employment for both genders (both directly and indirectly), the gap, and economic growth—a result we find robust across almost all specifications—the single exception being the coefficient on education spending in the 2SLS-IV estimation of the gap; while the coefficient is positive, it is not statistically significant at the 10% level. The total effect of a one standard deviation increase in education spending as a share of GPP is an additional 24,200 and 22,000 female and male employees, respectively, and a 0.8% increase in the gap. The larger positive effects on women's relative employment may be due to the impact that spending on education has on

[13]Future studies may further evaluate this relationship by instrumenting for healthcare spending, or possibly disaggregating this spending category in order to better evaluate this relationship.

labor demand, via employment in care sectors, and labor supply, via the reduction in unpaid labor burdens, both of which exhibit greater significance in female than male employment estimations.

3.5. Policy Implications

The results provided here support the conceptual model presented in chapter 1 in that spending on social infrastructure, as well as demand factors including economic growth, trade, and domestic investments, are positively related to employment for both genders. Referring to figure 1.1, the results imply that paths (1) and/or (2)[14] and (3) are functioning adequately for public spending on education, whereas regarding healthcare spending, path (3) does not appear to be operating as anticipated . Furthermore, education spending may increase gender equality in employment and support the 'win-win' scenario proposed by Seguino, Berik, and van der Meulen Rodgers (2010). While intrinsically equality is a good worthy of pursuit, there are extrinsic reasons to reach for this goal as well. The relationship between public spending on education and gender equality in employment in the short-run may be bolstered by long-run impacts on productivity and growth, given that expansions in women's employment could increase income controlled by women which is more likely to be spent on children's health and nutrition (Doss, 2013). Such spending impacts children's ability to obtain an education, and thus an economy's long-run productivity and economic growth. Klasen and Lamanna (2009) also find extrinsic reasons for increasing gender equality in employment as they find that equality in employment increases economic growth—the opposite chain of causality of that presented here. Thus, placing greater emphasis on public spending on education may increase economic growth in the short and long runs, via the impacts of public-sector expansions and productivity, respectively, while also increasing gender equality in such a way as to strictly avoid downward harmonization.

[14]Given our formulation of our econometric model, we cannot differentiate between paths (1) and (2) but instead may only determine if at least one of the two paths are operational.

This argument for increasing the level of public spending may meet with opposition by those who argue that such spending would crowd out the private sector. However, crowding out "... ignores the likely possibility, especially in developing economies where market imperfections are extensive, that public investment can crowd in or encourage private investment, as when the public provision of infrastructure, education and training, or credit makes private investment opportunities more attractive" (Braunstein, 2012, p. 4). Therefore, crowding in is a more likely outcome than crowding out when placing greater emphasis on social infrastructure spending.

Investing in education, particularly the education of young women in China, would likely have additional repercussions for the Chinese economy. First, the larger increase in female secondary school attainment—which implies an increase in gender equality in education—is positively associated with economic growth (Table 3.5), a result also found by Klasen and Lamanna (2009). Second, such an increase in female educational attainment may allow women to accumulate the education needed to acquire jobs in the industrial sector which are otherwise out of reach—a result which may help to reduce the male bias inherent in industrialization. However, we acknowledge that social restraints may prevent women from obtaining employment in the industrial sector with higher wages and better benefits despite their acquisition of the necessary education. Social protections, and support for women in the labor market in the form of anti-discrimination laws, childcare, maternity/parental leave, and healthcare, may act as a sufficient condition for increasing women's presence in the industrial sector and should therefore be included in concert with an increase in education spending in order to increase women's ability to access such positions. Such protections could help increase women's opportunities for promotion and employment, and reduce discrimination in wages and gender-based occupational segregation which would allow women to increase their labor supply and thus their bargaining power within the household (Morrison and Sabarwal, 2008; Berik, van der Meulen Rodgers, and Seguino, 2009; Braunstein, 2008).

3.6. Conclusion

In this paper, we analyze the role of social infrastructure spending in gendered employment creation in urban China using several econometric techniques. We model gendered employment growth—our proxy for gender equality—as a function of public spending on social infrastructure controlling for demand, individual capabilities, and structural change. Finally, we provide economic significance estimations and discuss the policy implications of the results.

We find industrialization to be positively associated with urban employment for both genders, but negatively related to women's relative employment. Given the current patterns of industrialization and the likelihood that they will persist, our results indicate that if not countered, the relative status of women in terms of employment may decline over time.

Our results provide a possible solution to this issue as they indicate that, while the relationship between health expenditure and gendered employment is mixed, education spending can increase gender equality in employment via upward harmonization. Thus, it may be the case that public spending on education could be used as a gender-sensitive development policy in China with the goals of increasing 1) gender equality in a way that is upward harmonizing, 2) growth in the long run (due to enhanced productivity), and 3) growth in the short run (given the effects of expansionary fiscal policy). Lastly, we argue that social protections should be implemented in concert with these policies in order to increase women's ability to capitalize on the additional labor market opportunities.

The results presented here provide policy guidelines which utilize development strategies in a gender-sensitive manner in the context of the Chinese economy. This research aims to highlight the importance of social infrastructure spending and its relationship with gendered employment while bringing to light the impacts of structural change on gendered outcomes. It is hoped that this work will encourage further explorations of the ways in which gender considerations can be incorporated into public policy decisions.

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Appendix 3A: Descriptive Statistics of Transformed Variables

	Mean	Standard Deviation
Growth	11.7%	7.7%
Population Growth	-0.002	3.0%
Public spending as % of GPP	0.9%	2.2%
Science as % of GPP	0.0%	0.1%
Transportation as % of GPP	0.1%	0.5%
Community projects as % of GPP	0.1%	0.5%
Health as % of GPP	0.1%	0.2%
Education as % of GPP	0.1%	0.4%
Administrative as % of GPP	0.5%	1.6%
Foreign investment as % of GPP	0.1%	0.5%
Domestic investment as % of GPP	2.9%	3.3%
Trade as % of GPP	29.0%	38.2%
Industry as % of GPP	5.8%	9.4%
Female Employment Growth	-0.002	0.04
Female HC	19.2%	12.1%
Male Employment Growth	0.002	0.04
Male HC	22.9%	10.1%
F-to-M HC	80.0%	15.7%
Gap	-11.9%	7.8%

Notes: Means and standard deviations calculated as annual averages from 1999 to 2009, and across all 31 provinces. Public spending (including aggregate and disaggregated spending categories), fixed assets, trade, and industry measured in billions of Yuan. All categories of public spending, investments, and industrialization are differenced once. Source: Employment data from author's calculations based on data from China Labour Statistical Yearbook (2000-2010); others from author's calculations based on data from China Statistical Yearbook (2000-2010).

Appendix 3B: Descriptions of Data

Variable	Description	Source
Female and male employment	The total number of female and male employees in urban units (the Labour Ministry) including workers with urban and rural (employed in their urban unit for at least six months) household registration, not including not-on-post workers.	Author's calculations, CLSY Indicators: Female Employment [Number of Employed Persons] in Urban Units at Year-end by Sector and Region (2000-2010)
Population	The total number of people alive at midnight, the 3lst of December, within a given region not including Chinese nationals residing abroad and estimated by annual surveys of approximately 1% of the population using a stratified cluster sampling scheme (National Sample Surveys on Population Changes).	CSY Indicator: Household, Population, Sex Ratio and Household Size by Region (2000-2010)
Urban population	Refers to all people residing in cities and towns, measured identically to that of total population.	CPESY Indicator: Population and Household in City by Region (2000-2010)
Inflation	Index calculated using a consumer price index (urban and rural households) with a base year of 2000 where each subsequent year equals the product of the yearly growth of CPI and the index of the prior year.	Author's calculations, CSY Indicator: Residents Consumer Price Indices and Retail Price Indices of Commodities by Region (2000-2010)
Gross provincial product	The value of final products produced by all resident units at market prices measured in 2000 yuan.	CSY Indicator: Gross Regional Product and Indices (2000-2010)
Science	Public expenditures related to basic and applied research, R&D, and their administrative expenses measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Transportation	Road, waterway, railways, civil aviation and postal service public expenses measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Finance	Public expenses related to financial intermediation, industry (mining, manufacturing, construction), commerce, and tourism supervision and administration measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Security	Public expenses on public security and national defense including police forces, public and state security, the court system (prosecution, justice and prisons), military (active force, reserve force, and militia), and scientific research on national defense and special projects measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Social welfare	Public expenses on retirement income, social safety nets, and the National Social Security Fund measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Community projects	Officially reported as "Development Expenditure," this includes public spending on projects aimed at supporting underdeveloped areas including the planning and management of urban and rural communities, public facilities, housing, sanitation, among other development projects measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Health	Public expenses including general medical and health services, women and children's health, disease prevention and control, health inspection and supervision, and rural health care measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Education	Government appropriation for education including the total allocation for education, capital construction and research measured in yuan at current prices.	CSY Indicator: Government Expenditures by Region (2000-2010)
Agriculture	Public expenses related to administrative agriculture, forestry, and water conservancy development measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)
Administration	Public expenses including the affairs of Peoples Congress, the Peoples Political Consultative Conference, and other political parties, reforms, statistics, taxation, audit, customs, human resources, discipline inspection and supervision, population and family planning, trade, intellectual property, oceanic administration, surveying and mapping, earthquake, ethnic affairs, religious affairs, affairs of Hong Kong, Macao, Taiwan, and Overseas Chinese measured in 2000 yuan.	CSY Indicator: Government Expenditures by Region (2000-2010)

Trade	The sum of exports and imports (goods transported through Chinese customs valued at free on board prices and services provided between resident and non-resident units) measured at the provincial-level in USD. Given the total value of trade in yuan, converting to 2000 yuan requires a calculation of each province's trade share of the country-wide total in USD as the product of the country-wide trade in 2000 yuan.	Author's calculations, CSY Indicator: Total Value of Imports and Exports by Location of Importers/Exporters (2000-2010)
Foreign investments	The volume of construction (including materials, technology and equipment) and the purchases of fixed assets financed by foreign borrowings, foreign direct investments and other foreign investments measured in 2000 yuan where foreign currencies are converted into Renminbi applying the current exchange rate.	CSY Indicator: Total Investment in Fixed Assets by Ownership (2000-2010)
Domestic investments	Includes fixed investments described above financed by domestic (non-state) funds, calculated as total investment in fixed assets less foreign funded fixed assets and state-owned fixed assets measured in 2000 yuan where foreign currencies are converted into Renminbi applying the current exchange rate.	Author's calculation, CSY Indicator: Total Investment in Fixed Assets by Ownership (2000-2010)
Industrialization	The total value of industrial products and services produced during the reference period in a given region measured in 2000 yuan.	CSY Indicator: Main Indicators of Industrial Enterprises above Designated Size by Region (2000-2010)
Female human capital	The percentage of female employees who have completed a minimum of senior level education.	Author's calculations, CLSY Indicator: Educational Attainment Composition of Female Employment by Region (2000-2010)
Male human capital	The percentage of female employees who have completed a minimum of senior level education.	Author's calculations, CLSY Indicator: Educational Attainment Composition of Male Employment by Region (2000-2010)
Female-to-Male human capital	The ratio of female human capital to male human capital.	Author's calculations, CLSY (2000-2010)

Appendix 3C: Correlation Matrices (Model 1 Correlation Coefficients)

	F. employment growth	M. employment growth	Gap	Growth	Trade % of GPP	For. inv. % of GPP	Dom. inv. % of GPP	Public % of GPP	Population growth	Health % of GPP	Education % of GPP	Industry % of GPP
Growth	0.105	0.048	-0.011									
Trade as % of GPP	0.335	0.268	0.104	-0.063								
For. inv. as % of GPP	0.103	0.069	0.081	-0.023	-0.001							
Dom. inv. as % of GPP	0.021	0.119	-0.022	-0.340	-0.205	0.208						
Public as % of GPP	0.114	0.072	-0.283	-0.329	-0.038	0.016	0.192					
Population growth	-0.173	-0.210	-0.064	-0.440	0.205	-0.084	-0.140	0.037				
Health as % of GPP	0.109	0.128	-0.208	-0.342	-0.073	0.064	0.334	0.658	-0.096			
Education as % of GPP	0.100	0.100	-0.126	-0.564	-0.079	0.008	0.317	0.311	0.049	0.051		
Ind. as % of GPP	0.159	0.314	0.175	-0.481	0.084	0.259	0.552	0.140	-0.076	0.316	0.296	
Female HC	0.127			0.013	0.737	-0.022	-0.169	-0.122	0.199	-0.129	-0.188	-0.029
Male HC		0.055		-0.005	0.758	-0.004	-0.186	-0.156	0.183	-0.139	-0.205	0.017
Female-to-Male HC			-0.133	0.048	0.389	-0.034	-0.077	-0.105	0.159	-0.152	-0.123	-0.075

Notes: Growth, human capital, and trade variables are all lagged one period while all other variables differenced and lagged.

Model 2 Correlation Coefficients

	growth	Initial GPP	Population growth	Dom. inv. as % of GPP	For. inv. as % of GPP	Female-to-Male HC	Science as % of GPP	Trans. as % of GPP	Com. proj. as % of GPP	Health as % of GPP	Education as % of GPP	Admin. as % of GPP
Initial GPP	-0.022											
Population growth	-0.074	0.146										
Dom. inv. as % of GPP	0.016	-0.123	-0.140									
For. inv. as % of GPP	0.093	0.025	-0.084	0.208								
Female-to-Male HC	0.098	0.509	0.159	-0.077	-0.034							
Science as % of GPP	-0.325	0.168	0.045	0.111	-0.006	0.057						
Trans. as % of GPP	-0.292	-0.088	-0.006	0.050	-0.010	-0.101	0.284					
Com. proj. as % of GPP	-0.471	0.076	-0.007	0.090	0.007	0.014	0.575	0.235				
Health as % of GPP	-0.369	-0.131	-0.096	0.334	0.064	-0.152	0.375	0.747	0.281			
Education as % of GPP	-0.009	-0.115	0.049	0.317	0.008	-0.123	0.069	-0.222	0.321	0.051		
Admin. as % of GPP	-0.490	-0.104	-0.003	0.181	0.026	-0.113	0.561	0.764	0.651	0.701	0.131	
Trade as % of GPP	-0.019	0.812	0.205	-0.205	-0.001	0.389	0.238	-0.046	0.102	-0.073	-0.079	-0.064

Notes: Initial GPP is measured as is while trade and human capital variables are lagged one period and all other variables are differenced and lagged one period. "ln" represents the natural log operator.

Model 3 Correlation Coefficients

	Female human capital growth	Male Human Capital growth	Female-to-Male human capital growth	Female HC	Male HC	Female-to-Male HC
Human capital (level)	0.113	0.144	0.181			
Education as % of GPP	0.125	0.092	0.132	-0.130	-0.130	-0.083

Notes: Expenditure on education is measured as the difference of the natural log lagged once. "D" and "ln" refer to the difference and natural log operators, respectively.

CHAPTER 4

A Cross-Country Evaluation of Public Spending and Gendered Employment

4.1. Introduction

Of late, international development organizations and institutions, such as the World Bank (2012) and United Nations (2013), have emphasized the importance of gender equality, especially in the developing world. In *World Development Report 2012: Gender Equality and Development*, the World Bank highlights the relationship between gender equality and economic development as they evaluate the current status of gender equality across the world, analyze progress catalysts, identify constraints, and propose solutions via public policy responses. They argue that gender inequalities persist in the world's poorest regions largely due to differences in time use, access to markets, and treatment by formal institutions (World Bank, 2012).

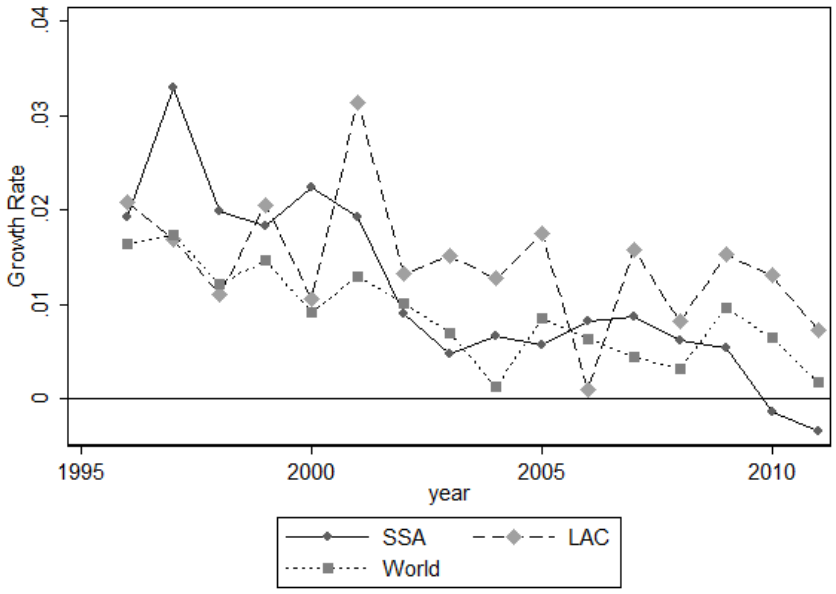
Illustrating the importance of gender equality, the third priority of the Millennium Development Goals (MDGs)—eight priorities specified to gauge the status of the world's poorest individuals—is an effort to "Promote Gender Equality and Empower Women" (United Nations, 2013, p. 18). However, according to the 2013 progress report on the MDGs, while progress has been made in many areas related to this goal, "women continue to be denied equal opportunity with men to participate in decisions that affect their lives" (United Nations, 2013, p. 5). Despite the near-achievement of parity in terms of gendered employment in some regions, in West and South Asia and North Africa, women encounter severe barriers to entry to paid employment (United Nations, 2013). While the goal of gender equality in employment by 2015 may be unreachable, acknowledging the current level of gender inequality across the world and dedicating development goals to improve the situation is a crucial start in the movement towards gender equality. The fact that the world is falling short of

these goals indicates that further work should be done to determine the ways in which these goals can be achieved.

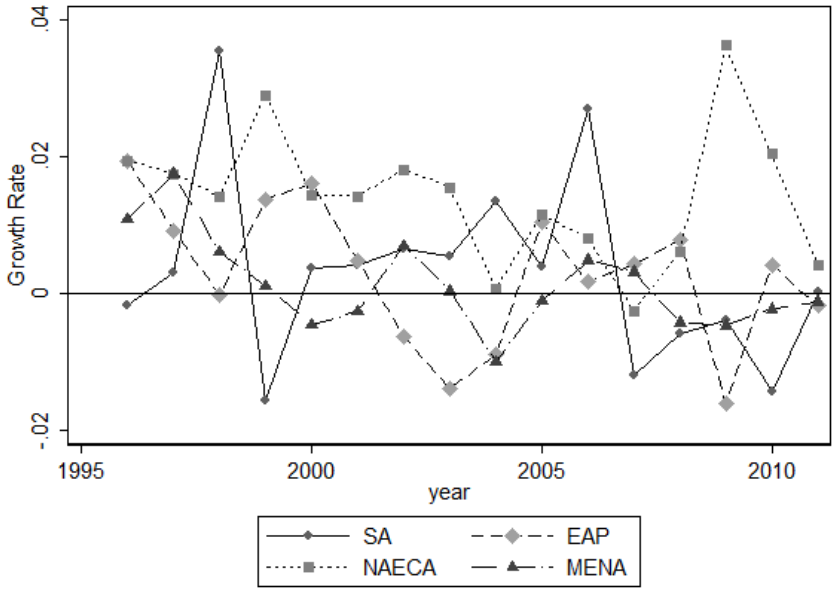
Given that institutions and social norms may uphold gender disparities in terms of access to markets, resources, time use, and education (Çağatay and Ertürk, 2004), and that these institutions and norms may appear quite differently across regional boundaries, it may not be surprising that a blanket goal of gender equality was not achieved simultaneously across the world. For example, in one region the bottleneck may occur inside the household as social norms and institutions may prevent women from obtaining labor outside of the home or from obtaining education beyond a certain age, while in another region, women may find inequality in labor market institutions and protections preventing them from obtaining employment. Figures 4.1 (a) and 4.1 (b) illustrate the growth rates of gender equality in employment, measured as the female employment rate less the male, by region where increases (and thus, positive growth rates) indicate positive movements in equality, and vice versa.[1] While we include the growth rates of gender equality in employment for the world on average, we also separate growth rates by region in order to provide a greater depth of understanding of the patterns of gender equality across the world. That is, figure 4.1 illuminates the regional trends and can identify if one region is driving the overall trend or if all regions are experiencing similar movements. With the exception of the Middle East and North Africa, from 1995 to 2001 the growth rate of equality in employment was positive in all regions. Notably however, the trend appears to decline over time as in most regions, movements towards equality have begun to slow evidenced by positive but declining growth rates in gender equality in employment. Furthermore, of late gender equality in employment has even begun to decline in several regions, namely the Middle East and North Africa, East Asia and the Pacific, South Asia, and sub-Saharan Africa, as demonstrated by negative growth rates in equality in employment.

In this chapter, we aim to analyze these trends and answer questions that may emerge from figure 4.1 such as: what determines gender equality in employment and what may

[1]Time series graphs of the gap, the female employment rate, and the male employment rate disaggregated by region can be found in Appendix 4A.



(a)



(b)

Figure 4.1. Regional Trends in Gender Equality in Employment (1996 to 2011)

Note: World Regions: NAECA (North America, Europe, and Central Asia), EAP (East Asia and the Pacific), SA (South Asia), LAC (Latin America and the Caribbean), MENA (Middle-East and North Africa), and SSA (sub-Saharan Africa). Gender equality in employment is measured as the ratio of female employment to the female population less the ratio of male employment to the male population.

be causing this downward trend? How can policy makers go about reversing this negative trend? In particular, what role does fiscal policy play in gender equality in employment? Specifically, we analyze the relationship between public spending on social infrastructure and women's relative employment for a couple of reasons. First, while there are many ways to measure gender equality, we focus on equality in employment due to the fact that women's access to employment is a signal as to the level of gender integration into the labor market and indicates women's relative bargaining power within the household. Second, we focus on time use and its relationship with women's relative labor supply because we believe it may be the primary bottleneck preventing movements towards gender equality in employment. We anticipate that spending on social infrastructure, that is, education and healthcare, may represent the best way to clear this bottleneck due to its relationship with time use as discussed in detail in chapter 1. Furthermore, spending on social infrastructure may also boost women's relative employment via labor demand (Razavi, Arza, Braunstein, Goulding, and Cook, 2012). Within this framework, we empirically analyze the relationship between social infrastructure spending and gendered employment in a cross-country context to identify if either category of social infrastructure is positively related to equality in employment via upward harmonization.[2] By analyzing this relationship in a cross-country context, we are unable to capture country-specific gender norms and institutions than may somewhat alter this relationship; however, on the other hand, we are better able to generalize our results.

Our results are consistent with the aforementioned theory in that public spending on education and healthcare are positively associated with gender equality in employment through upward harmonization while controlling for regional differences, demand determinants, and human capital accumulation. Furthermore, our results indicate that investments in fixed assets may be equality enhancing whereas increases in the size of the population, public spending net of social infrastructure, and industrialization may reduce equality in employment.

[2]Specifically, we seek a policy that is associated with increases in equality that occur by putting upward pressure on women's employment while avoiding policies which increase equality by lowering men's employment.

Our study contributes to the literature in several ways. First, to the best of our knowledge, this is the first work to empirically analyze the impacts of social infrastructure on gendered employment in a cross-country study, and therefore our results may provide a unique and significant policy tool for developing countries that are looking to implement gender-sensitive development policies. Second, our approach is unique in that we capture the ways in which social infrastructure may impact gender equality in employment, both directly and indirectly, through its impacts on economic growth and human capital. Third, we estimate our system of equations using multiple econometric methodologies which add robustness to the results. Finally, by estimating gender equality in employment as well as the employment rate for each gender, our results capture movements in employment equality and the reason for these changes, be they positive movements in women's relative employment or negative shifts in men's.

This paper is organized as follows. In section two, we present our theoretical approach and build our empirical methodologies. In section three, we describe the data and detail the procedures for and outcomes of our econometric tests. We present the results and discuss our economic significance estimations in section four, and advance the policy implications of our results in section five. Lastly, we conclude the paper in section six.

4.2. Theoretical Approach

Gendered employment is estimated using three separate dependent variables: the female employment rate, the male employment rate, and gender equality in employment. Female and male employment rates are formulated such that the female (male) employment rate is the ratio of female (male) employment to the female (male) population. While our estimation includes the aggregate size of the population, estimating gendered employment rates with the size of the working-age population (for example, aged 15 and up) would provide a better measure of employment rates as it would exclude those too young to work from the measurement and may therefore more accurately capture the determinants of gendered employment. Gender-equality in employment, henceforth "the gap", is expressed similarly

to that of Seguino and Were (2013), such that

$$Emp^{gap} = \frac{Employment^f}{Population^f} - \frac{Employment^m}{Population^m}$$

where the superscripts f and m indicate female and male data, respectively. Using this specification, increases in the gap indicate movements towards equality.

Within the framework of the conceptual model of employment from chapter 1, gendered employment is estimated as a function of both labor demand and supply factors. Social infrastructure determines employment directly from the demand side as well as indirectly via household constraints, human capital, and economic growth (itself decided by several other variables). Structural change enters the model as a determinant of both labor demand and supply while additionally, the size of the population influences employment on the supply side via its effect on household constraints. Labor demand is also a function of investments, public spending on all elements other than social infrastructure spending, and trade. Thus, we estimate gendered employment, Emp_{it}, as follows

$$\begin{aligned} Emp_{it} = \beta_0 + \beta_1 Health_{i,t-1} + \beta_2 Educ_{i,t-1} + \beta_3 Gr_{i,t-1} + \beta_4 Inv_{i,t-1} + \beta_5 G_{i,t-1} \\ + \beta_6 Trade_{i,t-1} + \beta_7 Pop_{i,t-1} + \beta_8 HC_{i,t-1} + \beta_9 Ind_{i,t-1} + \beta_i + \epsilon^1_{i,t} \end{aligned} \tag{4}$$

where $Health$ and $Educ$ are public spending on healthcare and education as percentages of GDP, respectively, Gr is economic growth calculated as the growth rate of real GDP per capita, Inv are investments in fixed capital as a percent of GDP, G is the ratio of public spending net of social infrastructure to GDP, $Trade$ is the sum of exports and imports as a percentage of GDP, Pop is population, HC is attainment of at least secondary level education by gender, Ind is industrial output as a percentage of GPP, our proxy for structural change, $\epsilon^1_{i,t}$ are typical disturbance terms, β_i are regional controls, and β terms are unknown parameters we wish to estimate, for all countries, i, in time, t. All independent variables are lagged one period to account for the fact that these variables require time to significantly stimulate employment. Due to the single lag, we are only considering the short-run determinants of employment.

We specify a functional form for gendered employment similar to that of Seguino and Were (2013) and Braunstein and Grown (2011), and in such a way as to follow the feminist literature by incorporating regional considerations, the role of structural change, and the presence of the state. By including public spending absent of revenue collection, this analysis differs from that of Braunstein and Grown (2011), who focus on the role of taxation in gendered employment creation; our analysis captures the role of public spending net of taxation. Under our theoretical framework, a positive relationship between spending by the public sector and employment indicates that the stimulation of employment outweighs the negative impact of the taxation required to fund such public spending.

If left unaccounted for, our model may exhibit endogeneity problems given that two of the above named regressors, human capital and economic growth, are not strictly exogenous but are instead themselves determined by other variables. To avoid this potential problem, we specify functional forms for both endogenous variables, also from the framework of our conceptual model, and estimate their equations, in addition to employment, in a simultaneous equation estimation. Additionally, we utilize panel-corrected standard error and two-stage least squares techniques to estimate gendered employment and compare the results to that of the simultaneous equation estimation.

The conceptual model in chapter 1 outlines the determinants of economic growth from the framework of new growth theory where the neoclassical growth model is augmented with broad definitions of capital (human, physical, and health), institutional and macro conditions, a public sector, and an open economy. Thus, economic growth is a function of investments in human and fixed capital, population, the relative size of the public sector, trade, and initial GDP and growth is formalized such that

(5)

$$Gr_{i,t} = \eta_i + \eta_1 Inv_{i,t-1} + \eta_2 Pop_{i,t-1} + \eta_3 HC_{i,t-1} + \eta_4 fmHC_{i,t-1} + \eta_5 GDPpc_{i,t=0} + \eta_6 Health_{i,t-1} + \eta_7 Educ_{i,t-1} + \eta_8 G_{i,t-1} + \eta_9 Trade_{i,t-1} + \eta_{10} MC + \eta_{11} Inst_{i,t-1} + \epsilon^g_{i,t}$$

where $fmHC$ is the ratio of female-to-male secondary school attainment,[3] η_i are regional controls, MC are time fixed effects which control for macro conditions, $Inst$ is institutional quality proxied with country-specific rule of law indices, $\epsilon^g_{i,t}$ are error terms with the usual properties, and η terms are unknown parameters. Similarly to that of employment creation, all determinants are lagged one period to capture the short-run effects on growth. This formulation borrows from Klasen and Lamanna (2009), Barro (2001), and Barro (1996) in that our estimation of economic growth includes regional controls, investments, population, attainment of secondary level education, initial GDP, trade, and public spending.

Finally, in a formulation similar to that of Mankiw et al. (1992), human capital variables are themselves determined by the past human capital accumulation and investment in human capital such that

$$gHC_{i,t} = \alpha_i + \alpha_1 HC_{i,t} + \alpha_2 Educ_{i,t-1} + \epsilon^{hc}_{i,t} \tag{6}$$

where $gHC_{i,t}$ is the growth rate of gendered attainment of secondary education, α_i are regional controls, α terms are unknown parameters, and $\epsilon^{hc}_{i,t}$ are typical disturbance terms.

4.3. Data

Panel data for the 138 countries included in this study consists of data from the World Bank's *World Development Indicators*, Barro and Lee's *Educational Attainment Dataset*, the International Monetary Fund's *World Economic Outlook Database*, Kaufmann, Kraay, and Mastruzzi's *World Governance Indicators*, and the International Labour Organization for the period 1995 to 2011.[4] Limited data availability restricts the time frame of analysis as the rule of law index and public spending on healthcare are not available prior to 1995.

4.3.1. Data Descriptions. In table 4.1, we present descriptive statistics separated by region in order to illustrate the differences across regional boundaries where world regions

[3]By estimating human capital in aggregate as well as the ratio of gendered human capital, we are able to test for the growth-enhancing characteristics of gender equality in education as purported by Klasen and Lamanna (2009).

[4]All countries with at least one observation for spending on education, healthcare, exports, imports, the size of the labor force, and educational attainment, are included in our panel dataset.

are categorized as follows: North America, Europe, and Central Asia (NAECA), East Asia and the Pacific (EAP), South Asia (SA), Latin America and the Caribbean (LAC), Middle-East and North Africa (MENA), and sub-Saharan Africa (SSA).[5] Gendered employment rates are measured as the ratio of employees—formal part-time and full-time workers of at least 15 years of age—to the gendered population; such a measurement is limited as it is unable to capture informal workers and as the population figure includes all age ranges, also captures children and the elderly. The female employment rate differs greatly across regions; it is highest in NAECA (42.3%), followed by EAP (41.8%), SSA (36.7%), LAC (33.5%), SA (29.2%), and MENA (19.8%). On the other hand, the male employment rate is quite consistent across regions where NAECA, EAP, SA, LAC, and MENA all exhibit rates between 52.6% and 54.5%, while the lowest rate is in SSA (44.0%). The gap, estimated as the regional average difference between the two employment rates, is lowest in absolute value in SSA (-7.3%) and is consecutively higher in NAECA (-12.1%), EAP (-12.7%), LAC (-19.7%), SA (-23.4%), and MENA (-33.4%). Interestingly, while a low gap possibly indicates greater gender equality in employment, the gap in SSA is not due to a relatively larger role of women's employment, but alternatively, a depressed level of men's employment (figure 4.2). The fact that the female employment rate appears significantly lower than the male employment rate across regions may also illustrate the importance of the informal sector as the gap may be at least partly due to a greater prevalence of women in informal employment than men.

[5]A comprehensive list of the regional division of countries and detailed descriptions of all variables and their sources can be found in appendices A and B, respectively.

Table 4.1. Descriptive Statistics

	NAECA		EAP		SA		LAC	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Gap	-12.1%	5.1%	-12.7%	8.2%	-23.4%	11.9%	-19.7%	6.0%
F-to-M HC	95.1%	20.9%	94.5%	29.9%	67.7%	25.2%	100.6%	31.2%
Female Emp. Rate	42.3%	6.4%	41.8%	9.0%	29.2%	12.6%	33.5%	7.0%
Female HC	41.3%	13.4%	24.1%	16.1%	18.0%	17.2%	24.0%	10.5%
Male Emp. Rate	54.5%	4.4%	54.5%	5.9%	52.6%	4.2%	53.2%	4.1%
Male HC	44.7%	14.8%	24.7%	15.5%	24.6%	16.3%	25.1%	10.8%
Population (log)	16.2	1.5	16.3	2.5	17.5	2.6	15.8	1.6
Growth	2.8%	4.3%	4.7%	7.4%	3.9%	3.3%	2.1%	3.6%
Public Spending	8.2%	2.9%	6.3%	3.9%	5.4%	2.9%	6.2%	3.9%
Investments	17.5%	5.5%	19.4%	14.8%	16.9%	4.2%	15.2%	4.6%
Health Spending	5.5%	1.9%	2.0%	1.0%	1.7%	1.1%	3.6%	1.5%
Educ. Spending	5.0%	1.4%	3.7%	1.6%	3.4%	1.3%	4.6%	2.0%
Trade	91.5%	46.2%	120.0%	82.1%	65.2%	47.8%	73.8%	39.3%
Industrial Output	29.3%	6.0%	36.6%	15.7%	23.5%	5.2%	30.7%	8.6%
Rule of Law	0.8	1.0	-0.2	0.8	-0.3	0.5	-0.4	0.7
Initial GDPpc (log)	9.2	1.4	8.3	2.2	6.8	1.6	8.1	1.2

	MENA		SSA		World	
	Mean	SD	Mean	SD	Mean	SD
Gap	-33.4%	10.5%	-7.3%	8.7%	-15.6%	11.1%
F-to-M HC	91.4%	31.6%	65.2%	31.3%	87.7%	31.1%
Female Emp. Rate	19.8%	9.9%	36.7%	8.7%	36.0%	10.9%
Female HC	26.7%	13.4%	8.2%	7.8%	25.9%	17.4%
Male Emp. Rate	53.2%	10.9%	44.0%	4.9%	51.6%	7.2%
Male HC	28.7%	12.7%	11.4%	7.9%	28.5%	17.7%
Population (log)	15.7	1.6	15.8	1.1	16.0	1.7
Growth	1.3%	5.6%	1.9%	6.2%	2.6%	5.3%
Public Spending	10.4%	4.5%	7.6%	4.5%	7.6%	3.9%
Investments	14.5%	5.8%	12.6%	7.2%	15.1%	7.9%
Health Spending	2.8%	1.2%	2.6%	1.3%	3.6%	2.0%
Educ. Spending	5.4%	1.6%	4.5%	2.4%	4.7%	1.8%
Trade	89.9%	35.2%	76.8%	36.8%	87.0%	49.8%
Industrial Output	40.1%	13.3%	26.3%	13.3%	30.5%	11.6%
Rule of Law	0.1	0.7	-0.6	0.7	0.0	1.0
Initial GDPpc (log)	8.6	1.4	6.4	1.1	8.1	1.8

Notes: SD refers to standard deviation. Public Spending, Investments, Healthcare, Education, Trade, and Industrialization are calculated as percentages of GDP.

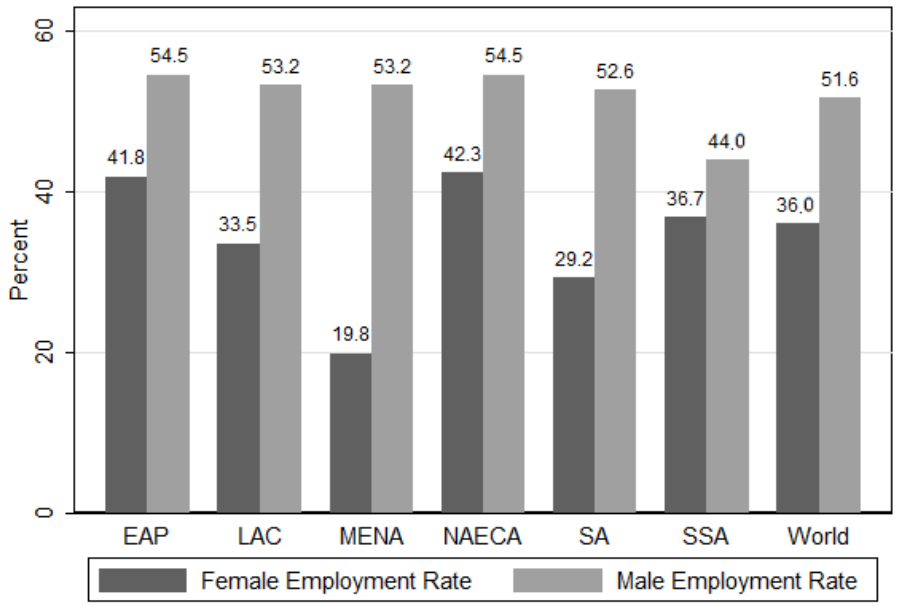


Figure 4.2. Average Gendered Employment Rates (1996 to 2011)

Note: The gendered employment rate is calculated as the ratio of gendered employment to the gendered population.

Public spending on healthcare, as a percentage of GDP, is highest in NAECA (5.5%), and sequentially lower in LAC (3.6%), MENA (2.8%), SSA (2.6%), EAP (2.0%), and SA (1.7%). Only economies in NAECA spend more on average on healthcare than education. Education spending is highest in MENA (5.4%), followed by NAECA (5.0%), LAC (4.6%), SSA (4.5%), EAP (3.7%), and SA (3.4%). Figure 4.3 provides an illustration of the relative patterns of public spending on education and healthcare over time measured as the world average. While the ratio of public spending on education to GDP is consistently higher that of healthcare spending, spending on healthcare is rising and quickly closing the gap. Furthermore, spending on healthcare exhibits a mostly smooth trend whereas spending on education is more erratic. Both categories of social infrastructure reach their highest level in 2009.

Gendered human capital, measured as completion of at least secondary level education, exhibits similar characteristics to the male employment rate in that it is comparable across all regions except SSA; female-to-male secondary school attainment is lowest in SSA (65.2%)

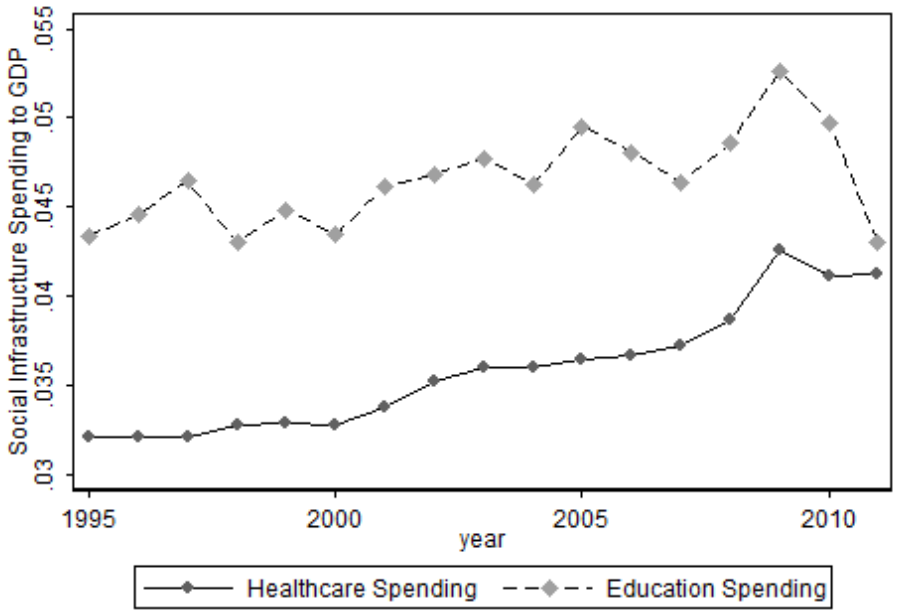
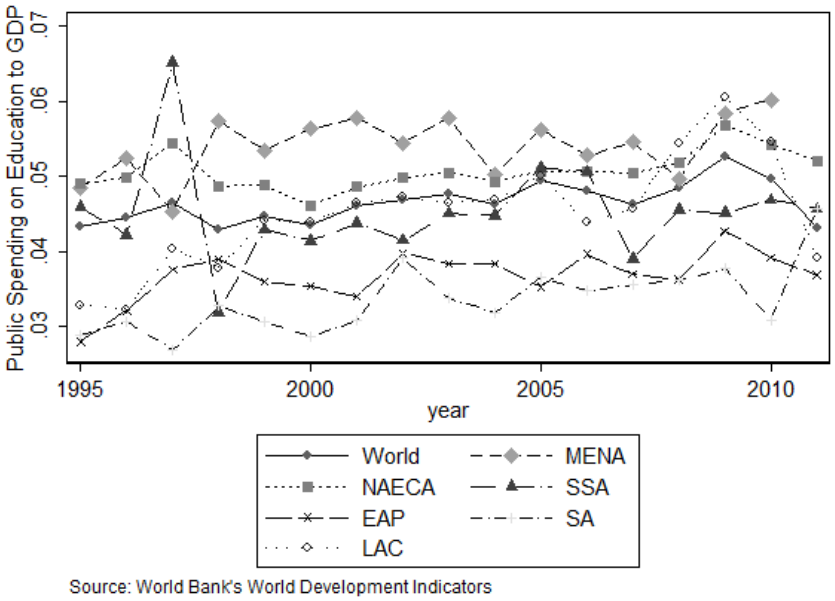


Figure 4.3. Public Spending on Social Infrastructure (World Average)

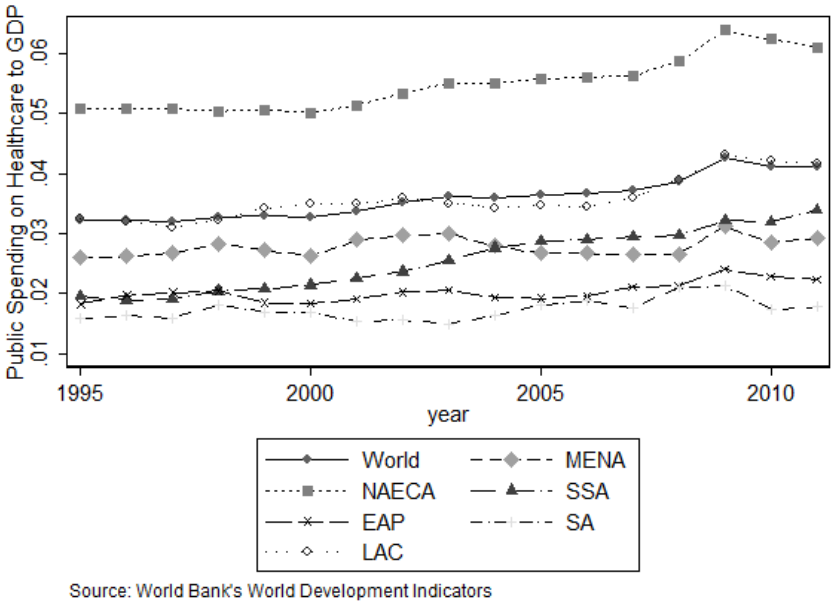
Source: World Development Indicators (World Bank).

and highest in LAC (100.6%). Trade as a percentage of GDP ranges from a low of 65.2% in SA, to a high of 120.0% in EAP; industrialization ranges from a low of 23.5% in SA, to a high of 40.1% in MENA. Institutional quality, estimated with the Rule of Law index (Kaufmann, Kraay, and Mastruzzi, 2013)—an index comprised of multiple measures of property rights, contract enforcement, and the police and court systems—ranges from approximately -2.5 (poorest quality) to 2.5 (highest quality). The highest and lowest Rule of Law indices appear in NAECA (0.80) and SSA (-0.64), respectively.

Figure 4.4 (a) illustrates the ratio of education spending to GDP across regions, whereas figure 4.4 (b) the patterns of healthcare spending. As a ratio of GDP, public spending on education is highest on average in MENA and lowest in SA; LAC has experienced the greatest relative increase in the average ratio of education spending to GDP. In terms of healthcare spending, NAECA leads by far in terms of highest average ratio, while SA experiences the lowest average ratio. SSA has enjoyed the greatest relative increase in the average rate of healthcare spending as a percentage of GDP.



(a)



(b)

Figure 4.4. Regional Trends in Social Infrastructure Spending

Note: World Regions: NAECA (North America, Europe, and Central Asia), EAP (East Asia and the Pacific), LAC (Latin America and the Caribbean), MENA (Middle-East and North Africa), SA (South Asia), and SSA (sub-Saharan Africa). Source: World Development Indicators (World Bank).

4.3.2. Econometric Tests and Specifications. The issue of nonstationarity being commonly prevalent in panel data, we utilize Fisher's test for stationarity under the null hypothesis of nonstationarity (Maddala and Wu, 1999) and find that we are able to reject the null for all variables except for those of secondary school attainment. Upon first differencing, we are able to reject the null for the three transformed variables. The results below are estimated with the initially stationary and transformed educational attainment variables.

We provide correlation matrices in Appendix 4D which we use to evaluate our data for the potential problem of collinearity. We utilize the general rule of thumb given by Kennedy (2003) where if a correlation coefficient is greater than 0.80 in absolute value, the relevant variables may exhibit collinearity severe enough to invalidate their associated coefficient estimates. To test for the presence of multicollinearity, we calculate condition numbers and variance inflation factors (VIFs) for each model, where condition numbers and VIFs exceeding 30 and 5, respectively, typically indicate significant multicollinearity. We find that the highest correlation coefficient, 0.79, is produced by female and male secondary school attainment, though this set of variables does not co-exist in any one estimation. The absolute value of all other correlation coefficients are under 0.60. The highest condition number and VIF in any estimation—27.75 and 3.29, respectively—are associated with the growth model. As neither exceed warning levels, we argue against the possibility that significant multicollinearity is an issue in this analysis.

While fertility rates and dependency ratios were also considered as determinants of gendered employment (in lieu of population), the variables exhibit significant collinearity problems. Correlation matrices indicate significant negative collinearity between both rates and initial GDP per capita, and public spending on healthcare; additionally, calculated condition numbers are above the threshold. Therefore, we use population as a way to capture the influence that additional members of the household have on gendered employment in subsequent estimations.

Next, we calculate the modified Wald statistics and utilize a test for groupwise heteroskedasticity among the residuals under the null of homoskedasticity and find that we are

able to reject the null and conclude that all of our estimations exhibit heteroskedasticity. Following Wooldridge (2001), we test for serial correlation in the errors with a null of no serial correlation and reject the null for all of our equations. Hence, we include standard errors robust to heteroskedasticity and serial correlation in all our estimations.

Given the endogeneity of economic growth in our employment estimations as detailed in section 4.2 above, estimating employment via OLS results in correlations between the error terms and the endogenous variable, thereby violating the assumptions of OLS. Thus, we control for endogeneity in estimating employment using two econometric approaches, a two-stage least squares instrumental variable (2SLS) estimation and a three-stage least squares simultaneous equation (3SLS) estimation. The former estimation technique allows us to control for endogeneity by using instruments for growth, while the latter controls for endogeneity similarly to that of 2SLS but also takes into account the covariances across equation error terms. When using these estimation techniques, we must test for the validity of our instruments and for identification in our 3SLS estimation. In our 2SLS estimation we chose instruments for growth, namely, inflation and initial GDP per capita, that are directly related to economic growth but not employment. Inflation is commonly used as an instrument for growth in the literature (Easterly, 1999; Barro, 1996) due to the fact that inflation is negatively directly related to economic growth (De Gregorio, 1996). Furthermore, it has no direct impact on employment as it only influences via its effect on economic growth, as evidenced by the fact that inflation is not considered a determinant of employment conceptually (see chapter 1), nor in the literature. Alternatively, Helliwell and Putnam (1995), Aidt, Dutta, and Sena (2008), Barro (1996), and Zhang and Casagrande (1998) propose that initial GDP per capita be used as an instrument for growth given the convergence hypothesis where the size of an economy is negatively directly related to its growth rate. Additionally, initial GDP theoretically has no bearing on employment and is not evidenced empirically as having such a relationship.

We test the validity of our instruments—that they are uncorrelated with the error term and thus not directly related to employment—by calculating the Sargan-Hansen test statistic

of overidentifying restrictions. With a null hypothesis of valid instruments, we do not find evidence to reject the null in our 2SLS estimations with one exception, the estimation of male employment. Since we are able to reject the null in this one case, we must conclude that the chosen instruments are somewhat correlated with male employment and thus must view the coefficient on growth in this estimation with caution. We also calculate the strength of our instruments—that they are adequately correlated with the endogenous regressor—using the Angrist and Pischke (2008) tests for underidentification and weak identification. We are unable to reject the null for both, with a null of identification and strongly identified instruments, respectively, and conclude that our instruments are identified, and strongly so, in all of our estimations.[6]

The two chosen instruments are not the only variables indicated in the literature as being adequate instruments for economic growth. Bhattacharyya and Jha (2009) and Fleck (2013) suggest using geographical variables, such as land area, seaboard, natural resources, and tropical location, as instruments for growth. However, the relationship between geography and economic growth may not be systemic across the world; many economies with larger total land ownership are now advanced while others of similar size are much less developed. Thus, using land area as an instrument for economic growth may be more appropriate in regional analyses, such as those evaluating economic growth in one continent or another, or in province/state-level analyses at the country level, but choose to test geography for its strength as an instrument for growth nonetheless. We utilize the log of land area as an instrument for growth in addition to inflation (specification 1), initial GDP (specification 2), and both inflation and initial GDP (specification 3). Using the Anderson, Rubin, et al. (1949) tests for underidentification and weak identification, we find sufficient evidence to reject the null for both, with a null of identification and strongly identified instruments, respectively. We must therefore conclude that this alternative instrument for growth is not

[6]We also utilize the Cragg and Donald (1993) F statistic for weak identification. With a null of weakly identified instruments, we have sufficient evidence to reject the null. Additionally, we utilize the Kleibergen and Paap (2006) and Anderson, Rubin, et al. (1949) tests for weakly identified instruments and conclude that our model is not weekly identified.

adequately correlated with growth and thus should not be used as an instrument for growth in our employment model.

Lastly, to provide confidence in our 3SLS estimation, we must ensure that our model is identified—the number of unknowns in the system does not exceed the number of equations—which would verify that our structural parameters are appropriately specified, and that the instruments are valid. We use Baum (2007) to test the rank and order conditions which are necessary and sufficient conditions for identification in a simultaneous equation system and find that the system is fully identified, providing confidence in the uniqueness of our derived structural coefficients. We calculate a Sargan-Hansen test statistic and verify the validity and identification of our instruments, in that they are adequately correlated with the endogenous variables while also not correlated with the error terms.

4.4. Results and Economic Significance Estimations

Tables 4.2-4.6 report the results of our employment models where the dependent variables in the first three tables, tables 4.2, 4.3, and 4.4, are the gap, the female employment rate, and the male employment rate, respectively. Each estimation is made using multiple econometric methodologies under two separate specifications to add robustness to the results. We first utilize panel-corrected standard error (PCSE) estimations, found in columns (1) and (4). However, as this technique ignores the potential problem of endogeneity, we next control for the possible correlations between the possibly endogenous variables and the error terms by instrumenting for economic growth in two-stage least squares (2SLS) estimations (columns 2 and 5). Finally, we control for endogeneity, in addition to the potential correlation between the equations' error terms, by using three-stage least squares (3SLS) simultaneous equation estimations in which equation 4 is estimated with all three gendered employment variables in concert with equation 5 and all three gendered versions of equation 6 (columns 3 and 6). The conceptual model presented in chapter 1 provides the motivation for this last specification as we illustrate that while gendered human capital and economic growth are explanatory variables for employment, they may contain significant endogenous components as they

themselves are determined by other variables. The subsequent tables, tables 4.5 and 4.6, report the results of our endogenous regressors, growth and human capital, respectively.

Table 4.2. Estimations of the Gap

	Specification 1			Specification 2		
	PCSE	2SLS	3SLS	PCSE	2SLS	3SLS
Dep Var: Gap	(1)	(2)	(3)	(4)	(5)	(6)
Growth	0.147	0.335	0.117	0.149	0.083	0.097
	(0.073)**	(0.499)	(0.073)*	(0.079)*	(0.494)	(0.071)
Invest. % of GDP	0.052	-0.001	0.075	0.034	0.039	0.074
	(0.026)**	(0.110)	(0.048)	(0.025)	(0.108)	(0.047)
Population	-0.010	-0.010	-0.009	-0.013	-0.013	-0.009
	(0.002)***	(0.003)***	(0.003)***	(0.002)***	(0.003)***	(0.003)***
Female-to-Male HC	-0.030	-0.030	0.003	-0.040	-0.043	0.003
	(0.012)**	(0.018)	(0.003)	(0.012)***	(0.017)**	(0.004)
Trade	-0.045	-0.045	-0.047	-0.066	-0.067	-0.051
	(0.007)***	(0.011)***	(0.011)***	(0.008)***	(0.013)***	(0.010)***
Industrialization	-0.068	-0.091	-0.100	-0.014	-0.014	-0.076
	(0.028)**	(0.054)*	(0.035)***	(0.032)	(0.050)	(0.035)**
Public Total % GDP	0.110	0.108	0.053			
	(0.039)	(0.010)	(0.068)			
Non-S.I. % of GDP				-0.185	-0.225	-0.166
				(0.065)***	(0.113)**	(0.084)**
Health % of GDP				0.424	0.436	0.702
				(0.170)**	(0.298)	(0.293)**
Education % of GDP				0.994	0.999	0.089
				(0.186)***	(0.218)***	(0.045)**
NAECA	-0.001	-0.003	-0.001	-0.004	-0.002	-0.002
	(0.005)	(0.017)	(0.012)	(0.003)	(0.017)	(0.012)
MENA	-0.247	-0.248	-0.241	-0.262	-0.266	-0.240
	(0.007)***	(0.013)***	(0.014)***	(0.007)***	(0.014)***	(0.014)***
SSA	0.008	0.006	0.015	-0.002	-0.006	0.016
	(0.005)	(0.015)	(0.012)	(0.005)	(0.016)	(0.012)
LAC	-0.079	-0.077	-0.083	-0.096	-0.098	-0.096
	(0.006)***	(0.014)***	(0.013)***	(0.006)***	(0.015)***	(0.013)***
SA	-0.132	-0.132	-0.131	-0.132	-0.131	-0.127
	(0.012)***	(0.022)***	(0.016)***	(0.012)***	(0.021)***	(0.015)***
Constant	0.111	0.118	0.078	0.145	0.155	0.075
	(0.030)***	(0.060)*	(0.051)	(0.037)***	(0.062)**	(0.051)
R2	0.52	0.52	0.52	0.54	0.54	0.53
N	705	669	705	705	669	704

Notes: Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Inflation and initial GDP are used as instruments for economic growth in the 2SLS estimations. All explanatory variables are lagged one period. Non-S.I. refers to public spending net of spending on social infrastructure. Human capital variables are first-differenced. The 3SLS results are obtained by simultaneously estimating a system of 7 equations with endogenous variables of the gap, female and male employment, economic growth, and the growth rates of female, male, and female-to-male human capital. Regional dummies include all but that of EAP.

Table 4.3. Female Employment Rate Estimations

	Specification 1			Specification 2		
Dep Var: Female Employment Rate	PCSE (1)	2SLS (2)	3SLS (3)	PCSE (4)	2SLS (5)	3SLS (6)
Growth	0.169	0.493	0.139	0.173	0.248	0.141
	(0.054)***	(0.359)	(0.076)*	(0.060)***	(0.314)	(0.075)*
Invest. % of GDP	0.121	0.044	0.134	0.105	0.080	0.127
	(0.036)***	(0.089)	(0.050)***	(0.036)**	(0.078)	(0.049)**
Population	-0.008	-0.008	-0.007	-0.008	-0.009	-0.007
	(0.002)***	(0.003)**	(0.003)**	(0.002)***	(0.003)***	(0.003)***
Female HC	-0.002	-0.002	0.020	-0.024	-0.029	0.028
	(0.023)	(0.035)	(0.011)*	(0.022)	(0.034)	(0.015)*
Trade	-0.051	-0.050	-0.051	-0.065	-0.064	-0.060
	(0.007)***	(0.010)***	(0.011)***	(0.008)***	(0.010)***	(0.011)***
Industrialization	-0.012	-0.038	-0.023	0.017	0.008	-0.004
	(0.025)	(0.043)	(0.037)	(0.026)	(0.040)	(0.037)
Public Total % GDP	0.095	0.113	0.079			
	(0.046)**	(0.085)	(0.070)			
Non-S.I. % of GDP				0.164	0.159	0.064
				(0.075)**	(0.117)	(0.093)
Health % of GDP				0.762	0.688	0.687
				(0.223)***	(0.277)**	(0.307)**
Education % of GDP				1.132	1.171	0.596
				(0.308)***	(0.329)***	(0.199)***
NAECA	-0.021	-0.024	-0.023	-0.023	-0.020	-0.028
	(0.007)***	(0.017)	(0.012)*	(0.006)**	(0.017)	(0.013)
MENA	-0.272	-0.270	-0.270	-0.287	-0.287	-0.276
	(0.008)***	(0.015)***	(0.015)***	(0.009)***	(0.014)***	(0.015)***
SSA	-0.065	-0.064	-0.061	-0.076	-0.078	-0.065
	(0.007)***	(0.016)***	(0.013)***	(0.007)***	(0.015)***	(0.013)***
LAC	-0.074	-0.068	-0.074	-0.088	-0.085	-0.086
	(0.006)***	(0.014)***	(0.013)***	(0.007)***	(0.015)***	(0.014)***
SA	-0.123	-0.119	-0.123	-0.127	-0.124	-0.123
	(0.016)***	(0.024)***	(0.016)***	(0.015)***	(0.023)***	(0.016)***
Constant	0.551	0.558	0.543	0.525	0.536	0.522
	(0.034)***	(0.057)***	(0.053)***	(0.039)***	(0.056)***	(0.053)***
R2	0.43	0.41	0.43	0.44	0.44	0.44
N	705	669	705	704	668	704

Notes: See Table 4.2

Table 4.4. Male Employment Rate Estimations

	Specification 1			Specification 2		
Dep Var: Male Employment Rate	PCSE (1)	2SLS (2)	3SLS (3)	PCSE (4)	2SLS (5)	3SLS (6)
Growth	0.018	0.083	0.024	0.042	0.126	0.047
	(0.050)	(0.269)	(0.044)	(0.048)	(0.265)	(0.043)
Invest. % of GDP	0.066	0.053	0.058	0.057	0.045	0.050
	(0.026)**	(0.062)	(0.029)**	(0.027)**	(0.063)	(0.028)*
Population	0.001	0.001	0.002	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Male HC	0.076	0.079	0.019	0.073	0.076	0.026
	(0.014)***	(0.018)***	(0.009)**	(0.013)***	(0.018)***	(0.013)**
Trade	-0.004	-0.003	-0.004	-0.009	-0.008	-0.010
	(0.005)	(0.007)	(0.007)	(0.007)	(0.009)	(0.007)
Industrialization	0.070	0.070	0.077	0.067	0.064	0.074
	(0.016)***	(0.035)**	(0.021)***	(0.018)***	(0.034)*	(0.021)***
Public Total % GDP	0.004	0.011	0.025			
	(0.034)	(0.055)	(0.040)			
Non-S.I. % of GDP				0.190	0.227	0.218
				(0.090)**	(0.103)**	(0.058)***
Health % of GDP				-0.127	-0.232	-0.055
				(0.150)	(0.212)	(0.177)
Education % of GDP				0.413	0.451	0.533
				(0.282)	(0.373)*	(0.198)***
NAECA	-0.031	-0.031	-0.023	-0.033	-0.032	-0.027
	(0.006)***	(0.010)***	(0.007)***	(0.006)***	(0.010)***	(0.007)***
MENA	-0.026	-0.021	-0.029	-0.034	-0.030	-0.038
	(0.010)***	(0.011)*	(0.009)***	(0.008)***	(0.010)***	(0.009)***
SSA	0.068	-0.065	-0.077	-0.074	-0.070	-0.081
	(0.005)***	(0.009)***	(0.007)***	(0.007)***	(0.010)***	(0.007)***
LAC	0.009	0.012	0.009	0.010	0.015	0.009
	(0.006)	(0.008)	(0.008)	(0.007)	(0.009)*	(0.008)
SA	0.008	0.012	0.008	0.004	0.007	0.003
	(0.006)	(0.009)	(0.009)	(0.006)	(0.009)	(0.009)
Constant	0.456	0.457	0.463	0.447	0.449	0.450
	(0.027)***	(0.031)***	(0.031)***	(0.026)***	(0.030)***	(0.031)***
R2	0.43	0.42	0.42	0.44	0.43	0.43
N	705	669	705	704	668	704

Notes: See Table 4.2

Table 4.5. Economic Growth Estimations

	Specification 1		Specification 2	
	PCSE	3SLS	PCSE	3SLS
Dep Var: Growth	(1)	(2)	(3)	(4)
Initial GDPpc	-0.002	-0.002	-0.002	-0.002
	(0.001)*	(0.001)*	(0.001)	(0.001)
Invest. % of GDP	0.205	0.218	0.207	0.220
	(0.070)***	(0.025)***	(0.069)***	(0.024)***
Population	0.002	0.002	0.002	0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Total HC	-0.015	-0.018	-0.018	-0.020
	(0.016)	(0.016)	(0.017)	(0.016)
Female-to-Male HC	-0.002	-0.003	-0.003	-0.003
	(0.010)	(0.008)	(0.012)	(0.008)
Trade	0.011	0.010	0.011	0.011
	(0.007)*	(0.005)*	(0.007)*	(0.005)**
Public Total % GDP	-0.109	-0.110		
	(0.044)**	(0.037)***		
Non-S.I. % of GDP			-0.161	-0.165
			(0.089)*	(0.054)***
Health % of GDP			-0.023	-0.044
			(0.183)	(0.167)
Education % of GDP			-0.351	-0.389
			(0.337)	(0.181)**
NAECA	0.025	0.025	0.024	0.025
	(0.009)***	(0.007)***	(0.009)***	(0.007)***
MENA	-0.005	-0.006	-0.004	-0.004
	(0.007)	(0.008)	(0.009)	(0.008)
SSA	-0.019	-0.017	-0.019	-0.017
	(0.008)**	(0.006)***	(0.010)**	(0.006)***
LAC	-0.011	-0.011	-0.013	-0.012
	(0.006)*	(0.006)*	(0.007)*	(0.007)*
SA	-0.004	-0.004	-0.003	-0.004
	(0.007)	(0.003)	(0.008)	(0.009)
Great Recession	-0.050	-0.051	-0.051	-0.052
	(0.017)***	(0.009)***	(0.017)***	(0.009)***
Rule of Law	0.004	0.004	0.003	0.003
	(0.004)	(0.003)	(0.004)	(0.003)
R2	0.43	0.45	0.44	0.45
N	719	705	718	704

Notes: See Table 4.2

Table 4.6. 3SLS Human Capital Estimations

Dep Var:	Female HC growth (1)	Male HC growth (2)	Female-to-Male HC growth (3)
Female HC	0.001		
	(0.008)		
Male HC		0.000	
		(0.006)	
Female-to-Male HC			0.002
			(0.001)
Education % of GDP	0.100	0.142	0.066
	(0.155)*	(0.111)*	(0.091)
NAECA	0.012	0.003	0.009
	(0.010)	(0.007)	(0.006)
MENA	0.034	0.006	0.028
	(0.014)**	(0.010)	(0.008)***
SSA	0.036	0.022	0.015
	(0.009)***	(0.007)***	(0.005)***
LAC	0.020	0.009	0.011
	(0.011)*	(0.008)	(0.006)*
SA	0.061	0.026	0.035
	(0.014)***	(0.010)***	(0.008)***
R2	0.12	0.09	0.07
N	704	704	704

Notes: Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Education expenditure is lagged one period.

We present two specifications of employment, where our first specification, also called the partial-specification model, includes total public spending as an employment and growth regressor. Alternatively, in our second specification, called the full-specification model, we regress employment and growth on public spending net of social infrastructure, education spending and public spending on healthcare. The rationale behind these two specifications is based on the theory that the two categories of spending on social infrastructure may be related to employment in different ways than all other public spending, and with differing magnitudes (see chapter 1 for full details). By first regressing aggregate public spending, and subsequently, disaggregated spending, we can capture how these alternative specifications can lead to dissimilar results and policy conclusions.

As we discuss the econometric results in table 4.2, we wish to draw attention to the fact that due to the formulation of the gap, increases in the gap indicate positive movements in gender equality in employment while reductions indicate the opposite. Furthermore, we must use these results in combination with the results from the estimations of the female and male employment rates to fully determine the impact on gendered welfare, as increases in the gap may be due to either positive movements in women's employment relative to men's (upward harmonization), or to negative movements in the employment rates of both genders where the associated losses in women's employment are less than those of men's (downward harmonization).

The results in table 4.2 indicate that growth is only positively related to gender equality in employment at statistically significant levels in half of the specifications; while it is statistically significant in both our PCSE estimations and the 3SLS estimation under the first specification, is not statistically significant in either of our 2SLS estimations. The results presented in table 4.3 suggest that economic growth may be positively associated with the female employment rate. Across all specifications, the results imply that growth may be a powerful job creator for women, however, when growth is instrumented with inflation and initial GDP (in the 2SLS estimations), the results are not statistically significant. In table 4.4 we report the results for the male employment rate which indicate that economic growth is not related to the male employment rate at statistically significant levels in any estimation. These findings suggest that it may be the case that at least for women's employment, the connection between growth and employment expressed in our model (Figure 1.2) is appropriate.

Given that the relationship between growth, the gap, and the female employment rate is positive and significant in several estimations, while the relationship between the gap and the male employment rate is not statistically significant in any estimation, we argue that economic growth may increase gender equality in employment. This move towards equality occurs via upward harmonization as women's employment rises with growth while men's employment either rises or is unaffected. That is, since the female employment rate

appears to be somewhat associated with economic growth, while the male employment rate does not, the results may signify that women's employment is more responsive to economic fluctuations than men's. If women function as the reserve labor force, then their employment would be more reactive to growth than men's. Furthermore, growth itself may not be directly related to male employment from year-to-year, given that we control for the determinants of economic growth, and thus this explanatory variable is intended to capture the employment that is created by the additional economic activity induced by economic growth. That is, the Keynesian multiplier process may take longer to influence men's employment than women's. Further studies with longer time horizons may be able to better capture this effect.

The relationship between female-to-male secondary school attainment and the gap is not robust; in the PCSE and 2SLS estimations the relationship is negative whereas in the 3SLS estimation, where gender-relative educational attainment and its role in economic growth is endogenized, the relationship is positive. Furthermore, this ratio is only statistically significant in half of the estimations. The positive relationship between female secondary school attainment and the female employment rate only exists at statistically significant levels in the 3SLS estimations. On the other hand, the positive relationship between the male employment rate and male secondary school attainment is robust across specifications. The fact that men exhibit a greater association between employment and educational attainment may indicate that the opportunity cost of not working is higher for men than for women. Thus the relationship between human capital accumulation and employment, presented in figure 1.2, may be stronger for men than women.

Industrialization is negatively related to the gap in all estimations and is statistically significant in more than half of the estimations. While the relationship between industrialization and the female employment rate is not statistically significant in any estimation, the positive relationship between the male employment rate and industrialization is robust across specifications. Regarding the transmission mechanism between employment and industrialization presented in figure 1.2, the relationship between industrialization and women's employment is almost non-existent whereas the relationship between men and industrialization is strong

and positive. With a null hypothesis of equality between the coefficients on industrialization in the estimations of gendered employment rates, we use a Wald test and find significant evidence to reject the null and conclude that the coefficients are different at the 10% significance level in all but the PCSE estimation of specification 2. Thus, men's employment may be more strongly reactive to the process of industrialization and the structural shift towards industrial output than women's.

The negative relationship between the population and the gap and female employment rate is robust across all estimations, while no statistically significant relationship exists between the population and the male employment rate. These results indicate that the while the male employment rate remains unaffected by the size of an economy's population, an economy with a larger population is associated with a lower the relative female employment rate and depressed gender equality in employment.

Additionally, trade is negatively related to the gap and the female employment rate at statistically significant levels across all estimations while trade is not statistically significantly related to the male employment rate in any estimation. Therefore, trade is associated with reductions in the female employment rate and gender equality in employment. While theoretically we anticipate that trade in levels may be positively associated with employment for both genders (see figure 1.2), we do not find this when estimating trade as a ratio of GDP. Rather, these results imply that economies in which trade encompasses a relatively larger share of GDP experience relatively lower levels of employment. This may in part be due to a focus on manufacturing in export sectors, and therefore greater capital-labor ratios than those found in other sectors of the economy.

Conversely, investments in fixed assets are only statistically significant in one estimation of the gap. While such investments are positively related to the employment rates for both genders at significant levels across the PCSE and 3SLS estimations, the coefficients in the 2SLS estimations are positive, though not at statistically significant levels.[7] Thus the results are consistent with the hypothesis presented in our model that investments in fixed assets are

[7]Using a Wald test of the equality of coefficients on trade in the estimations of gendered employment rates, we do not find evidence to reject the null.

positively associated with the employment rates of both genders; interestingly, this occurs where each gender is affected in such a way that gender equality in employment remains unchanged.

Regarding the regional dummy variable results, given that EAP is the excluded region, all the presented regional coefficients should be considered relative to this region. For example, with negative coefficients, the results indicate that observations in MENA, LAC, and SA tend to exhibit lower levels of gender equality in employment than those in EAP, all else equal across estimations. Relative to EAP, the female employment rate tends to be lower in MENA, SSA, LAC, and SA countries, findings which are robust across estimations. Regarding the male employment rate, the results indicate that relative to EAP, the male employment rate tends to be lower in NAECA, MENA, and SSA at statistically significance levels across estimations; there are no robust differences between the male employment rates in EAP and LAC and SA. While the results relating SSA and the gap indicate that the gender equality is greater in SSA than EAP, the robust negative relationship between SSA and the female and male employment rates indicate that the gap is lower in SSA than EAP, not due to a higher female employment rate, but instead due to a lower relative male employment rate. These results are consistent with the basic findings presented in figure 4.2.

In specification 1, (columns 1, 2, and 3), the relationship between aggregate public spending and the gap is not statistically significant. While consistently positive, in only one estimation is aggregate public spending statistically significantly related to the employment rate of either gender. In specification 2, (columns 4, 5, and 6), where public spending is disaggregated into public spending net of social infrastructure, spending on healthcare, and education spending, the estimated coefficients on non social infrastructure spending exhibit statistical significance across all estimations of the gap and the male employment rate where the coefficients are consistently negative and positive, respectively. In the estimation of the female employment rate, coefficients on non social infrastructure is positive in only one estimation. These results imply that non social infrastructure spending is associated with reductions in gender equality in employment as it is associated with men's employment

whereas it exhibits no significant relationship with women's employment. Thus, while theory purports that public spending in general may be good for women, these results reveal that not all public spending is positively associated with women's relative employment.

In analyzing the disaggregated categories of social infrastructure spending, we find that both categories exhibit positive relationships with the gap and the female employment rate, results which are robust across estimations; the single exception being the coefficient on healthcare spending in the 2SLS estimation of the gap which is positive but not statistically significant. While the positive relationship between the male employment rate and public spending on education is statistically significant across two of the estimations, the male employment rate is not related to healthcare spending at statistically significant levels across estimations. The results imply that healthcare spending is associated with increases in women's relative employment via upward harmonization in that women's employment increases whereas men's does not. Furthermore, we find sufficient evidence to reject the null of equality between the coefficients on education spending in the female and male employment rate estimations using a Wald test at the 10% significance level in two of the three estimations. Thus, while the evidence indicates that public spending on education is positively associated with the employment rates of both genders, thus supporting the theory presented in our model of employment (figure 1.2), the association with the female employment rate is stronger allowing us to conclude that women's relative employment increases via upward harmonization.

By estimating our model in two specifications, our results illustrate how disaggregating public spending can lead to different conclusions than when aggregating. In tables 4.3 and 4.4, two categories of public spending exhibit positive relationships with employment while the other exhibits a negative relationship. Thus, it is not surprising that the results from the partial-specification model were not statistically significant, nor were the signs consistent across techniques. We therefore argue that disaggregating public spending may provide an even greater understanding of the determinants of employment.

As we have fully evaluated the results of our employment model, we next discuss the findings of the 3SLS estimations of economic growth (table 4.5) and gendered human capital accumulation (table 4.6). To provide robustness to the results, in addition to the two specifications of the 3SLS estimation, we provide PCSE estimations of economic growth. These findings indicate that in specification 1, initial GDP per capita is negatively related to economic growth, thus possibly indicating the presence of convergence as described by Kneller, Bleaney, and Gemmell (1999). However, while the negative coefficient is also present in the second specification, it is not statistically significant at the 10% level. The strong positive associations between economic growth and investments and trade are robust across specifications at statistically significant levels—results which are consistent with the model presented in chapter 1 (figure 1.2). Secondary school attainment, both in total, and measured in gender equality, are not related to economic growth at statistically significant levels in any estimation.

Robust across estimations, growth rates in NAECA economies are typically higher than those of EAP. Conversely, the SSA and LAC regions exhibit growth rates that are lower than those of EAP. Robust across estimations, the great recession, our time fixed-effect which controls for the macroeconomic conditions in 2008 and 2009, is associated with lower economic growth. While our institutional control, the rule of law index, is positively associated with economic growth, it is not statistically significant at the 10% level in any estimation. While at first we would hypothesize that the rule of law is positively related to economic growth, once we control for all of the components of economic activity that may be influenced by the rule of law, such as trade, investments, and public spending (Rodrik, Subramanian, and Trebbi, 2004), it is not surprising that this institutional control is not statistically significant.

Public spending in the partial specification model is negatively associated with economic growth at statistically significant levels in both estimations. Because our model is specified such that public spending is made net of taxes, it may be the case that in aggregate, the taxes required to fund public spending may reduce economic growth in the subsequent year. It is imperative to note here that this is a short-run model where all explanatory variables are

lagged one period, and thus processes which may take longer than a year to create economic growth would not be reflected positively here. Additionally, the short time lag may allow the reverse chain of causality, where poor growth performances may require a political response such as increases in public spending to appear in these results, thereby producing the negative relationship between economic growth and aggregate public spending. Further studies may control for this reverse chain by further lagging public spending or by averaging spending and growth across time and estimating the relationship in a cross-country analysis.

In the full-specification model, public spending net of social infrastructure is negatively associated with economic growth at statistically significant levels across estimation techniques. Here, we again consider the same rationale for this relationship as with aggregate public spending, where the negative tax effects may be outweighing the positive growth effects and/or the reverse chain of causality may be driving the negative results. In one of the two estimations, public spending on education is negatively associated with economic growth at a statistically significant level. This is not surprising given the short-run specification of this model where returns to education may be associated with improvements in technological progress, productivity, and growth in the *long-run* (Romer, 1990; Klasen and Lamanna, 2009). Furthermore, this relationship may be distorted by reverse causality where alternatively, the expected positive returns may be seen in five or ten year lags (Krueger and Lindahl, 2000). Additionally, as evidenced earlier, the effect public spending may have on women's employment and secondary school attainment should increase women's bargaining power within the household through their relative provisioning capacity and voice, and thus their control over the household resources (Braunstein, 2008). When women have greater control over household resources children's health and education increase (Doss, 2013), which is found to be growth-enhancing in the long-run (Klasen and Lamanna, 2009). Thus, further studies which incorporate longer lags may be able to capture these other positive long-term effects of education spending.

Public spending on healthcare is not related to economic growth at statistically significant levels. Given the downward pull of public spending, described above, the lack of relationship

between healthcare spending and economic growth may indicate that the positive growth effects of healthcare may be somewhat offsetting the negative effects. Additionally, several studies have argued that the relationship between public spending on healthcare and healthcare outcomes, such as reductions in infant/child mortality, is weak and/or nonexistent (Baldacci, Clements, Gupta, and Cui, 2008; Filmer and Pritchett, 1999; Musgrove, 1996), possibly due to the fact that much of public spending on healthcare is allocated towards obtaining cures as opposed to prevention services (Kelly, 1997; Mundle, 1998). It may also be the case that since an increase in healthcare spending refers to increase in healthcare spending as a fraction of GDP, the cause of the larger fraction of GDP allocated to healthcare (such as an outbreak, fire, earthquake, or other natural disaster) may be what is driving the negative relationship with economic growth. For any/all of these reasons, it is not surprising that the relationship between healthcare spending and economic growth is not statistically significant. Further studies may be able to capture the hypothesized growth-enhancing characteristics of healthcare spending by first separating out the allocations of healthcare spending into preventative and non-preventative categories, then by using controls for natural disasters, and finally, by controlling for the reverse chain of causality between public spending and economic growth. The resultant analyses should indicate that preventative healthcare spending is positively related to economic growth.

Lastly, table 4.6 provides the results of our second specification of the 3SLS estimations of the growth rate of female human capital, male human capital, and the ratio of female-to-male human capital. We find that the level of secondary school attainment is not related to the associated growth rate in any estimation, that relative to EAP, SSA and SA are associated with higher growth rates in secondary school attainment for both genders, and that the growth rate of gender equality in such educational attainment is higher in MENA, SSA, LAC, and SA than in EAP. We also find that public spending on education corresponds positively with the growth rates of secondary school completion for both genders.

To act as a robustness check on our results, we estimate the system of equations where we alternatively define human capital as completion of at least primary education as opposed

to secondary. These results, found in Appendix 4F, are for the most part consistent with the previous estimation in that results relating to social infrastructure spending are undeviating across the definitions of human capital, though the results on the relationship between the gap and healthcare spending exhibit less statistical significance in the alternative estimation. In the estimations of the gap and the female employment rate the coefficients on the accumulation of female-to-male and female primary education are positive and statistically significant in at least half of the specifications. Furthermore, in the estimation of the gap the coefficients on industrialization are larger in absolute value and more statistically significant when estimating with primary education data. Regarding the estimations of economic growth, investments in fixed-assets and trade became insignificant while female-to-male human capital and the rule of law became significant in all of the 3SLS estimations. In the alternative estimation, the relationship between public spending on education and attainment of primary education remains positive but is no longer statistically significant.

For additional robustness, we estimate the system using a 2SLS estimation with a lagged value of the endogenous variable (economic growth) as an instrument as per Easterly (1999), Anderson and Hsiao (1981), and Judson and Owen (1999) who argue that such an approach increases efficiency without losing effectiveness. Since this estimation is exactly identified, we are unable to test the assumption that the error terms are not correlated with the instrument; however in testing the strength of our instrument we find it weak across equations and estimations. Regarding social infrastructure spending, the results (which can be found in Appendix 4G) indicate consistency with those found under previous instruments. Furthermore, in the estimations of the gap and the female employment rate, the coefficients on growth are statistically significant with larger magnitudes than under the previous instruments. We additionally provide estimates of economic growth with alternative proxies for institutional quality (including corruption and voice) in Appendix 4H.

Regarding public spending on social infrastructure, the results presented above are consistent with the conceptual model presented in chapter 1 in that public spending on healthcare and education are public policies which may increase gender equality in employment via

upward harmonization through direct employment effects and/or indirect effects by way of household constraints. This is evidenced by the fact that both are associated with increases in the gap and the female employment rate with either positive or a lack of a significant relationship with the male employment rate. While neither category of social infrastructure is associated with an increase in short-run economic growth, as per figure 1.2 such spending may increase growth in the long-run through its effects on human capital, women's bargaining power, and long-run productivity (Klasen and Lamanna, 2009; Doss, 2013; Braunstein, 2008). Furthermore, the results presented here illustrate how the process of economic growth and investments in fixed assets and human capital accumulation may positively affect women's relative employment without harming men's, and thus are positively associated with women's relative employment via upward harmonization whereas industrialization, the size of the population, trade, and public spending net of social infrastructure are positively related to men's relative employment.

4.5. Economic Significance & Policy Implications

In an effort to provide a grounded interpretation of these results, we provide economic significance calculations utilizing a methodology proposed by Miller and van der Meulen Rodgers (2008). In table 4.7, we present economic significance calculations as the product of a one standard deviation change in each independent variable (table 4.1) and that variable's estimated coefficient in the full-specification simultaneous equation estimation of each of the endogenous variables (tables 4.2-4.6). We chose this estimation because the full-specification model is more explanatory than the partial-specification and because the 3SLS estimation controls for endogeneity as well as the correlation between the equations' error terms and thus is the most appropriate estimation for our system of equations. Each estimation of economic significance can be interpreted as the impact on the dependent variable of a one standard deviation increase in the explanatory variable.

For example, a one standard deviation increase in economic growth is correlated with a 0.7% increase in the female employment rate calculated as the product of 5.3% (one

standard deviation, found in table 4.1) and 0.141 (the coefficient on growth found in the 3SLS estimation of Specification 2 in table 4.3). While the same increase in economic growth is associated with a 0.3% increase the male employment rate and a 0.5% increase in the gap, they are not statistically significant at the 10% level. All further discussions of economic significance are limited to those significant at the 10% significance level.

Table 4.7. Economic Significance

1 SD change in:	Female Employ. Rate	Male Employ. Rate	The Gap	Growth	Female HC Growth	Male HC Growth	F-to-M HC Growth
Growth	**0.7%**	0.3%	0.5%				
Invest. % of GDP	**1.0%**	**0.4%**	0.6%	**1.7%**			
Population (log)	**-1.2%**	0.2%	**-1.5%**	**0.3%**			
Gendered HC	**0.5%**	**0.5%**	0.1%	-0.1%	0.0%	0.0%	0.1%
Trade as % of GDP	**-3.0%**	-0.5%	**-2.5%**	**0.5%**			
Industrialization	0.0%	**0.9%**	**-0.9%**				
Non-S.I. % of GDP	0.3%	**0.9%**	**-0.7%**	**-0.6%**			
Health % of GDP	**1.4%**	-0.1%	**1.4%**	-0.1%			
Education % of GDP	**1.1%**	**1.0%**	**0.2%**	**-0.7%**	**0.2%**	**0.3%**	0.1%
Initial GDP				-0.4%			
Rule of Law				0.3%			

Notes: Entries in **bold** indicate statistical significance. Gendered human capital refers to female human capital in the estimations of the female employment rate and the growth rate of female human capital, male human capital in the estimations of the male employment rate and the growth rate of male human capital, and female-to-male human capital in all other estimations. "Invest." and "Non-S.I." refer to investments in fixed assets and non social infrastructure investments, respectively.

A one standard deviation increase in investments is also associated with a 1.0%, 0.4%, and 1.7% increase in the female employment rate, the male employment rate, and economic growth, respectively. A one standard deviation increase in the size of the population is associated with a 1.2% decline in the female employment rate, a 1.5% decline in the gap, and a 0.3% increase in economic growth.

A one standard deviation increase in secondary school attainment is associated with a 0.5% increase the employment rate for both genders. A one standard deviation increase

in trade is related to a 3.0% decline in the female employment rate, a 2.5% decline in the gap, and a 0.5% increase in economic growth. Public spending net of social infrastructure also exhibits mixed results as a one standard deviation is associated with a 0.9% increase in the male employment rate, and a 0.9% and 0.6% decrease in the gap and economic growth, respectively. A one standard deviation increase in industrialization is associated with a 0.9% increase in the male employment rate and a 0.9% decrease in the gap. A one standard deviation increase in public spending on healthcare is associated with a 1.4% increase in the female employment rate and the gap. A one standard deviation increase in education spending is correlated with a 1.1% and 1.0% increase in the female employment rate and the male employment rate, respectively, a 0.2% increase in the gap, a 0.7% decrease in economic growth, and a 0.2% and 0.3% increase in the growth rates of female and male secondary school completion, respectively.

4.6. Conclusion

In an econometric analysis of 138 countries from 1995 to 2011, this work expands the current empirical literature relating infrastructure spending and gendered variables and can be used to broaden the list of available tools from which to draw when aiming to implement development policy in a gender-sensitive manner.

In this paper we estimate the relationships between social infrastructure spending, gendered employment and economic growth in a regional context using multiple econometric techniques and under two model specifications where gendered employment is estimated as a function of social infrastructure controlling for demand, structural change, and human capabilities. We also include economic significance calculations and discuss the policy implications of our results.

We find that public spending on education and healthcare may be used as policy tools to increase gender equality via upward harmonization; despite the lack of increase in short-run economic growth, theoretically such spending may increase growth in the long-run. Furthermore, economic growth may also be beneficial for gender equality in employment. Our

results also indicate that trade, public spending net of social infrastructure, the size of the population, and industrialization are all associated with declining equality in employment.

We also acknowledge a main limitation of this study in that it utilizes a short-run perspective on the multitude of relationships evaluated here. Future work with a longer time horizon may be able to capture the long-run mechanisms that allow public spending on social infrastructure to be translated to productivity, and thus economic growth, either via significant time lags or by averaging data and implementing a cross-sectional study. Furthermore, a long-run evaluation would also be able to control for the potential reverse causality that may be relating public spending and economic growth in our model.

It is hoped that this work encourages further evaluations of social infrastructure spending, as well as the multitude of alternative policy prescriptions through a gendered lens.

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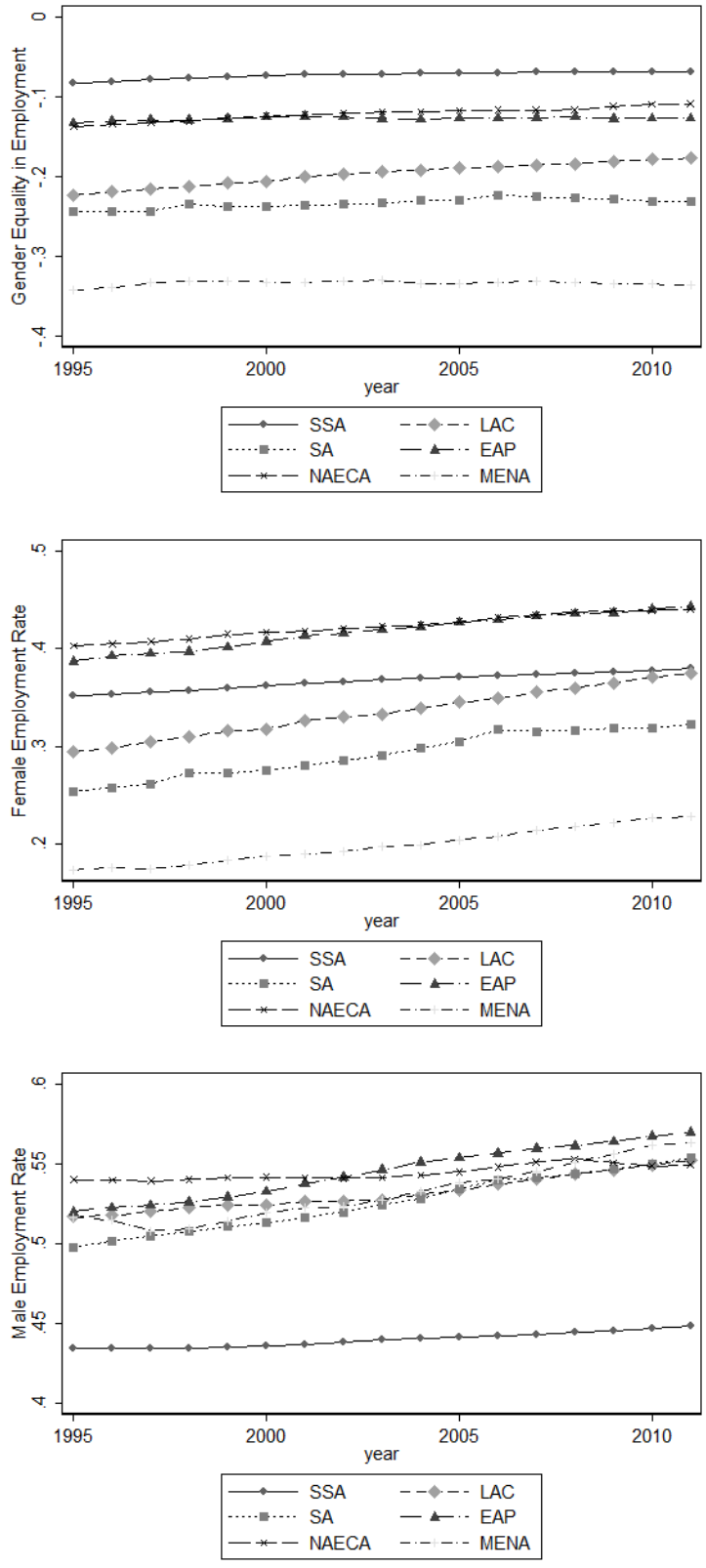

Appendix 4A: Regional Patterns of Gendered Employment

Appendix 4B: Data Descriptions

Variable	Description	Source
Population	Total population figures include all residents regardless of legal status or citizenship at midyear. The female population comprises of women who meet the requirements of the population above. The male population is calculated as the difference between the total and female populations.	Author's calculations, World Bank's World Development Indicators, "Population (Total)" and "Population, female (% of total)"
Human Capital	Percentage of the population age 15 and over who have obtained at least secondary education, measured by gender, in five year intervals (1995, 2000, 2005, 2010). Measurements are extended forward from each interval.	Author's calculations, Barro and Lee Educational Attainment Dataset (2013)
Employment	All legally and formally employed persons (both part-time and full-time) age 15 and older. Female employment is calculated as the product of total employment and the female share of employment. Male employment is calculated as the difference between total and female employment.	Author's calculations, International Labour Organization Indicators
Real GDP per capita	Gross domestic product, gross value added produced in the economy plus taxes and minus subsidies not included in the value of the products, as a ratio of the midyear population measured using 2005 U.S. dollars. Growth is measured as the growth rate of real GDP per capita. Missing data for Argentina, Cambodia, Croatia, Djibouti, Ireland, Jamaica, Kuwait, Libya, Maldives, Myanmar, and Qatar supplemented with that of World Economic Outlook Database (International Monetary Fund, 2013).	World Bank's World Development Indicators, "GDP per capita (constant 2005 US$)" and International Monetary Fund's World Economic Outlook Database, "Gross domestic product per capita, constant prices"
Investments	Gross fixed capital formation includes plant, machinery, and equipment purchases, construction expenditures on roads, railways, schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings, and land improvements.	World Bank's World Development Indicators, "Gross fixed capital formation (% of GDP)"
Public Spending	General government expenditures on goods and services from central and local sources, less spending on education and healthcare obtained from World Development Indicators (World Bank, 2013). Missing data for Myanmar, Samoa, Solomon Islands, and United Arab Emirates supplemented with that of World Economic Outlook Database (International Monetary Fund, 2013).	Author's calculations, World Bank's World Development Indicators, "General government final consumption expenditure (% of GDP)" and International Monetary Fund's World Economic Outlook Database, "General government total expenditure"
Healthcare Spending	Public expenses on health including spending from central and local governments and foreign borrowings and grants.	World Bank's World Development Indicators, "Health expenditure, public (% of GDP)"
Education Spending	Public expenses on education includes government spending (from central and local sources) on institutions, administration, and subsidies for private entities.	World Bank's World Development Indicators, "Public spending on education, total (% of government expenditure)"

Trade	The value of all goods and other market services provided to the rest of the world, less the value of all goods and other market services received from the rest of the world . These indicators include "the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services" (World Bank, 2013).	Author's calculations, World Bank's World Development Indicators, "Exports of goods and services (% of GDP)" and "Imports of goods and services (% of GDP)"
Industrialization	Comprised of value added in the following categories: "mining, manufacturing, construction, electricity, water, and gas" (World Bank, 2013).	World Bank's World Development Indicators, "Industry, value added (% of GDP)"
Inflation	The growth rate of the price index measuring changes in the prices of goods and services consumed by a typical household.	Author's calculations, International Monetary Fund's World Economic Outlook Database, "Inflation, end of period consumer prices"
Rule of Law	An indicator which captures the quality of governance, namely, contract enforcements, the court and legal systems, and the probability of crime. Governance ranges from -2.5 (weak) to 2.5 (strong). Missing years are smoothed with subsequent data.	Kaufmann, Kraay, and Mastruzzi's Rule of Law index (2013)

Appendix 4C: Countries Listed by Region

NAECA		EAP	SA	LAC	MENA	SSA
Albania	Latvia	Brunei Darussalam	Bangladesh	Argentina	Algeria	Benin
Armenia	Lithuania	Cambodia	India	Barbados	Bahrain	Botswana
Australia	Luxembourg	China	Maldives	Belize	Cyprus	Burundi
Austria	Moldova	Equatorial Guinea		Bolivia	Egypt, Arab Rep.	Cameroon
Belgium	Netherlands	Fiji	Nepal	Brazil	Iran, Islamic Rep.	Central African Republic
Bulgaria	New Zealand	Indonesia	Pakistan	Chile	Israel	Congo, Dem. Rep.
Canada	Norway	Korea, Rep.	Sri Lanka	Colombia	Jordan	Congo, Rep.
Croatia	Poland	Lao PDR		Costa Rica	Kuwait	Cote d'Ivoire
Czech Republic	Portugal	Malaysia		Cuba	Libya	Gabon
Denmark	Romania	Mongolia		Dominican Republic	Malta	Gambia, The
Estonia	Russian Federation	Myanmar		Ecuador	Morocco	Ghana
Finland	Slovak Republic	Philippines		El Salvador	Qatar	Kenya
France	Slovenia	Singapore		Guatemala	Saudi Arabia	Lesotho
Germany	Spain	Thailand		Guyana	Syrian Arab Republic	Liberia
Greece	Sweden	Tonga		Haiti	Tunisia	Malawi
Hungary	Switzerland	Vietnam		Honduras	United Arab Emirates	Mali
Iceland	Tajikistan			Jamaica	Yemen, Rep.	Mauritania
Ireland	Turkey			Mexico		Mauritius
Italy	Ukraine			Nicaragua		Mozambique
Japan	United Kingdom			Panama		Namibia
Kazakhstan	United States			Paraguay		Niger
Kyrgyz Republic				Peru		Rwanda
				Trinidad and Tobago		Senegal
				Uruguay		Sierra Leone
				Venezuela, RB		South Africa
						Swaziland
						Tanzania
						Togo
						Uganda
						Zambia
						Zimbabwe

Appendix 4D: Correlation Matrix

	Gap	Female Emp. Rate	Male Emp. Rate	Growth	Initial GDP	Invest. % of GDP	Non-S.I. % of GDP	Health % of GDP	Education % of GDP
Growth	0.02	0.12	0.17	1.00					
Initial GDP	-0.24	0.00	0.44	0.07	1.00				
Invest. % of GDP	-0.04	0.10	0.25	0.37	0.19	1.00			
Non-S.I. % of GDP	0.00	-0.02	-0.05	-0.08	0.02	0.11	1.00		
Health % of GDP	0.15	0.16	0.02	-0.03	0.24	0.12	0.15	1.00	
Education % of GDP	0.03	-0.06	-0.17	-0.10	-0.01	0.13	0.32	0.40	1.00
Population	-0.25	-0.16	0.17	0.05	-0.11	-0.09	-0.20	-0.39	-0.23
F-to-M HC	-0.10	0.05	0.28	0.04	0.35	0.20	0.21	0.37	0.30
Female HC	-0.09	0.14	0.41	0.15	0.30	0.20	0.13	0.29	0.12
Male HC	-0.08	0.15	0.41	0.15	0.24	0.18	0.07	0.23	0.06
Trade % of GDP	0.03	0.09	0.09	0.15	0.25	0.36	0.21	0.27	0.40
Industrialization	-0.21	-0.07	0.27	0.26	0.32	0.36	0.08	-0.07	0.02
Rule of Law	-0.27	-0.06	0.39	0.03	0.41	0.25	0.18	0.36	0.27
NAECA	0.18	0.25	0.11	0.19	0.11	0.15	0.18	0.26	0.00
MENA	-0.57	-0.58	0.04	0.00	0.09	0.00	0.08	-0.12	0.14
SSA	0.38	0.06	-0.59	-0.22	-0.37	-0.26	0.13	-0.08	0.08
LAC	-0.14	0.01	0.27	-0.09	0.28	0.02	-0.21	0.33	0.01
SA	-0.21	-0.12	0.18	0.05	-0.23	0.04	-0.13	-0.33	-0.10

Appendix 4D: Correlation Matrix (continued)

	Population	F-to-M HC	Female HC	Male HC	Trade % of GDP	Industrialization	Rule of Law	NAECA	MENA	SSA	LAC	SA
Population	1.00											
F-to-M HC	-0.27	1.00										
Female HC	-0.05	0.64	1.00									
Male HC	0.06	0.40	0.94	1.00								
Trade % of GDP	-0.47	0.48	0.32	0.19	1.00							
Industrialization	0.07	0.36	0.23	0.17	0.40	1.00						
Rule of Law	-0.13	0.35	0.23	0.16	0.23	0.09	1.00					
NAECA	-0.07	0.22	0.58	0.60	0.15	-0.01	-0.04	1.00				
MENA	0.15	-0.05	-0.07	-0.03	-0.10	0.16	0.11	-0.17	1.00			
SSA	-0.20	-0.37	-0.60	-0.60	-0.11	-0.23	-0.17	-0.37	-0.23	1.00		
LAC	-0.15	0.30	0.13	0.06	-0.03	0.02	0.11	-0.23	-0.14	-0.31	1.00	
SA	-0.20	0.43	-0.21	0.01	-0.29	-0.12	-0.04	-0.15	-0.09	-0.20	-0.12	1.00

Appendix 4E: First-Stage Regressions: Specification 1

Dep Var: Growth	Female Emp. (2SLS)	Male Emp. (2SLS)	Gap (2SLS)	S.E. (3SLS)
Invest. % of GDP	0.192	0.194	0.191	0.149
	(0.061)***	(0.063)***	(0.060)***	(0.026)***
Population	0.000	0.000	0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Female HC	-0.022			0.038
	(0.018)			(0.280)
Male HC		-0.022		-0.129
		(0.016)		(0.258)
Female-to-Male HC			-0.012	-0.024
			(0.010)	(0.061)
Trade	0.007	0.006	0.007	-0.002
	(0.006)	(0.006)	(0.006)	(0.006)
Industrialization	0.076	0.074	0.080	0.065
	(0.035)**	(0.034)*	(0.037)**	(0.020)***
Public Total % GDP	-0.139	-0.143	-0.132	-0.050
	(0.040)***	(0.042)***	(0.040)***	(0.046)
NAECA	0.025	0.026	0.023	0.018
	(0.005)***	(0.006)***	(0.006)***	(0.006)***
MENA	-0.001	-0.003	-0.008	-0.009
	(0.007)	(0.006)	(0.006)	(0.008)
SSA	-0.010	-0.009	-0.008	-0.020
	(0.007)	(0.006)	(0.006)	(0.007)***
LAC	-0.007	-0.007	-0.006	-0.010
	(0.006)	(0.006)	(0.006)	(0.006)
SA	0.000	0.001	0.000	-0.004
	(0.007)	(0.006)	(0.006)	(0.009)
Inflation	-0.061	-0.061	-0.060	
	(0.012)***	(0.012)***	(0.013)***	
Initial GDPpc	-0.003	-0.003	-0.003	-0.003
	(0.002)*	(0.002)*	(0.002)*	(0.001)**
Great Recession				-0.041
				(0.009)***
Rule of Law				0.002
				(0.003)
Constant	0.016	0.015	0.022	0.076
	(0.035)	(0.035)	(0.038)	(0.030)***
R2	0.29	0.29	0.30	0.30
N	669	669	669	705

Notes: Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Non-S.I. refers to public spending net of social infrastructure. Human capital is first differenced.

First-Stage Regressions: Specification 2

Dep Var: Growth	Female Emp. (2SLS)	Male Emp. (2SLS)	Gap (2SLS)	S.E. (3SLS)
Invest. % of GDP	0.193	0.195	0.189	0.153
	(0.061)***	(0.062)***	(0.061)***	(0.026)***
Population	0.001	0.001	0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Female HC	-0.020			0.048
	(0.018)			(0.279)
Male HC		-0.022		-0.130
		(0.015)		(0.257)
Female-to-Male HC			-0.012	-0.023
			(0.010)	(0.060)
Trade	0.009	0.009	-0.010	-0.002
	(0.006)*	(0.006)	(0.006)*	(0.006)
Industrialization	0.075	0.074	-0.076	0.070
	(0.034)**	(0.033)**	(0.037)**	(0.020)***
Non-S.I. % of GDP	-0.211	-0.217	-0.108	-0.094
	(0.062)***	(0.065)***	(0.042)***	(0.059)
Health % of GDP	-0.185	-0.187	-0.023	0.197
	(0.178)	(0.178)	(0.183)	(0.181)
Education % of GDP	-0.548	-0.555	-0.269	-0.156
	(0.210)***	(0.214)***	(0.095)***	(0.208)
NAECA	0.025	0.026	0.022	0.018
	(0.006)***	(0.006)***	(0.006)***	(0.007)**
MENA	0.003	0.003	0.001	-0.008
	(0.007)	(0.006)	(0.007)	(0.008)
SSA	-0.008	-0.007	-0.008	-0.021
	(0.007)	(0.006)	(0.006)	(0.007)*
LAC	-0.007	-0.006	-0.005	-0.014
	(0.007)	(0.007)	(0.007)	(0.007)*
SA	0.002	0.003	0.001	0.001
	-0.007	(0.006)	-0.006	-0.009
Inflation	-0.062	-0.062	-0.062	
	(0.012)***	(0.012)***	(0.012)***	
Initial GDPpc	-0.003	-0.003	-0.003	-0.003
	(0.002)*	(0.002)*	(0.002)*	(0.001)**
Great Recession				-0.043
				(0.009)***
Rule of Law				0.001
				(0.003)
Constant	0.024	0.023	0.017	0.075
	(0.037)	(0.036)	(0.038)	(0.030)**
R2	0.30	0.30	0.30	0.30
N	668	668	669	704

Notes: See notes from Appendix 4E: Specification 1.

Appendix 4F: Estimations of the Gap (Human Capital=Primary Education)

Dep Var:	Specification 1			Specification 2		
Gap	PCSE	2SLS	3SLS	PCSE	2SLS	3SLS
Growth	0.153	0.046	0.101	0.023	-0.162	0.086
	(0.072)**	(0.327)	(0.079)	(0.019)	(0.337)	(0.078)
Invest. % of GDP	0.001	-0.009	0.030	-0.013	-0.002	0.023
	(0.035)	(0.072)	(0.053)	(0.036)	(0.072)	(0.052)
Population	-0.008	-0.007	-0.008	-0.001	-0.009	-0.008
	(0.002)***	(0.004)*	(0.003)***	(0.003)	(0.004)**	(0.003)***
Female-to-Male HC	0.038	0.043	0.015	0.005	0.027	0.014
	(0.010)***	(0.016)**	(0.003)***	(0.012)	(0.016)*	(0.004)***
Trade	-0.050	-0.049	-0.047	-0.018	-0.068	-0.051
	(0.006)***	(0.011)***	(0.011)***	(0.006)***	(0.013)***	(0.011)***
Industrialization	-0.129	-0.145	-0.111	-0.082	-0.086	-0.086
	(0.031)**	(0.054)***	(0.038)***	(0.036)**	(0.052)*	(0.038)**
Public Total % GDP	-0.005	-0.049	0.050			
	(0.046)	(0.088)	(0.068)			
Non-S.I. % of GDP				-0.075	-0.323	-0.177
				(0.054)	(0.108)***	(0.086)**
Health % of GDP				0.046	0.305	0.688
				(0.165)	(0.286)	(0.297)**
Educ. % of GDP				0.303	0.806	0.070
				(0.140)**	(0.230)***	(0.059)
NAECA	0.004	0.008	0.003	-0.007	0.008	0.002
	(0.005)	(0.016)	(0.012)	(0.006)	(0.017)	(0.012)
MENA	-0.232	-0.232	-0.237	-0.243	-0.249	-0.235
	(0.007)***	(0.015)***	(0.015)***	(0.009)***	(0.015)***	(0.014)***
SSA	0.019	0.016	0.017	0.023	0.005	0.018
	(0.005)***	(0.015)	(0.012)	(0.005)***	(0.016)	(0.012)
LAC	-0.081	-0.081	-0.081	-0.091	-0.100	-0.093
	(0.006)***	(0.014)***	(0.013)***	(0.008)***	(0.016)	(0.014)***
SA	-0.134	-0.133	-0.131	-0.174	-0.130	-0.127
	(0.012)***	(0.022)***	(0.016)***	(0.013)***	(0.022)***	(0.016)***
Constant	0.050	0.048	0.059	-0.053	0.077	0.063
	(0.028)*	(0.063)	(0.052)	(0.042)	(0.067)	(0.052)
R2	0.53	0.52	0.52	0.70	0.53	0.53
N	700	664	700	700	664	699
Validity		Passed			Passed	
Identification		Passed	Passed		Passed	Passed

Notes: Standard errors in parentheses; * significance at 10%; ** significance at 5%; *** significance at 1%. Growth is instrumented by inflation and initial GDP in the 2SLS estimations. All explanatory variables are lagged one period. Non-S.I. refers to non social infrastructure spending. Human capital is first differenced. All but the EAP region are included as explanatory variables. Tests for validity utilize Sargan-Hansen test statistics of overidentifying restrictions. Identification in 2SLS and 3SLS estimations are Angrist and Pischke (2008) tests for under and weak identification and Baum (2007) tests of rank/order conditions, respectively.

Female Employment Rate Estimations (Human Capital=Primary Education)

Dep Var: Female Employment Rate	Specification 1 PCSE	2SLS	3SLS	Specification 2 PCSE	2SLS	3SLS
Growth	0.197	0.455	0.160	0.197	0.175	0.156
	(0.061)***	(0.334)	(0.083)*	(0.065)***	(0.260)	(0.082)*
Invest. % of GDP	0.128	0.078	0.121	0.121	0.113	0.113
	(0.044)***	(0.077)	(0.056)**	(0.041)***	(0.070)*	(0.055)**
Population	-0.007	-0.008	-0.008	-0.008	-0.008	-0.008
	(0.002)***	(0.003)**	(0.003)***	(0.002)***	(0.003)**	(0.003)***
Female HC	-0.008	-0.002	0.048	-0.031	-0.028	0.058
	(0.016)	(0.032)	(0.012)***	(0.017)*	(0.032)	(0.015)***
Trade	-0.051	-0.051	-0.053	-0.064	-0.063	-0.061
	(0.008)***	(0.010)***	(0.012)***	(0.008)***	(0.010)***	(0.011)***
Industrialization	-0.015	-0.030	-0.025	0.008	0.001	-0.011
	(0.027)	(0.039)	(0.040)	(0.029)	(0.038)	0.040
Public Total % GDP	0.100	0.095	0.059			
	(0.048)**	(0.083)	(0.072)			
Non-S.I. % of GDP				0.204	0.177	0.068
				(0.082)**	(0.117)	(0.095)
Health % of GDP				0.783	0.677	0.581
				(0.227)***	(0.276)**	(0.311)*
Educ. % of GDP				1.264	1.253	0.697
				(0.338)***	(0.349)***	(0.209)***
NAECA	-0.021	-0.024	-0.023	-0.024	-0.021	-0.026
	(0.006)***	(0.016)	(0.013)*	(0.006)***	(0.016)	(0.013)**
MENA	-0.273	-0.270	-0.263	-0.291	-0.289	-0.269
	(0.007)***	(0.015)***	(0.015)***	(0.008)***	(0.015)***	(0.015)***
SSA	-0.065	-0.063	-0.055	-0.078	-0.078	-0.057
	(0.007)***	(0.015)***	(0.013)***	(0.007)**	(0.015)**	(0.013)***
LAC	-0.073	0.069	-0.073	-0.087	-0.084	-0.083
	(0.006)***	(0.014)***	(0.013)***	(0.007)***	(0.015)***	(0.014)***
SA	-0.124	-0.119	-0.116	-0.131	-0.126	-0.115
	(0.015)***	(0.024)***	(0.017)***	(0.014)***	(0.023)***	(0.016)***
Constant	0.549	0.560	0.544	0.515	0.523	0.515
	(0.036)***	(0.059)***	(0.055)***	(0.037)***	(0.058)***	(0.055)***
R2	0.43	0.41	0.42	0.44	0.44	0.43
N	700	664	700	699	663	699
Validity		Passed			Passed	
Identification		Passed	Passed		Passed	Passed

Notes: See notes from Appendix 4F: Estimations of the Gap (human capital=primary education)

Male Employment Rate Estimations (Human Capital=Primary Education)

Dep Var: Male Employment Rate	Specification 1 PCSE	2SLS	3SLS	Specification 2 PCSE	2SLS	3SLS
Growth	0.054	0.504	0.063	0.075	0.501	0.078
	(0.052)	(0.176)***	(0.047)	(0.052)	(0.165)***	(0.046)*
Invest. % of GDP	0.086	0.028	0.089	0.079	0.035	0.083
	(0.026)***	(0.049)	(0.031)***	(0.026)***	(0.047)	(0.031)***
Population	-0.001	-0.002	-0.000	-0.001	-0.003	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Male HC	0.121	0.132	0.063	0.122	0.129	0.064
	(0.012)***	(0.019)***	(0.011)***	(0.011)***	(0.018)***	(0.014)***
Trade	-0.006	-0.008	-0.006	-0.011	-0.013	-0.011
	(0.005)	(0.007)	(0.007)	(0.006)*	(0.009)	(0.007)*
Industrialization	0.084	0.078	0.087	0.073	0.065	0.078
	(0.018)***	(0.034)**	(0.022)***	(0.019)***	(0.031)**	(0.023)***
Public Total % GDP	-0.009	0.027	0.001			
	(0.035)	(0.046)	(0.040)			
Non-S.I. % of GDP				0.198	0.277	0.220
				(0.093)**	(0.103)***	(0.059)***
Health % of GDP				-0.223	-0.304	-0.132
				(0.145)	(0.201)	(0.174)
Educ. % of GDP				0.553	0.689	0.606
				(0.306)*	(0.390)*	(0.204)***
NAECA	-0.032	-0.040	-0.027	-0.033	-0.039	-0.029
	(0.006)***	(0.009)***	(0.007)***	(0.006)***	(0.010)***	(0.007)***
MENA	-0.017	-0.014	-0.024	-0.027	-0.024	-0.033
	(0.010)*	(0.012)	(0.009)***	(0.008)***	(0.010)**	(0.009)***
SSA	-0.060	-0.054	-0.069	-0.065	-0.059	-0.074
	(0.006)***	(0.010)***	(0.007)***	(0.007)***	(0.010)***	(0.007)***
LAC	0.009	0.014	0.008	0.011	0.018	0.010
	(0.006)	(0.009)	(0.008)	(0.006)*	(0.010)*	(0.008)
SA	0.024	0.029	0.016	0.019	0.022	0.012
	(0008)***	(0.010)***	(0.009)*	(0.007)***	(0.010)**	(0.009)
Constant	0.453	0.467	0.467	0.438	0.450	0.444
	(0.030)***	(0.036)***	(0.031)***	(0.027)***	(0.033)***	(0.031)***
R2	0.45	0.38	0.44	0.46	0.4	0.45
N	700	664	700	699	663	699
Validity		Weak			Weak	
Identification		Passed	Passed		Passed	Passed

See notes from Appendix 4F: Estimations of the Gap (human capital=primary education)

Economic Growth Estimations (Human Capital=Primary Education)

	Specification 1		Specification 2	
Dep Var: Growth	PCSE	3SLS	PCSE	3SLS
Initial GDPpc	-0.002	-0.002	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Invest. % of GDP	0.014	0.023	0.013	0.023
	(0.025)	(0.026)	(0.024)	(0.026)
Population	0.003	0.003	0.003	0.003
	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Total HC	-0.003	-0.004	-0.001	-0.002
	(0.015)	(0.014)	(0.014)	(0.014)
Female-to-Male HC	0.012	0.009	0.015	0.012
	(0.004)***	(0.006)*	(0.004)***	(0.006)**
Trade	0.002	0.002	0.003	0.004
	(0.004)	(0.004)	(0.004)	(0.004)
Public Total % GDP	-0.062	-0.059		
	(0.031)**	(0.034)*		
Non-S.I. % of GDP			-0.158	-0.156
			(0.044)***	(0.049)***
Health % of GDP			0.022	0.017
			(0.171)	(0.146)
Educ. % of GDP			-0.412	-0.417
			(0.126)***	(0.168)**
NAECA	0.028	0.028	0.028	0.028
	(0.008)***	(0.006)***	(0.008)***	(0.006)***
MENA	-0.002	-0.003	0.003	0.002
	(0.007)	(0.007)	(0.007)	(0.007)
SSA	-0.017	-0.016	-0.015	-0.014
	(0.006)***	(0.005)***	(0.006)**	(0.005)**
LAC	-0.009	-0.009	-0.011	-0.010
	(0.006)*	(0.005)*	(0.006)	(0.006)*
SA	0.005	0.005	0.006	0.006
	(0.006)	(0.008)	(0.006)	(0.008)
Great Recession	-0.041	-0.042	-0.042	-0.043
	(0.017)**	(0.007)***	(0.016)***	(0.007)***
Rule of Law	0.008	0.008	0.008	0.008
	(0.003)***	(0.002)***	(0.003)***	(0.002)***
R2	0.44	0.45	0.45	0.46
N	714	700	713	699
Identification		Passed		Passed

See notes from Appendix 4F: Estimations of the Gap (human capital=primary education)

3SLS Human Capital Estimations (Human Capital=Primary Education)

Dep Var:	Female HC growth	Male HC growth	Female-to-Male HC growth
Female HC	0.004		
	(0.003)		
Male HC		0.004	
		(0.002)	
Female-to-Male HC			0.001
			(0.001)
Education % of GDP	0.047	0.019	0.014
	(0.110)	(0.077)	(0.055)
NAECA	0.002	0.001	0.001
	(0.007)	(0.005)	(0.004)
MENA	0.020	0.012	0.008
	(0.010)**	(0.007)*	(0.005)*
SSA	0.021	0.013	0.008
	(0.007)***	(0.005)***	(0.003)**
LAC	0.005	0.003	0.002
	(0.008)	(0.005)	(0.004)
SA	0.054	0.019	0.034
	(0.010)***	(0.007)***	(0.005)***
R2	0.10	0.06	0.11
N	669	669	669

See notes from Appendix 4F: Estimations of the Gap (human capital=primary education)

Appendix 4G: 2SLS Estimations (L.growth as Instrument for Growth)

	Gap		Female Employment Rate		Male Employment Rate	
	Spec. (1)	Spec. (2)	Spec. (1)	Spec. (2)	Spec. (1)	Spec. (2)
Growth	0.851	0.971	0.981	0.870	0.132	0.177
	(0.506)*	(0.595)*	(0.524)*	(0.481)*	(0.225)	(0.239)
Invest.	-0.090	-0.130	-0.044	-0.036	0.042	0.031
	(0.129)	(0.142)	(0.149)	(0.129)	(0.059)	(0.058)
Population	-0.01	-0.013	-0.008	-0.009	0.001	0.001
	(0.003)***	(0.004)***	(0.003)***	(0.003)***	(0.002)	(0.002)
Gendered HC	-0.024	-0.032	0.003	-0.022	0.080	0.077
	(0.021)	(0.022)	(0.039)	(0.037)	(0.019)***	(0.019)***
Trade	-0.047	-0.072	-0.052	-0.067	-0.003	-0.009
	(0.011)***	(0.014)***	(0.011)***	(0.011)***	(0.007)	(0.009)
Ind.	-0.123	-0.073	-0.066	-0.032	0.065	0.059
	(0.070)*	(0.075)	(0.065)	(0.059)	(0.034)*	(0.033)*
Public	0.201		0.203		0.015	
	(0.106)*		(0.120)*		(0.053)	
Non-S.I.		-0.087		0.318		0.227
		(0.125)		(0.167)*		(0.116)**
Health		0.438		0.774		-0.214
		(0.321)		(0.309)**		(0.195)
Education		1.185		1.483		0.47
		(0.251)***		(0.463)***		(0.390)
NAECA	-0.013	-0.017	-0.034	-0.032	-0.032	-0.034
	(0.017)	(0.019)	(0.019)*	(0.018)*	(0.009)***	(0.010)***
MENA	-0.248	-0.265	-0.270	-0.288	-0.021	-0.031
	(0.014)***	(0.014)***	(0.015)***	(0.014)***	(0.012)*	(0.010)***
SSA	0.012	0.002	-0.059	-0.073	-0.065	-0.071
	(0.016)	(0.017)	(0.017)***	(0.016)***	(0.010)***	(0.010)***
LAC	-0.073	-0.089	-0.063	-0.077	0.012	0.015
	(0.015)***	(0.016)***	(0.016)***	(0.017)***	(0.009)	(0.010)
SA	-0.132	-0.133	-0.12	-0.126	0.012	0.006
	(0.023)***	(0.022)***	(0.025)***	(0.024)***	(0.009)	(0.009)
Constant	0.107	0.148	0.553	0.526	0.458	0.451
	(0.066)	(0.069)**	(0.062)***	(0.062)***	(0.032)***	(0.031)***
R2	0.47	0.47	0.340	0.38	0.42	0.43
N	672	672	672	671	672	671
Identification	Weak	Weak	Weak	Weak	Weak	Weak

See notes from Appendix 4F: Estimations of the Gap (human capital=primary education). Ind refers to industrialization. Investments, public, Non-S.I., Health, and Education are all estimated as percentages of GDP.

Appendix 4H: Economic Growth Estimations (Alternative Estimations for Institutional Quality)

Dep Var: Growth	PCSE		3SLS	
Initial GDPpc	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Invest. % of GDP	0.218	0.214	0.232	0.228
	(0.070)***	(0.066)***	(0.024)***	(0.024)***
Population	0.002	0.001	0.002	0.001
	(0.001)**	(0.001)	(0.001)**	(0.001)*
Total HC	-0.015	-0.014	-0.018	-0.017
	(0.017)	(0.016)	(0.016)	(0.016)
Female-to-Male HC	-0.002	0.000	-0.002	-0.001
	(0.012)	(0.012)	(0.008)	(0.008)
Trade	0.009	0.009	0.008	0.009
	(0.006)	(0.006)	(0.006)	(0.005)
Public Total % GDP				
N.I. Public % of GDP	-0.154	-0.152	-0.160	-0.158
	(0.088)*	(0.086)*	(0.054)***	(0.054)***
Health % of GDP	0.116	0.124	0.102	0.100
	(0.178)	(0.178)	(0.169)	(0.168)
Education % of GDP	0.340	0.324	-0.375	0.361
	(0.331)	(0.328)	(0.181)**	(0.182)**
NAECA	0.022	0.020	0.023	0.021
	(0.009)**	(0.009)**	(0.007)***	(0.007)***
MENA	-0.007	-0.004	-0.007	-0.004
	(0.009)	(0.009)	(0.008)	(0.008)
SSA	-0.020	-0.020	-0.018	-0.018
	(0.010)**	(0.010)**	(0.006)***	(0.006)***
LAC	-0.014	-0.016	-0.013	-0.015
	(0.007)*	(0.007)**	(0.007)*	(0.007)**
SA	-0.050	-0.005	-0.006	-0.006
	(0.008)	(0.008)	(0.009)	(0.009)
Great Recession	-0.052	-0.052	-0.053	-0.053
	(0.017)***	(0.017)***	(0.009)***	(0.009)***
Voice	-0.004		-0.004	
	(0.004)		(0.003)	
Corruption		-0.006		-0.005
		(0.006)		(0.004)
R2	0.44	0.44	0.45	0.45
N	718	718	704	704

See notes from Appendix 4F: Estimations of the Gap (human capital=primary education)

Concluding Remarks

In the chapters of this dissertation, we contribute to the gender and development literatures by analyzing the relationship between fiscal policies and gendered employment, first at the theoretical level, and then via empirical evaluations in the contexts of both the Chinese economy and a cross-country study. In the first chapter, we lay the groundwork for this dissertation by summarizing and critiquing the current work on the relationships between fiscal policy, employment, and growth. We discuss the gendered nature of social norms, structures, and institutions and how public spending influences employment directly (where the public sector employs workers) and indirectly (where public spending influences growth which effects employment and where public spending affects household constraints which influence employment). We also provide a unique conceptual model of employment and identify gaps in the relevant literature.

In the second chapter we present an overview of women's role in the Chinese labor market with a focus on: 1) observing women's role in Chinese production in a recent historical context, covering the pre-Maoist era, the era of Mao, and the era of economic transitions; 2) evaluating the role of the state and the economic reforms in employment creation, occupational segregation, and stratification, particularly concerning women; 3) providing an extensive critique of the literature on women's relative wages in China; 4) supplying a synopsis of the status of women within Chinese rural-to-urban migration with particular focus on the current household registration system; and 5) analyzing potential future Chinese growth policies through a gendered lens.

Drawing from the first two chapters, we empirically analyze the relationship between public spending and gendered employment in China in the third. Here we detail functional forms for estimating employment where gendered employment is determined by social infrastructure spending controlling for demand, structural change, and human capabilities. The results indicate that while structural change may have a significant negative influence on gender equality in employment, an element of social infrastructure spending, namely, public spending on education, is positively associated with economic growth and gender equality in employment through upward harmonization. While the results found in this chapter are specific to China, it is hoped that future work may extend this study (and studies of other development policies) to other regions and countries across the world in order to provide gender-sensitive development policies to the developing world.

In the last chapter in this dissertation we extend the empirical procedure from the third to an analysis of social infrastructure spending and its impacts on gendered employment in a world-wide analysis. Empirically, gender equality in employment, the female employment rate, and the male employment rate are estimated as functions of public spending using multiple econometric techniques and controlling for regional differences, the level of industrialization, and the endogeneity of economic growth and human capital accumulation. The results presented in this chapter indicate that public spending on education and healthcare are gender equality enhancing via upward harmonization, while non-infrastructure spending, the size of the population, and industrialization are associated with declines in gender equality in employment. While public spending on infrastructure does not exhibit a positive relationship with economic growth in the short-run, theoretically, the investments should be transmitted into long-run growth through their effects on productivity.

It is hoped that this work encourages future empirical studies on the ways through which public policies may influence women's relative employment, both directly and indirectly by means of the burden of unpaid labor. Many development policies have yet to be evaluated through a gendered lens, and those which have, have likely not been assessed in every country/region worldwide. Future work in this vein may increase the tools available to policy makers who wish to implement development strategies in a gender-sensitive manner, and thus increase the overall standard of living while increasing gender equality in employment.