Stockholm School of Economics
Department of Economics
659 Degree Project in Economics
Spring 2022

Land of the Rising Women?

Estimating the Effect of Gender Culture on Regional Variations in Female Labour Force Participation in Japan

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Abstract

This paper analyses the explanatory power of differences in gender culture on persistent regional variations in female labour force participation across Japan. The phenomenon is scarcely studied, and establishing causality has never been the subject of research. The analysis is conducted at both the regional and prefectural level, using data from the World Values Survey, the Japanese General Social Survey, and macro-level data from Japanese Government Statistics. It also employs historical instrumental variables as an identification strategy for the effect of gender culture, using data from the 1925 Population Census. The empirical strategy aggregates data using both grouped and predicted means, the latter via the construction of a latent variable, and conducts four separate two-stage least squares estimations. We find gender culture to have no significant effect at the regional level, and some significant effect at the prefectural level. We conclude that the evidence for prefectures holds up poorly, however, with economic sector composition a more convincing explanatory variable and weak instruments not allowing for any means of causal inference. This conclusion is reached despite the literature conducting similar studies for other countries, which altogether identify significant effects of gender culture.

Keywords female labor force participation, gender culture, regional differences, instrumental variable estimation, latent variable

JEL R12, J70, C36

Supervisor:	Assistant Professor Fabio Blasutto
Date submitted:	16 May 2022
Date examined:	25 May 2022
Discussants:	Alexander Håkansson and Julia Lundgren
Examiner:	Professor Johanna Wallenius

Acknowledgements

We would like to thank the many individuals who facilitated us in this project: our thesis supervisor, Assistant Professor Fabio Blasutto, for his encouragement and help; Assistant Professor Pamela Campa, for generously sharing her advice and for her personal research contribution to gender and labour economics which we relied on heavily in carrying out this study; Associate Professor Patrik Ström, Director of the European Institute of Japanese Studies, for sharing his expertise of the Japanese context as we embarked on studying a country we knew far too little about; the wonderful Professor Anna Dreber Almenberg, for taking the time to discuss identification strategies with us; Assistant Professor Yoko Okuyama, for assisting us in finding data sets and candidates for our instrumental variables; and Sayuri Nakagawa of the Dentsu Institute for her inputs on the classification of the World Values Survey for Japan data.

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1 Introduction

The rise in female labour force participation rates among the countries that were early to industrialise may have been one of the most impactful economic phenomena of the 1900s. Interestingly, Japan has long lagged behind in female labour force participation, but after a period of rapid rise starting in the 2000s, surpassed the OECD average and reached levels a rate of 72 percent in 2019 (Shambaugh et al., 2017). While rarely commented on by Western scholars, Japan has considerable regional variations in patterns of female labour force participation, with a region on the Northern coast of Japan's largest island Honshu enjoying comparatively high rates (Y. Abe, 2013).

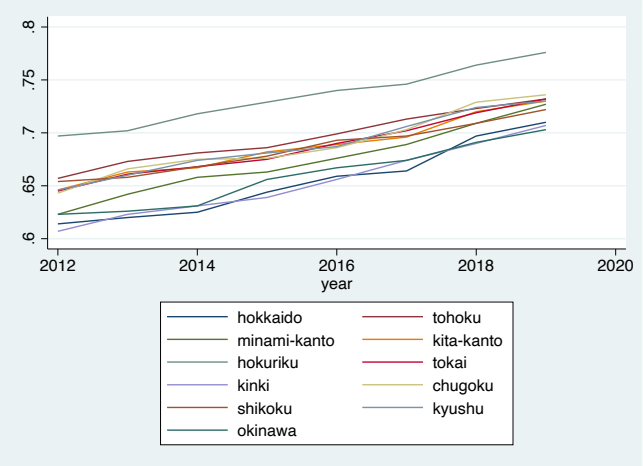

Figure 1: Regional Female Labor Force Participation Rate of Japan, 2012–2019 (% of Female Population Ages 15–64) (Japanese Government Statistics)

It is interesting to note that this region has displayed far higher rates for a long time, and moreover, as is observable on Figure 1, these patterns have persisted throughout the recent rise for Japan as a whole. Clearly, some economic and/or social factors should be able to account for these regional variations, and institutions should not, given that these regions find themselves in a context with institutional homogeneity.

We identify two distinct sets of reasons to study female labour force participation and the determinants thereof. First, there is an economic and demographic argument for increasing female labour force participation. For instance, Hsieh et al. (2013, p. 1473) find that "one-fifth of U.S. market GDP growth can be explained by falling labor market barriers, falling human capital barriers, and shifting occupational preferences" in the period 1960–2010. Indeed, the American experience of generating growth by shifting more women and racial minorities into high-skill occupations has been a key growth driver, with lessened discrimination creating more efficient labour markets for talent sorting (Hsieh et al., 2013). In the specific case of Japan, it has been estimated that Japanese GDP could rise by as much as 15 percent if the gender employment gap were to close and the ratio of female-to-male working hours rise to the OECD average (Matsui et al., 2019), which makes a strong case for the importance of pursuing

such a set of policies. The incentives for doing so are further strengthened by the looming demographic emergency caused by Japan's rapidly aging population (Crawford, 2021). If more women are not brought into the workforce, Japan will head towards disaster, which is especially true in light of Japan's reluctance towards and limited historical experience of assimilating large numbers of immigrants (Crawford, 2021). Promoting participation of women in economic activities is therefore a key policy imperative for Japan.

Second, there is a case for gender equality pertaining to women's ability to engage equally with the labour market and earn compensation for work done on equal terms as determined by said market. A low female-to-male labour force participation rate is an indication of labour market barriers for women and, unless it reflects a stark divide in preferences for work, would clearly imply prevalent gender inequality. Assuming that men and women do indeed have different preferences with regards to labour market participation, negative externalities may still be posed by reasons related to income distribution, as the lower participation by women will leave them more dependent on men for disposable income throughout various stages of their life. This problem can be exemplified by the high poverty rates of elderly Japanese women, who receive low pensions after lifetimes of little work, or at least less than their male counterparts on average (A. K. Abe, 2012). This argument is furthered by the finding that women are more affected by "the social disadvantages of poverty" than men (Goldberg (2010) as cited in (Zhou, 2020)). These findings then amount to an important reason for raising female labour force participation being a Japanese policy objective, but also an important motivation for why the underlying drivers of female labour force participation are worth examining.

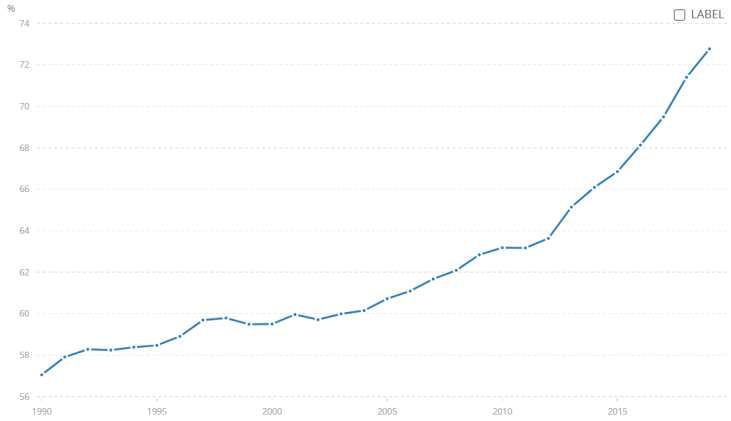

Figure 2: Japan's Female Labor Force Participation Rate, 1990–2019 (% of Female Population Ages 15–64) (World Bank)

The study of female labour force participation in Japan is also of contemporary importance. The aforementioned rise in female labour force participation throughout in recent decades, also represented in Figure 2, has led to Japan surpassing both the OECD average and the United States, whose rates have stagnated in that same period (Shambaugh et al., 2017). And yet the rise has coincided with a plunge in rankings of gender equality, where the World Eco-

nomic Forum ranked Japan at 120 of 150, an exceptionally low placing among the G-7 countries (WEF, 2021). These seemingly paradoxical parallel processes can be traced to the gendered post-war labour market features of Japan (Yamaguchi, 2019), and this contradictory pair of trends makes the Japanese setting all the more interesting for studies of how countries undergo changes in the gender-related conditions for participation in the labour market. Given that Japan is then a high-income country with low gender equality, its study fits well into the labour and gender economics fields, which strive towards explaining the dynamics of labour markets and how economic activities relate to gender. We thus identify Japan's persistent regional variations in female labour force participation as largely unstudied, at least with methods for causal inference (Y. Abe, 2013), and conclude that it is a relevant topic of study.

We attempt causal inference by motivating the use of several instrumental variables, which we implement independently in a model building on two measures of gender culture for the regions and prefectures of Japan, and then relating these to their respective female labour force participation rates. We operate on the definition of culture as the "systematic variation in beliefs and preferences across time, space, or social groups" by Fernandez (2007), where spatial variations are the particular subject of study in this thesis. We find the effect of gender culture to be insignificant in explaining regional differences in female labour force participation, in part due to difficulties relating to data availability, but also with reference to economic sector composition as a more convincing explanatory variable.

The ensuing paper is organised as follows: Section 2 provides a background of the Japanese labour market and how gender relates to it; Section 3 a literature review of previously conducted research on determinants of female labour force participation and the use of instrumental variable estimation in labour economics; Sections 4 and 5 the proposed research design and methodology to estimate the effect of gender culture; Section 6 the utilised data sets and its variables; Sections 7 and 8 the results and a discussion of their implications; and Section 9 concludes.

2 Background

An examination of the effect of gender culture on determining regional variations in female labour force participation in Japan necessitates an understanding of the Japanese labour market and how gender relates to it, recent developments and reforms aimed at increasing female labour force participation, and the persistence of historical trends in regional female labour force participation.

2.1 Gender and the Japanese Labour Market

To begin with, Japan lags considerably across rankings of gender equality relative to its economic development, particularly when compared with other OECD member nations. There are two chief reasons for Japan's poor showing in measures of gender equality: First, Japan is characterised by a low proportion of women in managerial positions at approximately 10 percent compared with the 30–40 percent typical for most Western nations, and has experienced low historic rates of improvement. Second, Japan is marked by a large gender wage gap, in that women earn a wage approximately 70 percent of that of men, compared with the 80–90 percent common in many OECD member nations (Yamaguchi, 2019, pp. 2–3). In fact, when accounting for the disproportionally large number of women in non-regular part-time work, women's average hourly wage nears 60 percent of that of men:

		Full-time, regular	Full-time, non-regular	Part-time, regular	Part-time, non-regular	Total/ mean
Composition of employees	Men	0.840	0.075	0.003	0.082	1.000
	Women	0.474	0.146	0.009	0.371	1.000
Mean hourly wage (JPY)	Men	2094	1324	1342	1059	1949
	Women	1462	1041	1068	939	1203
Wage ratio (women:men)		0.698	0.786	0.796	0.887	0.617

Table 1: Employment Type and Hourly Wages by Gender, 2008 Wage Trend Census (Yamaguchi (2009) as cited in (Yamaguchi, 2019, p. 4)).

The gender disparity in the composition of employment types is firmly associated with the propensity of women to leave the labour force to care for their children, to then pursue chiefly non-regular part-time work upon their return. The subsequent effects on the gender wage gap are, moreover, exacerbated by the labour institutions which prevail across Japanese firms (Yamaguchi, 2019, pp. 5–6). Originating in the post-war period of rapid economic growth, four principal attributes—distinct from those of Western firms—feature heavily in the Japanese labour market, namely stem linearity, autonomy, homo-functional hierarchy, and the *enyaku* (kintract[1]) system. Together, these traits evoke the organisation of samurai households, indigenous to Japan's history and culture. Accordingly, Japanese firms typically maintain rigid hierarchies and utilise lifetime employment and seniority-based compensation to discourage employees

[1]The term 'kintract' combines the words 'kin' and 'contract' and refers to the system prevalent across *ie* organisations in samurai society, wherein initiated members, including those without blood ties, could serve the *ie* for life.

from leaving the company lest they lose considerable benefits and are branded as 'disloyal' (Murakami et al. (1979) as cited in (Yamaguchi, 2019, pp. 10–11)). These features comprise the basis for Japan's employment system and practices, and entail a number of disadvantages for women.

Investment in firm-specific human capital is very common, and the emphasis on internal labour markets thus very prominent in Japanese companies (Odaki & Kodama (2010) as cited in (Yamaguchi, 2019, pp. 13–14)). Employers wishing to prevent outflow of their human capital offer strong job security with a seniority-based wage system for regular employees to increase retention. However, this practice makes adjusting the number of employees difficult, so Japanese firms tend to upwardly adjust working hours, and a level of chronic overtime is common for regular employees (Yamaguchi, 2019, pp. 15–17). In matters relating to work-life balance, firms are, by extension, incentivised to reinforce the traditional married couple's division of household labor as a premise for considering the household and not the individual as the pertinent unit, where the archetypes of the male salaryman and the female *shufu* (housewife) (Macnaughtan (2015) as cited in (Crawford, 2021, p. 3)) prevail.

Regular employment is thus a system of an "exchange between offering security and accepting constraints" (Yamaguchi, 2019, p. 20). Given that women prioritise the house and home, men can be subjected to the constraints of regular employment such as long working hours in exchange for the security of seniority-based wage premiums. Women, having taken on a greater share of the household tasks, have difficulties in maintaining regular employment, particularly when they have children to care for. However, seniority-based wage premiums and promotion opportunities are rare for non-regular work, so the archetypes effectively push women into an institutionally inferior state with lower wages (Yamaguchi, 2019, pp. 22–23). In the words of economist Naohiro Yashiro,[2] the large differences in wage attributable to the widespread use of seniority-based pay "de-facto rationalises the current [gender] wage gap" (as cited in Crawford (2021, p. 6)).

Gender thus plays a significant role in the Japanese labour market, and conservative views on gender roles are propagated by firms that need to impose long work hours on their employees. In this institutional environment, women are disadvantaged in their ability to attain promotions and receive seniority-based wage premiums, unless they choose to deviate from the role prescribed to them as women, wives and mothers.

2.2 Female Labour Force Participation in Japan

As it stands, were the gender employment gap to close and the ratio of female-to-male working hours rise to the OECD average, Japan could enjoy an increase in GDP estimated at upwards of 15 percent (Matsui et al., 2019, p. 3). During Shinzo Abe's second tenure as Prime Minister of Japan, spanning 2012 to 2020, the government introduced a number of policies aimed at raising female labor force participation in order to address Japan's considerable demographic challenges. In the 2010s, Japan experienced a rapid rise in female labor force participation, transitioning from one of the OECD's lowest to far above the

[2]This paper will follow the Western name order convention of printing an individual's given name first, followed by their family name, contrary to the East Asian convention of assigning names in the reverse order.

OECD average, previously shown by Figure 1. The numerous proposed economic reforms, were collectively dubbed *Womenomics* and, in the words of Kathy Matsui, Vice Chair and Chief Japan Strategist for Goldman Sachs:

> One of the most impactful changes the Abe administration made was to shift the context for diversity away from a human rights or social issue to an economic and business imperative.
>
> (Matsui, 2019, p. 153)

Before then, there were large differences in female labour force participation across the regions of Japan from 1975 until the 1990s, when Japan experienced economic downturn, and the regions converged in their female labour force participation rate:

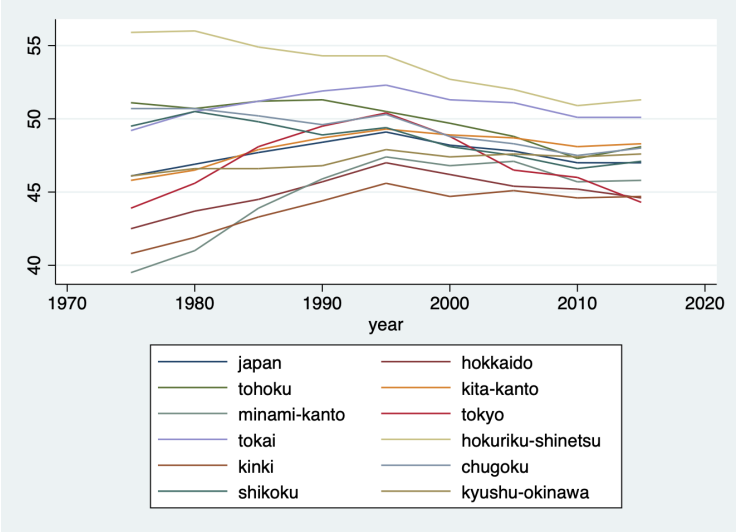

Figure 3: Regional Female Labour Force Participation Rate of Japan, 1975–2015 (% of Female Population Aged 15 and Over) (Japanese Government Statistics, 2022)

As can be seen above in Figure 3, despite some convergence, there are long-standing differences in female labour force participation rates across regions of Japan. The most influential analysis of regional variations of female labour force participation in Japan published in English by Y. Abe (2013) notes that these regional variations have largely been ignored by Western scholars, and it identifies a Northern coastal region that starkly differs in its patterns of female labour force participation, measured both generally and in regularity of work, compared with the rest of Japan. The author attributes this to differing norms and historical differences in patterns of female labour force participation, but admittedly does not infer a causal relation between these—it is this gap that we wish to fill in the ensuing paper.

3 Literature Review

The papers reviewed in this section describe, theorise about, or suggest how one might go about to study the relation between women and the labour market. We present this section in the context of a particular theoretical paper, the widely cited Akerlof and Kranton (2000), which presents a game-theoretic utility-maximisation model describing a woman's work choices in a labour market where gender culture exists. In this model, a woman will face a trade-off between female identity as described by the gender culture—which often most means limiting involvement in the labour market—and engaging in said labour markets to receive economic benefits and possibly other sources of utility, such as skills development, promotion opportunities, entitlements, and so on. In the world of Akerlof and Kranton (2000), which we explicitly use as the foremost theoretical foundation behind studying the phenomenon of spatial differences in choices made by women in the labour market, unequal labour market outcomes are at least partially the result of utility-maximising by women as economic agents, excluding non-individual choices such as legal barriers and discrimination. Thus, every determinant of female labour force participation described below should be read within the context of this model: an improvement in the gains from engaging in the labour market vis-à-vis fulfilling a cultural identity will raise female labour force participation marginally, and vice versa. After reviewing some of these relevant determinants, including empirical work on gender culture, and ending with a review of identification strategies we intend to utilise in our own methodology.

3.1 Determinants of Female Labour Force Participation

In studying the relationship between female labour force participation and economic development, Goldin (1994) launched her U-shaped curve hypothesis, which describes a tendency for female labour force participation to fall as developing countries increase their national income, only to rise as national income increases further. In brief, Goldin's explanation of the phenomenon rests chiefly on the high female labour force participation in agricultural societies falling as productivity rises, opening up for a more specialised role for women in the home. Then, as educational attainment for women increases and jobs in tertiary sectors become more prevalent, female labour force participation rises along with productivity (Goldin, 1994). In fact, the OECD lists educational attainment as a key driver of female labour force participation (Thévenon, 2014), which is not a surprising finding given education's long-noted importance as a source of human capital accumulation, as described with regards to gender in the Handbook of Labor Economics chapter written by Altonji and Blank (1999). Other than educational attainment, the OECD has listed determinants listed to policies and incentives that have boosted female labour force participation, but the analysis is complicated by how different such determinants are in effectiveness across the various welfare regimes of member countries. One such area is childcare services, which has been shown to be most effective in countries with a high degree of employment protection. Other policy-related determinants include tax regimes with regards to married couples and parental leave, although the latter generally co-varies with childcare, making the extent of their female labour force participation-boosting ability more uncertain (Thévenon, 2014). Finally, on a

more general level, the discriminatory practices disfavouring women on Japanese labour markets as described in the previous section should theoretically also be drivers of note, as they lower relative utility of working compared to fulfilling a traditional gender role following the logic of Akerlof and Kranton (2000).

Both Goldin and the more policy-oriented papers acknowledge culture as an important—but not easily measurable—determinant of female labour force participation. An example of this area of study is the comprehensive cross-national comparison written by Roger Clark, Thomas W. Ramsbey, and Emily Stier Adler in 1991. Viewed less statically, it has been proposed that the intermission of gender culture between generations may determine female labour force patterns, which has for example been studied by Farré and Vella (2012). They find that labour market behaviours of women are not only related to views on gender roles inherited from mothers on statistically significant levels, but also that men's attitudes are important, which had previously been established as an female labour force participation determinant in the literature on this subject. While noting that material conditions—the economic structures and processes of societies—impact labour force participation patterns, they affirm that cultural conditions have a definitive effect on women's economic status absent material conditions (Clark et al., 1991). The popularisation of social and demographic variables in empirical economics is seen as an important driver of new empirical strategies to study various phenomena of inequality, particularly gender and race, or at least so in the context of the United States (Altonji & Blank, 1999). We review one such strategy, instrumental variables in the next sub-section, as this has been a particularly utilised identification strategy in the intersection of gender and labour economics given the considerable degree of social and economic dynamism resulting from the rapid change in women's role in the labour market observed over the past century.

If studying the effect of culture on female labour force participation—for example to explain the variations thereof across Japanese regions as attempted in this paper—it is thus important to control for various other determinants. For instance, a region with a much higher female labour force participation could be associated with a gender culture more positive towards women's participation in the labour market, but after controlling for particularly important determinants such as education or regularity of work, this initially observed cultural impact could be absorbed almost entirely by the controls in the empirical model, until the significance of its effect is much more unclear. This could be the result of an actual negligible effect of gender culture on female labour force participation patterns, of a poorly estimated gender culture parameter, or multicollinearity due to the correlation of various economic and social indicators in economy-wide settings (Wooldridge, 2013, pp. 68–96). Even if we found an effect of culture on female labour force participation variations, this finding would be subject to reverse bias, as elaborated on in the following sections. To address the latter issue, we explore the use of instrumental variables in labour economics.

3.2 Instrumental Variables in Labour Economics

As Angrist and Krueger (1999, pp. 1278–1282) point out in their Handbook of Labor Economics chapter, labour economics has been important for the development of identification strategies within empirical economics, and the use of instrumental variables for this purpose is one such example. In Angrist and

Krueger (2001, pp. 71–72), the same authors note that instrumental variables are suitable for estimating "narrowly defined" causal relationships, which can help reduce omitted variable bias by providing some exogenous variation. The effect of this is that the parameter of interest—the independent variable—may be estimated consistently and without omitted variable (asymptotic) bias. It must however derive from an explanation for why it correlates with the dependent variable through the independent variable beyond plausibly spurious correlation (Angrist & Krueger, 2001, p. 73).

A notable example of instrumental variables estimation in labour economics pertaining to gender is Acemoglu et al. (2004). Using data from WW2 mobilisation rates, which differed widely between various communities across the United States, it sets out to determine the extent to which women's wages are predicted by the female labour force supply. They find that WW2 mobilisation rates had persistent effects on regional variations in female labour force participation in the United States, and was negatively correlated with earnings as boosted labour supply supply lowered wages of both men and women, albeit not with uniform effects across the male earnings distribution, which indicates that female and male labour supply were imperfect substitutes in the immediate postwar period (Acemoglu et al., 2004).

Achieving external validity in the study of culture as a determinant of female labour force participation with an epidemiological approach by utilising world value survey data from the ancestral countries of second-generation Americans as proxies for culture, Fernandez (2007) shows that women with mothers born in more conservative countries are less likely to be a part of the labour force (Fernandez, 2007). Drawing on these findings, Campa et al. (2009) used disaggregated World Values Survey data to estimate the gender culture espoused by individuals, and introduced gender culture espoused by firms as their gender preference in hiring for jobs they intend to announce the following year, choosing the Italian labour market context at a province level. Furthermore, they introduce a historical instrumental variable to eliminate reverse causality problems, using 1911 data on relative female-to-male literacy rates for Italian provinces. With this approach, Campa et al. (2009) showed that regional heterogeneity in gendered labour market outcomes in Italy depend on the gender culture both with reference to firms and individuals, which is consistent with the theoretical view that norms are an important determinant.

We claim that these two findings are in line with the consensus that gender culture does affect female labour force participation variations across regions. To name just two papers, Hayo and Caris (2000) find gender culture to be a significant determinant of female labour force participation across Northern Africa and the Middle East, while estimating religious denomination to be an insignificant such determinant, and Lietzmann and Frodermann (2021) examine regional variations across Germany to show that more egalitarian views on women has a significant effect on female labour force participation levels there. In a rather narrow field of research—gender culture and its effects on regional variations in female labour market behaviour—we find no contrary evidence to the findings of Fernandez (2007) and Campa et al. (2009), which together serve as methodological inspirations for our own empirical research design as described in the next section, and suggest that this will be true for the Japanese context just like any other, not least due to this argument being posited in the most influential paper on this subject, Y. Abe (2013).

4 Research Design

Our literature review, presented in the previous section, investigated determinants of female labour force participation and the use of instrumental variables in labour economics. This section, therefore, identifies the purpose and delimitation of our study, proposes our research question, and outlines the research contribution of the study.

4.1 Purpose and Scope

The purpose of this study is to establish the extent to which gender culture explains the variations in female labour force participation across the regions of Japan. We will use individual-level survey data for a given year to measure the gender culture which prevails, and estimate its effect on the female labour force participation rate using a two-stage least squares regression analysis. We will conduct both a regional and prefectural analysis.

4.2 Research Question and Contribution

We are testing whether gender culture is a determinant of regional variations in female labour force participation in Japan. We thus aim to answer the following research question:

> Do differences in gender culture explain the regional variations in female labour force participation in Japan?

Relating back to the theoretical model introduced by Akerlof and Kranton (2000), we argue that continued examination into the hypothesis that work choice and adherence to identity formed by gender culture is necessary for understanding and addressing the misallocation of talent and economic inequality resulting from the existence of this trade-off. As previously emphasised, we know of no attempts at causal inference for explaining the regional female labour force participation variations across Japan, and for this reason consider our attempt at doing so worth pursuing—even if risks of endogeneity with the chosen instrument exist. Plenty of descriptive analyses of the gendered patterns on the Japanese labour market exists, where perhaps the most comprehensive accounts come from Yamaguchi (2019) and Y. Abe (2013) has made great contributions to describing and analysing regional patterns. Still, we find the gap in need of explaining for this phenomenon to be quite large, and hence find that any transparent contribution to the subject is worth exploring. As Yamaguchi (2019) describes, Japan is a country suffering from gender inequality to a greater extent than its peers among the developed economies. We therefore intend to undertake the first study—at least that we know of, and certainly in the English language—into the effects of gender culture on female labour force participation across regions of Japan to try to explain this persisting phenomenon in a relevant context. Based on the research discussed in the previous section, we hypothesise that differences in gender culture will explain the variations in female labour force participation across Japanese regions.

5 Methodology

This section presents and motivates the methodology selected to estimate the effect of gender culture on regional variations in female labour force participation in Japan. First, we motivate the use of an instrumental variable estimation, then we define our model, upon which we describe an extension to our model.

5.1 Instrumental Variable Estimation

At the most basic level, we wish to estimate the effect of a region's gender culture on its female labour force participation, which can be modelled as follows:

$$FLFP_i = \beta_0 + \beta 1 GC_i + u_i \tag{5.1}$$

where $FLFP_i$ denotes the female labour force participation rate, GC_i the gender culture, u_i the error term, and i the sub-national unit considered. A general description of the above model is therefore that the coefficient β_1 captures the percentage unit change in the female labour force participation rate given a (theoretical and arbitrary) one-unit increase of one in gender culture. What is not explained by the gender culture is then captured by the error term u_i.

However, the above model may be insufficient in that gender culture could be an endogenous explanatory variable, giving rise to reverse causality. Female labour force participation could, in fact, directly affect gender culture, where inhabitants of a region with high levels of female labour force participation may have their views on gender roles challenged. Put differently, varying patterns in workforce participation may generate different norms on what the appropriate role of women with regard to the workforce or leadership is. This problem is precisely what Fernandez (2007) overcomes by taking the epidemiological approach to studying the phenomenon, and what Campa et al. (2009) overcomes by implementing a historical instrumental variable—the latter of which we aim to emulate in this thesis. A distinct difference between the two is that Campa et al. (2009) constructs gender culture measured from both an individual and employer perspective, using World Values Survey and firm data, respectively.

Instrumental variable estimation can, in this case, produce consistent parameter estimates given that the instrument is both relevant and exogenous. Our instrument will be relevant if it correlates with gender culture, and exogenous if it does not correlate with the error term of our proposed model. Exogeneity is otherwise referred to as validity or the exclusion restriction, and can in more practical terms be described as the need for our instrument to correlate with female labour force participation only through its effect on gender culture. Exogeneity can generally not be tested for; instead, we must rely on some reasonable justification for the instrument being exogenous for it to be useful (Wooldridge, 2013, p. 514). Relevance, however, can be tested for; a simple rule of thumb suggested by Stock & Watson (2003) as cited in (Baltagi, 2011, p. 267) is that an instrument is not weak—and therefore relevant—when an F-statistic generated by the first-stage regression is larger than 10. Those same authors argue that instruments must be highly relevant in order to be useful, or else the normal distribution will yield a poor approximation (Stock & Watson, 2003 as cited in (Baltagi, 2011, p. 267)).

5.2 Motivation of Instrument Relevance

We seek a determinant of gender culture unrelated to female labour force participation, except through its impact on gender culture. As Tabellini (2010) finds in his comprehensive study of economic development in Europe, culture plays an important role for determining economic outcomes over time. In light of this, we use historical data available in the 1925 Population Census, and investigate the suitability of some of the relevant instruments available. These include male-to-female population ratios, female divorce rates, average household sizes, and urban-to-rural population ratios, which we believe can be argued to serve as potential predictors of variations in gender culture today.

Among the instrumental variables investigated, the male-to-female population ratios in 1925 might have the greatest relevance. Indeed, similar data is used in Grosjean and Khattar (2018), which finds that uneven historical sex ratios in Australia had significant and persisting effects on gendered behavior in the economy, such that male-biased areas in the 18th and 19th centuries have more conservative gender cultures today. We consequently anticipate male-to-female population ratios to be a relevant instrumental variable, with higher male-to-female ratios translating to more conservative gender cultures which in turn should have influenced female labour force participation patterns.

For household sizes, we use the findings from Menta and Lepinteur (2021) which—at the individual household-level—conclude that girls take on a larger share of the housework as the family size increases, and adopt or develop more conservative gender norms as well, and use this to hypothesise that larger household sizes will correlate with more conservative gender cultures.

We motivate the relevance of 1925 divorce rates while still acknowledging the violation of the exclusion restriction by impacting modern female labour force participation patterns, in similar ways to Grosjean and Khattar (2018). Most famously, Becker et al. (1977) explored divorce from a traditionally economic utility perspective, concluding both theoretically and empirically that divorces should be a determinant of female labour force participation in the sense that they reflect rational choices—a divorce may be the result of the female party's conclusion that more utility may be gained from being single—which in turn may be associated with entering the labour force. Japan may, historically, have experienced different dynamics of divorce, however. As found by Mukai (2004, p. 12), the high divorce rates in Japan until the late industrial revolution has dual implications: On the one hand, a high divorce rate may be indicative of a degree of gender equality, wherein either married party may choose to exit the arrangement for reasons pertaining to individual compatibility. This is proposed, but also challenged by Goode (1993, pp. 224–227), however, who also notes that industrialisation reduced divorces from "traditional causes", giving the example of elder in-laws sending away brides as a result of these not successfully filling traditional gender roles as expected in marriage. We subsequently suggest that high divorce rates may have indicated more conservative gender norms.

Lastly, we use urban-to-rural population ratios of the population and hypothesise that a higher ratio of urban population will be positively associated with less conservative gender culture. We tie this directly to Goldin's U-curve (Goldin, 1994), as despite the negative association between urbanisation and female labour force participation found in various papers, most of recent work studies the Middle East, which largely fall within the bottom of the curve, and

an advanced economy should instead be found towards the upper right despite the previously identified divergence of Japan.

To conclude, we hypothesise that more restrictive gender culture measurements should be correlated with higher 1925 male-to-female ratios, larger 1925 average household sizes, higher 1925 female divorce rates, and lower 1925 ratios of urban-to-rural populations. The premier theory behind this use of history is the notion that norms are transmitted across generations within local communities, building a case for why these instruments might help better estimate gender culture measures in a contemporary setting without these being directly related to female labour force participation.

5.3 Limitations of Instruments

We could have strengthened the choice of each of these instruments by regressing them on 1925 or near-1925 data on female labour force participation on a regional level across Japan, as Campa et al. (2009) does with literacy rates, but in the absence of any such data, we cannot make an assertion of that kind, and rely on heavy risks of violating the exclusion restriction. The foremost theoretical reason for this, we argue, has to do with inter-generational transmission of culture theory, for example as researched by Farré and Vella (2012). This suggests that high female labour force participation rates and associated gender culture in 1925 would have been transmitted between generations of women at the local level, meaning our instrumental variables would also be directly correlated with female labour force participation levels. Because of the considerable time period between the collection of the instrumental variable data and the other data sets, however, we propose that time period, which is the main argument for the choice of instrument posited explicitly in Campa et al. (2009), diminishes this impact sufficiently as to motivate implementation of them in the empirical model we present in the methodology section.

Admittedly, we also choose to investigate these four variables for data availability reasons. Historical Japanese data is comparatively hard to come by, and is rarely available in a translated form accessible to the authors of this paper. Interesting alternatives could have been relative literacy rates of men and women, as used by Campa et al. (2009), or historical agricultural practices as explored in Alesina et al. (2013). We posit that the range of instruments examined provide some external value, however, as historical divorce rates have not been used as instrumental variables for this purpose, for example, and may inspire better hypotheses and applications than ours.

5.4 Group Means 2SLS Estimation

In determining the effect of gender culture on female labour force participation, the nature of available data will typically beget a so-called micro-macro multi-level situation. Our dependent variable, female labour force participation, is measured at the higher regional level, as are a number of viable controls. Meanwhile, our independent variable, gender culture, is proxied by measures at the lower individual level, and will likely be affected by individual sociodemographics. The most common strategy to analysing micro-macro data is to aggregate the individual-level data to the group-level via the use of means (Foster-Johnson & Kromrey, 2018, p. 2462) and the first model of our thesis is

thus specified as follows:

$$FLFP_i = \beta_0 + \beta_1 GC_i + \beta_2 X_{ki} + u_i \tag{5.2}$$

where $FLFP_i$ denotes the female labour force participation rate, GC_i the aggregated index for gender culture, X_{ki} the set of controls, u_i the error term, i the region/prefecture, and k the number of control variables. A general description of the above model is therefore that the coefficient β_1 captures the percentage unit increase in the female labour force participation rate given an arbitrary unit increase of one in the constructed index of gender culture, controlled for by a set of variables. What is not explained by the aggregated index of gender culture and the controls are then captured by the error term u_i.

Our instrument isolates the exogenous variation of gender culture via the estimation of the following model:

$$GC_i = \pi_0 + \pi_1 IV_i + \pi_2 X_{ki} + v_i \tag{5.3}$$

where IV_i denotes one of the four instrumental variables examined, X_{ki} again the set of controls, v_i the error term, i the region/prefecture, and k the number of control variables, as above. This model operates under the assumption that the instrument IV_i is exogenous, while acknowledging some weaknesses to that assumption as described previously.

In an empirical comparison of strategies to predict group-level outcomes, Foster-Johnson and Kromrey (2018) found that research oriented towards estimating a group-level effect using a traditional regression analysis of group means using sample means of individual-level predictors in conjunction with White's correction will maximise statistical power. The analysis in Section 7 will, therefore, use robust standard errors throughout.

5.5 Predicted Means 2SLS Estimation

Directly aggregating individual-data as in the above proposed model precludes the use of individual-level socio-demographics as controls. Moreover, by simply aggregating the data at the highest level, there is a substantial loss of information and power (Bryk & Raudenbush, 1992 as cited in (Bauer, 2003, p. 135)). To reduce the loss of information somewhat by permitting the use of socio-demographic controls on our measures of gender culture, the second model of our thesis designs a latent construct for gender culture, specified as follows:

$$FLFP_g = \beta_0 + \beta_1 \xi_g + \beta_2 X_{kg} + u_g \tag{5.4}$$

where $FLFP_g$ denotes the female labour force participation rate at the regional/prefectural level, ξ_g the constructed latent variable for gender culture derived from individual-level data, X_{kg} the set of regional controls, u_g the error term, g the region/prefecture, and k the number of control variables. The model is defined in the same terms as (5.2) with the key difference being that the gender culture is a latent variable and unobserved—which is more true to the concept of culture itself.

The group score ξ_g is related to the individual score x_{ig} of each respondent in group g as follows:

$$x_{ig} = \xi_g + w_{ig} \tag{5.5}$$

where ξ_g is the group-level latent variable, x_{ig} the individual response, w_{ig} the error term, i the respondent, and g the group. Put simply, the response of an individual will stem from the gender culture of the region/prefecture, with an error term for the individual, some of the variance of which can be captured by individual socio-demographic controls.

We then design our proposed latent variable via the notation of generalised structural equation modelling:

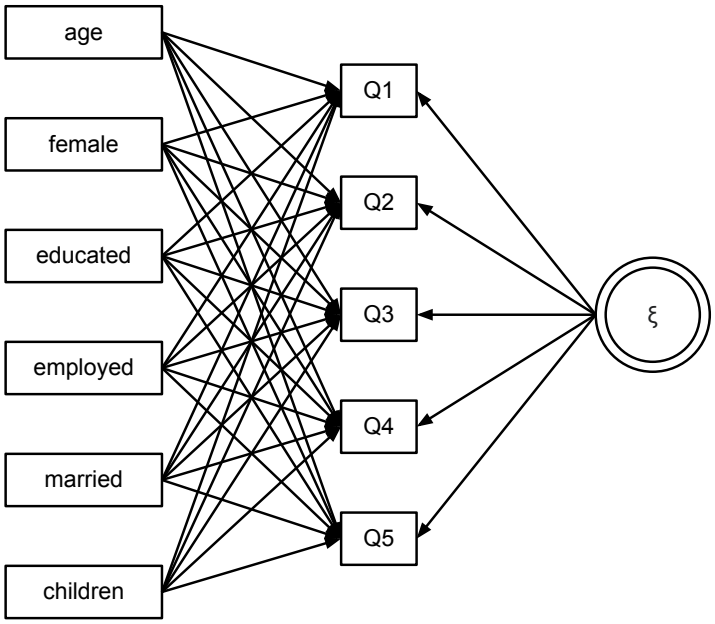

Figure 4: Constructing a Latent Variable for Gender Culture (designed by the authors)

Figure 4 illustrates how our observed socio-demographics act as controls for the responses to our five statements used to proxy gender culture, and because an individual's socio-demographics will affect their responses to the five statements, paths go from the controls to the statements. All of these are observed endogenous variables, and are therefore represented by squares. These five statements are then measures of our latent variable dubbed gender culture, i.e. a respondent's gender culture will affect their responses to the five statements, represented by the paths from the latent variable to the statements. As the latent variable is unobserved, it is represented by a circle. The latent variable is also defined at the group-level, meaning it is constant within the region/prefecture and varies across them. This feature is denoted by the use of double circles.

There are a number of proposed approaches to conducting multi-level micro-macro analyses, but these rarely perform better than a standard structural equation model; the exception is the bias-correcting method of Croon and Van Veldhoven (2007) but it is a complex and technical process rarely supported by statistical software (Devlieger et al., 2016, p. 763). We will, therefore, aggregate our individual-level data to the group-level in this case as well, but rather

than constructing an index for gender culture by deriving the group mean of individual-level responses, we predict the scores of our latent variable using factor analysis as per Figure 4 and then predict the mean of the latent variable per individual via empirical Bayes estimation. It is then this score, not one directly derived from the survey data, that is aggregated to the group-level.

Our proposed model is thus specified as follows:

$$FLFP_g = \beta_0 + \beta_1 \xi_g^* + \beta_2 X_{kg} + u_g \tag{5.6}$$

where $FLFP_g$ denotes the female labour force participation rate at the regional/prefectural level, ξ_g^* the (now observable) construct for gender culture derived from individual-level data, X_{kg} the set of regional controls, u_g the error term, g the region/prefecture, and k the number of control variables.

Our instrument then isolates the exogenous variation of our construct for gender culture via the estimation of the following model:

$$\xi_g^* = \pi_0 + \pi_1 IV_g + \pi_2 X_{kg} + v_g \tag{5.7}$$

where IV_g denotes one of the four instrumental variables examined, X_{kg} again the set of controls, v_g the error term, g the region/prefecture, and k the number of control variables, as above.

With the same reasoning as previously, given that we aggregate individual-data, the analysis in Section 7 will use robust standard errors throughout.

6 Data

To determine the extent to which gender culture explains the regional differences in female labour force participation in Japan, our analysis relies on a number of data sets to construct the variables defined in the previous section. This section will, therefore, provide an overview of the applied data sets, describe how our measures and variables were defined and constructed, discuss omitted variables, and deliberate the limitations of the data available to us.

6.1 Data Sets

Our thesis relies on a database over economic indicators at the prefectural level for our outcome variable and multiple controls, individual-level survey data to fashion a gender index—also with a number of controls—and historical census data for the construction of our instruments.

First, Japanese Government Statistics (2022) provided us with data on a number of indicators via the Regional Statistics Database on e-Stat, the portal site for Japanese Government Statistics. The database permits the extraction of items from the main statistical record of Japan's prefectures and municipalities, including economic indicators. For a list of the indicators we quoted in our analysis, please refer to Appendix A.

Second, for our regional analyses, Yamazaki (2020) provided us with data from the World Values Survey for Japan in 2010. The data set consists of $N = 2443$ observations, classified over eleven regions in Japan. These regions are uniquely defined in the World Values Survey, and the classification is not used by other sources; to see the classification of prefectures into regions, please refer to Appendix B. The individual-level survey data covers the participants' socio-demographics and opinions across a number of topics, including their view on gender roles.

Third, for our prefectural analyses, Tanioka et al. (2007) provided us with data from the Japanese General Social Survey in 2005. The data set comprises $N = 2023$ observations, classified over Japan's 47 prefectures. The survey data is comparable in nature and purpose to that of the World Values Survey, with the main difference being that the data is classified at the lower prefectural level instead of the higher regional level.

Fourth, for the specification of our instrumental variables, Japanese Government Statistics (2014) provided us with population census data for Japan in 1925. The data includes, for every prefecture, the total population, the male and female populations, the male-to-female population ratio, the number of households, and the urban and rural populations.

6.2 Measures

With our models specified in Section 5 and the applied data sets described above, we derived a set of measures for our dependent and independent variables, controls and instruments as follows.

Female Labour Force Participation Our dependent variable, specifically the female labour force participation, was quoted at the prefectural level from e-Stat and is defined as the participation in the labour force for women aged

15 and over, expressed as a rate in percent. This definition, to be contrasted with the more typical delimitation of women aged 15–64, was necessitated by data availability concerns, in that female labour force participation rates by age is unavailable at the prefectural level. For our regional analyses, an average of the female labour force participation was derived for each region, weighted by prefectural population.

Gender Culture Our independent variable, namely gender culture, is defined as the systematic variation in beliefs and preferences as they relate to gender and gender roles (see Fernandez (2007)). Given that culture is a parameter without a natural scale, we used a set of statements from the World Values Survey for our regional analyses, and a comparable set of statements from the Japanese General Social Survey for our prefectural analyses, as proxies. For the World Values Survey, the statements we used[3] can be seen below:

Code	**Statement**
V45	When there is a shortage of work/employment opportunities, a man should be given a job before a woman is.
V47	There is always trouble where a wife earns more than her husband.
V50	It causes trouble for the children if the mother works for money.
V52	University education is more important for boys than it is for girls.
V54	It is about as equally fulfilling to be the housewife of a home, as to work in return for money.

Table 2: Gender Culture in the World Values Survey (Yamazaki, 2020)

The statements in Table 2 were selected as agreement is indicative of the view that women should primarily fulfil the *shufu* (housewife) role in society, and that men should take precedence in the labour market. Similarly, in the case of the Japanese General Social Survey, the statements we employed in our analysis can be seen below:

Code	**Statement**
Q4WWJBIA	If a husband has sufficient income, it is better for his wife not to have a job.
Q4WNMGA	Without a doubt, a woman's happiness lies in marriage.
Q4WWHHX	A husband's job is to earn money; a wife's job is to look after the home and family.
Q4JBMMCC	A preschool child is likely to suffer if his or her mother works.
Q4WWHPHH	It is more important for a wife to help her husband's career than to have one herself.

Table 3: Gender Culture in the Japanese General Social Survey (Tanioka et al., 2007)

[3]Note that these statements were only available to us in back-translated form, i.e. from English to Japanese, then back to English. Some of the wordings are thus rather clunky.

The responses to the above two sets of statements were coded from a Likert scale to a binary scale, where agreement was coded to 1, disagreement was coded to 0, and non-responses were coded as missing values. This transformation was necessitated by the use of different Likert scales for different variables, where some allowed for strong agreement and disagreement, and others did not. The distinction between 'normal' (dis)agreement and strong (dis)agreement is also subjective to the individual, and transforming the variable to a binary scale removes this subjectivity. For a more detailed description of the applied transformations, see Appendix A.

In the case of our aggregated analysis, an index for gender culture was constructed by deriving a mean score for each individual, and then taking an average for the region or prefecture. In the case of our latent variable analysis, the individual responses were used to measure our group-level latent variable, the predicted mean of which was then taken per region or prefecture.

Instrumental Variables Our four instrumental variables, specifically the male-to-female population ratio, the female divorce rate, the average household size, and the urban-to-rural population ratio, have all been derived from population census data for 1925 by Japanese Government Statistics (2014) on e-Stat. The male-to-female population ratio was provided in the data; the female divorce rate was derived by dividing the number of female divorcées by the female population; the average household size was found by dividing the population by the number of households; and the urban-to-rural population ratio was calculated by dividing the urban population by the rural population. These indicators were derived for each prefecture, and to see the resultant data set, please refer to Appendix C.

Regional Controls To avoid over-estimating the effect of gender culture on female labour force participation, we used controls for various determinants thereof. Using prefectural data from e-Stat, we controlled for economic sector composition, the average female salary, and the availability of childcare institutions. The economic sector composition was found by deriving the proportion of primary, secondary and tertiary employment of each prefecture from e-Stat and assigning a score of 1, 2 or 3 to each respective proportion. To see a detailed list of our regional controls, please refer to Appendix A. We did not control for indicators such as the fertility rate because they are likely endogenous to the model and the individual choice of having children and working are likely inter-related.

Individual Socio-Demographic Controls Given that our latent construct for gender culture is measured by individual-level indicators, the latent variable estimation can include controls for the respondents' socio-demographics, again to avoid over-estimating the effect of gender culture on female labour force participation. Our controls include sex, age, educational attainment, employment status, marital status, and number of children, all of which were provided by the World Values Survey data in the case of our regional analyses and the Japanese General Social Survey data in the case of our prefectural analyses.

Our quantitative variables, namely those for age and number of children, were left as is. We did, however, transform all descriptive variables to a binary

scale: sex was coded to a female dummy, educational attainment to a university dummy, employment status to a regular employment dummy, and marital status to a married dummy. In the case of educational attainment and employment status, there is no natural numerical scale where a one-unit step between two outcomes corresponds to the same relative change between two other outcomes. Given, then, that educational attainment in Japan typically begins to vary only after high school, and we argued in Section 2 that regularity of work is a major determinant of success in the Japanese labour market, coding the two as binary variables becomes viable. To see a detailed list of our individual controls, please refer to Appendix A.

6.3 Limitations of the Data

There are a number of limitations to our data which will affect our analysis. First, our attempt at studying disaggregated phenomena within Japan was limited by the size of the sub-national units studied. Without available municipal data for all variables of interest, our method fails to capture that the regions considered are large and have variations in and of themselves. The effect of this is that homogeneity between Japanese regions may be overestimated, as the 47 prefectures are sure to have a greater degree of variations, certainly with regard to more locally dynamic economic variables. While an issue at the prefectural level, the problem is made worse by the fact that the most readily available data with which to estimate gender culture, the World Values Survey, is classified into only eleven regions.

Second, our study is limited by data collection practices. The World Values Survey for Japan is conducted in waves, as is the Japanese General Social Survey, meaning they are not conducted every year nor is there a set number of years between surveys. Similarly, and perhaps more importantly, much of the prefectural data collected by Japanese Government Statistics is only gathered every five years. We could not, therefore, construct panel data to increase the number of observations available to us, thus increasing power, in our analysis unless the prefectural data was collected the same year as the survey was conducted, which was rarely the case.

Third, there are a number of viable regional controls which we are unable to include due to data availability. As previously established, the level of female educational attainment has been found to be drivers of female labour force participation, but this indicator is not available at the prefectural level. Similarly, the availability of part-time and full-time jobs would be an appropriate control, but even this was not available. For this reason, we are likely to over-estimate the effect of gender culture on female labour force participation.

Fourth, the general difficulty in finding data posed difficulties in finding potential instrumental variables to test. Historical data was limited in scope, and effectively limited us to just a few candidates. Moreover, much of the data available is in Japanese and not in digital form, such that a more expanded database was inaccessible to us. Our results will thus likely be inconclusive, as the pool of instruments was small and would perhaps not have been chosen had we had more alternatives to draw from.

7 Results

This section presents the empirical results obtained from our study using the methodologies and data examined in Sections 5 and 6, respectively. First, we demonstrate the results of our group means two-stage least squares estimation at both the regional and prefectural level. Second, we present the results of our predicted means two-stage least squares estimation, also at both the regional and prefectural level.

7.1 Group Means 2SLS Estimation

This subsection presents the results of our group means two-stage least squares estimations at the regional and prefectural level. As described in Section 6, we use individual-level data for our measure of gender culture. We pursue, in this subsection, the first of our strategies as described in Section 5. We specifically take a mean score of the responses to our five statements to construct an index for gender culture, measured at the individual level, and assign the mean score of these measures to each region for our regional analysis and prefecture for our prefectural analysis. In our regional analysis, we also transform our instrumental variables to the regional level by assigning their mean score, weighted by the 1925 prefectural populations, to each region.

7.1.1 Regional Analysis

For our regional analysis, we aggregate our individual-level data from the World Values Survey for Japan in 2010 to the regional level. The data provided by Yamazaki (2020) has been classified into eleven regions, and the following estimations will thus comprise eleven observations. For a list specifying the prefectures belonging to each region, see Appendix B. To see the summary statistics of our data, please refer to Appendix D.

To initiate our analysis and consider the simplest of cases, we regress the female labour force participation rate on our index for gender culture without controls in an ordinary least squares model:

```
Linear regression                               Number of obs     =         11
                                                F(1, 9)           =       1.63
                                                Prob > F          =     0.2332
                                                R-squared         =     0.0687
                                                Root MSE          =     1.9751

------------------------------------------------------------------------------
             |               Robust
        flfp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     gcindex |  -18.26457   14.28932    -1.28   0.233    -50.58927    14.06013
       _cons |   56.31387   7.409754     7.60   0.000     39.55184     73.0759
------------------------------------------------------------------------------
```

Table 4: Regional Ordinary Least Squares Estimation of Female Labour Force Participation on Gender Culture by Group Means (rendered by the authors using Japanese Government Statistics (2022) and Yamazaki (2020))

As can be seen in Table 4, the coefficient of our index for gender culture, and thus the model itself, is insignificant. This is perhaps unsurprising given the

small number of observations and the subsequently large standard errors. With the aim of improving our model and allowing for causal inference, if possible, we begin by testing the relevance of our instruments by correlating our index for gender culture with our four potential instrumental variables:

	gcindex	mtf~1925	fdi~1925	hou~1925	urb~1925
gcindex	**1.0000**				
mtfratio1925	**0.0482**	**1.0000**			
fdivrate1925	**0.6507**	**-0.2922**	**1.0000**		
house1925	**-0.1469**	**-0.2992**	**-0.3456**	**1.0000**	
urbtrur1925	**0.0085**	**0.5845**	**-0.0899**	**-0.5436**	**1.0000**

Table 5: Relevance of Instruments on Gender Culture by Group Means at the Regional Level (rendered by the authors using Japanese Government Statistics (2014) and Yamazaki (2020))

As can be seen in Table 5, there is almost no correlation between our index for gender culture and the male-to-female population ratio in 1925 nor the urban-to-rural population ratio in 1925. The correlation between our index for gender culture and the average household size in 1925 is not much higher. The female divorce rate in 1925, however, is strongly correlated to our index for gender culture, with a correlation coefficient of 0.6507 between them. The polarity of the coefficient is also consistent with our hypothesis that a higher female divorce rate in 1925 would propagate more conservative views on gender roles today. With the size of the correlation coefficient, our instrument is relevant and we conduct a two-stage least squares regression using the female divorce rate in 1925 as an instrument for our index for gender culture:

Instrumental variables (2SLS) regression

Number of obs	**11**
Wald chi2(**4**)	**39.61**
Prob > chi2	**0.0000**
R-squared	**0.6965**
Root MSE	**1.0198**

flfp	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
gcindex	**-4.607863**	**28.40076**	**-0.16**	**0.871**	**-60.27233**	**51.05661**
sector	**-40.44976**	**12.03455**	**-3.36**	**0.001**	**-64.03704**	**-16.86248**
femsalary	**.0750076**	**.0425069**	**1.76**	**0.078**	**-.0083044**	**.1583196**
childcare	**-.4101419**	**1.524242**	**-0.27**	**0.788**	**-3.397601**	**2.577317**
_cons	**139.8045**	**31.41999**	**4.45**	**0.000**	**78.22245**	**201.3865**

Instrumented: gcindex
Instruments: sector femsalary childcare fdivrate1925

First-stage regression summary statistics

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(1,6)	Prob > F
gcindex	**0.4818**	**0.1363**	**0.2425**	**2.09768**	**0.1977**

Table 6: Instrumenting Gender Culture by Group Means with the Female Divorce Rate in 1925 at the Regional Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Yamazaki (2020))

As can be seen in Table 6, the model is significant, as is the coefficient of the economic sector composition. The coefficient of the average female salary is also near-significant. First, as the regional economy shifts in its activities towards the higher sectors, the female labour force participation decreases. If we compare two regions with a one-unit difference between their economic sector compositions, the region with the higher economic sector composition would have a female labour force participation rate 40.4 percent lower than the region with the lower economic sector composition. The size of the proposed difference is, of course, unrealistic, as it would bring the female labour force participation rate almost to zero, but it may apply for smaller differences in economic sector composition. Given that economic sector composition varies only by a few dozen basis points between regions, a more applicable example may be a region with an economic sector composition 10 basis points higher than another, where the former would then have a female labour force participation rate 4.0 percent lower than the latter. A region's economic sector composition, therefore, has a powerful effect on female labour force participation, according to the model.

Second, as the average female salary increases, so too does the female labour force participation. Were we to consider two regions with a one-unit difference in average female salary, corresponding to 1,000 JPY per month, or about 75 SEK,[4] the region with the higher average female salary would have a female labour force participation rate 0.075 percent higher than the region with the lower average female salary. To use a more meaningful difference—given that the variation in regional female salary averages is in the high tens—a ten-unit difference between regions in the average female salary, corresponding to 10,000 JPY per month and an increase in salary of several percent for most people, would yield a female labour force participation rate 0.8 percent higher in the region with the higher average female salary. The region's average female salary thus has a meaningful impact on female labour force participation, according to the model.

However, the coefficients of our index for gender culture and the availability of childcare institutions are neither of them significant—far from it, in fact. The instrument is also quite weak, with the F-statistic generated by the first-stage regression of 2.10 falling far short of the value of 10 proposed by Stock & Watson, 2003 as cited in Baltagi (2011) despite the high correlation coefficient we observed earlier. Here, the weakness of our instrument is probably due to the small number of observations, and the large correlation coefficient is thus more likely a result of the 'luck of the draw' as opposed to being representative of a true relationship.

Given that the coefficient of our index for gender culture is insignificant, we go on to examine the effects of the addition of our three controls on female labour force participation; this in part to check if the coefficient of our index for gender culture is significant in a sub-specification of our model, and also to consider the contribution of each of our control variables. We thus conduct a sensitivity analysis in which we run the two-stage least squares regression using the female divorce rate in 1925 as an instrument for our index for gender culture again with all possible sub-sets of controls:

[4] According to the mid-market exchange rate as reported by Xe Currency Converter on 01 May 2022.

Variable	model_1	model_2	model_3	model_4
gcindex	2.5327505	-18.55747	-10.287382	4.4124112
sector		-17.565758**		
femsalary			-.02682133	
childcare				-.13833759
_cons	45.953777***	103.067***	58.71123**	45.282437

legend: * p<.05; ** p<.01; *** p<.001

Variable	model_5	model_6	model_7	model_8
gcindex	-8.4795816	3.4930918	8.6797318	-4.6078635
sector	-41.16657***	-21.72497**		-40.44976***
femsalary	.08036705**		-.04379524*	.07500762
childcare		-1.9903819	-1.9930355	-.41014194
_cons	141.57632***	106.9311***	57.112778**	139.80449***

legend: * p<.05; ** p<.01; *** p<.001

Table 7: Sensitivity Analysis of the Two-Stage Least Squares Estimation of Gender Culture by Group Means at the Regional Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Yamazaki (2020))

As can be seen in Table 7, only the coefficient of economic sector composition is significant across all regressions. The coefficient of the average female salary is, interestingly, only significant when the model specifies an additional control, and the polarity of the coefficient of average female salary is positive when economic sector composition is controlled for, but negative when it is not. This may be indicative of multicollinearity between economic sector composition and average female salary. Neither of the coefficients of the availability of childcare institutions nor of our index for gender culture are ever significant.

7.1.2 Prefectural Analysis

For our prefectural analysis, we aggregate our individual-level data from the Japanese General Social Survey, conducted in 2010, to the prefectural level. The data provided by Tanioka et al. (2007) has been classified by prefecture, and the subsequent estimations will thus comprise 47 observations. To see the summary statistics of our data, please refer to Appendix D.

To initiate our analysis and consider the simplest of cases, we regress the female labour force participation rate on our index for gender culture without controls in an ordinary least squares model:

Linear regression

Number of obs	47
F(1, 45)	3.52
Prob > F	0.0673
R-squared	0.1082
Root MSE	2.3558

flfp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gcindex	-11.25339	6.001199	-1.88	0.067	-23.34042	.833647
_cons	54.57767	3.155902	17.29	0.000	48.22136	60.93399

Table 8: Prefectural Ordinary Least Squares Estimation of Female Labour Force Participation on Gender Culture by Group Means (rendered by the authors using Japanese Government Statistics (2022) and Tanioka et al. (2007))

As can be seen in Table 8, the coefficient of our index for gender culture is near-significant. To check the explanatory power of our index for gender culture without instrumentation, we add our controls:

Linear regression

Number of obs	47
F(4, 42)	17.92
Prob > F	0.0000
R-squared	0.4670
Root MSE	1.8852

flfp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gcindex	-9.99595	4.388685	-2.28	0.028	-18.85267	-1.139226
sector	-22.27579	3.305604	-6.74	0.000	-28.94677	-15.60481
femsalary	.0169889	.0132278	1.28	0.206	-.0097059	.0436836
childcare	-.468103	.5078773	-0.92	0.362	-1.493041	.5568348
_cons	108.7891	7.523813	14.46	0.000	93.60543	123.9728

Table 9: Prefectural Ordinary Least Squares Estimation of Female Labour Force Participation on Gender Culture by Group Means with Controls (rendered by the authors using Japanese Government Statistics (2022) and Tanioka et al. (2007))

As can be seen in Table 9, the coefficients of our index for gender culture and economic sector composition are significant. As the gender culture becomes more confining, female labour force participation decreases. If we compare two prefectures, one without normative views on gender roles, and another with strict traditional views on gender roles, the one-unit difference in their index for gender culture would correspond to a female labour force participation rate 10.0 percent lower in the 'traditional' prefecture. With reference to the reduced p-value of the coefficient of our index for gender culture, there is likely multicollinearity between it and the economic sector composition, which speaks to our broader hypothesis that gender culture is endogenous to the model and that causal inference requires the use of an identification strategy. To see our test for multicollinearity between the independent variables of our model, please refer to Appendix D, where our VIF-test notably does not support our claim of multicollinearity. We thus test the relevance of our instruments by correlating our index for gender culture with our four potential instrumental variables:

	gcindex	mtf~1925	fdi~1925	hou~1925	urb~1925
gcindex	1.0000				
mtfratio1925	0.0789	1.0000			
fdivrate1925	-0.0785	-0.2419	1.0000		
house1925	-0.1546	-0.1313	-0.2557	1.0000	
urbtrur1925	0.0693	0.5825	-0.0102	-0.3158	1.0000

Table 10: Relevance of Instruments on Gender Culture by Group Means at the Prefectural Level (rendered by the authors using Japanese Government Statistics (2014) and Tanioka et al. (2007))

As can be seen in Table 10, there exists no strong relationship between our index for gender culture and any of the proposed instrumental variables. To continue the analysis, however, we select average household size in 1925 as an instrument for gender culture, with the correlation coefficient between them of -0.1546 being the largest of the four. Moreover, the polarity of the correlation coefficient is not consistent with our hypothesis that a larger average household size in 1925 would propagate more conservative views on gender roles today. We conduct a two-stage least squares regression:

```
Instrumental variables (2SLS) regression          Number of obs   =         47
                                                  Wald chi2(4)    =      48.12
                                                  Prob > chi2     =     0.0000
                                                  R-squared       =     0.3845
                                                  Root MSE        =      1.915
```

flfp	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
gcindex	-.1105188	20.8724	-0.01	0.996	-41.01967	40.79863
sector	-23.49475	4.893218	-4.80	0.000	-33.08528	-13.90422
femsalary	.0218164	.0161257	1.35	0.176	-.0097895	.0534222
childcare	-.4783895	.5718773	-0.84	0.403	-1.599249	.6424695
_cons	105.6228	10.3096	10.25	0.000	85.41632	125.8292

```
Instrumented:  gcindex
Instruments:   sector femsalary childcare house1925

First-stage regression summary statistics
```

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(1,42)	Prob > F
gcindex	0.0432	-0.0479	0.0313	1.84041	0.1822

Table 11: Instrumenting Gender Culture by Group Means with the Average Household Size in 1925 at the Prefectural Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 11, the model is significant, as is the coefficient of economic sector composition. As the economy shifts in its activities towards the higher sectors, the female labour force participation decreases. If we compare two prefectures with a one-unit difference between their economic sector compositions, the prefecture with the higher economic sector composition would have a female labour force participation rate 23.5 percent lower than the region with the lower economic sector composition. This proposed difference is, again, unrealistically large, but for a prefecture with an economic sector composition

10 basis points higher than another, the former would have a female labour force participation rate 2.4 percent lower than the latter. A prefecture's economic sector composition, therefore, has a large effect on female labour force participation, according to the model.

None of the other coefficients are significant, and are not close to being so. The instrument is also rather weak, with the F-statistic generated by the first-stage regression of 1.84 falling far short of the value of 10. Rather than being a result of the small number of observations as in the regional analysis, though this may be the case here as well, the small correlation coefficient pointed to the instrument likely being inappropriate to begin with, as indicated by the size and polarity of the correlation coefficient.

To examine the effects of the addition of our three controls, we finally conduct a sensitivity analysis in which we run the two-stage least squares regression using the average household size in 1925 as an instrument for our index for gender culture again with all possible sub-sets of controls:

Variable	model_1	model_2	model_3	model_4
gcindex	-62.393586	-9.1311503	-38.453616	-64.88754
sector		-18.169042***		
femsalary			-.03922321	
childcare				.177436
_cons	81.868478**	100.43791***	77.75556***	82.812747*

legend: * p<.05; ** p<.01; *** p<.001

Variable	model_5	model_6	model_7	model_8
gcindex	-11.334519	6.8327462	-27.172096	-.11051879
sector	-22.375434***	-20.297744***		-23.494753***
femsalary	.02381311		-.04511138**	.02181637
childcare		-.69180087	-.54694966	-.47838951
_cons	107.23402***	98.931932***	74.227404***	105.62276***

legend: * p<.05; ** p<.01; *** p<.001

Table 12: Sensitivity Analysis of the Two-Stage Least Squares Estimation of Gender Culture by Group Means at the Prefectural Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 12, only the coefficient of economic sector composition is significant across all regressions. The coefficient of the average female salary is only significant when the composition of economic sectors is not controlled for, which interestingly stands in contrast to the findings of the regional sensitivity analysis, where the opposite was the case. Neither of the coefficients of the availability of childcare institutions nor of our index for gender culture are significant in any of our regressions. With that said, the scale of the estimated coefficients of our index for gender culture, despite not being significant, are highly sensitive to the addition and removal of controls, indicating multicollinearity between it and the other controls.

7.2 Predicted Means 2SLS Estimation

This subsection presents the results of our latent variable two-stage least squares estimations at the regional and prefectural level. As described in Section 6, we use individual-level data for our measure of gender culture. We pursue, in this subsection, the second of our strategies as described in Section 5. We specifically design a latent variable for gender culture as measured by our respective sets of statements relating to views on gender roles at the regional and prefectural level. We then aggregate our data by region for our regional analysis and by prefecture for our prefectural analysis, and repeat the earlier two-stage least squares estimations.

7.2.1 Regional Analysis

For our regional analysis, we design a latent variable as measured by the set of questions given in Table 2 from the data provided by Yamazaki (2020) in the World Values Survey for Japan in 2010. We then aggregate the predicted means of our latent variable from our individual-level data to the regional level, and conduct our two-stage least squares estimations from the earlier section again to see if they yield better results. To see the summary statistics of our data, please refer to Appendix D.

Before constructing our latent variable, we inspect the correlation matrix over our indicator variables to screen for potentially unrelated and highly inter-correlated indicators:

	v45_sc~e	v47_in~e	v50_su~r	v52_un~y	v54_ho~e
v45_scarce	**1.0000**				
v47_income	**0.3467**	**1.0000**			
v50_suffer	**0.2214**	**0.2195**	**1.0000**		
v52_univer~y	**0.3530**	**0.2689**	**0.2906**	**1.0000**	
v54_housew~e	**0.0338**	**-0.0115**	**0.0341**	**0.0610**	**1.0000**

Table 13: Validity of Indicators at the Regional Level (rendered by the authors using Yamazaki (2020))

As can be seen in Table 13, agreement to the statement "It is about as equally fulfilling to be the housewife of a home, as to work in return for money." is barely correlated with the responses to the other statements selected as proxies for gender culture. It thus becomes difficult to present this variable as an emergent manifestation of the same underlying phenomenon represented by the latent variable affecting the other variables, which is why we remove it from our study. The other variables have about equal correlations between them, so correlating their errors in the construction of the latent variable is unnecessary.

We use the remaining four indicators, all controlled with our socio-demographic variables listed above, as measures of our latent variable. We also define the latent variable by region such that it is constant within the region and varies across the regions. For additional details, please refer to Appendix E. By predicting the means of our latent variable and thus creating a latent construct for gender culture, we aggregate these to the regional level to permit for analysis using macro data, i.e. our female labour force participation data.

To initiate our analysis and consider the simplest of cases, we regress the female labour force participation rate on our latent construct for gender culture

in an ordinary least squares model without controls:

Linear regression				Number of obs	=	11
				F(1, 9)	=	0.07
				Prob > F	=	0.8023
				R-squared	=	0.0043
				Root MSE	=	2.0423

flfp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
latent	-5.629994	21.83556	-0.26	0.802	-55.02546	43.76547
_cons	50.489	13.03333	3.87	0.004	21.00555	79.97244

Table 14: Regional Ordinary Least Squares Estimation of Female Labour Force Participation on Gender Culture by Predicted Means (rendered by the authors using Japanese Government Statistics (2022) and Yamazaki (2020))

As can be seen in Table 14, the coefficient of our latent construct for gender culture, and thus the model itself, is insignificant. Again, this is perhaps unsurprising given the small number of observations and the subsequently large standard errors yielded by the grouping of our data, as was the case in the previous section for the regional level. With the aim of improving our model and allowing for causal inference, if possible, we begin by testing the relevance of our instruments by correlating our latent construct for gender culture with our four potential instrumental variables:

	latent	mtf~1925	fdi~1925	hou~1925	urb~1925
latent	1.0000				
mtfratio1925	-0.3231	1.0000			
fdivrate1925	0.7783	-0.2922	1.0000		
house1925	-0.0733	-0.3010	-0.3436	1.0000	
urbtrur1925	-0.0753	0.5845	-0.0899	-0.5475	1.0000

Table 15: Relevance of Instruments on Gender Culture by Predicted Means at the Regional Level (rendered by the authors using Japanese Government Statistics (2014) and Yamazaki (2020))

As can be seen in Table 15, our latent construct for gender culture is more correlated with our instruments than our index for gender culture. Again, the female divorce rate in 1925 is strongly related to our latent construct for gender culture with a correlation coefficient of 0.7783 between them. The size of the correlation coefficient makes a case for the potential relevance of our instrument, wherefore we then conduct a two-stage least squares regression using the female divorce rate in 1925 as an instrument for our latent construct for gender culture:

Instrumental variables (2SLS) regression

Number of obs	11
Wald chi2(4)	39.51
Prob > chi2	0.0000
R-squared	0.7005
Root MSE	1.0131

flfp	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
latent	-8.688063	24.18604	-0.36	0.719	-56.09182	38.71569
sector	-38.77347	10.1685	-3.81	0.000	-58.70336	-18.84358
femsalary	.0683705	.0319843	2.14	0.033	.0056824	.1310586
childcare	-.4750223	1.023974	-0.46	0.643	-2.481975	1.53193
_cons	139.7563	29.13868	4.80	0.000	82.64559	196.8671

Instrumented: latent
Instruments: sector femsalary childcare fdivrate1925

First-stage regression summary statistics

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(1,6)	Prob > F
latent	0.6826	0.4710	0.5489	19.5781	0.0044

Table 16: Instrumenting Gender Culture by Predicted Means with the Female Divorce Rate in 1925 at the Regional Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Yamazaki (2020))

As can be seen in Table 16, the model is significant, as are the coefficients of the economic sector composition and of the average female salary. First, as the regional economy shifts in its activities towards the higher sectors, the female labour force participation decreases. If we compare two regions with a one-unit difference between their economic sector compositions, the region with the higher economic sector composition would have a female labour force participation rate 38.8 percent lower than the region with the lower economic sector composition. The size of the proposed difference is again unrealistic, but for a region with an economic sector composition 10 basis points higher than another, the former would have a female labour force participation rate 3.9 percent lower than the latter. A prefecture's economic sector composition thus has a large effect on female labour force participation in this model as well:

Second, as the average female salary increases, so too does the female labour force participation. Were we to consider two regions with a one-unit difference in average female salary, corresponding to 1,000 JPY per month, the region with the higher average female salary would have a female labour force participation rate 0.068 percent higher than the region with the lower average female salary. To use a more meaningful difference, a ten-unit difference between regions in the average female salary, corresponding to 10,000 JPY per month and an increase in salary of several percent for most people, would yield a female labour force participation rate 0.7 percent higher in the region with the higher average female salary. Even here, the region's average female salary has a meaningful impact on female labour force participation, according to the model.

The coefficients for our latent construct for gender culture and the availability of childcare institutions are insignificant. However, the F-statistic of 19.58 is indicative of a strong instrument, permitting for causal inference. The insignifi-

cance of the coefficient of our latent construct for gender culture is more glaring as a result: the instrument was both relevant according to the correlation coefficient and strong as indicated by the F-statistic, and yet the coefficient of our latent construct for gender culture is nowhere near significant. The argument for multicollinearity and endogeneity is here strengthened, and will be discussed in more detail in Section 8.

Given that the coefficient of our latent construct for gender culture is insignificant, we examine the effects of the addition of our three controls on female labour force participation; this in part to check if the coefficient of our latent construct for gender culture is significant in a sub-specification of our model, and also to consider the contribution of each of our control variables. We thus conduct a sensitivity analysis in which we run the two-stage least squares regression using the female divorce rate in 1925 as an instrument for our latent construct for gender culture, again with all possible sub-sets of controls:

Variable	model_1	model_2	model_3	model_4
latent	2.6168471	-22.214783	-11.399207	3.580368
sector		-18.609284**		
femsalary			-.02837613	
childcare				-.06869845
_cons	45.693897**	109.48061***	60.583997*	45.26525

legend: * p<.05; ** p<.01; *** p<.001

Variable	model_5	model_6	model_7	model_8
latent	-13.726555	-.07892914	6.9846742	-8.6880631
sector	-39.47766***	-21.625523**		-38.773468***
femsalary	.07356046**		-.04078042*	.0683705*
childcare		-1.8652365	-1.7476072	-.47502232
_cons	142.41064***	108.18108***	56.188739*	139.75635***

legend: * p<.05; ** p<.01; *** p<.001

Table 17: Sensitivity Analysis of the Two-Stage Least Squares Estimation of Gender Culture by Predicted Means at the Regional Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Yamazaki (2020))

As can be seen in Table 17, the coefficient of economic sector composition is always significant. The coefficient of average female salary is also significant when the model has an additional control, but not on its own. As in the previous regional analysis, the polarity of the coefficient of average female salary is positive when economic sector composition is controlled for, but negative when it is not. This may, again, be indicative of multicollinearity between economic sector composition and average female salary. As before, the coefficients for our latent construct for gender culture and the availability of childcare institutions are never significant.

7.2.2 Prefectural Analysis

For our prefectural analysis, we design a latent variable as measured by the set of questions given in Table 3 from the data provided by Tanioka et al. (2007) in the Japanese General Social Survey in 2005. We then aggregate the predicted means of our latent variable from our individual-level data to the

prefectural level, and conduct our instrumental variable analysis again to see if they yield better results. To see the summary statistics of our data, please refer to Appendix D.

Before constructing our latent variable, we inspect the correlation matrix over our indicator variables to screen for potentially unrelated and highly intercorrelated indicators:

	q4wwjb~e	q4wnmg~e	q4wwhh~e	q4jbmm~r	q4wwhp~r
q4wwjbia_i~e	**1.0000**				
q4wnmga_ma~e	**0.3174**	**1.0000**			
q4wwhhx_ho~e	**0.5187**	**0.4384**	**1.0000**		
q4jbmmcc_s~r	**0.3326**	**0.2849**	**0.3722**	**1.0000**	
q4wwhphh_c~r	**0.3841**	**0.3797**	**0.4857**	**0.3192**	**1.0000**

Table 18: Validity of Indicators at the Prefectural Level (rendered by the authors using Tanioka et al. (2007))

As can be seen in Table 18, the variables have about equal correlations between them and can therefore be described as emergent manifestations of the same underlying phenomenon represented by the latent variable, and correlating their errors in the construction of the latent variable is unnecessary. We use the indicators, all controlled with our socio-demographic variables at the individual level, as measures of our latent variable. We also define the latent variable by prefecture such that it is constant within the region and varies across the regions. For additional details, please refer to Appendix E. After predicting the means of our latent construct for gender culture, we aggregate these to the prefectural level to permit for analysis using macro data, i.e. our female labour force participation data.

To initiate our analysis and consider the simplest of cases, we regress the female labour force participation rate on the predicted prefecture-level means of our latent construct for gender culture without controls in an ordinary least squares model:

Linear regression

Number of obs	= **47**
F(1, 45)	= **3.06**
Prob > F	= **0.0869**
R-squared	= **0.0864**
Root MSE	= **2.3844**

flfp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
latent	**-17.95046**	**10.25622**	**-1.75**	**0.087**	**-38.60755**	**2.706617**
_cons	**57.84027**	**5.2687**	**10.98**	**0.000**	**47.22856**	**68.45197**

Table 19: Prefectural Ordinary Least Squares Estimation of Female Labour Force Participation on Gender Culture by Predicted Means (rendered by the authors using Japanese Government Statistics (2022) and Tanioka et al. (2007))

As can be seen in Table 19, the coefficient of our latent construct for gender culture is near-significant. To check the explanatory power of our latent construct for gender culture without instrumentation, we add our controls:

Linear regression

Number of obs	= 47
F(4, 42)	= 16.56
Prob > F	= 0.0000
R-squared	= 0.4636
Root MSE	= 1.8913

flfp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
latent	-16.9507	8.21801	-2.06	0.045	-33.53532	-.3660845
sector	-23.25101	3.745838	-6.21	0.000	-30.81042	-15.69161
femsalary	.0207314	.0142039	1.46	0.152	-.0079331	.049396
childcare	-.3355566	.5793652	-0.58	0.566	-1.504763	.8336496
_cons	113.6127	9.687242	11.73	0.000	94.06302	133.1623

Table 20: Prefectural Ordinary Least Squares Estimation of Female Labour Force Participation on Gender Culture by Predicted Means with Controls (rendered by the authors using Japanese Government Statistics (2022) and Tanioka et al. (2007))

As can be seen in Table 20, the coefficients of our latent construct for gender culture and economic sector composition are significant. As the gender culture becomes more confining, female labour force participation decreases. If we compare two prefectures, one without normative views on gender roles, and another with strict traditional views on gender roles, the one-unit difference in their latent construct for gender culture would correspond to a female labour force participation rate 17.0 percent lower in the 'traditional' prefecture. With reference to the reduced p-value of the coefficient of our latent construct for gender culture, there is likely multicollinearity between it and the economic sector composition, which again speaks to our broader hypothesis that gender culture is endogenous to the model and that causal inference requires the use of an identification strategy. To see our test for multicollinearity between the independent variables of our model, please refer to Appendix D, which puzzlingly does not indicate that it exists for our variables in this case either. We thus test the relevance of our instruments by correlating our latent construct for gender culture with our four potential instrumental variables:

	latent	mtf~1925	fdi~1925	hou~1925	urb~1925
latent	1.0000				
mtfratio1925	0.1635	1.0000			
fdivrate1925	0.0024	-0.2419	1.0000		
house1925	-0.1086	-0.1313	-0.2557	1.0000	
urbtrur1925	0.0248	0.5825	-0.0102	-0.3158	1.0000

Table 21: Relevance of Instruments on Gender Culture by Predicted Means at the Regional Level (rendered by the authors using Japanese Government Statistics (2014) and Tanioka et al. (2007))

As can be seen in Table 21, there exists no strong relationship between our latent construct for gender culture and any of the proposed instrumental variables. Notably, however, the most relevant instrument changed from average household size in 1925 to male-to-female population ratio in 1925, with a correlation of 0.1635 with our latent construct for gender culture. The polarity of the correlation coefficient is consistent with our hypothesis that a higher male-

to-female population ratio in 1925 would propagate more conservative views on gender roles today. For a comparison with the previous two-stage least squares estimation using household size in 1925 as an instrument for gender culture, please refer to Appendix D We thus conduct a new two-stage least squares regression:

Instrumental variables (2SLS) regression

Number of obs	47
Wald chi2(4)	61.00
Prob > chi2	0.0000
R-squared	0.1317
Root MSE	2.2747

flfp	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
latent	-52.5993	31.64914	-1.66	0.097	-114.6305	9.431875
sector	-22.19713	5.234901	-4.24	0.000	-32.45735	-11.93691
femsalary	.0175461	.0206396	0.85	0.395	-.0229067	.0579989
childcare	-.0134808	.6434772	-0.02	0.983	-1.274673	1.247711
_cons	129.2942	15.86541	8.15	0.000	98.19857	160.3898

Instrumented: latent
Instruments: sector femsalary childcare mtfratio1925

First-stage regression summary statistics

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(1,42)	Prob > F
latent	0.0724	-0.0159	0.0472	3.20474	0.0806

Table 22: Instrumenting Gender Culture by Predicted Means with the Male-to-Female Population Ratio in 1925 at the Prefectural Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 22, the model is significant, as is the coefficient of the economic sector composition. As the prefectural economy shifts in its activities towards the higher sectors, the female labour force participation decreases. If we compare two prefectures with a one-unit difference between their economic sector compositions, the prefecture with the higher economic sector composition would have a female labour force participation rate 22.2 percent lower than the region with the lower economic sector composition. The size of the proposed difference is again unrealistic, but for a region with an economic sector composition 10 basis points higher than another, the former would have a female labour force participation rate 2.2 percent lower than the latter. A prefecture's economic sector composition thus has a large effect on female labour force participation in this model as well.

Notably, the coefficient of our latent construct for gender culture is near-significant. As the gender culture becomes more confining, female labour force participation decreases. If we compare two prefectures, one without normative views on gender roles, and another with strict traditional views on gender roles, the one-unit difference in their latent construct for gender culture would correspond to a female labour force participation rate 52.6 percent lower in the 'traditional' prefecture. This would bring about a negative female labour force

participation rate in most prefectures, so it is unrealistic, but it is noteworthy that the latent construct for gender culture neared significance, unlike in previous models.

The coefficients of the average female salary and the availability of childcare institutions are insignificant, and the F-statistic of 3.20 is indicative of a weak instrument. We examine the effects of the addition of our three controls on female labour force participation; this in part to check if the coefficient of our latent construct for gender culture is significant in a sub-specification of our model, and also to consider the contribution of each of our control variables. We thus conduct a sensitivity analysis in which we run the two-stage least squares regression using the male-to-female population ratio in 1925 as an instrument for our latent construct for gender culture again with all possible sub-sets of controls:

Variable	model_1	model_2	model_3	model_4
latent	-164.26626	-45.388073	-93.141607*	-147.30187
sector		-18.955367***		
femsalary			-.04560094*	
childcare				1.3076392
_cons	133.38395*	121.0323***	106.733***	121.77588*

legend: * p<.05; ** p<.01; *** p<.001

Variable	model_5	model_6	model_7	model_8
latent	-52.700013	-45.009926	-95.384949	-52.599304
sector	-22.200576***	-19.491804***		-22.197127***
femsalary	.01773666		-.04181157	.01754609
childcare		-.23017344	.28265812	-.01348084
_cons	129.28365***	122.72603***	106.43846***	129.2942***

legend: * p<.05; ** p<.01; *** p<.001

Table 23: Sensitivity Analysis of the Two-Stage Least Squares Estimation of Gender Culture by Predicted Means at the Prefectural Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 23, only the coefficient of economic sector composition is significant across all regressions, always to the 0.1 percent level. The coefficient of the average female salary is only significant if it is the sole control in the model, and it is therefore likely that it is linearly related with economic sector composition, but that average female salary is driven by the economic sector composition and not vice versa. Notably, the coefficient of our latent construct for gender culture is significant in Model 3 where only the average female salary is controlled for. The coefficient, however, is very unrealistic. The coefficient of the availability of childcare institutions is never significant.

8 Discussion

In this section, we interpret the results covered in the previous section, relating this back to the model described in the methodology. We also situate the results in the context of our literature review, relating it to the findings that forms the logic behind this thesis's model and choice of variables.

8.1 Interpretation of Results

In the case of the regional group means analysis, the coefficient of gender culture is never significant, and the use of female divorce rates in 1925 makes for a weak instrument for gender culture. The coefficient of economic sector composition is always significant, but there are indications of multicollinearity between the controls of the model, albeit not as certified by VIF-tests. In the case of the prefectural group means analysis, the coefficient of gender culture is only significant in the controlled ordinary least squares-case, and the use of average house size in 1925 makes for a weak instrument for gender culture. The coefficient of economic sector composition is, again, always significant, but the volatility of the index for gender culture is indicative of its endogeneity in the model.

In the case of the regional predicted means analysis, the coefficient of gender culture is, as in the regional group means analysis, never significant. However, the relevance of the female divorce rates in 1925 as an instrument for gender culture is higher, and the instrument strong. The continued insignificance of the coefficient of gender culture is then notable, in that causal inference can be made yet there is not marked effect of gender culture on female labour force participation. Even here, the coefficient of economic sector composition is always significant. In the case of the prefectural predicted means analysis, the coefficient of gender culture is only significant in the controlled ordinary least squares-case and in one of the models of the sensitivity analysis in which only the average female salary is controlled for. The relevance of the average house size in 1925 as an instrument for gender culture was poorer than in the group means case, but the relevance of the male-to-female population ratio as an instrument for gender culture was higher, and the instrument, though weak, was a bit stronger. The coefficient of economic sector composition is, again, always significant.

Hence, we find little support for this paper's hypothesis. The examination of region-level female labour force participation variation consistently show that gender culture—as measured by both group means and predicted means, and when estimated with instrumental variables and without—is an insignificant explanatory variable. Our prefecture-level results, while showing some significant results indicating support for our hypothesis, suffer from poor instrumental variables and p-values that have probably been inflated by multicollinearity with the seemingly better explanatory variable of composition of economic sectors. Thus, while finding some indication that gender culture does explain variations in female labour force participation across Japan when measured at the prefectural level, we can ascertain no support for our hypothesis despite its footing in a strong literature, and refrain from causal inference in the reverse due to the uncertain quality of our chosen instruments.

With regard to theoretical implications, the model presented in Akerlof and Kranton (2000) might not sufficiently explain variations in female labour force

participation across Japan when controlling for economic indicators. As per this model, and the associated trade-off between choosing work and associated earnings or conforming to a female identity as prescribed by an established gender culture, the differences thereof—particularly due to the fact that regions and prefectures of Japan face the same institutional environment—should explain variation. It does so for example in Campa et al. (2009), Menta and Lepinteur (2021), and in Lietzmann and Frodermann (2021), all three of which take similar approaches, by using World Values Survey data, and together study very different countries—from Italy and Germany, to Morocco and Jordan (albeit the latter two on a country rather than regional level). We are surprised to find so little support for our hypothesis, even at prefecture level which allows for more heterogeneity to be captured by data, and that sectors seem to be such an impactful explanatory variable even when Campa et al. (2009) controls for it similarly to us for the Italian context.

From a strict external validity point of view, however, we should not draw the conclusion that Japan is different from the rest of the world and that we, in this particular study, have shown that gender culture has poor explanatory power for the persistent differences within Japan. The framework in Akerlof and Kranton (2000) makes intuitive sense in a Japanese setting too—but the question worth asking is if the cause lies not in gender culture as expressed in survey questions per se, but rather that discriminatory barriers that are not captured by such measures could be an important reason for these differences instead. This hypothesis would give much merit to the approach used in Campa et al. (2009), which uses not only survey data from individual but also survey data from firms, in order to understand the employment preferences from the employer's side too. As highlighted in our background, Japan has longstanding gendered barriers on the labour market and has struggled to rid itself of them.

8.2 Limitations of Study

Our two-stage least squares approach to testing for a causal effect is hampered by imperfect, and in most cases, weak instruments. We discuss possible violations of the exclusion restriction that may apply for each of them in Section 5 and accept that this is a clear drawback. Had our results been defined more greatly by significant results for the effect of gender culture on female labour force participation, however, the pitfalls of this would be greater, at least in the case where we would claim to have found an effect rather than failing to identify one with a partially tested method. We also contend that the scope of this study is that the part of our thesis attempting to undertake causal inference through instrumental variables is more of an investigation into identification strategies. With imperfect instruments, we argue that economists more clever or well-read into the Japanese context—not least with some familiarity with the language—should find better ones and conduct studies similar to ours. Had our results been more significant, we would have had to be incredibly cautious still about making inference because of reasonable violations of the exclusion restriction that we cannot test for and the mostly limited relevance.

Another noteworthy flaw of our study is that it may be outdated. With the rapid rise in female labour force participation occurring in the 2010s, it would have gained much from incorporating this time period into this study. Indeed, an important part of our motivation for this study is the rapid change

that Japan has undergone—a curious scholar should be intrigued by questions of what the dynamism of labour market changes does to a society, and how culture interacts with that change.

8.3 Implications for Future Research

Another approach to studying the phenomenon of persistent variation in female labour force participation across Japanese regions would be to use data from Waves 6 and 7 of the World Values Survey, collected in 2010 and 2019 respectively, and examine the change in effect of gender culture on female labour force participation. Handling 2019 data is comparatively arduous for non-Japanese analysts like ourselves—regions are defined differently than in the 2010 data set but can be assigned correctly thanks to including city of residence of respondents—but is far from impossible to undertake. Similarly, one might be able to use cohort data from, for example, the Japanese General Social Survey and apply a fixed effects model for the same reasons. Two things are compelling about this approach: Firstly, it could help capture shifts in gender culture (if any such shifts occurred) concurrent with the rapid rise in female labour force participation throughout this period of *Womenomics*, and secondly, it would benefit from the same data collection methods at the two or more points in time.

From a data collection point of view, a much more ideal study would use survey data with perhaps tens of thousands of respondents categorised by prefecture only to get sufficiently large numbers of observations for each prefecture while retaining the heterogeneity that is lost when studying these phenomena at the regional level. Of course, collecting such data is costly, but the Japanese government as the foremost stakeholder interested in raising female labour force participation to combat the demographic challenge of an aging population would benefit from greater insights into the dynamics of culture and the participation in economic activities of women. Collecting such data and making it widely available would help social scientists and policymakers alike determine if norms, economic factors, or other reasons entirely are driving female labour force participation and how policy might in turn be shaped in the light of this knowledge.

Relating back to the point on firm data as a way to capture the gender culture on the employer side as well: Since firms are responsible not only for hiring but specifically creating incentives for women to work and will do so poorly by offering jobs in line with traditional and unattractive norms, the measure of gender culture might have been complemented well by firm data. Hence, future studies should aim to collect such data if it does not exist and try to emulate the approach used in Campa et al. (2009) with the purpose of getting both the "demand" and "supply" side of the labour market, which could together mitigate potential measurement errors for gender culture compared to only using data from individuals in the World Values Survey.

We naturally suggest that the phenomenon of persistent regional variations in female labour force participation or similar gendered economic phenomena should be studied in the context of other countries. We know from convincing arguments in Fernandez (2007) most famously, that women with immigrant backgrounds (in the United States, at least) will differ in their degree of labour force participation depending on the gender culture in their mother's countries of origin. We also know from papers like that of Campa et al. (2009) that con-

vincing cases for the impact of gender culture and the historical backgrounds of such can be made. Studies like these may be especially convincing in countries with regions sharing similar institutions—i.e. centralised states—such as France or South Korea. Moreover, studying countries that are similar to Japan will be a great extension of our own contribution. To speculate, this phenomenon could also be present in the other 'Asian Tigers', and other countries finding themselves as outliers with regards to the Goldin (1994) U-shaped curve framework might all be worth examining.

To make the analysis more complete, we examined if the ratio between male-to-female labour force participation across regions would vary similarly to our chosen dependent variable. Interestingly, the measure did not, with little to no variation in this ratio across Japanese regions—meaning male labour force participation should vary along similar patterns as that of women. Logically, this would imply that the gendered patterns we analysed simply do not exist, and that labour force participation in general is the source of variation, without regard to gender. We contend in the strongest terms that they do—the leading expert on female labour force participation Yukiko Abe describes the underlying phenomenon we study in detail, not least noting that regions with higher female labour force participation also see women working in regular jobs to a greater extent (Y. Abe, 2013). Much points to sectoral dynamics here, since women are overall more likely to take on jobs in the service sector while men are better represented in primary good production and manufacturing (Y. Abe, 2013), but the exact nature of the variations in female labour force participation across regions of Japan remains inconclusive. Despite the questions remaining, with us having built at least slightly on the scarce work on this subject, we hope to see future research examining it all the more closely.

9 Conclusion

What we attempt to do in this paper is to examine the effect of gender culture on the persisting differences in female labour force participation across regions of Japan. We study this through a baseline linear model regressing a measure of gender culture based on survey data and relevant control variables on female labour force participation, and also utilising a two-stage least squares with a range of instruments found in historical data. The use of an index and latent construct, respectively, and our hypothesis that gender culture has explanatory value for these persistent differences, is motivated by a rich literature combining tools and theory from various social sciences exported to labour and gender economics. Still, we find little to support our hypothesis, with the few significant results only at the prefectural level and dubious due to suspected endogeneity problems. With no successes at drawing clear conclusions or making causal inference whatsoever, we argue that—based on our complete knowledge of the scholarships on this subject—the regional variations in Japan either deviate from existing theory or must be explained with a method differing from or greatly improving upon ours.

We do not assert that we have convincingly showed that gender culture is not an important determinant of female labour force participation in Japan—but we are convinced that we show that World Values Survey based data, which has shown contrary results for regional variations within other countries, does not support this hypothesis. We presented some suggestions for how this phenomenon might better be studied in the previous section, and invite scholars with a different approach to ours to try and explain it. Nonetheless, we believe we present not just an investigation into methods through which our research questions could be answered, but a case for why these questions as applied to the Japanese context should be studied further. Is Japan an outlier from existing theory entirely, or do we need better data to conduct regional or prefectural studies for this country to capture an existing effect of gender culture on female labour force participation in a more appropriately formulated population model?

Our results are not of the generalisable kind because they are somewhat inconclusive: Either significant only under dubious grounds or not in line with existing research. Instead, they motivate why this area of research should be pursued further. One area that we believe needs more focus going ahead is making more nuanced analyses of the labour market, finding ways to integrate the dynamics of regular and non-regular employment, of which the latter makes up the lion's share of the new jobs women entering into the labour force in Japan have taken on, and sectoral analyses. Connections between political and managerial representation of women and the labour market may be particularly important for the Japanese context. What we are definitely convinced about is that regional studies, not just for Japan, provide ample opportunities for providing policy guidance if outcomes vary across space. Even more ambitious studies could make use of comparative regional approaches, investigating phenomena such as the one examined in this thesis in multi-country settings. The interaction between culture and economic outcomes requires further attention, and may benefit from studies not isolating Japan.

Simon Kuznets, the winner of the 1971 Nobel Memorial Prize in Economics, famously quipped that there were four types of economies in the world: De-

veloped, undeveloped, Japan and Argentina (The Economist, 2019). We agree with this joke to the extent that Japan has the qualities of an outlier—despite its high income levels, it diverges from other OECD counterparts in many ways, not least with regards to gender equality, a category in which it has been a longtime under-performer. Understanding why Japan is different may provide Western scholars with valuable points of comparison and stimulate the formulation of new theory, but more importantly, Japan and its policymakers must come to understand these phenomena itself. Without doing so, it risks perpetuating levels of inequality inhibiting economic growth and social cohesion, with severe effects on its long-term economy and ability to manage the demographic challenges already troubling the country, which loom larger still on the horizon.

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A Detailed List of Variables

This section provides a detailed list of the variables and indicators derived from each of the data-sets mentioned in Section 6.

A.1 Japanese Government Statistics

The indicators quoted from Japanese Government Statistics (2022) and their transformations, where applicable, were as follows:

Code	Description	Transformation
#F0110102	Labour force participation rate (female) [%]	–
#F01201	Ratio of persons employed in primary industry [%]	Coded to 1 in aggregation
#F01202	Ratio of persons employed in secondary industry [%]	Coded to 2 in aggregation
#F01203	Ratio of persons employed in tertiary industry [%]	Coded to 3 in aggregation
#F0620104	Wages regularly paid (monthly average, female) [thousand yen]	–
#J02501	Number of child welfare institutions (per 100,000 persons) [facilities]	–

Table 24: Prefectural Indicators from e-Stat (Japanese Government Statistics, 2022)

A.2 World Values Survey for Japan 2010

The variables quoted from Yamazaki (2020) and their transformations, where applicable, were as follows:

Code	Description	Transformation
V256	Region	–
V240	Sex	1 for female 0 for male
V242	Age	–
V248	Highest educational level attained	1 for university 0 for other responses
V229	Employment status	1 for self-employed 1 for full time 0 for other responses
V57	Marital status	1 for married 1 for living together as married 0 for other responses
V58	Children	0 for no children 1 for 1 child ...and so on... 8 for 8 or more children
V45	When there is a shortage of work/ employment opportunities, a man should be given a job before a woman is.	1 for agree 0.5 for neither 0 for disagree
V47	There is always trouble where a wife earns more than her husband.	1 for agree 0.5 for neither 0 for disagree
V50	It causes trouble for the children if the mother works for money.	1 for agree strongly 1 for agree 0 for disagree 0 for strongly disagree
V52	University education is more important for boys than it is for girls.	1 for agree strongly 1 for agree 0 for disagree 0 for strongly disagree
V54	It is about as equally fulfilling to be the housewife of a home, as to work in return for money.	1 for agree strongly 1 for agree 0 for disagree 0 for strongly disagree

Table 25: Variables from World Values Survey (Yamazaki, 2020)

A.3 Japanese General Social Survey 2005

The variables quoted from Tanioka et al. (2007) and their transformations, where applicable, were as follows:

Code	Description	Transformation
PREF	Prefecture name	–
SEXA	Sex	1 for female 0 for male
AGEB	Age	–
XXLSTSCH	Last school respondent attended	1 for college 1 for university 1 for graduate school 0 for other responses
TP12JOB	Employment status	1 for self-employed 1 for regular employee 1 for executive 0 for other responses
MARC	Marital status	1 for currently married 0 for other responses
CCNUMTTL	Total number of children	–
Q4WWJBIA	If a husband has sufficient income, it is better for his wife not to have a job.	1 for agree 1 for somewhat agree 0 for somewhat disagree 0 for disagree
Q4WNMGA	Without a doubt, a woman's happiness lies in marriage.	1 for agree 1 for somewhat agree 0 for somewhat disagree 0 for disagree
Q4WWHHX	A husband's job is to earn money; a wife's job is to look after the home and family.	1 for agree 1 for somewhat agree 0 for somewhat disagree 0 for disagree
Q4JBMMCC	A preschool child is likely to suffer if his or her mother works.	1 for agree 1 for somewhat agree 0 for somewhat disagree 0 for disagree
Q4WWHPHH	It is more important for a wife to help her husband's career than to have one herself.	1 for agree 1 for somewhat agree 0 for somewhat disagree 0 for disagree

Table 26: Variables from Japanese General Social Survey (Tanioka et al., 2007)

B Regional Classification of Prefectures

There exist a number of regional classifications to categorise Japan's 47 prefectures into aggregated units. The classification employed by Yamazaki (2020) is, however, atypically defined and not explicitly provided. We thus contacted Professor Seiko Yamazaki in her capacity as Principal Investigator of the World Values Survey for Japan in 2010 and her colleague, Sayuri Nakagawa, answered on her behalf:

Dentsu Institute <d-ii@dentsu.co.jp>
Wed 13/04/2022 06:40
To: Jakob Ringberg <24495@student.hhs.se>

Hello Jakob,

Thank you for your interest. I am Sayuri Nakagawa from Dentsu Institute and writing to you on behalf of Seiko. Please find the answer to your enquiry as follows.

>First, how were Japan's prefectures divided across the eleven regions used for local substitution? Given that we have some data at the prefectural level, we would like to recode these to a regional classification of the WVS.

As for the Wave 6, we divided the nation into 11 blocks as follows:

1. Hokkaido: Hokkaido
2. Tohoku: Aomori/Iwate/Miyagi/Akita/Yamagata/Fukushima
3. North Kanto: Ibaraki/Tochigi/Gunma/Saitama
4. South Kanto: Chiba/Kanagawa/Yamanashi
5. Tokyo: Tokyo
6. Tokai: Gifu/Shizuoka/Aichi/Mie
7. Hokuriku/Shin-etsu: Niigata/Toyama/Ishikawa/Fukui/Nagano
8. Kinki: Shiga/Kyoto/Osaka/Hyogo/Nara/Wakayama
9. Chugoku: Tottori/Shimane/Okayama/Hiroshima/Yamaguchi
10. Shikoku: Tokushima/Kagawa/Ehime/Kochi
11. Kyushu/Okinawa:
    Fukuoka/Saga/Nagasaki/Kumamoto/Oita/Miyazaki/Kagoshima/Okinawa

C Instrumental Variable Data

Our four instrumental variables, specifically the male-to-female population ratio, the female divorce rate, the average household size, and the urban-to-rural population ratio, have all been derived from population census data for 1925 by Japanese Government Statistics (2014) on e-Stat. The male-to-female population ratio was provided in the data; the female divorce rate was derived by dividing the number of female divorcées by the female population; the average household size was found by dividing the population by the number of households; and the urban-to-rural population ratio was calculated by dividing the urban population by the rural population. The resultant data-set is given in tabular form below:

Code	Prefecture	Male-to-female pop. ratio	Female divorce rate	Average household size	Urban-to-rural pop. ratio
0	Japan	1.010	0.0147	5.0	0.2753
1	Hokkaido	1.094	0.0104	5.3	0.3217
2	Aomori	1.011	0.0150	5.9	0.1325
3	Iwate	0.992	0.0179	5.9	0.0588
4	Miyagi	1.012	0.0154	6.0	0.1586
5	Akita	1.011	0.0173	5.9	0.0492
6	Yamagata	0.972	0.0142	6.1	0.1480
7	Fukushima	0.978	0.0151	5.6	0.0963
8	Ibaraki	0.970	0.0137	5.1	0.0341
9	Tochigi	0.968	0.0141	5.4	0.1185
10	Gunma	0.962	0.0134	5.4	0.1692
11	Saitama	0.957	0.0091	5.5	0.0234
12	Chiba	0.976	0.0122	5.2	0.0308
13	Tokyo	1.138	0.0141	4.6	0.8349
14	Kanagawa	1.093	0.0093	4.9	0.6476
15	Niigata	0.977	0.0126	5.5	0.1165
16	Toyama	0.968	0.0096	5.1	0.1724
17	Ishikawa	0.949	0.0144	4.9	0.2443
18	Fukui	0.961	0.0159	4.8	0.1114
19	Yamanashi	1.000	0.0132	5.1	0.1282
20	Nagano	0.950	0.0126	5.2	0.1108
21	Gifu	1.006	0.0131	4.9	0.1136
22	Shizuoka	1.000	0.0122	5.4	0.1853
23	Aichi	0.984	0.0143	4.9	0.6696
24	Mie	0.968	0.0139	4.9	0.1420
25	Shiga	0.941	0.0130	4.6	0.0537
26	Kyoto	1.041	0.0145	4.6	0.9360
27	Osaka	1.088	0.0170	4.5	2.7882
28	Hyogo	1.020	0.0131	4.6	0.4978
29	Nara	0.985	0.0138	5.0	0.0914
30	Wakayama	0.992	0.0126	4.7	0.1382

Code	Prefecture	Male-to-female pop. ratio	Female divorce rate	Average household size	Urban-to-rural pop. ratio
31	Tottori	0.954	0.0188	5.1	0.0803
32	Shimane	0.993	0.0190	4.6	0.0608
33	Okayama	0.982	0.0172	4.6	0.1118
34	Hiroshima	1.024	0.0176	4.6	0.3246
35	Yamaguchi	1.020	0.0146	4.5	0.1480
36	Tokushima	0.998	0.0131	4.8	0.1212
37	Kagawa	1.010	0.0167	4.8	0.1663
38	Ehime	0.979	0.0200	4.7	0.1399
39	Kochi	0.988	0.0208	4.6	0.1057
40	Fukuoka	1.027	0.0148	5.0	0.3846
41	Saga	0.965	0.0129	5.3	0.0656
42	Nagasaki	1.040	0.0145	5.0	0.3234
43	Kumamoto	0.969	0.0164	5.2	0.1281
44	Oita	0.973	0.0154	4.9	0.1103
45	Miyazaki	1.015	0.0193	5.0	0.1188
46	Kagoshima	0.941	0.0216	4.7	0.0926
47	Okinawa	0.925	0.0294	4.6	0.1559

Table 27: Instrumental Variable Data from 1925 Population Census by Prefecture [in French] (Japanese Government Statistics, 2014)

D Additional Analysis

This section provides additional analysis to that of Section 7 and its sub-sections, with accompanying comments of their implications.

D.1 Regional Group Means Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
flfp	11	47.21546	1.941665	44.58	50.87
gcindex	11	.4981455	.0278648	.4531	.5587
sector	11	2.6533	.0754602	2.5647	2.8148
femsalary	11	237.5409	25.85253	205.38	298.2
childcare	11	1.915636	.4440533	1.2737	2.5401
mtfratio1925	11	1.017291	.0545277	.9624	1.138
fdivrate1925	11	.0142909	.0025359	.0104	.018
house1925	11	5.028182	.3907126	4.6	5.86
urbtrur1925	11	.3551909	.3655392	.0797	1.2582

Table 28: Summary Statistics of Regional Group Means Data (rendered by the authors using Japanese Government Statistics (2014, 2022) and Yamazaki (2020))

As can be seen in Table 28, there is considerable variation between regions in the average female salary and the availability of childcare institutions, less in the female labour force participation rate, and even less so in our index for gender culture and the economic sector composition. With the small number of observations, the low variability in some of our data will likely have implications for the following analysis, and these will be discussed in further detail in Section 8. There are otherwise no missing values or evidently disparate values.

D.2 Prefectural Group Means Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
flfp	47	48.57234	2.467414	41.9	53.1
gcindex	47	.5336468	.0721268	.3758	.7072
sector	47	2.586419	.077504	2.4597	2.7979
femsalary	47	220.8532	20.39665	186.9	296.4
childcare	47	2.178936	.6834002	1.11	4.45
mtfratio1925	47	.9950426	.0429104	.925	1.138
fdivrate1925	47	.0150872	.0035423	.0091	.0294
house1925	47	5.046981	.4255153	4.4753	6.0778
urbtrur1925	47	.2544872	.4284623	.0234	2.7882

Table 29: Summary Statistics of Prefectural Group Means Data (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 29, there is considerable variation between prefectures in the female labour force participation rate, our index for gender culture, the average female salary and the availability of childcare institutions, but less so for the composition of economic sectors. There are no missing values or evidently disparate values. It should be noted that the ranges of values our variables take are far larger at the prefectural level than at the regional level. While this is a result of having more disaggregated data, in contrast to the aggregation of prefectures into regions and the subsequent reduction in variability in our data, it may call into question the appropriateness of the regional classification of the World Values Survey for Japan in 2010 by Yamazaki (2020). This is discussed further in Section 8.

Variable	VIF	1/VIF
femsalary	2.18	0.459635
sector	1.90	0.527257
childcare	1.24	0.809123
gcindex	1.01	0.987768
Mean VIF	1.58	

Table 30: Test of Multicollinearity for Prefectural Group Means Variables (rendered by the authors using Japanese Government Statistics (2022) and Yamazaki (2020))

As can be seen in Table 30, while there is some multicollineraity between the independent variables, the tolerance is not very close to being breached.

D.3 Regional Predicted Means Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
v45_scarce	2,279	.5842475	.3341314	0	1
v47_income	1,791	.4584031	.3005126	0	1
v50_suffer	1,726	.2161066	.4117071	0	1
v52_univer~y	1,768	.2239819	.417028	0	1
v54_housew~e	1,783	.897364	.303568	0	1
v240_fem	2,443	.5182153	.4997704	0	1
v242_age	2,443	50.74212	16.29775	18	80
v248_educ	2,389	.2394307	.4268254	0	1
v229_empstat	2,284	.5091944	.5000249	0	1
v57_maristat	2,423	.699546	.4585501	0	1
v58_children	2,416	1.570778	1.131498	0	8

Table 31: Summary Statistics of Regional Predicted Means Data (rendered by the authors using Japanese Government Statistics (2014, 2022) and Yamazaki (2020))

As can be seen in Table 31, the majority of our variables are dummy variables, excepting the control variables for age and number of children. To see a detailed description of our variables, please refer to Appendix A. The mean response notably varies greatly between the statements we aim to use as indicator variables for the construction of our latent variable, which is indicative of a breach in validity of at least one of the indicators. There are some missing values, particularly from non-responses to the questions relating to gender culture, but these lapses are not considerable and should not have a meaningful effect on the model. There are no evidently disparate values.

D.4 Prefectural Predicted Means Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
q4wwjbia_i~e	1,984	.5136089	.4999408	0	1
q4wnmga_ma~e	1,970	.5659898	.4957521	0	1
q4wwhhx_ho~e	1,986	.520141	.49972	0	1
q4jbmmcc_s~r	1,968	.5462398	.4979838	0	1
q4wwhphh_c~r	1,960	.4826531	.4998265	0	1
sexa_fem	2,023	.5452299	.4980732	0	1
ageb_age	2,023	52.95205	16.90733	20	89
xxlstsch_e~c	2,009	.3175709	.4656475	0	1
tp5unemptp~t	1,952	.4482582	.497443	0	1
marc_maris~t	2,023	.7281265	.445035	0	1
ccnumttl_c~n	2,020	1.709901	1.149111	0	8

Table 32: Summary Statistics of Prefectural Predicted Means Data (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 32, the majority of our variables are dummy variables, excepting the control variables for age and number of children. To see a detailed description of our variables, please refer to Appendix A. Compared to the regional analysis, the mean response barely varies between the questions we aim to use as indicator variables for the design of our latent variable. There are some missing values, particularly from non-responses to the questions relating to gender culture, but these lapses are not minimal and should not have a meaningful effect on the model. There are no evidently disparate values.

Instrumental variables (2SLS) regression

Number of obs	47
Wald chi2(4)	56.97
Prob > chi2	0.0000
R-squared	0.4322
Root MSE	1.8393

flfp	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
latent	-5.998222	81.31257	-0.07	0.941	-165.3679	153.3715
sector	-23.57481	4.566724	-5.16	0.000	-32.52542	-14.62419
femsalary	.0217101	.0145662	1.49	0.136	-.0068392	.0502594
childcare	-.4345094	1.089736	-0.40	0.690	-2.570353	1.701334
_cons	108.7948	35.60283	3.06	0.002	39.0145	178.575

Instrumented: latent
Instruments: sector femsalary childcare house1925

First-stage regression summary statistics

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(1,42)	Prob > F
latent	0.0329	-0.0592	0.0066	.433693	0.5138

Table 33: Instrumenting Gender Culture by Predicted Means with the Average Household Size in 1925 at the Prefectural Level (rendered by the authors using Japanese Government Statistics (2014, 2022) and Tanioka et al. (2007))

As can be seen in Table 33, the model is significant, as is the coefficient of the economic sector composition. As the prefectural economy shifts in its activities towards the higher sectors, the female labour force participation decreases. If we compare two prefectures with a one-unit difference between their economic sector compositions, the prefecture with the higher economic sector composition would have a female labour force participation rate 23.6 percent lower than the prefecture with the lower economic sector composition. The size of the proposed difference is again unrealistic, but for a region with an economic sector composition 10 basis points higher than another, the former would have a female labour force participation rate 2.4 percent lower than the latter.

The coefficients of our latent construct for gender culture, the average female salary, and the availability of childcare institutions are all insignificant. Moreover, the F-statistic of 0.43 is the worst we have seen yet and is indicative of a very weak instrument. The phenomenon captured by our latent variable is, therefore, distinct from that of our index for gender culture when related to the average household size in 1925.

Variable	VIF	1/VIF
femsalary	**2.15**	**0.464882**
sector	**1.88**	**0.532158**
childcare	**1.26**	**0.794188**
latent	**1.03**	**0.973514**
Mean VIF	**1.58**	

Table 34: Test of Multicollinearity for Prefectural Predicted Means Variables (rendered by the authors using Japanese Government Statistics (2022) and Tanioka et al. (2007))

As can be seen in Table 34, while there is some multicollineraity between the independent variables, the tolerance is not very close to being breached, as was also the case for our group means analysis.

E Latent Variable Estimations

For each of the following tables, please note that the first loading has been restricted to 1 for purposes of identifiability. Put simply, the restriction gives scale to the other factor scores. Note also that the latent variable has been defined at the group-level—the region and the prefecture, respectively—such that the standard errors are clustered by group. Finally, because the individuals controls jointly affect the responses to the statements, the model must account for the multivariate regression structure, such that the error in the estimation includes the covariance between the socio-demographics.

As can be seen in Table 35, the socio-demographics are in most cases significant in their effect on the indicator variable, where number of children seems to play the smallest role, and age the biggest. The same can be observed for Table 36. The predicted means are therefore likely to differ from the group means, and the outcomes of the analysis will probably differ.

Log pseudolikelihood = **−2326.0038**

(1) **[v45_scarce]G[regcode] = 1**

(Std. Err. adjusted for **11** clusters in regcode)

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
v45_scarce						
v240_fem	−.089132	.0133297	−6.69	0.000	−.1152577	−.0630064
v242_age	.0027045	.0005901	4.58	0.000	.001548	.003861
v248_educ	−.0785086	.01415	−5.55	0.000	−.1062421	−.0507751
v229_empstat	−.0783589	.0155757	−5.03	0.000	−.1088867	−.0478312
v57_maristat	.0265789	.0107352	2.48	0.013	.0055383	.0476195
v58_children	.0093784	.0067276	1.39	0.163	−.0038075	.0225643
G[regcode]	1	(constrained)				
_cons	.5165403	.0304404	16.97	0.000	.4568781	.5762025
v47_income						
v240_fem	−.0025345	.0182193	−0.14	0.889	−.0382437	.0331747
v242_age	.0022891	.0006907	3.31	0.001	.0009353	.0036428
v248_educ	−.0785012	.013429	−5.85	0.000	−.1048215	−.0521809
v229_empstat	−.0097043	.0126725	−0.77	0.444	−.0345419	.0151333
v57_maristat	.0166427	.0168247	0.99	0.323	−.0163332	.0496186
v58_children	.0001445	.0076441	0.02	0.985	−.0148376	.0151267
G[regcode]	.6747248	.3472807	1.94	0.052	−.0059328	1.355382
_cons	.3542168	.0409136	8.66	0.000	.2740275	.434406
v50_suffer						
v240_fem	−.0512562	.029726	−1.72	0.085	−.109518	.0070056
v242_age	.0018591	.0007976	2.33	0.020	.0002959	.0034224
v248_educ	−.0348961	.024362	−1.43	0.152	−.0826448	.0128526
v229_empstat	−.0475373	.0239391	−1.99	0.047	−.0944571	−.0006176
v57_maristat	.0046886	.0247993	0.19	0.850	−.0439171	.0532943
v58_children	.0138098	.0101857	1.36	0.175	−.0061538	.0337735
G[regcode]	−.7468665	.7322187	−1.02	0.308	−2.181989	.6882557
_cons	.1591267	.0453084	3.51	0.000	.0703238	.2479296
v52_university						
v240_fem	−.0755182	.0316174	−2.39	0.017	−.1374872	−.0135492
v242_age	.0058149	.0015944	3.65	0.000	.0026899	.0089399
v248_educ	−.056321	.0129833	−4.34	0.000	−.0817678	−.0308741
v229_empstat	−.0345903	.0176261	−1.96	0.050	−.0691369	−.0000437
v57_maristat	−.0235509	.0141988	−1.66	0.097	−.0513801	.0042783
v58_children	−.0179162	.011087	−1.62	0.106	−.0396464	.003814
G[regcode]	2.153592	.5412192	3.98	0.000	1.092822	3.214362
_cons	.0407432	.0741929	0.55	0.583	−.1046721	.1861585
var(G[regcode])	.0003484	.0002072			.0001086	.0011178
var(e.v45_scarce)	.1022576	.0030695			.0964151	.1084541
var(e.v47_income)	.0866685	.0031563			.0806979	.0930809
var(e.v50_suffer)	.163937	.005452			.1535921	.1749787
var(e.v52_university)	.1535487	.0093875			.1362091	.1730957
cov(e.v45_scarce,e.v47_income)	.0236922	.0025086	9.44	0.000	.0187753	.028609
cov(e.v45_scarce,e.v50_suffer)	.0222066	.0024244	9.16	0.000	.0174549	.0269583
cov(e.v45_scarce,e.v52_university)	.0346306	.0037756	9.17	0.000	.0272304	.0420307
cov(e.v47_income,e.v50_suffer)	.0217862	.0021504	10.13	0.000	.0175714	.0260009
cov(e.v47_income,e.v52_university)	.0244201	.0025078	9.74	0.000	.0195049	.0293352
cov(e.v50_suffer,e.v52_university)	.0403371	.0077878	5.18	0.000	.0250733	.0556008

Table 35: Regional Latent Variable Estimation (Yamazaki, 2020)

Log pseudolikelihood = **-5590.6474**

(1) **[q4wwjbia_income]G[prefcode] = 1**

(Std. Err. adjusted for **47** clusters in prefcode)

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
q4wwjbia_income						
sexa_fem	**-.0853874**	**.0278273**	**-3.07**	**0.002**	**-.1399279**	**-.030847**
ageb_age	**.0036614**	**.0009168**	**3.99**	**0.000**	**.0018645**	**.0054584**
xxlstsch_educ	**-.1293222**	**.0257072**	**-5.03**	**0.000**	**-.1797073**	**-.0789371**
tp5unemptp12job_empstat	**-.0425516**	**.0273942**	**-1.55**	**0.120**	**-.0962433**	**.01114**
marc_maristat	**-.0939253**	**.0308206**	**-3.05**	**0.002**	**-.1543327**	**-.033518**
ccnumttl_children	**.0254893**	**.0116161**	**2.19**	**0.028**	**.0027221**	**.0482565**
G[prefcode]	**1**	(constrained)				
_cons	**.4492777**	**.0604487**	**7.43**	**0.000**	**.3308805**	**.567755**
q4wnmga_marriage						
sexa_fem	**.0238566**	**.0224964**	**1.06**	**0.289**	**-.0202355**	**.0679488**
ageb_age	**.0088157**	**.0006542**	**13.48**	**0.000**	**.0075335**	**.0100979**
xxlstsch_educ	**-.0458514**	**.022534**	**-2.03**	**0.042**	**-.0900172**	**-.0016856**
tp5unemptp12job_empstat	**-.0197867**	**.020866**	**-0.95**	**0.343**	**-.0606833**	**.0211099**
marc_maristat	**-.0137896**	**.0265144**	**-0.52**	**0.603**	**-.0657568**	**.0381776**
ccnumttl_children	**.0032589**	**.0105111**	**0.31**	**0.757**	**-.0173425**	**.0238603**
G[prefcode]	**-.7584206**	**.8026793**	**-0.94**	**0.345**	**-2.331643**	**.8148019**
_cons	**.1197476**	**.0405482**	**2.95**	**0.003**	**.0402747**	**.1992206**
q4wwhhx_housewife						
sexa_fem	**-.0786691**	**.024309**	**-3.24**	**0.001**	**-.1263137**	**-.0310244**
ageb_age	**.0075302**	**.0006813**	**11.05**	**0.000**	**.0061948**	**.0088656**
xxlstsch_educ	**-.1019181**	**.0294771**	**-3.46**	**0.001**	**-.1596921**	**-.0441441**
tp5unemptp12job_empstat	**-.0472927**	**.0196915**	**-2.40**	**0.016**	**-.0858874**	**-.0086981**
marc_maristat	**-.0744475**	**.0213826**	**-3.48**	**0.000**	**-.1163566**	**-.0325384**
ccnumttl_children	**.0190029**	**.0104493**	**1.82**	**0.069**	**-.0014772**	**.0394831**
G[prefcode]	**.8798265**	**.7989372**	**1.10**	**0.271**	**-.6860617**	**2.445715**
_cons	**.2375846**	**.0510242**	**4.66**	**0.000**	**.137579**	**.3375902**
q4jbmmcc_suffer						
sexa_fem	**-.0744943**	**.02201**	**-3.38**	**0.001**	**-.117633**	**-.0313556**
ageb_age	**.0065685**	**.0007047**	**9.32**	**0.000**	**.0051873**	**.0079497**
xxlstsch_educ	**-.0389398**	**.0274996**	**-1.42**	**0.157**	**-.0928379**	**.0149584**
tp5unemptp12job_empstat	**-.0517275**	**.025319**	**-2.04**	**0.041**	**-.1013519**	**-.0021031**
marc_maristat	**-.0451431**	**.025502**	**-1.77**	**0.077**	**-.0951261**	**.0048399**
ccnumttl_children	**.0003757**	**.0140131**	**0.03**	**0.979**	**-.0270895**	**.027841**
G[prefcode]	**1.584176**	**.9821964**	**1.61**	**0.107**	**-.3408935**	**3.509245**
_cons	**.2993145**	**.0487265**	**6.14**	**0.000**	**.2038123**	**.3948166**
q4wwhphh_career						
sexa_fem	**-.0780274**	**.0238937**	**-3.27**	**0.001**	**-.1248581**	**-.0311966**
ageb_age	**.0061687**	**.0006975**	**8.84**	**0.000**	**.0048016**	**.0075357**
xxlstsch_educ	**-.1004774**	**.0237258**	**-4.23**	**0.000**	**-.146979**	**-.0539758**
tp5unemptp12job_empstat	**-.074963**	**.0228804**	**-3.28**	**0.001**	**-.1198078**	**-.0301182**
marc_maristat	**-.0874673**	**.02803**	**-3.12**	**0.002**	**-.142405**	**-.0325296**
ccnumttl_children	**.0207558**	**.0116039**	**1.79**	**0.074**	**-.0019875**	**.0434991**
G[prefcode]	**1.290915**	**1.448061**	**0.89**	**0.373**	**-1.547233**	**4.129063**
_cons	**.2887518**	**.0541325**	**5.33**	**0.000**	**.182654**	**.3948497**
var(G[prefcode])	**.0012103**	**.0011973**			**.0001741**	**.0084135**
var(e.q4wwjbia_income)	**.2336118**	**.0024363**			**.2288853**	**.2384359**
var(e.q4wnmga_marriage)	**.2195809**	**.0037616**			**.2123307**	**.2270786**
var(e.q4wwhhx_housewife)	**.2207128**	**.0032114**			**.2145074**	**.2270977**
var(e.q4jbmmcc_suffer)	**.2290043**	**.0025688**			**.2240246**	**.2340948**
var(e.q4wwhphh_career)	**.2244892**	**.0042525**			**.2163073**	**.2329806**
cov(e.q4wwjbia_income,e.q4wnmga_marriage)	**.0625478**	**.0059039**	**10.59**	**0.000**	**.0509763**	**.0741193**
cov(e.q4wwjbia_income,e.q4wwhhx_housewife)	**.1090764**	**.0051316**	**21.26**	**0.000**	**.0990186**	**.1191342**
cov(e.q4wwjbia_income,e.q4jbmmcc_suffer)	**.0663357**	**.0052698**	**12.59**	**0.000**	**.0560072**	**.0766643**
cov(e.q4wwjbia_income,e.q4wwhphh_career)	**.0748674**	**.0053709**	**13.94**	**0.000**	**.0643407**	**.0853942**
cov(e.q4wnmga_marriage,e.q4wwhhx_housewife)	**.0848177**	**.0056924**	**14.90**	**0.000**	**.0736608**	**.0959747**
cov(e.q4wnmga_marriage,e.q4jbmmcc_suffer)	**.052787**	**.0045433**	**11.62**	**0.000**	**.0438823**	**.0616917**
cov(e.q4wnmga_marriage,e.q4wwhphh_career)	**.0719997**	**.0044605**	**16.14**	**0.000**	**.0632572**	**.0807422**
cov(e.q4wwhhx_housewife,e.q4jbmmcc_suffer)	**.0684852**	**.0045185**	**15.16**	**0.000**	**.0596291**	**.0773413**
cov(e.q4wwhhx_housewife,e.q4wwhphh_career)	**.0935787**	**.0052731**	**17.75**	**0.000**	**.0832437**	**.1039137**
cov(e.q4jbmmcc_suffer,e.q4wwhphh_career)	**.0595742**	**.0053399**	**11.16**	**0.000**	**.0491082**	**.0700402**

Table 36: Prefectural Latent Variable Estimation (Tanioka et al., 2007)