Social Reproduction, Gender Equality and Economic Growth

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1. Introduction

In recent years, a plethora of macro models have emerged that integrate the role of gender in influencing economy-wide well-being.[1] One strand focuses on the supply-side effects of gender equality in education and labor force participation, emphasizing the resulting benefits for productivity and economic growth. A second approach is one that incorporates those supply-side considerations but also addresses the role of aggregate demand and economic structure in influencing the relationship between gender relations and macro-level outcomes. Missing from much of this work is an explicit exploration of the role of care and more generally, social reproduction—fundamental to the production of human capacities but also a driver of employment and other macro-level outcomes.

Braunstein, et al (2011) have filled that lacuna, with a structuralist macro model that incorporates the role of social reproduction as well as gender. This paper furthers that model. It uses principal component analysis to quantify a set of regimes linking structures of economic growth and development with those of social reproduction. Social reproduction is defined in terms of the time and money it takes to produce, maintain and invest in the labor force. Our approach differs from previous supply-side models in that social reproduction takes place not only within the household but also in the public and market sectors of the economy. Regimes can be characterized by the extent to which social reproduction takes place in any of these three domains and the gender distribution of the labor in each. More broadly, the analytical emphasis is on understanding how the distributions of production and reproduction among women, men, the state and capital structure the dynamics of economic growth, and how gender inequality is both cause and consequence of these relationships.

We begin by developing a conceptual macroeconomic model of growth and social reproduction that allows us to define a set of stylized set of regimes for how the two interrelate. We then empirically estimate these regimes for a wide cross-section of both

[1] For surveys of this literature, see, for example, Stotsky (2006), Seguino (2010), Nallari and Griffith (2011), Elborgh, *et al.,* (2013), Kabeer and Natali (2013), Cuberes and Teignier (2014), Onaran (2015), and Seguino (2017).

developing and developed countries over the period 1991-2015, though data choices are primarily geared towards capturing developing country structures. The goal is to evaluate the contradictions and complementarities embedded in systems of growth and social reproduction, as well as how these systems change over time. The resulting portrait identifies how accounting for care illuminates the promise and pitfalls of increasing gender equality in the labor market through wages or employment participation.

2. A macroeconomic framework for social reproduction

This section develops a conceptual framework for thinking about economic growth in ways that can explicitly accommodate processes of social reproduction and the dynamics of gender inequality. This conceptual model reflects the formal theoretical model presented in Braunstein et al. (2011) and builds on the discussion in Braunstein (2014).

The macroeconomic approach is "structuralist" in the sense that the distribution of income plays a central role in consumption, investment and growth, and the structure of the economy is an important determinant of how these interactions play out, and that the distribution of income by class and gender plays a central role in consumption, investment and growth. A central feature of this model is that the macroeconomy is demand-constrained. This is because firms operate with excess capacity, and changes in the short-run level of output change the degree of capacity utilization of the economy.[2] Wages, rather than being set by the marginal product of labor, as in neoclassical models, but rather by a social bargaining process whose outcome reflects the extent of un- or under-employment in the economy.

Before presenting the model, we introduce how we portray the economic dimensions of care and social reproduction. We define care in both labor-process and output terms. In terms of labor process, care is a work activity that involves close personal or emotional interaction with those being cared for (Folbre 2006). In terms of output, care refers to either direct or indirect care services that are inputs into the production and maintenance of the labor force. Gender norms around care are also important. Unpaid work and care have been understood by feminist economists as highly gendered activities with gendered meanings, asymmetrically distributed between men and women in both the paid and unpaid sectors, and a key contributor to gender inequality in both the market and the home (Badgett and Folbre 1999; Nelson and England 2002). More specifically, women carry the greatest burden of performing care work, whether construed as direct care or indirect care activities, such as fetching water or fuelwood.

As an output and an input labor has two facets, quantity (time) and quality (the productivity of that time), though we refer to both by using the term human capacities.[3] We draw capacities in the widest sense of the term and include a broad array of features that

[2] This demand-side approach differs from some models in which macroeconomic disequilibria (and thus unemployment, inflation, or slow growth) are assumed to be due to a deficiency of savings (Elson 2004).

[3] To some extent, quantity and quality can be traded off with one another (Becker and Lewis 1973), but declines in fertility can be so large that increased quality cannot compensate.

make human beings more economically effective, such as emotional maturity and self-confidence, as well as standard human capital measures, such as education and skills.

Human capacities are produced in the household sector using unpaid labor time and commodities. In the short-run, changes in human capacities production impact labor productivity, reflecting the extent to which one is being supported and replenished at home, the day-to-day aspects of reproduction. In the long term, spending time or money on the production of labor, whether it results in higher fertility or labor productivity, is treated as investment rather than daily maintenance. Investments in human capacities raise future productive capacity (i.e. generate economic growth) in ways similar to building more factories and equipment, though investing in the future labor force is almost never treated as investment in macroeconomic models. In this way, we differ from any other macro models that fail to treat spending in support of developing the future labor force as investment. As with conventional treatments of investment, however, we model investment in human capacities as a factor that stimulates current aggregate demand while also contributing to long-term economic prospects.

At its core, then, the model is about treating labor as a produced means of production. Primarily women (but also men) carry out this reproduction process by doing both paid and unpaid work. A key goal is to differentiate between societies that care more and/or better than societies that care less. The reason could be social norms around intergenerational obligation that induce altruistic preferences; strong social welfare sectors that create highly skilled and well-paid jobs in the care sector; or, more likely, gendered ideals that encourage women to provide high-quality care for little or no pay. These social production characteristics interact with the structure of the macroeconomy to influence outcomes. To set up this framework, we begin with the demand side of the macroeconomy.

2.1 Demand, caring spirits and growth

The demand side of the economy is driven by investment demand, which, in the short-run, raises demand for current output and, in the long-run, raises economic growth by increasing productive capacity. In our model, investment is of two types: what we term physical investment undertaken by firms, and human capacities investment undertaken by individuals and households. Funds for both types of investment are drawn from national income, which depends on the functional distribution of income, that is, the split between the profit share and the wage share of income.

The extent of business investment depends partly on expectations about the profitability of those investments , or, in the words of Keynes, "animal spirits."[4] In addition to expectations, business investment is a function of sales, which in turn depend on the level of aggregate demand. The latter is influenced by the distribution of income because workers spend a larger share of their income than capitalists. A redistribution to workers in the form of higher wages will stimulate demand and this component of investment (dubbed the

[4] The notion of "animal spirits" reflects the psychological element in business decision-making regarding profitability, built on the widely acknowledged but poorly understood waves of market confidence and panic. For more on this point, see Braunstein *et al.,* (2011).

"accelerator effect"). On the other hand, higher wages also lowers the profit share of income and dampens the incentive to invest (the "profitability effect"). These effects move in opposite directions. The net impact of higher wages on business spending and thus aggregate demand depends on which of these two effects is stronger. Economies in which increases in the wage share of income stimulate output, employment, and growth are termed "wage-led." Their converse, where increases in the wage share are associated with lower output and growth are termed "profit-led."[5]

Turning to investment in human capacities, rather than center their decisions on expected profit rates, individuals finance investments in themselves and others based on expectations about future economic opportunities. Higher wage shares boost expectations that employment opportunities will exist, as does more current economic activity as measured by output. The pathway from expectations about future opportunities to actual investments in human capacities is governed by what we term "caring spirits": the tendency, whether determined by social norms, individual motivation, or public preferences as reflected in the structure of the social welfare state, to provide care (or support for care) for one's self and others in ways that add to current aggregate demand and future productivity.

Although the extent of caring spirits takes place along a continuum, for simplicity we differentiate between two stylized types of caring spirit regimes: those with "strong" caring spirits versus those with "weak" ones; we also alternatively refer to the strong/weak dichotomy as altruistic/individualistic to emphasize the difference between other-directed and self-oriented preferences. Economic growth or higher wage shares will have a bigger positive impact on investment in human capacities in altruistic societies than in individualistic ones. And the stronger the caring spirits, the more likely that economic growth is wage-led. The reason is that higher wages now increase not only consumer demand, but also demand for investment in human capacities.

In addition to caring spirits, the wage- versus profit-led dichotomy also partly depends on the type and extent of globalization, especially in a developing country context. The greater the dependency on external sources of demand, the less likely that wage increases boost aggregate demand enough to compensate for the decline in profits. Monetary and fiscal policy stances exclusively focused on maintaining price stability in the context of free flows of capital and trade, as opposed to those more actively and directly supportive of growth and development, tend to coincide with profit-led or individualistic regimes. Such policy stances may seem an essential part of macro management in the current era of globalization, but their deflationary effects make for poor employment growth and tend to depress investments in human capacities. **Table 1** summarizes these demand-side dynamics for both wage- and profit-led economies.

2.2 Supply, gender and the distribution of social reproduction

[5] Strictly speaking, to get to this point we need to say something about savings. On the demand side, macroeconomic equilibrium means that the investment desired by investors equals that supplied by savers (both domestic and foreign). Because investment is both the binding constraint and the mechanism for social reproduction on the demand side in our framework, we do not give further detail on savings dynamics.

The supply side of the model is constituted by interaction among three different spheres: the labor market, the product market, and the production of human capacities in the household sector.

Labor and product markets are characterized by a division of labor between women and men. In general, we link female labor supply with the provision of direct and indirect care services in the market, but the significance of this sector as a source of employment for women and a determinant of human capacities production will ultimately vary based on economic structure.[6] Wages are determined by labor's bargaining power, which rises along with output – as output rises, unemployment falls, giving workers more ability to bargain over wages. Women's collective bargaining power is presumably lower than men's, a point consistent with the prevalence and persistence of the gender wage gap across all sorts of economies.[7]

The wages that emerge from conditions in the labor market, combined with labor productivity as determined by the state of human capacities, specify the costs of production. Profit shares are then determined by how much price is marked up over cost, an outcome constrained by demand conditions and the firm's degree of monopoly power. We can begin to see some of the contradictory forces at work in the system: higher wages for women are desirable from the perspective of gender inequality, but they also may raise the price of care and put pressure on reproduction. At the same time, buoyant demand for paid care from either the private or public sectors is key to supporting higher wages for care workers.

Turning now to the production of human capacities in the household sector, inputs into the social reproduction are of three types: time, commodities, and infrastructure. In terms of time inputs, women, men, children, and networks of kin or community may all be important contributors of unremunerated time into social reproduction, but women perform the bulk of unpaid household work, whether or not they also participate in paid work (Budlender 2008; Charmes 2006; Folbre 2006). If women (or men) spend less time at home, human capacities production may suffer. Just how much depends on the structure and productivity of that unpaid labor time, involving factors like skill, motivation, the availability of care related commodities, and of course the state of one's own human capacities (tired caregivers are usually less effective ones).

The second set of inputs, commodities, is financed by income from work or public and private transfers. They include direct and indirect care services and capital goods, such as stoves, refrigerators, and washing machines. The impact of income on human capacities depends not only on how much is earned and spent, but on what is purchased, and whether

[6] It is worth noting that nothing intrinsically makes women more suited for such work. Rather gender norms and stereotypes shape the gender division of labor, and macro-level policies can assist in this process, as for example, policies in Nordic countries on sharing parental leave.

[7] Women's relatively weaker bargaining power is a function of how they are inserted into the paid economy as workers. Insofar as women tend to be more likely to be employed in part-time work, the informal sector, and in mobile labor-intensive manufacturing firms, they are in a weaker bargaining position vis-à-vis employers than men on average. Thus the gender wage gap is at least partly related to economic structure as well as a country's labor market policies.

these commodities provide good substitutes or complements for unpaid care time. Think of professionalized and well-paid versus informal and underpaid care sector workers, purchasing a refrigerator versus a television set, or devoting public funds to the provision of childcare services versus expanding national defense. All of these arguably contribute to social reproduction, just to varying degrees and in ways that reflect gender.

The last input, public infrastructure, refers to goods like roads, electricity, sanitation and water that decrease the opportunity cost of market work, mostly by lowering the time intensity of care work by women, but also by lowering the price and increasing the availability of care commodities (Agénor and Agénor 2009). Infrastructure is an often-neglected aspect of the relationships between social reproduction, gender inequality and growth, but a key determinant and outcome of the gender system.

Taken together, the production of human capacities in the household sector, combined with the determination of wages, prices and profit shares in the labor and product markets, constitute the supply side of our conceptual model. We differentiate between two stylized supply regimes that reflect the gender distribution of social reproduction: *low road* versus *high road*. The key difference between the two is that in the low road regime, higher female labor force participation is associated with a decline in human capacities production, while in the high road regime increased female labor force participation also increases human capacities production.

In the low road regime, the negative association between human capacities production and female labor force participation is driven by low wages and poor working conditions for women in general and care sector workers in particular, set against a backdrop of little public support for social reproduction.[8] Low wages for women mean, on the one hand, that they can ill afford to purchase care commodities to compensate for the decline in the nonmarket work time that market participation induces (we will discuss male contributions in a moment). It also suggests that the care commodities they do purchase are likely to be inferior substitutes for unpaid time, as the quality of these commodities reflects the poor labor market conditions in which they are produced. Weak demand for care services, both from workers who can ill afford them and paltry public provision, keep their prices – and the wages of these workers – low. The net result from an aggregate supply perspective is that expanding market production and increasing women's labor force participation threaten profits because the potentially higher profit share spurred by more economic activity is outweighed by the decline in human capacities production. In the short run this decline manifests as lower labor productivity, and in the longer term, as decreased investment in human capacities. It is worth noting here that it is this element that has been strikingly absent in many gendered macro models.

Conversely, the high-road regime is characterized by the opposite: higher female labor force participation is associated with increases in human capacities production. Strong care sectors, occasioned by good wages for care workers and lots of public and private

[8] Indeed, low wages for care workers and weak public provision are empirically correlated with one another across a variety of countries (Budig and Misra 2010).

demand for care services underlie a sort of virtuous cycle. Commodities serve as effective substitutes and complements for declines in women's unpaid labor time with marketization, perhaps also making it possible for women to reorganize their unpaid labor time in ways that actually raise its efficiency. Less time taken up by indirect care services frees up time for work and direct care, potentially increasing human capacities production and investment. Good infrastructure for reproductive work reinforces these positive relationships. While it is true that the higher wages and taxes that pay for the high road do press on the profit share, the higher prices supported by strong demand and increases in labor productivity more than compensate.

So far we have focused on female labor force participation and the fortunes of (primarily female) care sector workers. But both women and men contribute time and money to social reproduction, either directly or indirectly through taxes and charitable contributions. How they split these responsibilities is correlated with whether the high or low road regime prevails. The more that women and men share the time and financial costs of care, the more likely that increases in female labor force participation and output will increase the production of human capacities by more than it will cut into profits, the more likely the high road case will be. This is the gender egalitarian (GE) case. This is in part because women's movement into paid labor is not so costly in terms of investments in human capacities due to men taking on some of this role. Note that gender egalitarianism is also reflected in a number of factors associated with the high road: smaller gender wage gaps (to the extent they stem from good wages for women as opposed to low wages for men), an extensive and high quality market care sector, far-reaching public provision of care services, and good reproductive infrastructure.

By contrast, in cases where men contribute very little to social reproduction in terms of either time or financing (directly or via payments to the state or other organizations), the more likely the low road case prevails, and women's market participation is associated with decreases in social reproduction and profit share (because pressures on care brought about by women's increasing market participation lower labor productivity and raise unit labor costs). We call this the feminization of responsibility and obligation (FRO) case, borrowing a term developed by Sylvia Chant (2006) to replace the concept feminization of poverty. Parallel to the high road regime, the contributing factors of the low road regime are associated with the type of gender system that leads to a feminization of responsibility and obligation: low wages for women as reflected in a large gender wage gap, little support from men or the state in carrying out social reproduction, and limited markets for care commodities which, when they do exist, are characterized by low pay and poor quality output. **Table 2** summarizes the main features of the low- and high-road supply regimes.

2.3 Combining aggregate demand and supply: Growth and social reproduction

Table 3 shows how aggregate demand and supply interact in ways that draw out the causal connections among growth, gender inequality, and social reproduction. The result is four stylized regimes: time squeeze, mutual, wage squeeze and exploitation. To assess the differences among them, we consider the impact of a decline in gender-based wage

inequality and consequent increase in female labor force participation – together amounting to an increase in gender equality in the labor market.

Starting in the upper left-hand corner, "time squeeze" combines wage-led/altruistic growth with a low-road distribution of social reproduction. In this regime, more gender equality in the form of higher wages for women in general or higher wages for care workers in particular supports investment and growth because it raises human capacities production and domestic aggregate demand by more than it cuts into profits. However, as female labor force participation increases, the time devoted to human capacities production declines, and relationships in the wider economic system – from the structure of the paid care sector to the lack of support from men for care to the lack of reproductive infrastructure – mean that the time decrease compromises labor productivity and human capacities production. The more extensive the feminization of responsibility and obligation, the stronger these negative effects. The term "time squeeze" emphasizes the trade-offs between the marketization of women's work and the consequent time pressures on human capacities production. If these contradictions are substantial enough, the time squeeze effects of higher wages completely counteract their positive growth effects, leading to stagnation or growth path instabilities.

Moving to the upper right corner of Table 3, with a high road distribution of social reproduction and wage-led/altruistic growth, the regime is labeled "mutual" because production and reproduction reinforce one another. In this case, more gender wage equality raises growth because it raises human capacities investment and aggregate demand by more than it cuts into profits. Higher market participation among women induced by higher wages does lower the time available for human capacities production. But gender egalitarian relations of reproduction, buoyed by strong public support for care and the availability of effective care commodities, not only protect against time squeeze, they actually induce an increase in the production of human capacities (quantity and/or quality) in the context of higher incomes. From a citizen-worker-carer perspective, this is the win-win scenario.

The lower right corner of Table 3, which combines profit-led growth with a high road distribution of social reproduction, is termed "wage squeeze" because higher wages for women do enhance human capacities production, but not by enough to outweigh the negative impact that higher wages have on profits, overall investment and growth. One can think of relatively gender egalitarian relations accompanied by a structure of production that makes long-term investments in human capacities expensive or risky. The stronger the profit-led nature of the economy – for instance, the more open to the global economy, or the more deflationary its macro policy – the more pronounced these contradictions. The result is that policies promoting gender equality may be anathema to growth, or make it unstable. Somewhat counter-intuitively, if the promotion of gender equality via higher female labor participation actually lowers women's wages because of higher labor supply, growth and human capacities production may increase.

The final regime, "exploitation," combines the profit-led and low-road cases. In this scenario, higher wages for women lower growth because they cut into profits and capitalist investment by more than they raise human capacities investment. At the same time, the higher market participation brought about by higher wages for women actually lower human

capacities production because of the time squeeze type effects of the low road. These effects can be so pronounced that human capacities investment plays no role in moderating profit-led growth. Thus the term exploitation refers to how production and growth are predicated on exploiting women's reproductive labor and human resources in general. As the polar opposite of the mutual regime, it is the lose-lose scenario.

3. Estimating social reproduction regimes

This section uses principal component analysis (PCA) to empirically estimate and rank the supply and demand factors that promote growth, based on the social reproduction model described above. This PCA analysis includes four steps: (1) selection of variables (described above); (2) application of the PCA; and (3) interpretation and illustration of results, including the classification of countries into groups based on their demand and supply regimes. The goal, more generally, is characterize the comparative cross-sectional and time-path values of the social reproduction regimes, a measure that can then be used in a more standard growth econometrics analysis. This paper focuses on the former, and a second project will use the estimates in the latter.

3.1 Data

The PCA scores for demand (growth and investments in human capacities) and supply (the distribution of social reproduction) are derived from analysis of data that reflect the driving elements listed in Tables 1 and 2 respectively. The overall time period is 1991-2015, largely because of the availability of gender-disaggregated employment data, and is subdivided into three periods over which variables are averaged for the PCA analysis: 1991-2001, 2002-2007, and 2008-2015. Because the primary focus is on developing countries, the data has to be both meaningful from a development perspective, as well as widely available both cross-sectionally and longitudinally.

Table 4 lists each element, the corresponding variable(s) used to measure it, and summary statistics for each time period. A data appendix lists further details on sources.

Table 4a describes the data included in the demand score, which is positively associated with wage-led/altruistic growth and negatively associated with profit-led/individualistic growth. *Caring spirits* are captured by relative achievements in the non-income (education and health) and income components of the Human Development Index (HDI), with changes taken over five-year periods.[9] The basic argument is that countries with strong caring spirits, where investments in well-being are a central cause and consequence of economic activities, would also be top performers in terms of positive changes in their non-income HDIs relative to changes in income. That is, the stronger the caring spirits, the higher the "yield" in non-income HDI for a given level of economic activity. In that sense, it is important to emphasize that this methodology evaluates relative performance – there is no external absolute value for strong caring spirits against which country performance is

[9] Achievements in education are measured by mean years of schooling for adults older than 25 and expected years of schooling for children entering school; achievements in health are measured by life expectancy at birth (UNDP 2013).

evaluated. On average, achievements in non-income HDI have outweighed changes in income, but the positive gap has narrowed over time.

Global orientation is gauged by two measures, manufacturing exports as a share of GDP, and inward foreign direct investment (FDI) as a share of gross fixed capital formation. Both are intended to reflect the extent to which domestic wage growth might be constrained by the specter of global competition, particularly among developing countries. Global manufacturing export markets have become extremely competitive, partly due to sluggish aggregate demand growth in the global North, but also to the increasing number of developing countries trying to pursue an export-led growth path. Both factors are reflected in slow price growth for the sorts of manufactures that developing countries export, which also constrains wage growth in these industries (UNCTAD 2016). In terms of FDI, the higher the share of FDI in domestic investment, the more globally mobile is overall investment, which can constrain productivity and wage growth as firms become more likely to respond to increasing wage pressures by relocating or outsourcing rather than raising productivity (Seguino 2007). Both measures increase over the three time periods listed, which raises the specter of profit-led or individualistic growth regimes in later relative to earlier periods.

The last element on the demand side is *macro policy*. There were lots of choices here, but public investment and tariffs are particularly representative of the development-oriented activism that we wanted to emphasize.[10] Public investment as a share of GDP proxies how active governments are in building up the infrastructure necessary for growth and development. There is variation over the periods listed, with growth in the latter period reflecting both the declines in GDP associated with the Great Recession, and the variety of counter-cyclical fiscal policies applied in response (the standard deviation increased substantially as well). Weighted average tariff rates applied, which uses data on imports by product group (harmonized system codes at the two-digit level) to weight tariff rates, reflects more than the extent to which the domestic economy is shielded from import competition. It signals how active governments are in managing trade, and the extent to which they conform (either by philosophy or via trade agreement commitments) to reigning global policy sentiments around trade liberalization. As reflected by the model, we expect both public investment and tariff rates to be positively associated with wage-led growth.

Table 4b lists summary statistics for the elements and associated variables on the supply side. The greater the resulting score, the more high-road/gender egalitarian is the distribution of social reproduction; the lower it is, the closer to the low-road/feminization of responsibility and obligation course.

The first element, *men's relative contribution to social reproduction*, is about the gender distribution of both the time and financial costs of social reproduction, but in practical terms

[10] Other macro policy variables we tried introduced more noise than signal into the system, probably because of the mix of causal factors – beyond the policy sentiments we are trying to reflect – associated with these variables (e.g. real exchange rates or inflation). In future work, we will consider including measures of financial liberalization.

the immediate aim is to capture gender differentials in unpaid care time (though the prospect of mining expenditure surveys by gender to produce an aggregate measure of gender differences in financial contributions to care is an interesting one). There is increasing availability of time use studies, but not nearly enough to populate a panel data analysis. The UN's Statistical Division has an excellent cross-national, with some time series, dataset on the average hours per day women and men spend on unpaid domestic work; in the end there just was not enough data coverage to make this a practical option. Given available proxies, we chose the female-to-male ratio of mean age at first marriage based on the logic that the greater the gap, the greater the gender inequality embodied in intra-household gender relations, the more unequal the distribution of unpaid care time. The data that we do have bears out this hypothesis: taking average values over the time period (1991-2015) for both the female-to-male mean age at first marriage and the female-to-male ratio of hours spent on domestic work from UNSD, the correlation coefficient is -0.52 (with observations for 80 countries), a substantial association in the expected direction, particularly given it is an average spanning over 20 years (if we limit the sample to observations taken after 2005, the correlation increases to -0.64).

The *gender wage gap* presents similar challenges for adequate proxying. After trying a number of different alternatives, we elected to use the female-to-male ratio of the share of wage and salaried employment in total employment to capture the relative quality and productivity of employment. The balance of the categories of work include self-employed, contributing family workers, and employers. For developing countries in particular, where self-employment and contributing to family work is often an indicator of residual unemployment, using relative access to wage employment seemed a reasonable proxy for gender-based wage inequality in the labor market. And even with average values that far exceed estimates of gender wage gaps around the world, the variable makes a significant positive contribution to the supply side score (see discussion below).

Public provisioning for care is represented by public social protection and health expenditure as a share of GDP, which includes public benefits for unemployment, employment injury, disability, maternity, and general social assistance as well as health. These shares have been increasing on average over the period, with higher levels in developed than developing countries (and a period mean of 20.9 versus 5.2 percent). Averaging data on the percent of the population with access to electricity, non-solid fuel, improved sanitation and water sources gives a proxy for *reproductive infrastructure*, a measure with a lot more variance among developing than developed countries. Both variables are positively associated with a gender egalitarian distribution of social reproduction.

The last element included in the supply side score is the *extent and quality of the market care sector*. Based on the observation that women's service sector work tends to be concentrated in the caring professions (CITE), we use women's services employment as a share of total employment (men plus women) to proxy for the extent of the market care sector. To get at the question of quality, we effectively discount this measure by the extent of income inequality in the economy (by raising it to power of the inverse of the income inequality measure) on the argument that the more inequality, the lower the quality (and pay) of care sector work. The Palma ratio, which is the share of income going to the richest 10

percent of the population divided by the share of income going to the poorest 40 percent of the population, is used for income inequality. The higher the value of this variable, the more gender egalitarian the distribution of social reproduction.

3.2 Methodology

The objective of this analysis is to create two country-level scores that reflect demand and supply regimes and allow for cross-country and longitudinal comparisons. The technique of principal component analysis (PCA) is particularly suitable in this regard. PCA is a statistical method that provides a condensed representation of the information brought by a large number of interdependent factors, as those that shape different social reproduction regimes. More specifically, it is a multidimensional scaling tool for a set of variables, simultaneously describing both the connections among the variables and the similarities among the observed units. The resulting principal components retain as much information as possible about the original variables, with the first principal component accounting for maximal variance, as does each succeeding principal component while being orthogonal to preceding components. However, regular PCAs become problematic when there are lots of missing values. To address this issue, we used a regularized iterative PCA algorithm (Josse and Husson, 2013) based on a "shrinkage" approach in order to impute missing values without overfitting the data, a problem for some variables in the analysis such as *mcare* (see Table 4 for information on missing values).[11]

To generate the two PCA scores, we first implemented three distinct PCAs over the three time periods (1990-2001, 2002-2007 and 2008-2015), and found cross-time consistency on both the component estimates and the relative contributions of the underlying data (all of which was first standardized). Then we imputed missing values following the regularized PCA algorithm for each of the three periods. And finally we implemented a "general" PCA on the dataset, including imputed values, but using only data from 2008-2015 to compute the components. Final scores for each country and time period, however, utilize these estimates as well as the underlying data for that time period. This method allows for a longitudinal comparison, taking the latter period as the reference point.

Table 6 gives the coordinates and relative contributions of variables on the first component of the PCA, and the percentage of variance captured for both demand and supply. The three time periods are listed for comparative illustration; it is only the components in the last time period that are used for scoring in the next section.

Looking at the coordinate results on the first component, we can see that the signs of the variables all conform to those predicted by the conceptual model. For demand and growth, variables associated with more altruism and wage-led growth have positive values (*HDI2*, *pub* and *TFF*), while those associated with profit-led or individualistic regimes have negative values (*mfgX* and *FDI*). Similarly, on the supply side, all of the variables are positive, and thus greater values are associated with a more gender egalitarian distribution of social

[11] Overfitting occurs when the model describes random error or noise instead of the underlying relationships between variables.

reproduction. The percentage of variance accounted for by the first component is about 40 percent on the demand side and 73 percent on the supply side. In general, the supply side estimates seem more robust and stable across time than the demand side. Improving our measure of caring spirits, and extending those for both macro policy and global orientation will be priorities for the next stage of work.

3.3 Results

Figure 1 illustrates the distribution of countries across the four social reproduction regimes based on their PCA scores for the period 2008-2015. **Table 6** details the percent distribution of countries by region across these regimes, and **Table 7** lists each country individually and their respective regime as illustrated in Figure 1.

Figure 1a includes developing and transition countries, and **Figure 1b** developed countries only.[12] Note that the axes for the two groups differ. This is because the classification of countries across regime categories is based on the within-group average to which that country belongs – either developing and transition or developed countries. This brings out the point that there is no absolute, context-independent value to which country scores are being compared.

Starting with Figure 1a, a majority of developing and transition countries are in either time or wage squeeze, exhibiting contradictory relations between growth dynamics on the one hand and high- versus low-road systems of social reproduction on the other. On the face of it, the growth potential of more countries is limited by wage squeeze (48) than time squeeze (40), but this result is driven by the preponderance of transition economies that fall into the wage squeeze category (14).

Most of developing Asia is classified in wage squeeze, which likely reflects the contradictions of globally-oriented production coupled with developmental states that provide generous public supports for care. That the results for Asia are driven by countries in East and Southeast Asia is consistent with this observation. Most countries in developing America are also in wage squeeze, a result driven primarily by countries in Central America and the Caribbean, which, like parts of East and Southeast Asia, tend to be more dependent on external sources of demand.

The majority of developing countries are classified in the time squeeze regime, indicating that despite wage-led structures of growth, which bode well for the growth-enhancing effects of gender equality and associated investments in human capacities, growth potential is limited by prevailing low-road structures of social reproduction. As more women enter the labor market, the consequent strain on women's time limit human capacities development and the growth of labor productivity. The policy implication of this combination is clear: increasing women's paid employment must be accompanied by more support for care to sustainably deliver growth. Most African countries fall into this category (33), as do a number of South Asian countries.

[12] The classification of countries across development groups and regions conforms to those used by the UN.

South American countries are most likely to be classified as mutual, a somewhat surprising result given the level of inequality and informality that prevails in the region. These challenges seem to have been compensated for to an important extent by recent increases in social protection spending (a hypothesis confirmed by the time paths illustrated in Figure 2). This outcome is instructive, both because it demonstrates the importance of policy, but also because it reminds us that a mutual regime does not automatically or inherently induce economic growth. Rather, it describes relationships between gender equality in the labor market and economic growth – given the constraints and supports posed by prevailing systems of care and social reproduction. In the South American case, closing the gender wage gap by raising women's wages is good for growth and social reproduction, and could induce a virtuous cycle for development.

The exploitation quadrant, which pairs profit-led/individualistic structures of growth with a low-road distribution of social reproduction, is populated primarily by countries in Southeast Asia and Africa. Although the two sides of the social reproduction regime reinforce one another, improving gender equality in the labor market may threaten growth, both on the demand and supply sides. Intervening on one side of the regime – demand or supply – will induce movement towards either time or wage squeeze, depending on the nature of the policy intervention.

Figure 1b gives the distribution of developed countries, with country labels owing to the smaller number of data points. As one would expect, most developed countries are wage-led, with their domestic economies providing significant sources of aggregate demand, and greater relative investments in human capacities given their already-high levels of development. The Nordic countries, well-known for their generous social welfare systems and commitment to gender equality, are firmly in the mutual category. Weaker commitments to a gender egalitarian distribution of social reproduction put many of the more liberal economies in the time squeeze regime, suggesting that the contributions of women's increasing participation and wages in the labor market are weighed down by insufficient supports for social reproduction. For profit-led growth countries, most tend towards a more gender egalitarian distribution of social reproduction and thus the wage squeeze case, though when countries are very close to the origin (as in the case of Germany) or a particular axis, they are weaker manifestations of the regime.

Figure 2 gives the time path of regimes for the world and broad country group, averaging PCA scores for the group in question. It is merely illustrative in the sense that what matters is the movement of individual country scores, but considering these average time paths can nonetheless give readers a sense of the longitudinal nature of the estimates.

The world as a whole is clearly progressing towards more profit-led/individualistic growth regimes, particularly between the first two periods; it is also moving towards a more gender egalitarian distribution of social reproduction. Developed countries, as a group, are moving towards more profit-led demand as well, though the pace has slowed down relative to achievements in gender egalitarianism on the supply side over the last decade or so. Transition economies shifted dramatically towards more profit-led growth over the 1990s, in line with the nature of their economic reforms. There has been a bit of a turnaround since,

which has also included more movement towards gender equality in the distribution of social reproduction, but the average is still squarely in the wage squeeze quadrant.

On average developing Africa has likewise become more profit-led, and progress towards gender egalitarianism was reversed between the last two periods. A similar pattern is exhibited by developing Asia, though the gender egalitarian reversal is quite small. What is more remarkable here is the average shift from the mutual to the wage squeeze quadrants in the 2000s versus the 1990s. Developing America shows a pattern similar to developed countries: more profit-led growth, especially over the 1990s, with a more recent move towards more gender egalitarianism.

These dynamics indicate how various policy interventions and structural changes have coalesced to move the structures of growth and social reproduction over time, and could be used to measure the relative effectiveness of social or economic development policies. They also provide a global portrait of gendered structures of growth and care, with important implications for the relationship between gender equality in the labor market and economic growth. That the world is universally moving towards more profit-led demand regimes is consistent with the current era of globalization, where a sort of hyper-integration has made competitive pressures particularly sharp for developing countries, while at the same time offering new opportunities for development and structural change. The increasing gender egalitariansim in the distribution of social reproduction that has accompanied this movement alights on a troubling contradiction emergent in the global system, and indicates that interventions focusing solely on the supply side risk being undermined by dynamics on the demand side.

4. Concluding discussion

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Table 1. Demand and Growth

Wage-led/Altruistic	Profit-led/Individualistic
Explanation	
Higher wage share is expansionary: The positive impact of increased consumer demand, combined with increased investments in human capacities, outweigh the contractionary impact of the decline in the profit share.	***Higher profit share is expansionary:*** The positive impact of increased capitalist investment demand outweighs the negative impact of lower wages on consumer demand and human capacities investment.
Factors that make this scenario more likely	
Strong caring spirits	Weak caring spirits
Domestically-oriented economy	Globally-oriented economy
Developmental macro policy	Openness-oriented macro policy

Table 2. Supply and the Distribution of Social Reproduction

Low Road: Feminization of responsibility & obligation	High Road: Gender egalitarian
Explanation	
Increasing output and female labor force participation is associated with declines in human capacities production, ultimately lowering profits.	Increasing output and female labor force participation is associated with increases in human capacities production and higher profits.
Factors that make this scenario more likely	
Low male contributions to social reproduction	Significant contributions to social reproduction by both women and men
Large gender wage gaps	Small gender wage gaps
Limited and/or low quality market care sector	Extensive and high quality market care sector
Little public provision of care	Strong public provision of care
Poor reproductive infrastructure	Good reproductive infrastructure

Table 3. Growth and social reproduction

	Supply: The distribution of social reproduction	
Demand: Growth	Low road Feminization of responsibility & obligation (FRO)	High road Gender egalitarian (GE)
Wage-led/altruistic	***Time squeeze*** *Higher wages for women are good for growth, but more market participation squeezes time and lowers human capacities production. Growth is elusive or unstable.*	***Mutual*** *Higher wages for women are good for growth, and more market participation increases human capacities production. Growth and social reproduction reinforce one another.*
Profit-led/individualistic	***Exploitation*** *Higher wages for women lower growth, and more market participation squeezes time and lowers human capacities production. Growth is partly based on exploiting women's labor and human resources.*	***Wage squeeze*** *Higher wages for women lower growth, but more market participation enhances human capacities production. Growth is elusive or unstable.*

Table 4a. Summary statistics: Demand

Element	Variable	Short name	Period	Mean	Median	Standard deviation	Missing values (%)
Caring spirits	5-year percentage point change in non-income HDI less 5-year percentage point change in income index	*HDI2*	1990-2001	0.02	0.02	0.02	14.74
			2002-2007	0.01	0.01	0.03	9.62
			2008-2015	0.01	0.01	0.02	3.21
Global orientation	Manufacutring exports as a share of GDP (%)	*mfgX*	1990-2001	11.63	6.00	15.90	9.62
			2002-2007	14.66	7.10	20.39	9.62
			2008-2015	14.88	7.96	20.00	10.90
	Inward FDI as a share of gross fixed capital formation (%)	*FDI*	1990-2001	13.23	9.82	12.53	7.05
			2002-2007	21.67	16.72	20.86	5.77
			2008-2015	22.54	14.12	31.11	3.85
Macro policy	Public investment as a share of GDP (%)	*pub*	1990-2001	5.77	4.88	3.67	20.51
			2002-2007	5.20	4.64	2.67	20.51
			2008-2015	6.46	4.82	5.14	23.08
	Weighted average tariff rates applied	*TFF*	1990-2001	10.86	10.00	6.36	16.67
			2002-2007	8.32	7.58	5.06	7.05
			2008-2015	7.05	6.69	3.95	7.69

Table 4b. Summary statistics: Supply

Element	Variable	Short name	Period	Mean	Median	Standard deviation	Missing values (%)
Men's relative contribution to social reproduction	Ratio of female age of first marriage to male age of first marriage	*afmr*	1990-2001	0.86	0.88	0.06	8.33
			2002-2007	0.87	0.88	0.06	30.77
			2008-2015	0.87	0.88	0.06	21.15
Gender wage gap	Ratio of the share of wage and salaried workers in women's employment to men's employment	*fmemp*	1990-2001	0.92	1.03	0.27	30.77
			2002-2007	0.93	1.03	0.26	25.00
			2008-2015	0.94	1.03	0.24	21.15
Public provisioning of care	Public social protection and health expenditure as a share of GDP (%)	*sph*	1990-2001	8.67	4.37	7.71	10.90
			2002-2007	9.63	6.37	7.74	10.26
			2008-2015	10.77	7.37	8.39	6.41
Reproductive infrastructure	Average access to electricity, non-solid fuel, improved sanitation facilities and improved water source	*repro*	1990-2001	67.01	80.35	30.11	2.56
			2002-2007	70.90	85.14	28.90	2.56
			2008-2015	73.02	88.11	28.19	2.56
Extent and quality of the market care sector	Share of women's service employment to total employment, raised to the power of the inverse of the Palma ratio[13]	*mcare*	1990-2001	10.38	2.58	17.05	37.18
			2002-2007	8.39	2.62	12.41	30.13
			2008-2015	9.32	3.11	13.07	31.41

[13] The Palma ratio is the ratio of the richest 10 percent of the population's share of gross national income divided by the poorest 40 percent share (Palma 2014).

Table 5. Coordinates, contributions and inertia of the principal component analyses

Coordinates of the variables on the 1st component of the PCA by time period (demand side)

Variable	1990-2001	2002-2007	2008-2015
HDI2	0.24	0.52	**0.32**
mfgX	-0.71	-0.74	**-0.78**
FDI	-0.64	-0.58	**-0.50**
pub	0.69	0.55	**0.63**
TFF	0.68	0.74	**0.79**

Contributions of the variables on the 1st component of the PCA by time period (demand side)

Variable	1990-2001	2002-2007	2008-2015
HDI2	3.04	13.35	**4.88**
mfgX	26.36	27.37	**30.45**
FDI	21.79	17.03	**12.49**
pub	24.52	15.21	**20.16**
TFF	24.27	27.03	**32.01**

Percentage of variance captured by each component for each of the 3 time periods (demand side)

Variable	1990-2001	2002-2007	2008-2015
1st component	38.61	40.01	**39.93**
2nd component	20.82	19.92	**20.61**
3rd component	16.18	17.26	**19.11**
4th component	12.75	11.77	**12.03**
5th component	11.63	10.99	**8.31**

Coordinates of the variables on the 1st component of the PCA by time period (supply side)

Variable	1990-2001	2002-2007	2008-2015
afmr	0.81	0.83	**0.86**
fmemp	0.84	0.83	**0.86**
sph	0.72	0.84	**0.83**
repro	0.91	0.90	**0.90**
mcare	0.80	0.77	**0.83**

Contributions of the variables on the 1st component of the PCA by time period (supply side)

Variable	1990-2001	2002-2007	2008-2015
afmr	18.68	20.11	**20.31**
fmemp	19.81	19.58	**20.17**
sph	20.45	20.11	**19.07**
repro	23.19	23.30	**22.13**
mcare	17.87	17.16	**18.31**

Percentage of variance captured by each component for each of the 3 time periods (supply side)

Variable	1991-2001	2002-2007	2008-2015
1st component	70.79	69.70	**72.70**
2nd component	13.63	14.32	**12.06**
3rd component	7.39	7.67	**7.18**
4th component	4.42	5.38	**4.82**
5th component	3.77	2.91	**3.23**

Table 6. Distribution of social reproduction regimes by region, 2008-2015

Region	*Exploitation*	*Mutual*	*Time squeeze*	*Wage squeeze*	*Number of countries*
Developed economies	15%	24%	38%	24%	34
Developing Africa	15%	13%	69%	4%	48
Developing America	5%	32%	5%	59%	22
Developing Asia	15%	12%	18%	56%	34
Developing Oceania	100%	0%	0%	0%	1
Transition economies	0%	18%	0%	82%	17
World	***12%***	***18%***	***34%***	***36%***	***156***

Table 7. Social reproduction regime by region and country *(2008-2015)*

Developed countries	
Australia	Time squeeze
Austria	Mutual
Belgium	Wage squeeze
Bulgaria	Time squeeze
Canada	Time squeeze
Croatia	Time squeeze
Cyprus	Exploitation
Czech Republic	Wage squeeze
Denmark	Mutual
Estonia	Exploitation
Finland	Mutual
France	Mutual
Germany	Wage squeeze
Greece	Time squeeze
Hungary	Wage squeeze
Ireland	Wage squeeze
Israel	Time squeeze
Italy	Time squeeze
Japan	Mutual
Latvia	Exploitation
Lithuania	Exploitation
Netherlands	Wage squeeze
New Zealand	Time squeeze
Norway	Mutual
Poland	Exploitation
Portugal	Time squeeze
Romania	Time squeeze
Slovak Republic	Wage squeeze
Slovenia	Wage squeeze
Spain	Time squeeze
Sweden	Mutual
Switzerland	Time squeeze
United Kingdom	Mutual
United States	Time squeeze

Developing Africa	
Algeria	Mutual
Angola	Time squeeze
Benin	Time squeeze
Botswana	Mutual
Burkina Faso	Time squeeze
Burundi	Time squeeze
Cameroon	Time squeeze
Central African Republic	Time squeeze
Chad	Time squeeze
Congo, Dem. Rep.	Time squeeze
Congo, Rep.	Time squeeze
Cote d'Ivoire	Exploitation
Egypt, Arab Rep.	Mutual
Eritrea	Time squeeze
Ethiopia	Time squeeze
Gabon	Mutual
Gambia, The	Time squeeze
Ghana	Time squeeze
Guinea	Time squeeze
Guinea-Bissau	Time squeeze
Kenya	Time squeeze
Lesotho	Time squeeze
Liberia	Exploitation
Libya	Time squeeze
Madagascar	Exploitation
Malawi	Time squeeze
Mali	Time squeeze
Mauritania	Time squeeze
Mauritius	Wage squeeze
Morocco	Mutual
Mozambique	Exploitation
Namibia	Exploitation
Niger	Time squeeze
Nigeria	Time squeeze
Rwanda	Time squeeze
Senegal	Time squeeze
Sierra Leone	Exploitation
Somalia	Exploitation
South Africa	Wage squeeze
South Sudan	Time squeeze
Sudan	Time squeeze
Swaziland	Time squeeze
Tanzania	Time squeeze
Togo	Time squeeze
Tunisia	Mutual
Uganda	Time squeeze
Zambia	Time squeeze
Zimbabwe	Time squeeze

Developing America	
Argentina	Mutual
Bolivia	Mutual
Brazil	Mutual
Chile	Wage squeeze
Colombia	Mutual
Costa Rica	Wage squeeze
Cuba	Wage squeeze
Dominican Republic	Wage squeeze
Ecuador	Mutual
El Salvador	Wage squeeze
Guatemala	Exploitation
Haiti	Time squeeze
Honduras	Wage squeeze
Jamaica	Mutual
Mexico	Wage squeeze
Nicaragua	Wage squeeze
Panama	Wage squeeze
Paraguay	Wage squeeze
Peru	Wage squeeze
Trinidad and Tobago	Wage squeeze
Uruguay	Wage squeeze
Venezuela, RB	Mutual

Developing Asia	
Afghanistan	Time squeeze
Bahrain	Wage squeeze
Bangladesh	Time squeeze
Cambodia	Exploitation
China	Wage squeeze
Hong Kong SAR, China	Wage squeeze
India	Exploitation
Indonesia	Wage squeeze
Iran, Islamic Rep.	Mutual
Iraq	Mutual
Jordan	Wage squeeze
Korea, Dem. People's Rep.	Wage squeeze
Korea, Rep.	Wage squeeze
Kuwait	Wage squeeze
Lao PDR	Time squeeze
Lebanon	Wage squeeze
Malaysia	Wage squeeze
Mongolia	Wage squeeze
Myanmar	Exploitation
Nepal	Time squeeze
Oman	Mutual
Pakistan	Time squeeze
Philippines	Wage squeeze
Qatar	Wage squeeze
Saudi Arabia	Wage squeeze
Singapore	Wage squeeze
Sri Lanka	Wage squeeze

Syrian Arab Republic	Mutual
Thailand	Wage squeeze
Timor-Leste	Time squeeze
Turkey	Wage squeeze
United Arab Emirates	Wage squeeze
Vietnam	Exploitation
Yemen, Rep.	Exploitation
Developing Oceania	
Papua New Guinea	Exploitation
Transition economies	
Albania	Wage squeeze
Armenia	Wage squeeze
Azerbaijan	Wage squeeze
Belarus	Wage squeeze
Bosnia and Herzegovina	Wage squeeze
Georgia	Wage squeeze
Kazakhstan	Wage squeeze
Kosovo	Mutual
Kyrgyz Republic	Wage squeeze
Macedonia, FYR	Wage squeeze
Moldova	Wage squeeze
Russian Federation	Wage squeeze
Serbia	Wage squeeze
Tajikistan	Mutual
Turkmenistan	Mutual
Ukraine	Wage squeeze
Uzbekistan	Wage squeeze

Figure 1a. Social reproduction regimes, 2008-2015: Developing countries

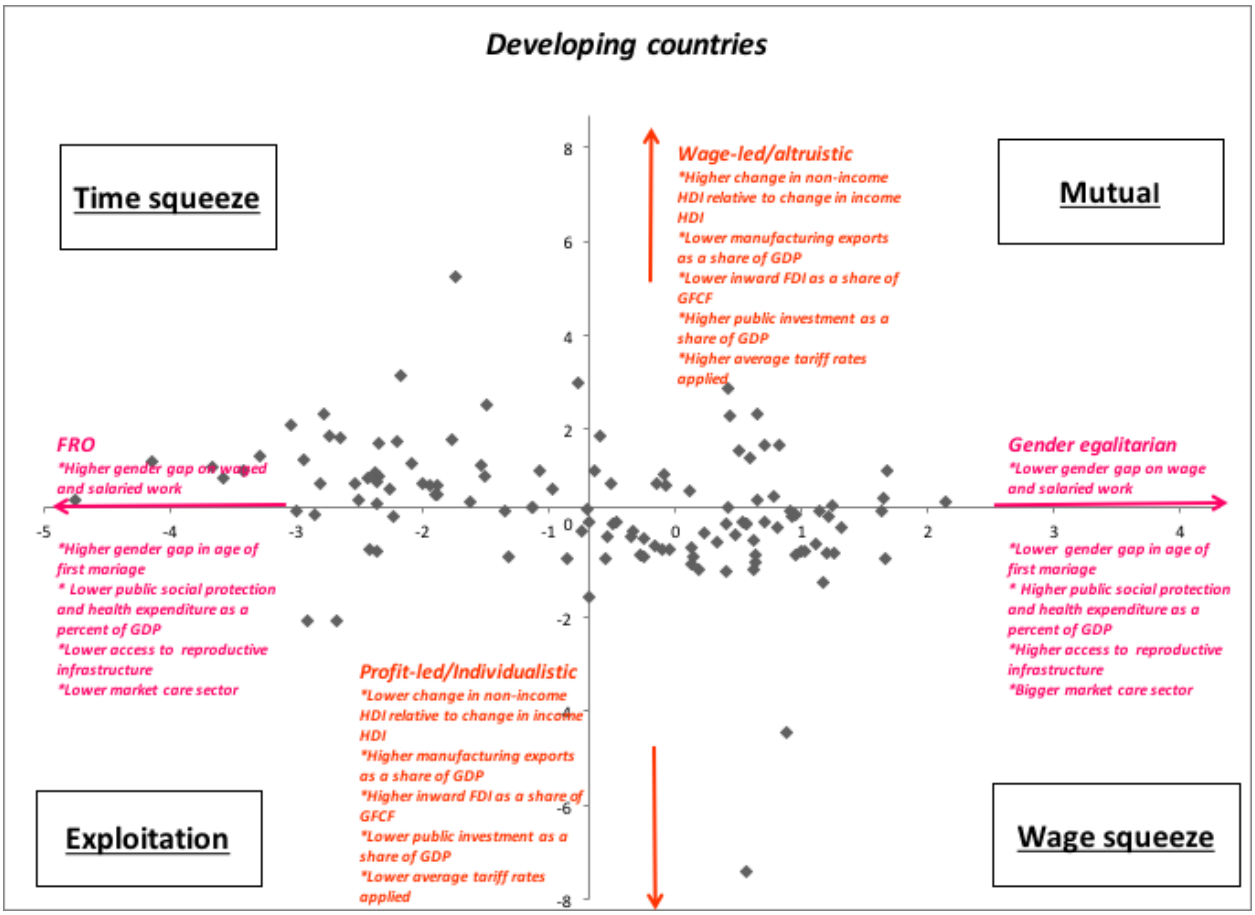


Figure 1b. Social reproduction regimes, 2008-2015: Developed countries

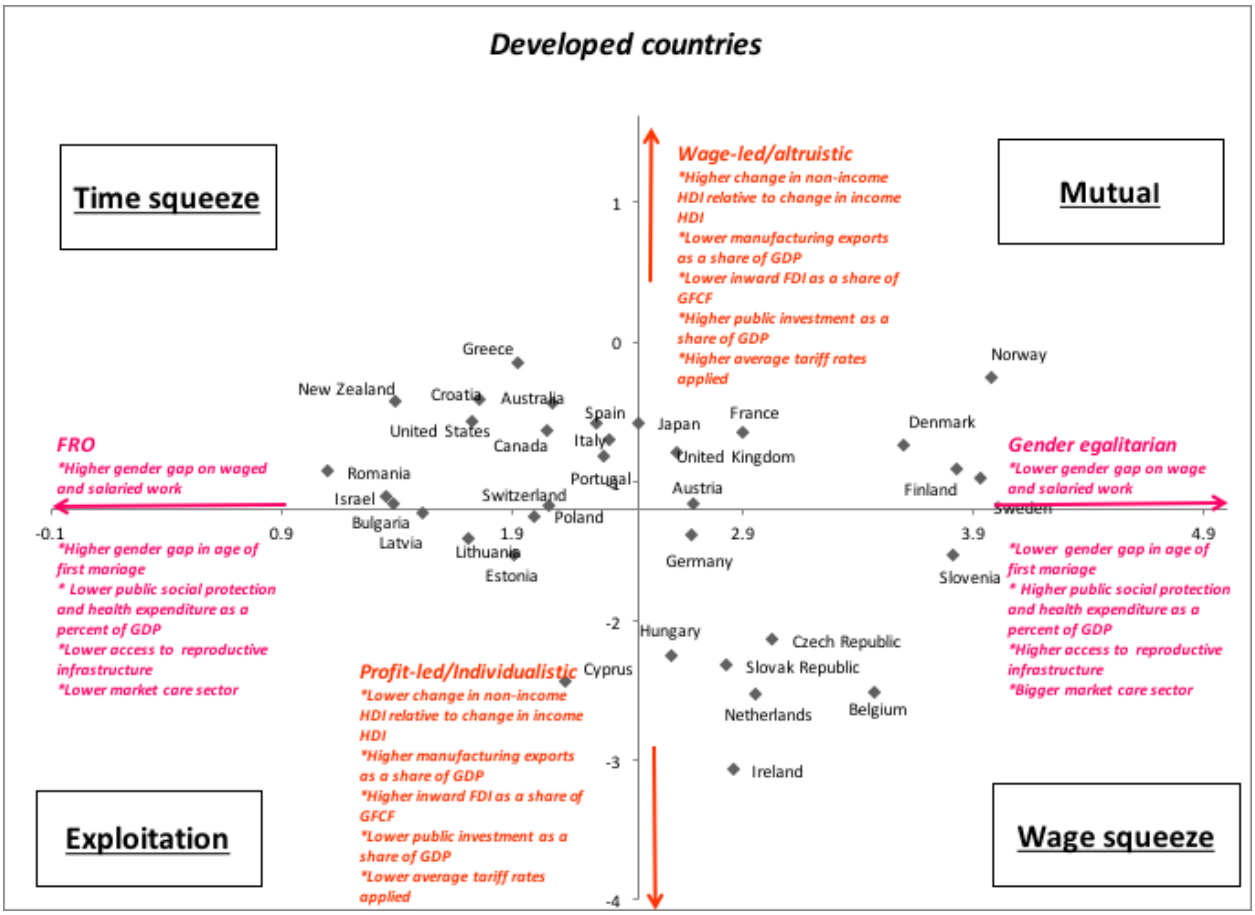


Figure 2. Time paths of social reproduction regimes, 1990-2015 *(base period: 2008-2015)*

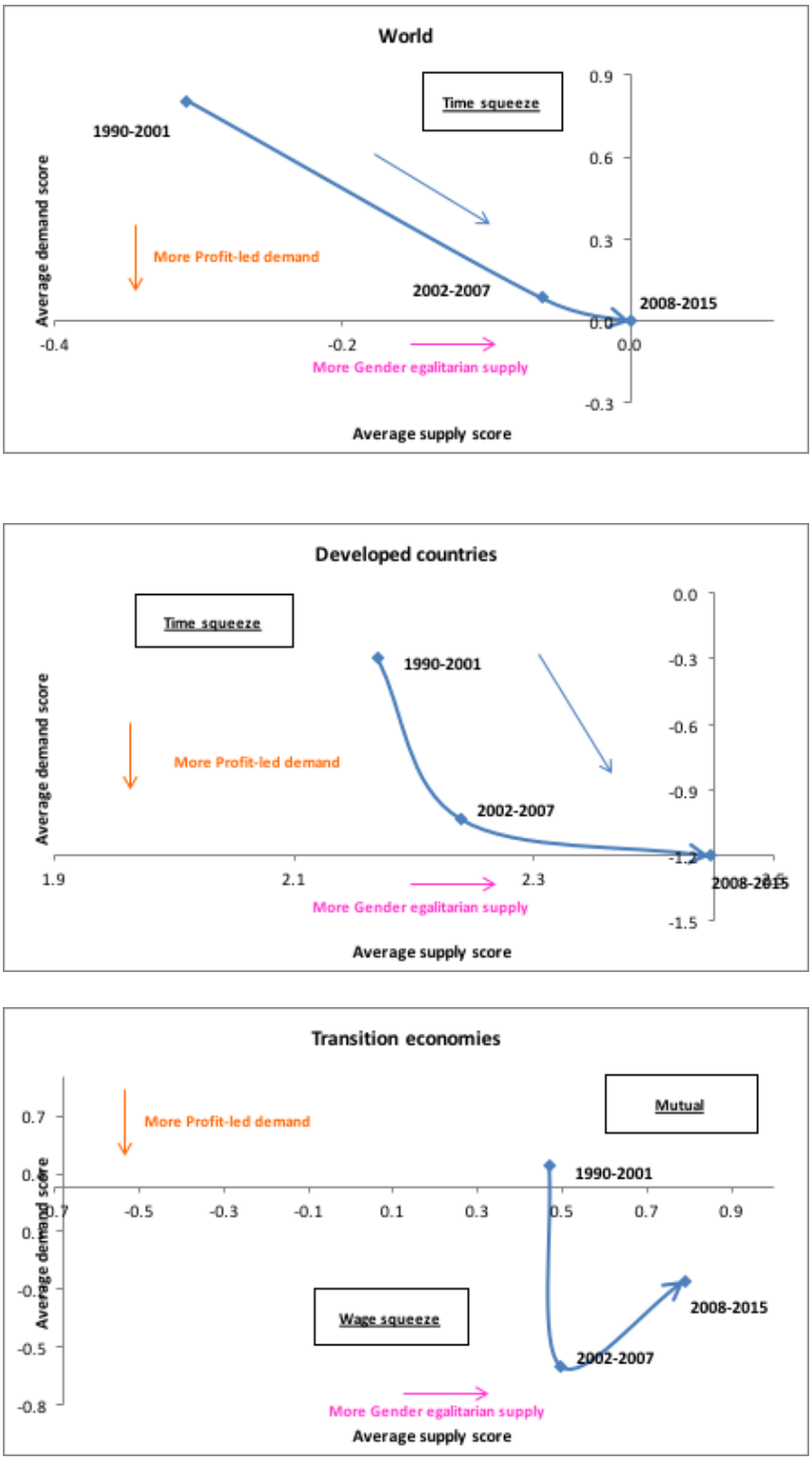
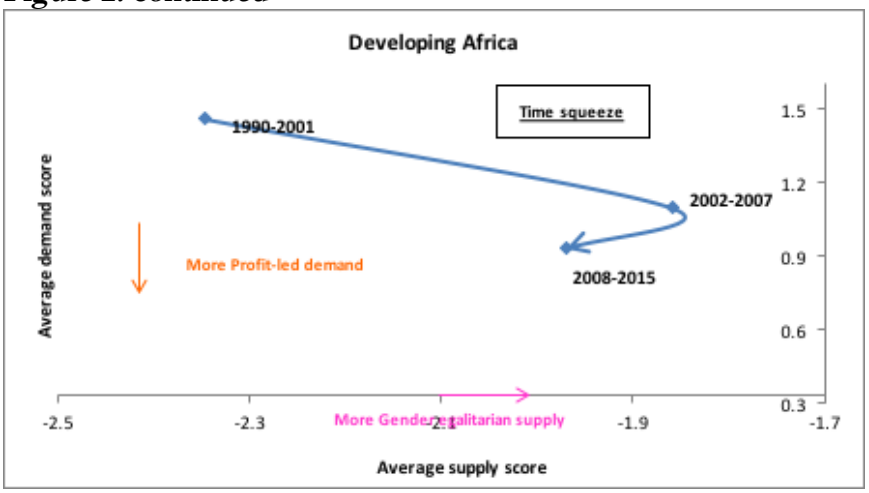
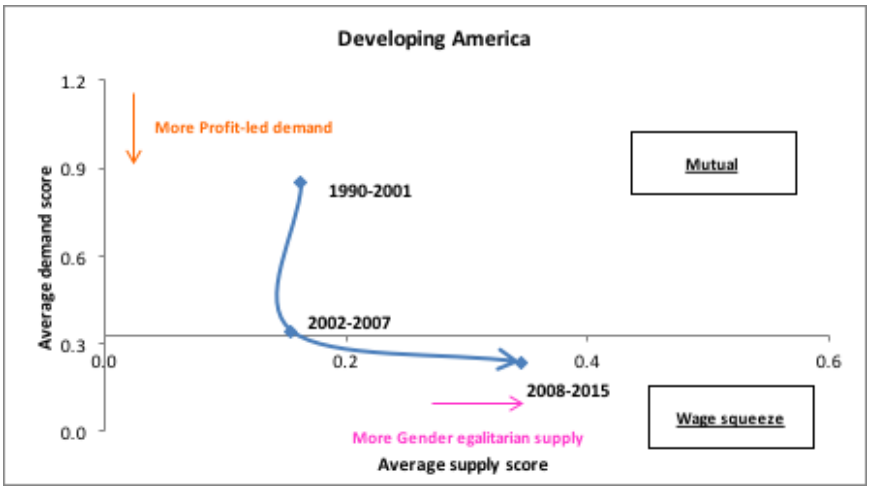
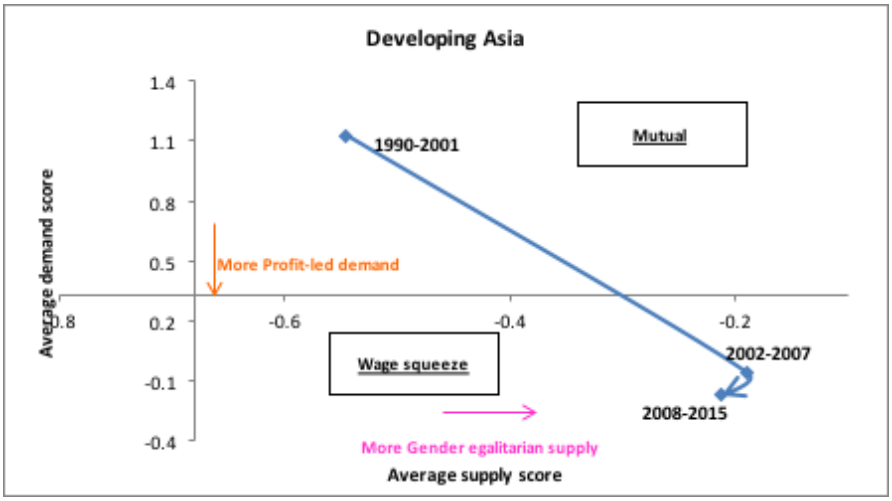


Figure 2. continued







Data Appendix

Variable	Short name	Source
5-year percentage point change in non-income HDI less 5-year percentage point change in income index	*HDI2*	Calculated based on disaggregating components of the Human Development Index (HDI), UNDP
Manufacturing exports as a share of GDP	*mfgX*	Manufacturing exports drawn from Comtrade database, GDP from World Development Indicators (WDI) database, both in US$.
Inward FDI as a share of GDP	*FDI*	Calculated from WDI database.
Public investment as a share of GDP	*pub*	Calculated from WDI database, based on reported shares of private investment in gross fixed capital formation.
Weighted average tariff rates applied	*TFF*	Calculated based on data drawn from TRAINS database, UNCTAD. Weights based on imports by product group at the HS 2-digit level.
Ratio of female age of first marriage to male age of first marriage	*afmr*	Calculated based on UNDESA Population Division World Marriage Data.
Ratio of the share of wage and salaried workers in women's to men's employment	*fmemp*	Calculated based on data drawn from WDI database.
Public social protection and health expenditure as a share of GDP	*sph*	Drawn from Table B.12 in the 2014/15 World Social Protection Report (ILO 2014). Public social protection expenditures include public benefits for the following: unemployment, employment injury, disability, maternity, and general social assistance.
Average access to electricity, non-solid fuel, improved sanitation facilities and improved water source	*repro*	Calculated based on series drawn from WDI database.
Share of women's service employment to total employment, raised to the power of the inverse of the Palma ratio	*mcare*	Employment share calculated based on data from WDI database; Palma ratio drawn from Global Income and Consumption Project (GICP) database.