ESTIMATING THE ROLE OF SOCIAL REPRODUCTION IN ECONOMIC GROWTH

Elissa Braunstein*, Colorado State University
Stephanie Seguino, University of Vermont
Levi Altringer, Colorado State University

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*Corresponding author email: elissa.braunstein@colostate.edu

THE CARE WORK AND THE ECONOMY (CWE-GAM) PROJECT

The Care Work and the Economy (CWE-GAM) Project strives to reduce gender gaps in economic outcomes and enhance gender equality by illuminating and properly valuing the broader economic and social contributions of caregivers and integrating care in macroeconomic policymaking toolkits. We work to provide policymakers, scholars, researchers and advocacy groups with gender-aware data, empirical evidence, and analytical tools needed to promote creative, gender-sensitive macroeconomic and social policy solutions. In this era of demographic shifts and economic change, innovative policy solutions to chronic public underinvestment in care provisioning and infrastructures and the constraints that care work places on women's life and employment choices are needed more than ever. Sustainable development requires gender-sensitive policy tools that integrate emerging understandings of care work and its connection with labor supply, and economic and welfare outcomes.

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THE AUTHOR TEAM

ELISSA BRAUNSTEIN

Elissa Braunstein is Professor of Economics at Colorado State University and Editor of Feminist Economics journal. Her work focuses on the international and macroeconomic aspects of development, with particular emphasis on economic growth, macro policy, social reproduction and gender. She publishes widely in both academic and policy venues, and has served as consultant to a number of international institutions, including the International Labour Organization, the World Bank, the United Nations Research Institute on Social Development, and UN Women. She holds a Ph.D. in economics from the University of Massachusetts Amherst, and a Master's of Pacific International Affairs from the School of Global Policy and Strategy at the University of California San Diego.

STEPHANIE SEGUINO

Stephanie Seguino is Professor of Economics at the University of Vermont. Dr. Seguino's research explores the impact of globalization on income distribution and well-being, with a particular emphasis on Asian and Caribbean economies. She has been an advisor or consultant to numerous international organizations including the World Bank, United Nations Development Program, the Asian Development Bank, and USAID, and publishes regularly in a number of economic journals, including World Development, Journal of Development Studies, and Feminist Economics.

LEVI ALTRINGER

Levi Altringer is a PhD Candidate in Economics at Colorado State University in Fort Collins where he also received a master's degree in Economics. His research interests include stratification economics, the political economy of race and gender, social reproduction, applied microeconomics, and public economics. His dissertation work seeks to better understand the role of mass incarceration in generating and perpetuating racial inequality within local labor markets across the US.

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1. INTRODUCTION

In recent years, a plethora of both mainstream and heterodox 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, grounded in structuralist macro, 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) filled that lacuna, with a structuralist macro model that incorporates the role of social reproduction as well as gender. This paper furthers that model from an empirical perspective. It uses principal component analysis to quantify a set of regimes linking structures of economic growth and development with those of social reproduction, and then uses these estimates in growth regression analysis to test the theoretical predictions linking social reproduction regimes to economic growth. 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 use principal component analysis to empirically estimate these regimes for a wide cross-section of both developing and developed countries over the period 1991-2015, though data choices are primarily geared towards capturing developing country structures. Finally, we include these PCA estimates in panel growth regressions over the same period, broadly confirming the relationships between social reproduction and growth hypothesized by the model. The main empirical finding is that most countries demonstrate a social reproduction regime which results in both lower and more volatile growth.

[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).

2. A MACROECONOMIC FRAMEWORK FOR SOCIAL REPRODUCTION

This section develops a conceptual framework connecting economic growth with 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 by class and gender 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 (Taylor 2004). 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, are the result of a social bargaining process that reflects the extent of unemployment 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 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, time use data indicate that women carry the greatest burden of performing care work, whether construed as direct care or indirect care activities, such as fetching water or fuel wood (Connelly and Kongar 2017).

As both 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 conceptualize capacities in the widest sense of the term and include a broad array of features that 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.

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[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.

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. In the long term, spending time or money on the production of labor, whether it results in higher fertility or improved 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 many 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 of this paper is to differentiate between societies that care more and/or better than societies that invest less in care. Reasons some societies might invest more in care 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: physical (or business) 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 and wage shares 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, as a result, increase this

[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).

component of investment (dubbed the "accelerator effect"). On the other hand, higher wages also lower the profit share of income, which 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" in the structuralist macro literature. Their converse, where increases in the wage share are associated with lower output and growth are termed "profit-led."[5] Before settling on our own terminology, however, we need to incorporate care.

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 of income boost expectations about future economic returns to labor, 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. Fertility is part of this story as well in the sense that strong caring spirits induce investments in both quality and quantity of human capacities.

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. Because of these differences in preferences, economic growth or higher wage shares will have a stronger positive impact on investment in human capacities in strong caring spirit societies than in weak ones. And the stronger the caring spirits, the more likely that economic growth is wage-led. The reason is that higher wages now not only induce physical investment demand via raising consumer demand, but also induce demand for investment in human capacities. When caring spirits are weak, higher wages add less to current investment demand and future human capacities. Investment and growth is thus more closely (and positively) associated with the share of income going to capital or profits. We therefore differentiate between the two regimes "care-led" versus "inequality-led" to emphasize the different results associated with changes in income distribution, care provisioning and investment demand.[6]

In addition to caring spirits, the care versus inequality-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

[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.
[6] This nomenclature departs from Braunstein et al. (2011) and Braunstein (2014), which respectively use altruistic/individualistic and wage-led/profit-led to characterize the demand side.

boost aggregate demand and investment in human capacities enough to compensate for the decline in investment or exports. Further, macro-level policies that focus exclusively on price stability in the context of liberalized flows of capital and trade are more likely to contribute to inequality-led or weak caring spirit regimes (Blecker 2016). The deflationary impact of such policy stances makes for poor employment growth and tends to depress investments in human capacities. In contrast, developmental macro policy emphasizes the objectives of fostering employment creation and other measures of broadly shared well-being, in part by policies that promote structural change, as compared to a focus on price stability alone. Table 1 summarizes and compares these demand-side dynamics for both care- and inequality-led economies.

Table 1. Demand and Growth

Care-led	Inequality-led
Explanation	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, and accumulation is positively associated with wages.	*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, and accumulation is positively associated with profits.
Factors that make each scenario more likely	*Factors that make each scenario more likely*
Strong caring spirits Domestically-oriented economy Developmental macro policy[7]	Weak caring spirits Globally-oriented economy Financialization

Table 1

2.2 SUPPLY, GENDER AND THE DISTRIBUTION OF SOCIAL REPRODUCTION

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 women's 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.[8] Wages are determined by labor's bargaining power, which rises along with output – as output rises, unemployment falls, giving workers more ability to

[7] Developmental macro policy emphasizes the objectives of fostering employment creation and other measures of broadly shared well-being, in part by policies that promote structural change, as compared to a focus on price stability alone.

[8] 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.

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.[9]

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 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 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, but in varying degrees.

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-

[9] 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 internationally 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.

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.[10] 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 men's 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 as well as 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, including lower fertility. 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 high levels of public and private 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

[10] 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).

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 women's labor force participation and output will increase the production of human capacities by more than it will cut into profits—and therefore, 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 will be 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 notion of the feminization of poverty. Parallel to the high-road regime, the contributing factors to 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.

Table 2. Supply and the Distribution of Social Reproduction

Low Road: Feminization of responsibility & obligation	High Road: Gender egalitarian
Explanation	*Explanation*
Increasing output and women's labor force participation is associated with declines in human capacities production, ultimately lowering profits.	Increasing output and women's labor force participation is associated with increases in human capacities production and higher profits.
Factors that make each scenario more likely	*Factors that make each scenario more likely*
Low contributions from men for 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 2

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 whereby we combine each potential demand regime with each supply regime, to create a 2x2 matrix. The styled regimes are labeled: 1) time squeeze, 2) mutual, 3) wage squeeze, and 4) exploitation. To characterize 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.

Table 3. Growth and social reproduction

	Supply: The distribution of social reproduction	*Supply: The distribution of social reproduction*
Demand: Growth	*Low road* Feminization of responsibility & obligation (FRO)	*High road* Gender egalitarian (GE)
Care-led	*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.*
Inequality-led	*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 3

Starting in the upper left-hand corner, "time squeeze" combines care-led 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 care 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. Again, it is worth noting that this potential outcome is widely missing in most gendered macro models, and yet is a possible result of increasing women's labor force participation under certain conditions.

Moving to the upper right corner of Table 3, with a high-road distribution of social reproduction and care-led 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 inequality-led growth with a high-road distribution of social reproduction, is termed "wage squeeze" because higher wages for women 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 inequality-led nature of the economy – for instance, the more open to the global economy, or the more financialized the economy – 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 and growth may increase because of the declining price of care.

The final regime, "exploitation," combines the inequality-led and low-road cases. In this scenario, higher wages for women lower growth because they dampen profits and thus business 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 lowers 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 inequality-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 begins where Braunstein et al. (2011) and Braunstein (2014) left off by presenting an empirical methodology and estimates for the model of social reproduction described above. It uses cross-section, time series data in a principal component analysis (PCA) for a large set of developed and developing economies, estimating values or "scores" for both the demand and supply sides, which together characterize a country's social reproduction regime. The goal is to empirically estimate and represent social reproduction regimes to be used in the econometric analysis to follow.

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. The period is subdivided into three sub-periods over which variables are averaged for the PCA analysis: 1991-2001, 2002-2007, and 2008-2015; these spans optimize data coverage as well as mark economic cycles. Because the primary focus is on developing countries, the data has to be meaningful from a development perspective, as well as widely available both cross-sectionally and longitudinally. Tables 4 and 5 list each element, the corresponding variable(s) used to measure it, and summary statistics for each time period. Data appendix A lists further details on sources.

Table 4 describes the data included in the demand score, which is positively associated with care-led growth and negatively associated with inequality-led growth. *Caring spirits* are captured by relative achievements in the education and health and income components of the Human Development Index (HDI), with changes taken over five-year periods.[11] That is, we measure caring spirits by their impact on a country's expected years of schooling and life expectancy at birth, both of which should be positively and strongly correlated with investments in human capacities, relative to the income component of the HDI. 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 education and health 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 evaluated. On average, achievements in education and health have outweighed changes in the income component of the HDI, but the positive gap has narrowed over time.

[11] 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).

Table 4. Summary statistics: Demand

Element	Variable	Short name	Period	Mean	Median	Standard deviation	Missing values (%)
Caring spirits	5-year percentage point change in education index less 5-year percentage point change in income index	*edHDI*	1990-2001	0.02	0.00	0.14	14.74%
			2002-2007	0.01	0.01	0.03	9.62
			2008-2015	0.07	0.05	0.09	9.62%
	5-year percentage point change in heath index less 5-year percentage point change in income index	*health HDI*	1990-2001	-0.01	-0.01	0.09	3.85%
			2002-2007	0.02	0.01	0.06	3.85%
			2008-2015	0.03	0.02	0.06	3.85%
Global orientation	Manufacturing 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	14.85	8.01	20.01	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	22.43	14.58	29.91	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 4

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 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 probability of inequality-led growth regimes in later relative to earlier periods.

The last element on the demand side is *macro policy*. There were a number of choices for proxy variables here, and public investment and tariffs are particularly good representatives of the development-oriented activism that we wanted to emphasize.[12] 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, with weights based on tariffs and imports by product group (harmonized system codes at the two-digit level), reflect 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 care-led growth.

Table 5 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.

[12] Other macro policy variables we tried introduced more noise than signal into the system, potentially 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.

Table 5. Summary statistics: Supply

Element	Variable	Short name	Period	Mean	Median	Standard deviation	Missing values (%)
Men's relative contribution to social reproduction	Ratio of women's age of first marriage to men's 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

Table 5

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 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 (UNSD) has an excellent cross-national, with some time series, dataset on the average hours per day women and men spend on unpaid domestic work; that source, however, does not offer enough data coverage to make this data source 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

[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).

gender inequality embodied in intra-household gender relations, and therefore, 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. We elected to use the ratio of women's-to-men's share of wage and salaried employment in total employment to capture the relative quality and productivity of employment.[14] The excluded 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 are often indicators of residual unemployment, using relative access to wage employment was deemed 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 time, with higher levels in developed than developing countries (and a period mean of 20.9 versus 5.2 percent respectively). 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 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*. Because women's service sector work tends to be concentrated in the caring professions, 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 the 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 so-called "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

[14] We tested additional variables, including women's education and labor force participation rates relative to men. These were not used because they did not add to the PCA, likely because they are much more highly correlated with a multitude of gender inequality dynamics than the gender wage gap, and hence did not group well with the other supply side elements.

population, is used for income inequality (Palma 2014).[15] 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. 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. In the analysis to follow, demand and supply scores are based on the first principal component estimates.

Regular PCAs become problematic when there are a large number of missing values. To address this issue, we used an iterative PCA algorithm (Josse and Husson, 2013) in order to impute missing values without overfitting the data, a problem for some variables in the analysis such as *mcare* (see Tables 4 and 5 for information on missing values).[16]

To generate the PCA scores, we divided the complete dataset into six subsets – three demand-side sets and three supply-side sets for each period of interest (1990-2001, 2002-2007 and 2008-2015). Then we imputed missing values following the iterative PCA algorithm, which uses the data we do have, and the statistical relationships present in that data, to estimate missing values. Using the new data series with imputed values, we then performed a standard PCA on the supply and demand side datasets. The resulting component estimates are a linear combination of the original variables. Note that we use only data from 2008-2015 to compute the components. Final supply and demand 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 some detail on the PCA results.[17] The coordinates of the first component are weights that are used to determine the contribution of the underlying variable to the final score. We can see that the signs of these weights all conform to those predicted by

[15] Using the Palma ratio emphasizes the importance of what is happening in the tails as opposed to characterizing income distribution overall, which we deem to be a closer reflection of the relative quality of service sector work.
[16] Overfitting occurs when the model describes random error or noise instead of the underlying relationships between variables.
[17] 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.

the conceptual model. For demand and growth, variables associated with stronger caring spirits and care-led growth (*HDI2*, *pub,* and *TFF*) are positive and therefore increase the demand score, while those associated with inequality-led regimes have negative values (*mfgX* and *FDI*) and therefore decrease the demand score. 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 reproduction and increase the supply score. The percentage of the variance found accounted for by the first component, the one we use to generate the demand and supply scores, is about 40 percent on the demand side and 73 percent on the supply side. In general, the supply-side estimates appear more robust and stable across time than the demand side.[18]

Table 6. Coordinates, contributions, and inertia of the principal component analyses

Demand variable	1990-2001	2002-2007	2008-2015	Supply variable	1990-2001	2002-2007	2008-2015
			Coordinates of the variables on the 1st component of the PCA by time period				
HDI2	0.24	0.52	0.32	*afmr*	0.81	0.83	0.86
mfgX	-0.71	-0.74	-0.78	*fmemp*	0.84	0.83	0.86
FDI	-0.64	-0.58	-0.50	*sph*	0.72	0.84	0.83
pub	0.69	0.55	0.63	*repro*	0.91	0.90	0.90
TFF	0.68	0.74	0.79	*mcare*	0.80	0.77	0.83
			Percentage of variance captured by the 1st component by time period				
	38.61	40.01	39.93		70.79	69.70	72.70

Table 6

3.3 RESULTS

Figures 1 and 2 illustrate the distribution of countries across the four social reproduction regimes based on their PCA scores for the period 2008-2015.

[18] 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.

Figure 1. Social reproduction regimes, developing countries 2008-2015

Figure 1

Figure 2. Social reproduction regimes, developed countries 2008-2015

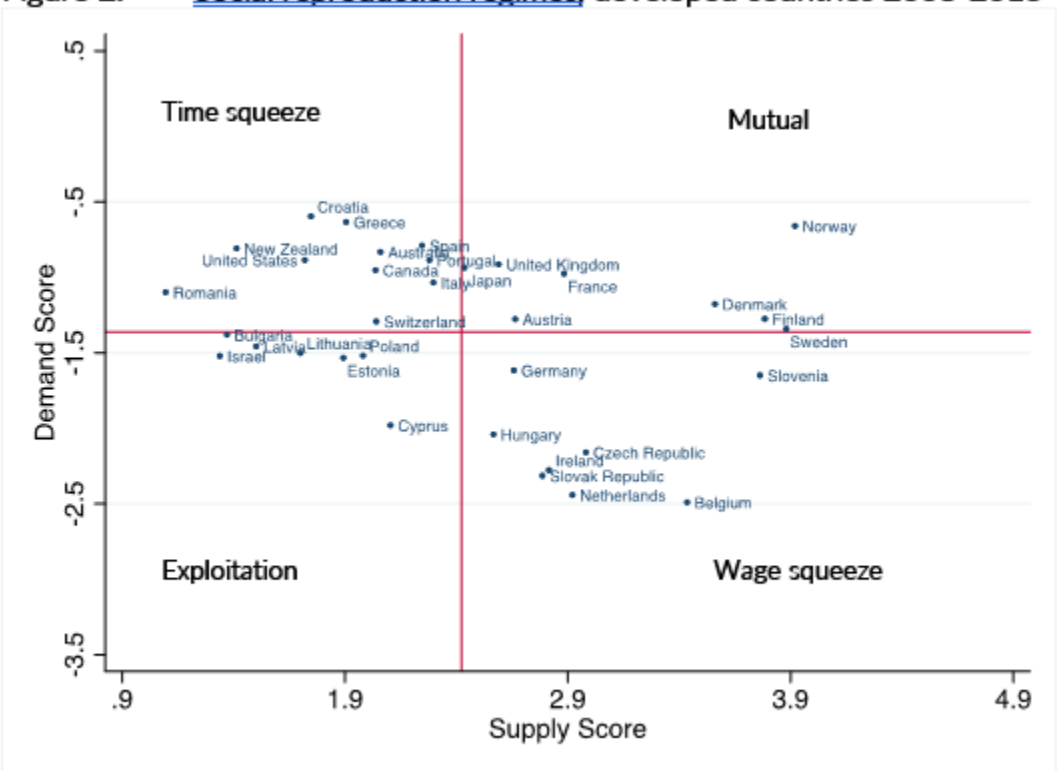

Figure 2

Figure 1 includes developing and transition countries, and Figure 2 developed countries only.[19] 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 1, a majority of developing and transition countries are in either time or wage squeeze quadrants (quadrants II and IV respectively), 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 developing countries is limited by wage squeeze (56) than time squeeze (39), but this result is driven by the preponderance of transition economies that fall into the wage-squeeze category (15).

Combining Figure 1 with the regional details in Table 7, most of developing Asia is classified as wage squeeze (quadrant IV), 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.

Table 7. Distribution of social reproduction regimes by region, 2008-2015

Region	*Exploitation*	*Mutual*	*Time squeeze*	*Wage squeeze*	*Number of countries*
Developed economies	21%	24%	32%	24%	34
Developing Africa	13%	13%	69%	6%	48
Developing America	0%	18%	5%	77%	22
Developing Asia	15%	9%	15%	62%	34
Developing Oceania	100%	0%	0%	0%	1
Transition economies	0%	12%	0%	88%	17
World	*12%*	*15%*	*32%*	*41%*	*156*

Note: The classification of country groups conforms to that used by the United Nations. Regime classification is separated into developed and developing countries using their respective mean demand and supply scores as regime boundaries.

Table 7

Most countries in developing Africa are classified in the time-squeeze regime (quadrant II of Figure 1), indicating that despite care-led structures of growth, which could bode well

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

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.

The exploitation quadrant (lower left in Figure 1), which pairs inequality-led structures of growth with a low-road distribution of social reproduction, is populated primarily by countries in Southeast Asia and Africa. In this scenario, 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 2 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 care-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 inequality-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.

4. ESTIMATING GROWTH

In this section we take the PCA estimates of social reproduction discussed above and use them in an econometric analysis of economic growth. The growth regression approach is simple and exploratory; it is intended to examine the model's hypotheses as much as it is to better understand the role of social reproduction in growth.

4.1 EMPIRICAL APPROACH AND DATA

The baseline of the empirical approach is given by equation (1) below, which specifies that average annual growth in real per capita GDP in country *i* over time *t*, $\bar{g}_{it}$, is a function of: (1) a convergence effect – where wealthier countries tend to grow more slowly than poorer ones because of both decreasing returns to capital and the lower costs of replication versus discovery – measured by the log of real per capita GDP at the beginning of the time period, $lnGDP_{it_0}$; (2) physical investment, measured by average investment as

a share of GDP over the time period, $\overline{INV/GDP_{it}}$; and (3) the stock of human capital, measured as average years of secondary schooling in the total population aged 15 and older at the beginning of the time period, H_{it_0}. One would expect the convergence effect to be negative (that is, wealthier countries should grow more slowly all else equal), and the associations between physical and human capital and growth to be positive. We also include a measure of institutional quality, the rule of law, to control for the well-documented role of political institutions in determining economic performance (Acemoglu and Robinson 2008). Regional (R_i) and time (T_t) fixed effects are also included in all regressions. Data notes and sources are in data appendix B, while summary statistics are provided in Table 8.

$$(1) \qquad \bar{g}_{it} = \alpha + \beta_1 lnGDP_{it_0} + \beta_2 \overline{INV/GDP}_{it} + \beta_3 H_{it_0} + \beta_4 law_{it} + \beta_5 R_i + \beta_6 T_t + \epsilon_{it}$$

We take two approaches to incorporating social reproduction into equation (1). The first adds the supply and demand scores to the baseline equation to explore whether and how care- versus inequality-led demand on the one hand, and low- versus high-road distributions of social reproduction on the other, are directly correlated with growth. To assist with interpretation and grouping developed and developing countries together for the regressions, we standardized the demand (supply) scores to have a mean of zero, with positive values indicating care-led (high-road) and negative values indicating inequality-led (low-road). The interpretation of the regressions will differ on the demand and supply scores. On the demand side, a positive coefficient estimate would indicate that being care-led is associated with higher growth, suggesting that (average) prevailing structures of growth and accumulation have indeed been care-led. The opposite result, a negative coefficient estimate, indicates instead that the drivers of inequality-led growth – the macro policy choices, wage compression, and lack of investment in human capacities – have been dominant in structuring growth dynamics. Looking at Table 8, demand scores have ranged between -6.0 and 5.6, with a mean close to zero of -0.06.[20]

The supply-side scores do not provide the same test of growth regime, since they represent the distribution of social reproduction rather than relations between the distribution of income (and hence investment) and growth. Given the strong and positive empirical association between health, education, and labor force participation-based measures of gender equality and economic growth widely documented in the gender and growth literature, we hypothesize a similarly positive association between the gender distribution of social reproduction and growth.

The second approach to accounting for social reproduction first generates four dummy variables that indicate whether an observation (for a particular country and time period) can be characterized as either exploitation (*EXP*), mutual (*MUT*), time squeeze (*TSQ*) or wage squeeze (*WSQ*) based on the combination of the supply and demand PCA scores. These dummy variables are then "weighted" by the strength of the regime, with weights

[20] This mean does not exactly equal zero because not all observations used in the score standardization were used in the regressions, and Table 8 includes only those observations included in the regressions.

calculated as the absolute value of the product of the demand and supply scores as represented by equation (2) below. This weighting scheme helps account for the fact that the determination of the PCA axis is relative and somewhat arbitrary (i.e. at what numerical value does a regime pass from one category to another), as well as sensitive to missing values. So the farther removed a country is from the PCA axis, the more confident we are in its classification, and hence that observation is more heavily weighted in the analysis. The final specification for this approach is detailed in equation (3), which we consider a test of the relationships between social reproduction regime and growth hypothesized in Table 3.

(2) $$W_{it} = |Supply_{it} \times Demand_{it}|$$

(3) $$\bar{g}_{it} = \alpha + \beta_1 lnGDP_{it_0} + \beta_2 \overline{INV/GDP}_{it} + \beta_3 H_{it_0} + \beta_4 law_{it} + \beta_5 EXP_{it} \times W_{it} + \beta_6 MUT_{it} \times W_{it} + \beta_7 TSQ_{it} \times W_{it} + \beta_8 WSQ_{it} \times W_{it} + \beta_9 R_i + \beta_{10} T_t + \epsilon_{it}$$

4.2 RESULTS

Columns (1) – (6) of Table 9 present the regression results for per capita GDP growth in a stepwise fashion, with columns (7) and (8) shifting the analysis to the standard deviation of growth to consider volatility. Focusing first on the growth regressions in columns (1) – (6), the pooled OLS estimates combine three time periods (the same as those used for the PCA, 1990-2001, 2002-2007, and 2008-2015) for a sample of 122 countries.

The first two columns present the baseline model of growth, which includes the log of initial real per capita GDP, average investment as a share of GDP, and the average value for the rule of law over the period. Initial average years of secondary schooling are included in column (1) and excluded in column (2) to account for and explore the fact that human capital stock is highly correlated with social reproduction, as might be expected (though our measure of caring spirits is about changes in relative achievements in human capital and income, and thus it seemed reasonable to also include a straightforward measure of human capital levels in a growth regression). In the end, the presence or absence of secondary schooling does not affect the rest of the regression estimates hardly at all; for that reason we will restrict our discussion to the estimates that include secondary schooling, though estimates without this variable are included for reference. Restricting our attention to column (1), then, the predicted coefficients on the baseline model are highly significant and as expected, with the exception of secondary schooling, which is typical of specifications like this.

Adding the supply and demand scores in columns (3) and (4) does not appreciably affect the baseline model coefficient estimates. Interestingly, the coefficient estimate on the demand score is negative in both specifications, though the standard errors are large and hence the estimate is not statistically significant. Keeping this imprecision in mind but considering the meaning suggested by the magnitude of the estimate, a one standard deviation shift away from inequality- to care-led growth (an increase of 1.52 in the demand score) is associated with a 0.13 percentage point decline in annual growth (which

averaged 2.23 percent). A shift from the strongest care-led score (5.64) to the strongest inequality-led score (-5.96) is associated with a 1.0 percentage point *increase* in growth.[21] These results are consistent with accounts that emphasize how neoliberal globalization, and the increasing (and interrelated) incidence of inequality and financialization across much of the world, have transformed the structures of growth from one that mostly benefits labor (or, in our nomenclature, carers) to one that largely benefits capital.[22]

Turning now to the supply score, the coefficient estimate is large and statistically significant, with a more gender egalitarian distribution of social reproduction positively associated with economic growth. To get a sense of economic importance, a one standard deviation (1.84) increase in the supply score is associated with a 0.7 percentage point increase in per capita growth. Shifting from the highest gender egalitarian score (4.71) to the strongest score for feminization of responsibility and obligation (-4.28) is associated with a loss in growth of 3.35 percentage points. As noted above, these results are in line with other studies connecting gender equality with economic growth, only here we draw out the importance of considering the gender distribution of reproductive labor.

Columns (5) and (6) present results for the weighted social reproduction regime approach specified in equation (3) above, both with and without secondary schooling respectively; we will focus this discussion on the results that include secondary schooling. The only regime positively associated with growth is the mutual regime, where care-led growth is paired with a gender-egalitarian distribution of social reproduction, and the dynamics of supply and demand reinforce one another from a gender perspective.[23] For every one point increase in the weight associated with this regime, growth increases by 0.13 percentage points. In the exploitation case the gender dynamics of demand and supply also complement one another, but growth is based on exploiting human resources and women's productive and reproductive labor. The coefficient estimate in column (5) indicates that there are growth costs to this path: a one point increase in the intensity (or weight) of the exploitation regime is associated with a 0.26 percentage point decline in growth. Both the time and wage squeeze cases are negatively associated with growth, though only the time squeeze case (which combines care-led growth with a low-road distribution of social reproduction) achieves statistical significance, with an order of magnitude similar to the exploitation case.

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[21] Recall that the PCA estimates for the first period, 1990-2001, exhibit some inconsistencies in the relationship between the macro policy variables and the first component of the PCA (see Table 6). If we drop this time period from the regression analysis, the demand score becomes larger and highly statistically significant, indicating that we have more work to do on the demand-side PCA but that the negative association is robust.

[22] In the parlance of the Marglin and Bhaduri model (1990) that gives the structural inspiration for this analysis, this is the contrast between a stagnationist (care-led) regime and an exhilarationist (inequality-led) regime.

[23] Running the regression with one weighted regime at a time gives the same results only with generally larger magnitudes and greater statistical significance on the regime coefficient estimates. We present the simultaneous estimates because it seems the most analytically straightforward.

While these results are broadly in line with the hypotheses of the conceptual model, it would also be useful to evaluate growth volatility, given the growth instabilities potentially associated with the contradictory aspects of the time and wage squeeze cases. Columns (7) and (8) of Table 9 present such results, both with and without secondary schooling respectively. The dependent variable is the standard deviation of annual per capita growth during the relevant time period – our measure of growth volatility.

Interestingly, though the wage squeeze regime fails to achieve statistical significance in the growth regressions, it is strongly positive and significant – both statistically and economically – for growth volatility. For every one point increase in the wage squeeze weight, the standard deviation of growth increases by 0.42 percentage points. Wage squeeze regimes are characterized by inequality-led growth paired with a gender egalitarian distribution of social reproduction. And though they are only weakly (but negatively) correlated with growth overall, it seems that there are greater potential costs from higher volatility. The other regimes fail to achieve statistical significance, though the coefficient on the exploitation weight is large and negatively associated with volatility. This result is consistent with the predictions of the model in the sense that the gender dynamics of the supply and demand sides, though exploitative, run in the same direction. However, while volatility is lower, so is growth.

Broadly speaking, the results presented in Table 9 confirm the hypothesized relationships between social reproduction and economic growth developed in the conceptual model and estimated by the PCA. Though it is a good first step, we would like to further refine the demand side PCA, particularly in terms of including a variable for financialization and incorporating more gender-specific measures of macroeconomic policy.

5. CONCLUDING DISCUSSION

Though the question of care has yet to make it very far into macroeconomic models of growth, the inefficiency of gender inequality in capabilities or employment has become a stylized fact among both academic empiricists and international development institutions. When care takes on a macro dimension, it tends to get treated as a constraint on women's labor force participation, and therefore women's disproportionate responsibility for care is highlighted primarily as one of the ways that gender inequality inhibits growth. This point is an important one, but it misses the economic value of care—and thus, the effects of policies that reduce investments in care. By proposing that we treat labor as a resource that is produced, the model and estimates presented illustrate how care and social reproduction can have macroeconomic consequences independent of their effects on women's work participation, and that the gendered structures of care provisioning are elemental to paths for development and growth.

More specifically, we find that for many countries, the prospects for growth with increased gender equality in the labor market are limited by the contradictions between the positive growth effects of higher wages and/or more market participation by women on the one hand, and the pressures such increases in market work will bring to bear in the

care economy on the other. For a the majority of developing countries more dependent on external sources of demand, many of them with developmental-type states that make substantial human capital investments, paths for growth with more gender equality are limited by what is essentially the loss in competitiveness that higher wages for women would bring. A third, much smaller group of countries with more mutual or complementary relations between growth, social reproduction, and gender equality in the labor market, illustrate how having the potential to spark a virtuous cycle does not automatically produce one. This is particularly troubling given the empirical evidence that growth in the past couple of 25 years is more inequality- than care-led, even as most countries have gotten more gender egalitarian in the distribution of social reproduction. Based on our econometric analysis of the relationship between social reproduction regime and growth, this tendency is associated with lower and more volatile growth.

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DATA APPENDIX

A. Data underlying the PCA

Variable	Short name	Source
5-year percentage point change in HDI education index less 5-year percentage point change in income index	*edHDI*	Calculated based on disaggregating components of the Human Development Index (HDI), UNDP
5-year percentage point change in HDI health index less 5-year percentage point change in income index	*healthHDI*	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.

Data Appendix A

B. Data used in the regressions

Variable	Short name	Source & notes
Per capita GDP growth	*Per capita GDP growth*	Period averages calculated using annual growth in real local currency units from WDI.
Per capita GDP	*lnGDP*	Log of real per capita GDP, using expenditure-side real GDP at chained PPPs (2011 US$) from Penn World Tables 9.0.
Investment as a share of GDP	*INV/GDP*	Gross fixed capital formation as a share of GDP, from WDI.
Secondary schooling	*Secondary Schooling*	Average years of secondary in the total population aged 15 and older (Barro and Lee 2013)
Rule of law	*law*	Worldwide Governance Indicators published by the World Bank, which aggregates data from a number of different sources on sentiments regarding the extent of legal safeguards, including the likelihood of crime and violence. Ranges between -2.5 and 2.5.
Region	*Region*	Regions include five groups based on the UN classification: developed, transition, developing Africa, developing America and developing Asia.
Demand score	*Demand score*	Generated by the PCA. Scores used for the long period estimates were generated from a long period imputation and PCA.
Supply score	*Supply score*	Generated by the PCA. Scores used for the long period estimates were generated from a long period imputation and PCA.
Weighted exploitation	*exploitation*	Dummy for exploitation weighted by magnitude of the regime as specified by equation (2).
Weighted mutual	*mutual*	Dummy for mutual weighted by magnitude of the regime as specified by equation (2).
Weighted time squeeze	*time squeeze*	Dummy for time squeeze weighted by magnitude of the regime as specified by equation (2).
Weighted wage squeeze	*wage squeeze*	Dummy for wage squeeze weighted by magnitude of the regime as specified by equation (2).

Data Appendix B

Table 1. Demand and Growth

Care-led	Inequality-led
Explanation	*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, and accumulation is positively associated with wages.	*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, and accumulation is positively associated with profits.
Factors that make each scenario more likely	*Factors that make each scenario more likely*
Strong caring spirits Domestically-oriented economy Developmental macro policy[24]	Weak caring spirits Globally-oriented economy Financialization

Table 2. Supply and the Distribution of Social Reproduction

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

[24] Developmental macro policy emphasizes the objectives of fostering employment creation and other measures of broadly shared well-being, in part by policies that promote structural change, as compared to a focus on price stability alone.

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)
Care-led	*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.*
Inequality-led	*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 4. Summary statistics: Demand

Element	Variable	Short name	Period	Mean	Median	Standard deviation	Missing values (%)
Caring spirits	5-year percentage point change in education index less 5-year percentage point change in income index	*edHDI*	1990-2001 2002-2007 2008-2015	0.02 0.01 0.07	0.00 0.01 0.05	0.14 0.03 0.09	14.74% 9.62 9.62%
	5-year percentage point change in heath index less 5-year percentage point change in income index	*health HDI*	1990-2001 2002-2007 2008-2015	-0.01 0.02 0.03	-0.01 0.01 0.02	0.09 0.06 0.06	3.85% 3.85% 3.85%
Global orientation	Manufacturing exports as a share of GDP (%)	*mfgX*	1990-2001 2002-2007 2008-2015	11.63 14.66 14.85	6.00 7.10 8.01	15.90 20.39 20.01	9.62 9.62 10.90
	Inward FDI as a share of gross fixed capital formation (%)	*FDI*	1990-2001 2002-2007 2008-2015	13.23 21.67 22.43	9.82 16.72 14.58	12.53 20.86 29.91	7.05 5.77 3.85
Macro policy	Public investment as a share of GDP (%)	*pub*	1990-2001 2002-2007 2008-2015	5.77 5.20 6.46	4.88 4.64 4.82	3.67 2.67 5.14	20.51 20.51 23.08
	Weighted average tariff rates applied	*TFF*	1990-2001 2002-2007 2008-2015	10.86 8.32 7.05	10.00 7.58 6.69	6.36 5.06 3.95	16.67 7.05 7.69

Table 5. Summary statistics: Supply

Element	Variable	Short name	Period	Mean	Median	Standard deviation	Missing values (%)
Men's relative contribution to social reproduction	Ratio of women's age of first marriage to men's 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[25]	*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

[25] 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 6. Coordinates, contributions, and inertia of the principal component analyses

Demand variable	1990-2001	2002-2007	2008-2015	Supply variable	1990-2001	2002-2007	2008-2015
Coordinates of the variables on the 1st component of the PCA by time period							
HDI2	0.24	0.52	0.32	*afmr*	0.81	0.83	0.86
mfgX	-0.71	-0.74	-0.78	*fmemp*	0.84	0.83	0.86
FDI	-0.64	-0.58	-0.50	*sph*	0.72	0.84	0.83
pub	0.69	0.55	0.63	*repro*	0.91	0.90	0.90
TFF	0.68	0.74	0.79	*mcare*	0.80	0.77	0.83
Percentage of variance captured by the 1st component by time period							
	38.61	40.01	39.93		70.79	69.70	72.70

Table 7. Distribution of social reproduction regimes by region, 2008-2015

Region	*Exploitation*	*Mutual*	*Time squeeze*	*Wage squeeze*	*Number of countries*
Developed economies	21%	24%	32%	24%	34
Developing Africa	13%	13%	69%	6%	48
Developing America	0%	18%	5%	77%	22
Developing Asia	15%	9%	15%	62%	34
Developing Oceania	100%	0%	0%	0%	1
Transition economies	0%	12%	0%	88%	17
World	*12%*	*15%*	*32%*	*41%*	*156*

Note: The classification of country groups conforms to that used by the United Nations. Regime classification is separated into developed and developing countries using their respective mean demand and supply scores as regime boundaries.

Table 8. Summary statistics for regression data

Variable	*Mean*	*Std. Dev.*	*Min*	*Max*
Per capita GDP growth (percent)	2.23	2.62	-8.25	13.53
Standard deviation of per capita GDP growth (percent)	3.21	3.56	0.35	36.85
Per capita GDP ($2011 PPP)	13,787	15,462	520	103,645
INV/GDP (percent)	21.87	5.59	4.52	44.34
Secondary schooling (years)	2.73	1.50	0.10	6.71
Rule of law	0.003	1.003	-2.152	1.987
Demand score	-0.06	1.52	-5.96	5.64
Supply score	0.23	1.84	-4.28	4.71
Exploitation	0.28	0.96	0.00	7.29
Mutual	0.40	1.38	0.00	12.81
Time squeeze	0.62	1.68	0.00	10.45
Wage squeeze	0.74	1.63	0.00	10.23

Table 8

Note: These statistics average the three time periods used in the panels (columns (1) – (8) of Table 9), and include only those observations used in the regressions.

Table 9. Regression results for growth and its volatility, 1990-2015

	Average annual per capita GDP growth						Standard deviation of growth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnGDP	-0.925***	-0.905***	-1.185***	-1.186***	-1.198***	-1.193***	0.522	0.646**
	(0.211)	(0.194)	(0.235)	(0.229)	(0.230)	(0.218)	(0.356)	(0.315)
INV/GDP	0.168***	0.168***	0.170***	0.170***	0.157***	0.157***	-0.142***	-0.139***
	(0.0306)	(0.0305)	(0.0303)	(0.0302)	(0.0322)	(0.0321)	(0.0477)	(0.0473)
Secondary schooling	0.0439		-0.00147		0.0142		0.309	
	(0.175)		(0.178)		(0.175)		(0.209)	
Law	0.566**	0.580**	0.488*	0.488*	0.708**	0.713***	-1.924***	-1.820***
	(0.269)	(0.253)	(0.268)	(0.255)	(0.276)	(0.259)	(0.512)	(0.480)
Demand score			-0.0824	-0.0823				
			(0.0760)	(0.0757)				
Supply score			0.373**	0.372**				
			(0.185)	(0.182)				
Exploitation					-0.264**	-0.265**	-0.459	-0.472
					(0.125)	(0.125)	(0.331)	(0.335)
Mutual					0.131*	0.130	0.114	0.102
					(0.0787)	(0.0791)	(0.115)	(0.112)
Time squeeze					-0.265**	-0.266**	0.0427	0.0206
					(0.103)	(0.103)	(0.200)	(0.208)
Wage squeeze					-0.0603	-0.0602	0.419***	0.420***
					(0.0828)	(0.0826)	(0.143)	(0.143)
Region fixed effects	x	x	x	x	x	x	x	x
Time fixed effects	x	x	x	x	x	x	x	x
Countries	122	122	122	122	122	122	122	122
Observations	363	363	363	363	363	363	363	363
R-sq	0.320	0.320	0.331	0.331	0.340	0.340	0.250	0.246

Table 9

Note: Details on variable definitions and sources given in data appendix B. All variables are contemporaneous averages except for lnGDP and secondary schooling, which are taken at the beginning of the time period. Regressions are pooled OLS for three time periods, 1990-2015, 2002-2007 and 2008-2015.

Figure 1. Social reproduction regimes, developing countries 2008-2015

Figure 2. Social reproduction regimes, developed countries 2008-2015