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Macroeconomic Shocks and Labor Supply in Emerging Countries. Some Lessons from Turkey*

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Abstract

We investigate the general equilibrium effects of minimum consumption constraints over labor supply decisions. Within a simple static model, a minimum consumption constraint modifies labor supply decisions of unskilled workers, generating the well-known added worker effect. The results of the model help to analyze the Turkish labor market where added worker effects were observed following the 2001 crisis. We investigate the asymmetric effects of the crisis, using the Household Budget Surveys that cover the period between 2002 and 2005. The substantial decrease in real wages has increased labor supply for unskilled labor, especially for women.

Keywords: Added worker, Taxation, Bivariate Probit, Labor Supply

JEL-Codes: H2, J21, J22, J31

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1 Introduction

The crisis that began in 2007 in a small segment of the US financial markets, the subprime sector, quickly evolved into a financial crisis and into a global recession. Developing and emerging countries, whose financial sectors were not significantly involved in the wave of financial innovation that eventually led to the crisis, were hit very hard through the reduction in world trade and the turbulence in financial markets. Three year into the crisis, we observe that the recession is leading to very important social consequences, with mounting (and most probably long lasting) unemployment and increasing pressure on wages. These problems are likely to be harsher in emerging and developing countries, whose system of social safety nets is insufficiently developed. The question of how labor markets react to economic fluctuations has been central to the economics literature. Typically, in a general equilibrium setting, the supply side of labor market has been treated as uniform and limited to the (possibly intertemporal) choice of resource allocation between consumption and leisure. Nevertheless, empirical studies on labor supply behavior are rich and document various factors affecting households' decisions to participate into labor market. In particular, two phenomena have been extensively studied in the empirical literature. The first, the *added worker effect*, asserts that inactive members of the households move into the labor force to compensate household income loss incurring from unemployment and/or considerable wage cuts. This effect is most often found in developing economies. The second, the *discouraged worker effect* runs the opposite way, as workers that are discouraged from unemployment and prolonged periods of job search, leave the workforce. Which effect dominates became the subject of considerable empirical investigation and debate (Mincer, 1962; Belton and Rhodes, 1976; Ashenfelter, 1980; Layard, Barton and Zabalza, 1980; Bardhan, 1984; Lundberg, 1985 and Maloney, 1987, 1991). Additional labor force participation is usually found to come from secondary (spousal) workers in the household, and frequently in empirical studies the push factor is the job loss of the head of the household. In downturns, increased household labor supply serves as a source of household income when access to credit is limited and formal insurance mechanisms such as unemployment benefits are weak. Since the institutional structure of labor market regulations and the strength of safety nets vary across countries, the methodologies and findings of the empirical studies also vary.[1] In this paper, we will focus merely on the added worker effect hypothesis; we emphasize as a push factor the income loss (real wage reduction) of the household head and the (risk of) job loss. In fact, the income loss factor (considerable wage cut of the head of household) has been mentioned but generally not investigated in

[1] Cullen and Gruber (2000) argue that these mixed findings may be explained by the 'crowding out' effects of unemployment insurance schemes, that supporting the household level of income may keep the secondary members out of the labor market in short term.

depth by theoretical and empirical work alike [2].

As it is well known, the degree of wage rigidity may be a crucial element in determining the relative strength of income loss and job loss factors during a crisis. Labor market institutions thus play a key role in wage and unemployment adjustment mechanisms.

We develop a simple static toy model embedding these features of labor supply; we introduce skill heterogeneity, and we investigate the effect of minimum consumption constraints over labor supply decisions of unskilled workers. When the economy is hit by a negative shock -in this case on technology- the minimum consumption constraint modifies the labor supply decisions of unskilled workers facing wage income loss, and the general equilibrium outcome of the model. This type of added worker effect leads to a countercyclical wage gap, that results from asymmetric effects of productivity shocks over the labor-consumption decisions of unskilled and skilled workers. We also introduce a simple redistributive policy by wage taxation/subsidies to investigate whether there is room for government policy in order to compensate the welfare effects of negative shocks.

The crisis of 2001 led to a widely documented added worker effect in Turkey[3]. The substantial decrease of real wages increased labor supply for unskilled labor, especially women. The severity of real wages decline for unskilled workers, compared to earlier crises as the one of 1994, yielded a much more significant added worker effect. The recovery of the economy was rather quick but, because of the pressure on wages, the added worker effect persisted until the year 2003. The original contribution of our research is to investigate the asymmetric effects of the 2001 crisis, and to identify the relative weight of job loss and wage loss as push factors. This is particularly important to form an anticipation of future developments linked to the current crisis, and to design the proper policy responses.

The paper is organized as follows: section 2 discusses some stylized facts that point to a strong added worker effect following the Turkish crisis of 2001, and reviews the related empirical literature. Then, in section 3 we introduce a simple static model with skill heterogeneity and wage taxation, showing that the introduction of minimum consumption constraints is enough to produce a decreasing labor supply for low skilled workers; depending on institutional conditions, the added worker effect may stem from increased unemployment or from reduced wage. Aggregated stylized facts are insufficient to capture the complexity inherent to labor supply decisions. Section 4 discusses therefore the asymmetric effects of added worker and empirical evidence of countercyclical wage gap for Turkey, using the Household Budget Surveys that cover the period between 2000 and 2006. The

[2]Maloney (1987) underlines that the underemployment of the husband has a substantial impact on the labor supply of the wife. This indirectly supports the fact that income loss due to underemployment leads to some labor reallocation within the household.

[3]See Gursel and Levent (2003) and Kızılırmak (2005) who also survey other work.

last section draws some parallels between the crisis of 2001 and the one of 2008-2009, and proposes topics for further research.

2 The Turkish Crisis of 2001 and the Added Worker Effect

The scope of this section is not to describe in detail the Turkish labor market, but to outline some stylized facts on the wage adjustment mechanism and to bring forth the transitory added worker effect which emerged after the 2001 crisis.

Following a decade of financial liberalization begun in the early 1980s (Rodrik, 1990), the Turkish economy has undergone several financial crises. In particular, the exchange rate crises of 1994 and 2001 have triggered severe banking crises and amplified the imbalances inherent to the economy. The international economics literature has extensively documented the propagating effects of these twin (current account and banking) crises when countries also suffer from chronic inflation, high level of dollarization, substantial procyclical current account deficits and unsustainable fiscal deficits (Calvo and Vegh, 1999; Kaminsky and Reinhart, 1999). Turkey falls into this category like many Latin American countries. But the Turkish case is peculiar in the sense that during two decades of chronic high inflation, the low nominal wage indexation prevented a possible wage-price spiral (preventing hyperinflation), and thus prevented the collapse of the monetary system (Yilmaz, 2000). Nevertheless, lacking nominal indexation, real wages during the last two decade were eroded.

Figure 1 shows the path of real wages, productivity and GDP since the late 1980s. During the 1990s real wages in Turkey followed rather closely the economic cycle, even if overshooting. Following the April 1994 crisis, they declined rapidly due to low indexation (Shiller, 1997; Celasun and McGettigan, 2004) and to the tension in the labor market. They then gained ground with the rapid recovery of the economy but with the after effects of the Russian crisis and of the earthquake of 1999, they nearly came to the level of 1994. Overall, the growth of wages over the decade of the 1990s was in line with real GDP. The twin crisis in February 2001 marked the beginning of decoupling. It led to the rapid fall of real wages to unprecedented levels, were they stagnated even during the recovery that began in 2002. The lagging behind of wages is even more evident if we look at productivity growth. The lack of available data at household level prevents further considerations over the wage dispersion in 2001. But anedoctical evidence induces to think that the lower skilled -and less unionized[4]- segment of labor supply faced either

[4] According to the 2002 Household Surveys, Only 4 percent of private sector employees are union members, compared to 28 percent in public enterprises and 51 percent in government. Moreover, even among active trade union members, only about 700,000 are

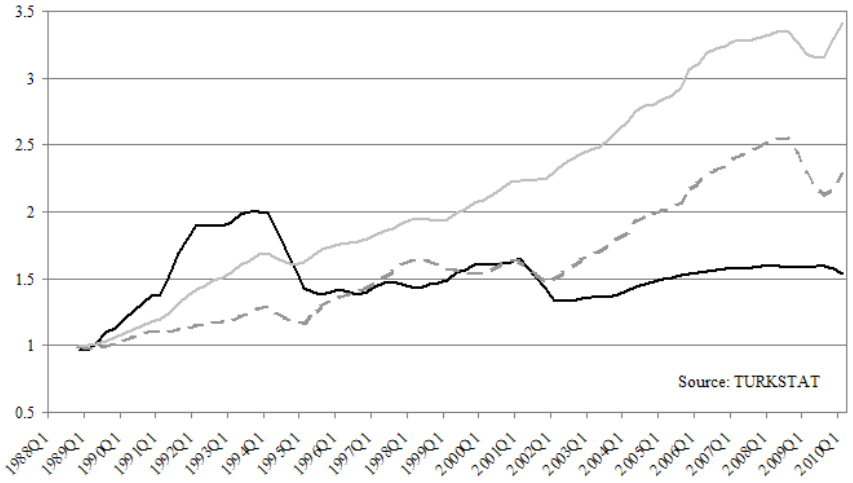

Figure 1: Real wage adjustment (black continuous), labor productivity (light continuous) and GDP growth (dashed) indexes, four quarter moving averages (1988Q1=1).

layoffs, or dramatic real wage reductions.

The high responsiveness of real wages to economic conditions conflicts with the findings on the legal regulations and prevailing employment protection legislation (EPL) regime, by which Turkey is placed among the economies with less flexible labor markets[5]. As Taymaz and Ozler (2003) underline, the observed dynamics of labor markets and the alleged inflexibility of regulatory and institutional frame do not match. The figures on unemployment duration and inflow into unemployment are not consistent with the EPL ranking of Turkey. This can probably be explained by the fact that the coexistence of wage flexibility and strict EPL regimes tends to lead to the informalization of labor contracts (see World Bank, 2006; chapter 4). At any rate, what is relevant for this paper is that the real wage adjustment provides evidence that because of the crisis, wage earners faced remarkable income losses.

The effect of unemployment and income losses has been the increase of labor force participation for secondary (spousal) workers. Several studies (Gursel and Levent, 2003; Kızılırmak, 2005) document that following the 2001 crisis, the added worker effect appears for female urban workers, vanishing as the economy begins to recover: starting from 2004, real wages have increased, albeit very slowly if compared with GDP or productivity (figure

covered by a collective agreement (World Bank, 2006).

[5]See the OECD EPL index, introduced by Nicoletti, Scarpetta and Boylaud (1999).

1).[6]

Urban and rural participation rates for women show some dissimilarities: the latter are higher for the reason that rural work needs some household labor sharing. This peculiarity of agricultural labor markets explains why added worker effects are usually observed on urban labor markets alone, and justifies our choice of focusing on the urban labor force. Furthermore, the more educated workforce (tertiary education level) follows dynamics that are less related to the business cycle, so in the following we fill focus on a comparison between less than secondary and secondary education groups.

To investigate the appearance of added worker effects, we need to focus in particular on how the participation rate for women changes over time and in tandem with the loss of job for men. In fact, as figure 2 shows, the correlation is particularly strong, in particular during periods of crisis.[7]

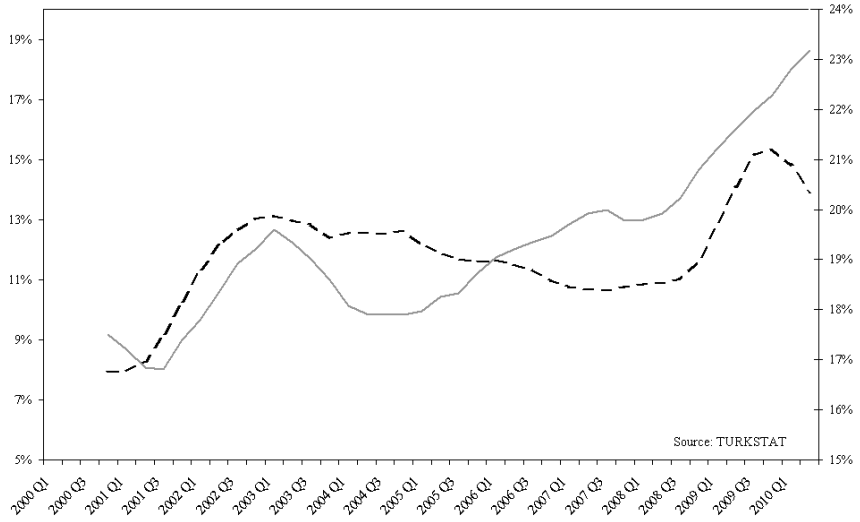

Figure 2: Male unemployment rate (black dashed, left axis) and female participation rate (light continuous, right axis).Urban workers, four quarter moving averages.

The other main feature of women participation rates is its strong dependence on educational levels (see figure 3. The added worker effect is more

[6]The slow real wage recovery can be attributed to several institutional factors likely to depress real wages, like the high share of informal sector, the low coverage of collective bargaining (Ilkkaracan, 2005. See also footnote 4) and the absence of an unemployment benefit system. The latter is related to a large empirical literature concerning the wage-unemployment relationship (the "wage curve"). At the micro level, Ilkkaracan and Selim (2003) shows significant negative correlation between wages and regional unemployment rates.

[7]Raw computation shows a correlation coefficient of 0.61 between male unemployment and female participation one quarter later, that increases to 0.75 if we only consider the period 2000-2003.

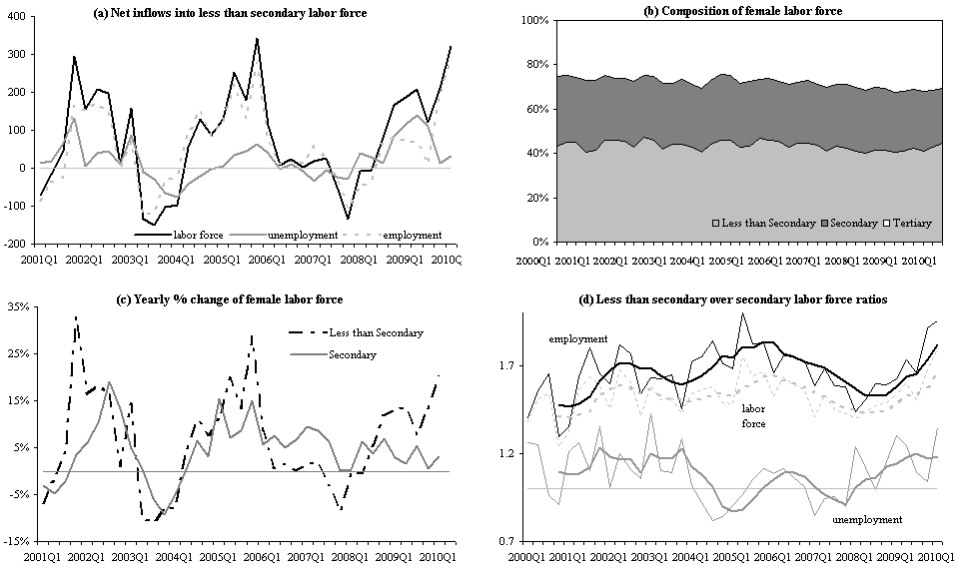

Figure 3: Urban female labor market evolution, 2000-2010

likely to appear among the less educated women. This is hardly surprising as in Turkey, as elsewhere, labor-intensive sectors (textiles and apparel) generally hire low skilled workers (Sugur and Sugur, 2005). In these sectors, social security coverage is weak and the informalization of labor contracts is relatively more frequent than in other sectors (Ozdemir, Erel and Yucesan-Ozdemir, 2004; Ozdemir and Yucesan-Ozdemir, 2004). Furthermore, given the high correlation of education levels between couples, we can expect participation of women to increase more for the lower (i.e. less than secondary) educated (who belong to households where the man, also non educated lost his job with a higher probability). Finally, the lower education level segment generally has a very low participation rate, which implies that the added worker effect is more likely. Second, that segment covers about 45% of total female labor force. Yet, almost 400,000 women (panel (a))within this segment moved into the labor market between 2001Q2 and 2002Q3, about 62% of the total inflow[8]. Panel (c) shows furthermore that fluctuations of the lower educated segment (dark dashed line) are more important in periods of crisis (2001-03, and even more so in 2009-10). The figure clearly shows that starting from the first quarter of 2001 the participation rate of less educated women increases substantially more than for the other education groups [9]. Participation of the lower education segments also reacted more strongly in periods of recovery (2004-05). This can be attributed to a growth effect: en-

[8]Gursel and Levent (2003) find similar compositional change but their data disaggregation is based on agricultural- non-agricultural, rather than urban-rural dissection.

[9]Among men, the least educated group lost around 500.000 jobs at the first quarter of 2002 compared to both secondary and tertiary education level

couraged by higher employment rates, some of the discouraged workers have moved back into the labor force. The difference in participation between education groups is mostly due to flows into employment (panel (d)). In fact, the ratio of unemployed in the two groups remained roughly constant, and the fluctuations in the labor force were mostly due to employment. This confirms the idea that the flows are mostly to be explained by the added worker effect.

We trace the same pattern of added worker effect in the aftermath of 2008 crisis. The employment ratio started increasing at mid-2008. The negative correlation between man unemployment and women participation reveals that the buffer labor supply hypothesis still holds. Contrary to the 2001 crisis, this time the unemployment ratio increased (panel (d)), showing that the lower educated segments has suffered from severe job loss more pronounced that in 2001. This might be due to the fact that exchange rate depreciation and strong foreign demand quickly supported the economy in 2001, but and much less so during the global crisis of 2009, when the burden had to be carried by domestic fiscal policy.

To conclude, a broad and aggregated look at female participation rates in the period following the crisis of 2001 and 2008 suggests the existence of an added worker effect: when the economy experienced a negative shock women with low education levels moved into the labor force most of them as being employed, and some as job seekers. This effect progressively becomes less important as the economy starts to recover. After presenting a simple model relating labor supply for low skilled workers to adverse macroeconomic shocks, we will turn to a more detailed empirical analysis, to try to disentangle the causes of the added worker effect that broadly emerged from the aggregated analysis of this section.

3 The Model

In this section, we present a static toy model that shows in a very simple setting how the introduction of subsistence consumption (minimum consumption constraints), may yield a negatively sloped labor supply curve. Decreasing labour supply is a rather standard outcome, as it appears whenever, in the utility of households, the income effect dominates the substitution effect. In our model, nevertheless, the slope of the function is not linked to the characteristics of utility, but to the existence of a constraint that prevents the household from optimally allocating its time between leisure and consumption.

Households Our economy has 2 households indexed by i, which have different skills (productivity). One household is (l)ow skilled, the other

(h)igh skilled, so that $i = l, h$. Each household has a standard utility function, with preferences over consumption and leisure. We introduce only one simple modification to this standard setting by supposing that household consumption has to be larger than a subsistency level γ. In the absence of non-wage income, this minimum consumption level γ may be a constraint over the choice of time allocation between leisure and consumption. The government taxes ($\tau_i > 0$) or subsidizes ($\tau_i < 0$) each type of worker.

Households have a labor endowment $n > 1$, and maximize utility in consumption of a numeraire good, c ($p = 1$), and in leisure, $\ell \equiv n - l$, where l represents labor supply:

$$\begin{aligned} &\max u_i(c_i, n - l_i) \\ &s.t \\ &c_i = w_i(1 - \tau_i)l_i \\ &c_i \geq \gamma \end{aligned}$$

Assuming a simple Cobb-Douglas utility function for households,

$$u_i = a \ln(c_i) + (1 - a) \ln(n - l_i),$$

we can build the Lagrangian as

$$L = a \ln(c_i) + (1 - a) \ln(n - l_i) + \lambda(c_i - w_i(1 - \tau_i)l_i)) + \mu(c_i - \gamma).$$

The solution for non-constrained households is straightforward

$$\begin{aligned} c_i &= w_i(1 - \tau_i)an \geq \gamma \\ l_i^s &= an \\ \ell_i &= (1 - a)n \end{aligned} \tag{1}$$

Thus, all the households for which $w_i(1 - \tau_i) \geq \gamma/an$ will actually choose the optimal allocation of leisure and consumption. The constrained workers ($w_i(1 - \tau_i) < \gamma/an$), on the other hand, will have to work more than what they actually desire:

$$\begin{aligned} c_i &= \gamma \\ l_i^s &= \frac{\gamma}{w_i(1 - \tau_i)} \\ \ell_i &= n - \frac{\gamma}{w_i(1 - \tau_i)} \end{aligned} \tag{2}$$

Consequently, labor supply does not depend on the wage in one region of the plane, and is negatively sloped in another[10]. Figure 4 illustrates labor supply of individual households under minimum consumption constraint.

[10] A less well behaved utility function (e.g. $u_i = c_i - \frac{1}{2a}l_i^2$) would yield a more general, u-shaped labor supply curve. As we are interested in the decreasing portion of the curve, we decided to keep an analytically more convenient formulation.

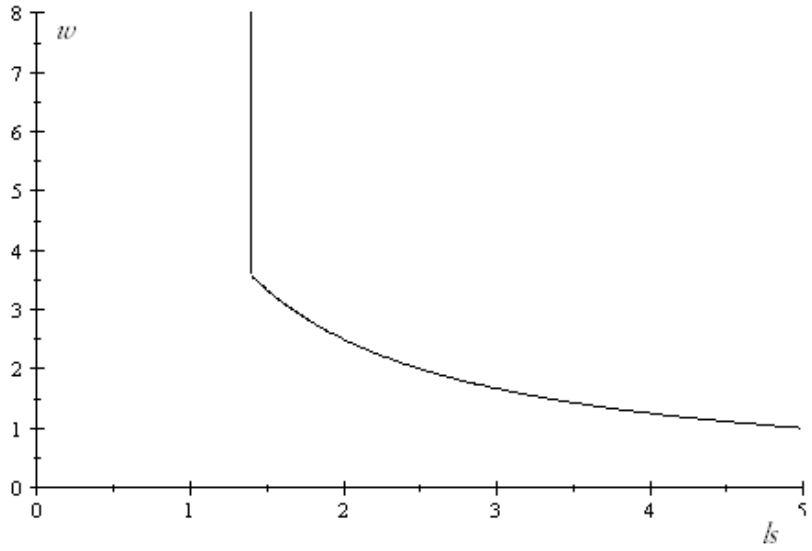

Figure 4: Labor supply for constrained ($w_i(1-\tau_i) < \gamma/an$) and unconstrained households. The parameter values for this numerical example are $\gamma = 5$, $n = 4$, $a = 0.35$, $\tau_i = 0$.

The Firm Problem A representative firm under perfect competition minimizes costs:

$$\begin{gathered} \min C(y, w_l, w_h) = w_h l_h + w_l l_l \\ s.t. \\ y = A l_h^{\alpha} l_l^{1-\alpha} \end{gathered}$$

where $i = h, l$ is skill. Thus, production requires both high and low skill labor. The skill level is reflected in the coefficient α, that we assume to be larger than $1/2 : \alpha \in (\frac{1}{2}, 1)$. Minimization of the cost function yields

$$\begin{aligned} A l_h^{\alpha-1} \alpha l_l^{1-\alpha} &= w_h \\ A l_h^{\alpha} l_l^{-\alpha} (1-\alpha) &= w_l \end{aligned}$$

Labour demand can be written as

$$\begin{aligned} l_l^d &= y A^{-1} \left(\frac{\alpha}{1-\alpha} \frac{w_l}{w_h} \right)^{\alpha-1} \\ l_h^d &= y A^{-1} \left(\frac{\alpha}{1-\alpha} \frac{w_l}{w_h} \right)^{\alpha} \end{aligned} \tag{3}$$

The Benchmark Case In equilibrium aggregate demand (equation 1) will be equal to supply. Furthermore, labor demand and supply must be equal. This gives, when households are not constrained,

$$\begin{aligned} Al_h^{\alpha} l_l^{1-\alpha} = y = an(w_l(1-\tau_l) + w_h(1-\tau_h)) \\ l_l^d = yA^{-1}\left(\frac{1-\alpha}{\alpha}\frac{w_h}{w_l}\right)^{1-\alpha} = an \\ l_h^d = yA^{-1}\left(\frac{\alpha}{1-\alpha}\frac{w_l}{w_h}\right)^{\alpha} = an \end{aligned}$$

We can then derive wages,

$$\begin{aligned} w_h^* = \frac{\alpha A}{(1-\tau_l)(1-\alpha) + (1-\tau_h)\alpha} \\ w_l^* = \frac{(1-\alpha)A}{(1-\tau_l)(1-\alpha) + (1-\tau_h)\alpha}, \end{aligned}$$

and the equilibrium wage ratio (where equilibrium is denoted by a star):

$$\begin{aligned} \rho^* \equiv \frac{w_h^*}{w_l^*} = \frac{\alpha}{1-\alpha} > 1 \\ \frac{c_h^*}{c_l^*} = \frac{w_h(1-\tau_h)an}{w_l(1-\tau_l)an} = \frac{\alpha}{1-\alpha}\frac{(1-\tau_h)}{(1-\tau_l)} \end{aligned}$$

To conclude, in the benchmark the wage ratio and consumption ratio only depend on technical coefficients α. Thus an aggregate shock, be it negative or positive, will not affect the relative wealth of the two groups.

Total productivity A is the exogenous variable we chose to shock the economy. Notice first of all that we can compute a threshold $\bar{A}$, above which no household will be constrained. As $w_h > w_l$, the threshold can be computed as the value of A for which the consumption of low skilled households is equal to γ.

$$c_l = an(1-\tau_l)w_l = \frac{an(1-\tau_l)(1-\alpha)A}{(1-\tau_l)(1-\alpha) + (1-\tau_h)\alpha} = \gamma.$$

This yields

$$\bar{A} = \frac{(1-\tau_h)\alpha + (1-\tau_l)(1-\alpha)}{(1-\tau_l)(1-\alpha)}\frac{\gamma}{an}$$

If $A < \bar{A}$, then the low skilled workers will be constrained, as their wage will not be high enough to guarantee $c_l \geq \gamma$. In that case we are in the *subsistence case*.

The Subsistence Case Let us assume that $A < \bar{A}$. This introduces a constraint for the low skilled workers. Labor demand is still given by eq. (3), but labor supply for the low skilled households and aggregate demand now are different (see eq. 2). Equilibrium in the good market is given by

$$c_l + c_h = \gamma + anw_h(1-\tau_h) = y$$

and as a consequence, the equilibrium in the two labor markets can be written as:

$$(\gamma + anw_h(1-\tau_h))A^{-1}\left(\frac{1-\alpha}{\alpha}\frac{w_h}{w_l}\right)^{1-\alpha} = \frac{\gamma}{w_l(1-\tau_l)}$$
$$(\gamma + anw_h(1-\tau_h))A^{-1}\left(\frac{\alpha}{1-\alpha}\frac{w_l}{w_h}\right)^{\alpha} = an$$

From this we can compute the wages

$$w_h = \frac{\gamma}{(1-\tau_l)\,an}\frac{\alpha}{1-\alpha} \tag{4a}$$

$$w_l = \left(\frac{Aan\,(1-\alpha)\,(1-\tau_l)}{((1-\alpha)\,(1-\tau_l)+\alpha(1-\tau_h))\,\gamma}\right)^{1/\alpha}\frac{\gamma}{(1-\tau_l)\,an} \tag{4b}$$

Notice that now w_h does not depend on A. The wage gap $\rho = \frac{w_h}{w_l}$ is

$$\rho = \left(\frac{\gamma}{an}\left(1+\frac{\alpha(1-\tau_h)}{(1-\alpha)\,(1-\tau_l)}\right)\right)^{1/\alpha}\frac{\alpha}{1-\alpha}A^{-1/\alpha}, \tag{5}$$

and it is negatively related to A :

$$\frac{\partial\rho}{\partial A} = -\left(\frac{\gamma}{an}\left(1+\frac{\alpha(1-\tau_h)}{(1-\alpha)\,(1-\tau_l)}\right)\right)^{1/\alpha}\frac{A^{-\frac{1+\alpha}{\alpha}}}{1-\alpha} < 0$$

Thus, a general reduction in the productivity level (a decrease in A) will have the effect of increasing the wage spread.

Plugging the expressions for wages 4a and 4b in equations 1 and 2, and in the absence of any redistribution policy ($\tau_l = \tau_h = 0$), we obtain

$$c_h = \gamma\frac{\alpha}{1-\alpha} \qquad l_h = an$$
$$c_l = \gamma \qquad l_l = \left(\frac{\gamma}{Aan\,(1-\alpha)}\right)^{1/\alpha}an$$

Notice that here we implicitly assume that the low skilled household has enough endowment of time, to be able to consume γ, i.e. that $n - \left(\frac{\gamma}{Aan(1-\alpha)}\right)^{1/\alpha}an \geq 0$. Rewriting in terms of A, then we obtain the lower bound for the overall productivity:

$$A > \underline{A} = \frac{\gamma a^{\alpha}}{an\,(1-\alpha)}$$

With $\tau_i = 0$, the threshold at which the low skilled are constrained is

$$A < \bar{A} = \frac{\gamma}{an(1-\alpha)}$$

As a consequence, the range of A values for which low skilled households are constrained but can still consume γ is $A \in [\underline{A}, \bar{A}]$. Figure (5) shows the behavior of consumption and labor supply for different values of A. The

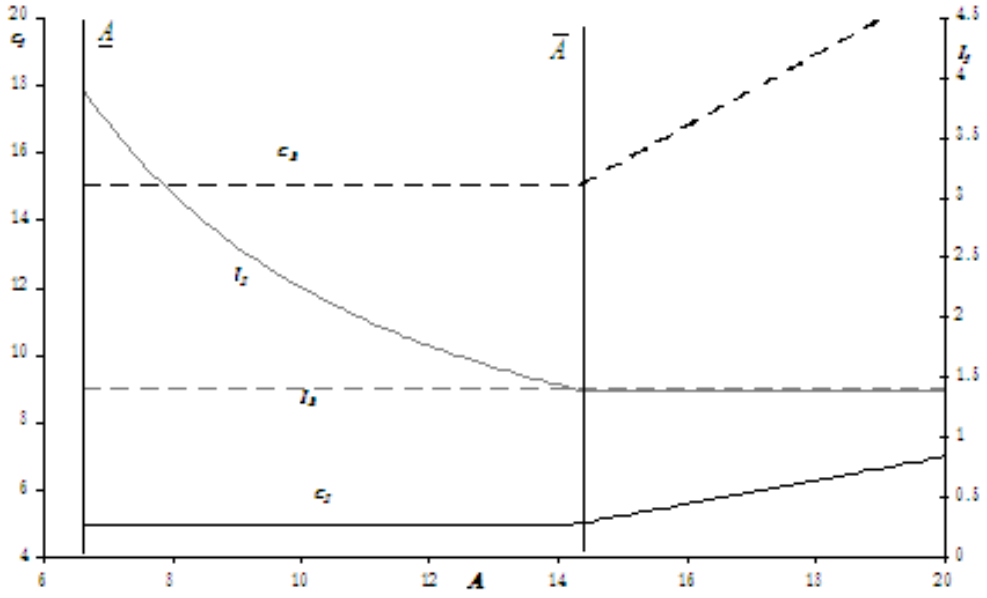

Figure 5: Consumption (black) and labor supply (gray) for high (dashed) and low (solid) skilled households. The parameter values are $\alpha = 0.75$, $\tau_i = 0$, $a = 0.35$, $n = 4$, $\gamma = 5$.

high skilled household supplies a constant amount of labor (dashed gray line), while below $\bar{A}$ the low skilled is forced to supply more. Notice finally that the constraints on the low skilled force him to consume $c_l = \gamma$, but also affect the high skilled (black dashed and solid lines respectively)

We also compute aggregate welfare, defined as the sum of the two household's utilities (the representative firm does not make any profits). Absent government intervention ($\tau_i = 0$), welfare is

$$U_{\tau=0} = a\ln(\gamma) + a\ln\left(\frac{\gamma\alpha}{1-\alpha}\right) + (1-a)\ln\left(n - \left(\frac{\gamma}{Aan(1-\alpha)}\right)^{1/\alpha} an\right) + (1-a)\ln(n-an) \tag{6}$$

3.1 Tax Policy and Welfare

Assume, for the sake of simplicity, that the government has no other role in the economy than redistribution, implying that the pre-crisis level of taxation is $\tau_{l,t-1} = \tau_{h,t-1} = 0$. (we add a subscript t because taxation changes from before to after the crisis). We also assume that the government faces a balanced budget constraint.

The government objective is to restore, through taxation, the pre-crisis wage gap $\rho^* = \alpha/(1-\alpha)$, i.e., it sets solves

$$\rho = \left(\frac{\gamma}{anA}\left(1 + \frac{\alpha(1-\tau_{h,t})}{(1-\alpha)(1-\tau_{l,t})}\right)\right)^{1/\alpha} \frac{\alpha}{1-\alpha} = \frac{\alpha}{1-\alpha} = \rho^*$$
$$w_{l,t-1}l_{l,t}\tau_{l,t-1} + w_{h,t-1}l_{h,t-1}\tau_{h,t-1} = w_{l,t}l_{l,t}\tau_{l,t} + w_{h,t}l_{h,t}\tau_{h,t} = 0$$

From the first equation, we have

$$\frac{\gamma}{anA}\left(1 + \frac{\alpha(1-\tau_{h,t})}{(1-\alpha)(1-\tau_{l,t})}\right) = 1$$

while from the second, substituting, we have

$$w_{l,t}\left(\frac{1-\alpha}{\alpha}\frac{w_{h,t}}{w_{l,t}}\right)^{1-\alpha}\tau_{l,t} = -w_{h,t}\left(\frac{\alpha}{1-\alpha}\frac{w_{l,t}}{w_{h,t}}\right)^{\alpha}\tau_{h,t}$$
$$\Rightarrow (1-\alpha)\tau_{l,t} = -\alpha\tau_{h,t}$$

Thus, we can compute the tax rates that bring the wage gap ρ to its pre-crisis level

$$\tau_{h,t} = \frac{\gamma - (1-\alpha)anA}{\alpha anA}$$
$$\tau_{l,t} = -\frac{\gamma - (1-\alpha)anA}{(1-\alpha)anA},$$

and the corresponding consumption levels:

$$c_l = \gamma \qquad c_h = anA - \gamma$$
$$l_l = l_h = an.$$

Thus, the after subsidies wage for the low skilled household is precisely what is needed to make it supply the amount of labor it would in absence of constraints. $U_{\tau\neq 0}$ denotes aggregate welfare in the case of government intervention:

$$U_{\tau\neq 0} = a\ln(\gamma) + a\ln(anA - \gamma) + 2(1-a)\ln(n - an) \tag{7}$$

We can then compute the change in aggregate welfare with government intervention as

$$\begin{aligned}\Omega &= U_{\tau\neq 0} - U_{\tau=0} \\ &= a\ln(anA-\gamma) + (1-a)\ln\left(n(1-a)\right) - \\ &- a\ln\left(\frac{\gamma\alpha}{1-\alpha}\right) - (1-a)\ln\left(n - \left(\frac{\gamma}{Aan\left(1-\alpha\right)}\right)^{1/\alpha} an\right)\end{aligned}$$

When we impose taxation we have an increase in welfare for the low skilled household (because it works less), but a decrease in welfare for the high skilled (because for the same amount of work, it consumes less). The following proposition states that in a neighborhood of $\bar{A}$ the net effect is positive, ($\Omega = U_{\tau\neq 0} - U_{\tau=0} > 0$), so that imposing taxes and subsidies, even if distortionary, allows an overall increase in welfare.

Proposition 1 *The welfare with taxation is larger ($U_{\tau\neq 0} - U_{\tau=0} > 0$) in a neighborhood of $\bar{A}$*

Proof. First, remark that: $U_{\tau\neq 0} - U_{\tau=0}|_{A=\bar{A}} = 0$. This is of course true, because at $A = \bar{A}$ the subsidy is zero. Then, compute $\frac{\partial\Omega}{\partial A}$

$$\begin{aligned}\frac{\partial\Omega}{\partial A} &= \frac{\partial(a\ln(anA-\gamma))}{\partial A} - \frac{\partial\left((1-a)\ln(n-(Aan)^{-1/\alpha}(1-\alpha)^{-1/\alpha}\gamma^{1/\alpha}an)\right)}{\partial A} \\ &= \frac{a^2 n}{Aan-\gamma} + \frac{(1-\alpha)^{-1/\alpha}\gamma^{1/\alpha}a\left(1-a\right)}{A\alpha((1-\alpha)^{-1/\alpha}\gamma^{1/\alpha}a-(Aan)^{1/\alpha})}\end{aligned}$$

If we evaluate it at $A = \bar{A}$, we have

$$\left.\frac{\partial\Omega}{\partial A}\right|_{A=\bar{A}} = a^2\frac{n(1-\alpha)}{\alpha\gamma} - a^2\frac{n\left(1-\alpha\right)}{\alpha\gamma} = 0$$

Thus we know that $A = \bar{A}$ is a local extreme. We can then take the second derivative:

$$\frac{\partial^2\Omega}{\partial A^2} = \frac{\partial\left(\frac{a^2 n}{Aan-\gamma}\right)}{\partial A} + \frac{\partial\left(\frac{X(1-a)}{A\alpha(X-(Aan)^{1/\alpha})}\right)}{\partial A}$$

where $X = (1-\alpha)^{-1/\alpha}\gamma^{1/\alpha}a$ collects some terms not depending on A. If we evaluate it at $A = \bar{A}$, we find

$$\left.\frac{\partial^2\Omega}{\partial A^2}\right|_{A=\bar{A}} = \frac{a^3 n^2\left(\alpha-1\right)^2\left(a+\alpha(1-a)\right)}{\alpha^2\gamma^2\left(1-a\right)} > 0$$

which implies that $\bar{A}$ is a minimum, and that $\Omega = U_{\tau\neq 0} - U_{\tau=0} > 0$ in its neighborhood. ■

In our model, the minimum consumption constraint modifies labor supply decision of low-skilled household, resulting in additional labor inflows to labor market. The added worker (labor) effect leads to a countercyclical wage gap (eq. 5). This is simply a result of asymmetric effects of productivity shocks (falling below the threshold $\bar{A}$) over the labor-consumption decisions of unskilled and skilled workers. The change of the wage gap is thus temporary, and as the economy starts to recover, it returns to its pre-crisis level.

Starting from the mid-year 2003 up to the end of 2004, we see that the added workers left the labor market (figure 3). After 2004 we observe strong employment growth for all education levels. It has to be noted in conjunction that real wages started to recover (though slowly) by 2004. In accordance with the implications of the model, we observe a countercyclical wage gap in Turkey. Using the education level as a proxy for skill, we grouped female wage earners with respect to their educational attainment. In order to be consistent with the educational split for participation rates, we calculated average hourly wages for urban male and female workers for 3 different education level. Table 1 shows average hourly wages and wage ratios among these sub-groups. Compared to the year 2002, when there is strong added worker effect, the wage gap among different skill levels has narrowed in the post-crisis period. This is true for all sub-groups and it implies that the twin-crisis in 2001 has produced asymmetric effects on the wage formation of different skill groups.

4 The Empirical Model

The theoretical model described above assumes the participation decision to be a household decision which can be regarded as a reallocation of marketable labor. However, the participation decision is in fact twofold. It can either be considered as an individual choice, more or less strictly related to individual human capital, or as a collective choice, resulting from the division of labor within the household. The family characteristics such as family income and composition or the labor market status and job earnings of family members are important factors in the participation decision of married women. The individual human capital determines the wage level in the labor market. Family related factors complement the participation decision along with a change in the marketable work sharing inside the household. The empirical model must take into account both the individual and household determinants of labor force participation decisions.

We use the same methodology used in Başlevent and Onaran (2003) which estimates a bivariate choice model of married couples to analyze the added worker effect in 1988 and 1994. Instead of focusing solely on the labor market participation of married women, we prefer to use a bivariate probit

model which helps capturing the collective response of the household. One of the outcome equations estimates the employment status of the husband taking the value of 1 if he is employed and 0 when he is unemployed. The other equation estimates the participation of the spouse taking the value of 1 if she participates, 0 when she is does not. The statistically significant correlation between these two equations shows that the labor market decisions of married couples are correlated and thus reflects the collective labor sharing within the household. If the correlation coefficient is negative and statistically significant, the model implies that households receiving negative employment shocks do reallocate their collective labor supply in order to mitigate the negative effect. The inactive wife will enter into the labor market if the household suffers from a serious income loss resulting from unemployment of the husband. In this sense, the model only partially captures the added worker effect, as it does overlooks wage cuts, and/or cases in which the household is not dependent only on the wage-income but rather have a composition of non-labor earnings. We do not a have a panel data which will enable to capture the wage cuts of husbands during the 2001-2002 period. Nevertheless, we can include the non-labor earnings that will, among other things, serve as cushion *vis-a-vis* an idiosyncratic shock in the absence of unemployment benefits. For the estimation of the bivariate model we used the Household Budget Surveys conducted by TURKSTAT between 2002 and 2008, even if we only report the data for the post-crisis period (2002-2005). The budget surveys include, beside labor market status of couples, the annual non-wage income of the households which can provide control variables at least for one of the important caveats of the bivariate model. The sample we retained only includes the married couples with wives aging between 24-49 and husbands aging between 24-54. Non-participant husbands are excluded from the sample since their inclusion may cause misspecifications related to early retirement and various other reasons. The two equation binary choice model relating the employment status of the husband (denoted by $e_1 = 1$ if employed, zero if not) and the participation of the wife (denoted by $p_2 = 1$ if she participates, zero if she does not) can be written as

$$e_1^* = \beta_1' \mathbf{x}_c + \gamma_1' \mathbf{x}_m + \mu_1 \text{ with } \; e_1 = 1 \quad \text{if} \quad e_1^* > 0, \;\; 0 \text{ otherwise,}$$

$$p_2^* = \beta_2' \mathbf{x}_c + \gamma_2' \mathbf{x}_m + \mu_2 \text{ with } \; p_2 = 1 \quad \text{if} \quad p_2^* > 0, \;\; 0 \text{ otherwise,}$$

where e_1^* and p_2^* are the latent variables of the two outcome equations and where the $\mu's$ are zero mean random disturbances jointly normally distributed, with the correlation coefficient denoted by ρ. The non-observable part of the collective decision may be explained through the residual covariance structure. A residual covariance significantly different from zero may serve as an indicator of unobserved dependency between the two labor

market statuses of the household. In other words, if ρ is significantly different from zero, then the two labor market responses depend on the common unobserved disturbance, and the likeliness of the husband being employed is correlated with the likeliness of the wife being participant. The added worker effect would require the correlation, i.e. ρ, to be negative and significant: the job loss of husbands needs to be correlated with the increased participation of wives. Notice that this empirical model only allows to capture the endogeneity of these two responses, without expliciting any direction of causality. To establish such a link, we would have to better relate the timing of the job loss and participation decisions, something that the nature of the sample does not allow[11].

$\mathbf{x}_c$ is the vector of common covariates of the household, that contains for husband and wife respectively, age, a no schooling dummy, primary education level, secondary education level,tertiary education level; furthermore, for the household as a whole $\mathbf{x}_c$ contains the number of children of age less than 2, between 2 and 5, and between 6 and 15 respectively. We have four model specifications, each including the common covariates of $\mathbf{x}_c$ but differing according to the inclusion of non-wage income of the household (in the vector $\mathbf{x}_m$). The content of $\mathbf{x}_m$ for the different models is summarized in table 2. Model 1 excludes the non-wage income whereas models 2, 3 and 4 include non-wage income with different combinations. Model 2 includes the pooled non-wage income of the couple, to address the wealth *level effect* of the household in line with the unitary family (collective) model of the household. Unitary models assume that resources are pooled within the household and the choice of couples related to labor sharing depends on prices, wages and total wealth. In contrast to collective decision models, some models assume that individual labor supply behavior of couples is differentially affected by their own sources of income, (Lundberg and Pollak 1994; Blau and Kahn 2007). We include the non-wage incomes separately to capture what is known in the literature as the *bargaining effect* within the household (model 3). If both are significant in the participation equation, this means that the secondary member (the wife) has some bargaining power with respect to labor sharing within the household. In our set-up, the bargaining pattern (in model 3) does not totally rule out the unitary model but it complements the unitary model by expliciting the effect of the bargaining power of spouses on the collective decision, since the idiosyncratic shock is absorbed in a collective manner (the case where correlation coefficient ρ is negative and significant). Finally, we suppose that the *wage-dependency effect* can be captured with a dummy variable that takes the value of 1 if the household has a positive non-wage income and takes 0 if it does not receive any non-wage income (model 4). The wage-dependency effect is the most

[11]We would need at least quarterly (if not monthly) surveys, and the possibility of tracking individual households over time.

relevant to our theoretical model. Table 3 shows the summary statistics of the data used for the estimations.

4.1 Results

Table 4 reports the results of our estimation. We have several relevant results, consistent with the predictions of the theoretical model. The main result is that the correlation coefficient ρ is negative and significant for the post-crisis period 2002-2004. This reveals that the labor market outcomes of married couples are related and that participation is the result of a collective decision within the household. The correlation coefficient ρ turns insignificant in 2005, implying that the effect of the crisis is over by then and shocks at the household level are absorbed by other means than buffer labor supply. The negative sign of the correlation coefficient between 2002 and 2004 is robust, as it remains significant under various model specifications.

A second result of the estimation is that the participation decision of wives is positively related to their own non-wage income and negatively linked to non-wage income of their partners[12]. This finding is evidence in support of a bargaining effect on the collective decision within the household, in the sense that the dependency of participation decisions of wives from husband unemployment is conditional on the their own non-wage income. Finally, household non-wage income does affect the participation decision of wives. This happens through two channels: if wage-income is the sole income source of the husband, the negative shock in the employment status of husband increases the probability of the wives to participate. In model 4, the dummy variable taking the value of one in presence of non-wage income (for either wife or husband or both) can be interpreted in this vein. In the post-crisis years 2002-2003, this dummy variable is negative and significant for the wives. It means that for the households in which husbands have no non-wage income (or whose only income source is paid jobs) some kind of added worker effect (or increased labor supply) is in play. In other words, the dependency to wage income for husbands increases the likeliness of wives to participate, but just for the post-crisis years 2002-2003. For other years, this effect is positive and it turns to be insignificant for the year 2005. The other factors which are mostly related to household composition have the expected signs, already highlighted by other studies (see Baslevent and Onaran, 2003; Tunali and Baslevent, 2006). The estimations show that as the number of children attending school decreases, it becomes more likely that female members of the household to participate into labor market. This supports the claim that the poor child care facilities contribute to keep

[12]We do not compute marginal effects, because we are not interested in the relative contribution of the different explanatory variables, but rather on their sign, and above all, in the sign of coefficient ρ.

women out of the labor market[13].

We can summarize our major empirical findings relevant to the theoretical model. Firstly, the effect of 2001 crisis has lasted until 2005 and has affected the labor market outcomes of the households who received a negative employment shock. The dependency on husband's wage-income increases the likeliness of wives to participate as a buffer labor supply in the presence of job losses. This dependency effect is significant and positive for the years 2002 and 2003. By the year 2005, the coefficient of correlation is still negative but it turns to be insignificant. This confirms that the added worker effect is a typical crisis phenomenon.

5 Conclusion

This paper analyzed the behavior of labor markets in situation of crisis. The supply side of labor markets can be an important aspect in explaining aggregate employment patterns. We investigated the effects of minimum consumption constraints over labor supply decisions of low-skilled workers when a severe negative shock hits the economy. Within the context of a very simple static general equilibrium model, the minimum consumption constraint modifies labor supply decisions of unskilled households triggering the well-known added worker effect. Additional inflows of low-skilled (female) workers in to the labor market lead to asymmetric effects on equilibrium wages producing a countercyclical wage gap, and a welfare loss for unskilled households. We tried to compare the results of the model with an empirical analysis of the factors affecting the participation of new entrants in the labor market between 2000 and 2006. Factors like job-loss and income-loss both heavily increase the likeliness of an additional worker in the household. Household attributes in the estimations capture the interaction between labor market decisions and the socio-economic environment.

The crisis that unfolds while we write is likely to yield similar outcomes. Figure 6, inspired by Eichengreen, and O'Rourke (2009), compares the unfolding of the 2001 twin crisis and of the 2008 global crisis. Taking the peak as equal to 100 (November 2000 and May 2008 for the two crises respectively, meaning that the end period is December 2002 and August 2010), it compares a set of key indicators to assess the relative severity of the two crises. The picture that emerges from the figure is rather clear. The early stages of the crisis were more severe in 2008 than in 2001. While less sudden, the drop in industrial production has been more pronounced in the first half of 2009 than it was in 2001-2002; the same can be said for the increase of unemployment (for which comparisons can be carried out only with quarterly data), while the stock market correction was similar in the

[13]There is a vast literature on child-care costs and female labor participation; see Blau and Robins (1988), and for Turkey World Bank (2006).

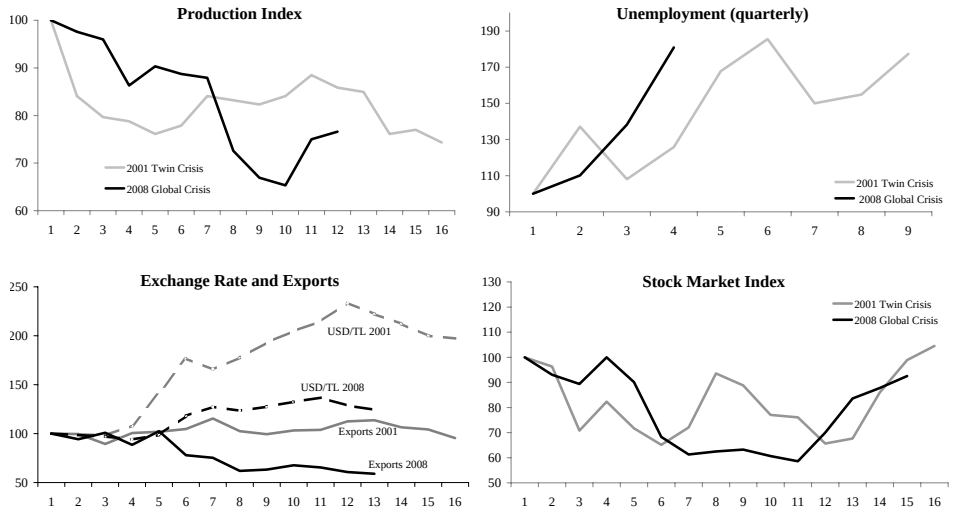

Figure 6: Comparison of the 2001 twin crisis (gray; peak: November 2000) with the 2008 global crisis (black; peak: May 2008). Our calculations

two cases. The peculiar (exchange rate) nature of the 2001 crisis emerges from the third quadrant, showing a much more marked depreciation than it is the case today. That depreciation allowed Turkey to export its way out of a crisis that remained substantially local. Today, in the context of a global crisis, exports are stagnating. In the second part of the period there is convergence in the data, with industrial production that remains nevertheless more volatile now than it was in 2002. The only major differences pertain to the exchange rate, that remains stable today (also thanks to the weakness of the dollar), and to the stock market, that sees a spectacular increase than we did not observe in 2002. To conclude, also considering the international environment and the tensions in the exchange rate markets, we can safely forecast a long and severe crisis today, at least of the same magnitude than we saw in 2001. The effects of the crisis on unemployment will also likely be extremely severe (also considering that we started in 2008 with a much higher unemployment rate than in 2001). Therefore, we can forecast an increased pressure on the poorest household to increase their supply of labor in the attempt to sustain their revenues.

As our model shows, albeit in a very simplified setting, appropriate government intervention, in the form of redistributive taxation, can reduce the impact of negative aggregate shocks, and improve aggregate welfare. Today, even more than in 2001, wage taxation becomes an instrument for social risk sharing, preventing the heavy burden of economic crisis to fall disproportionately on the shoulders of less qualified households.

Table 1: Urban Wage Structure by Gender and Education Level in Turkey (Hourly Wages)

	Women					Men				
Years	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Primary* (P)										
Wage Earners	1026330	980320	1076072	1160752	1202689	5405774	5355319	5757634	5968915	6069814
Av. Wage	0.67	0.86	1.08	1.19	1.30	0.95	1.15	1.40	1.52	1.68
Median Wage	0.60	0.83	1	1.10	1.25	0.75	1.04	1.25	1.41	1.59
Secondary (S)										
Wage Earners	607745	611639	618518	639265	698543	2229510	2349264	2444582	2618542	2722506
Av. Wage	1.64	2.21	2.37	2.58	2.84	1.72	2.00	2.28	2.43	2.70
Median Wage	1.25	1.50	1.9	2.08	2.34	1.25	1.54	1.82	1.99	2.19
Tertiary (T)										
Wage Earners	625997	663279	622464	716498	801831	1187623	1301217	1282315	1418716	1540372
Av. Wage	3.61	4.41	4.58	5.26	6.02	3.80	4.49	4.18	4.99	5.74
Median Wage	3.13	3.90	4.375	4.93	5.36	3.13	3.98	4.14	4.69	5.21
Wage Gap (Average)										
Wage Gap (Average)										
S/P	2.45	2.58	2.19	2.18	2.18	1.82	1.75	1.63	1.60	1.61
T/P	5.37	5.14	4.24	4.44	4.62	4.01	3.92	2.99	3.28	3.41
T/S	2.20	1.99	1.93	2.04	2.12	2.20	2.24	1.84	2.05	2.12
Wage Gap (Median)										
S/P	2.08	1.80	1.90	1.90	1.88	1.68	1.48	1.46	1.41	1.38
T/P	5.19	4.68	4.38	4.49	4.29	4.19	3.82	3.31	3.33	3.28
T/S	2.50	2.60	2.30	2.37	2.29	2.50	2.59	2.27	2.35	2.38

* Primary Education level includes all less than Secondary Level

Source: TURKSTAT

Table 2: Content of the vector $\mathbf{x}_m$ in the 4 empirical models

	Pooled non-wage income	Husband non-wage income	Wife non-wage income	Husband non-wage income dummy	Wife non-wage income dummy
Model 1	-	-	-	-	-
Model 2	x	-	-	-	-
Model 3	-	x	x	-	-
Model 4	-	-	-	x	x

Table 3: Descriptive Statistics

		2002		2003		2004		2005	
		mean	sd	mean	sd	mean	sd	mean	sd
	wife participation rate	0.144	0.351	0.140	0.347	0.160	0.367	0.170	0.376
	husband employment rate	0.954	0.209	0.960	0.195	0.965	0.185	0.966	0.181
Wife	age	35.200	6.450	35.456	6.381	35.506	6.446	35.652	6.355
	no schooling	0.193	0.395	0.148	0.356	0.138	0.345	0.147	0.354
	primary education level	0.625	0.484	0.639	0.480	0.624	0.484	0.628	0.483
	secondary education level	0.129	0.336	0.149	0.356	0.174	0.379	0.163	0.369
	tertiary education level	0.053	0.224	0.064	0.245	0.064	0.244	0.062	0.242
Husband	age	39.080	6.762	39.266	6.601	39.358	6.650	39.453	6.722
	no schooling	0.046	0.209	0.030	0.170	0.034	0.180	0.032	0.176
	primary education level	0.625	0.484	0.590	0.492	0.570	0.495	0.599	0.490
	secondary education level	0.206	0.405	0.243	0.429	0.256	0.437	0.236	0.425
	tertiary education level	0.123	0.329	0.137	0.344	0.140	0.347	0.133	0.340
Households	no of children age <= 2	0.226	0.449	0.203	0.433	0.207	0.435	0.204	0.435
	no of children age btw 2 and 5	0.329	0.547	0.295	0.520	0.321	0.534	0.288	0.507
	no of children age btw 6 and 15	1.148	1.095	1.100	1.040	1.104	1.031	1.123	1.044
	husband non-wage income	5.243	3.321	4.728	3.598	5.476	3.327	5.901	3.118
	wife non-wage income	0.642	1.955	0.534	1.809	0.627	1.951	0.809	2.217
	husband non-wage income dummy	0.769	0.421	0.682	0.466	0.798	0.402	0.840	0.367
	wife non-wage income dummy	0.103	0.304	0.086	0.280	0.101	0.301	0.123	0.329
	no. of observations	4501		10696		3591		3506	

Table 4: Estimation Results

	2002		**2003**		**2004**		**2005**	
	wife	**husband**	**wife**	**husband**	**wife**	**husband**	**wife**	**husband**
Model 1								
ρ	-0,210***		-0,234***		-0,297***		-0,101	
	(-4,065)		(-6,477)		(-4,720)		(-1,565)	
Model 2								
Total non-wage income	0,010	0,020*	-0,000	0,001	-0,008	0,022	0,006	0,009
	(1,227)	(1,998)	(-0,061)	(0,106)	(-0,915)	(1,821)	(0,624)	(0,669)
ρ	-0,214***		-0,234***		-0,296***		-0,102	
	(-4,125)		(-6,478)		(-4,703)		(-1,577)	
Model 3								
Husband	-0,022**	0,035***	-0,019***	0,009	-0,026**	0,033**	-0,022*	0,022
Non-Wage Income	(-2,646)	(3,513)	(-3,898)	(1,436)	(-2,908)	(2,777)	(-2,285)	(1,720)
Wife	0,234***	-0,067***	0,182***	-0,051***	0,199***	-0,007	0,223***	-0,068**
Non-Wage Income	(17,200)	(-3,759)	(19,810)	(-3,754)	(13,300)	(-0,265)	(17,336)	(-3,165)
ρ	-0,149***		-0,208***		-0,312***		-0,020	
	(-2,736)		(-5,576)		(-4,964)		(-0,299)	
Model 4								
Husband with	-0,133*	0,301***	-0,120**	0,115*	-0,113	0,337***	-0,012	0,042
non-wage income > 0	(-2,023)	(4,016)	(-3,072)	(2,364)	(-1,498)	(3,733)	(-0,139)	(0,395)
Wife with	1,787***	-0,463***	1,431***	-0,333***	1,529***	-0,045	1,590***	-0,440**
non-wage income > 0	(22,092)	(-4,040)	(26,008)	(-3,676)	(16,939)	(-0,254)	(19,720)	(-3,116)
ρ	-0,137*		-0,205***		-0,320***		-0,025	
	(-2,446)		(-5,470)		(-5,067)		(-0,377)	
No. of Obs.	4.501		10.696		3.591		3.506	

t-stats in parentheses. *, **, ***, denote significant variables at 10%, 5% and 1% respectively

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