Creative Destruction and Subjective Well-Being

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Abstract

This paper analyzes the effect of Schumpeterian creative destruction on subjective well-being. We highlight theoretically the two opposite forces that creative destruction has on well-being: a negative force through the higher risk of displacement and a positive one through higher growth expectations. Empirically, we find evidence supporting the existence of these two effects. We measure subjective well-being using the Cantril ladder of life in the Gallup survey, a measure of individuals' overall evaluation of their lives, and the life satisfaction question from the Behavioral Risk Factor Surveillance System. We also use a measure reflecting individuals' current "worry". For creative destruction we use establishment and job turnover following Davis et al (1996). The turnover data are MSA-level panel data from the Business Dynamics Statistics. We find that the effect of creative destruction on life satisfaction is unambiguously positive when we control for MSA level unemployment, less so when we do not. Creative destruction has a significant and very robust positive effect on both anticipated life satisfaction (the growth expectation effect) and worry (the displacement risk effect) . Consistent with our model, we also find that creative destruction has a more positive effect on life satisfaction in states with a more generous unemployment insurance policy.

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[STILL PRELIMINARY]

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1 Introduction

Should GDP growth be a primary objective for countries to pursue? The answer is far from being consensual. Thus some argue (e.g. Sen, Stiglitz and Fitoussi (2010)) that indicators other than (per capita) GDP growth should also be taken into account, in particular to reflect environmental quality, unemployment, and income inequality. Others take a more direct stand and argue that more GDP growth does not translate into more " happiness", in particular because it constantly destroys jobs and skills; therefore, according to that view, GDP growth should simply be disregarded as a social objective to pursue. Yet others (e.g. Murtin et al (2013)) propose to replace (per capita) GDP growth by a synthetic welfare measure which includes GDP growth but does not boil down to it.

In this paper, we focus attention on survey measures of subjective well-being from two different data sources and we investigate whether Schumpeterian creative destruction affects these measures positively or negatively. To measure creative destruction, we follow Davis, Haltiwanger and Schuh (1996) and use their measure of firm turnover, defined as the sum of the establishment entry rate and the establishment exit rate, and their measure of job turnover, defined as the job creation rate plus the job destruction rate. The data come from the Census' Business Dynamics Statistics and are available at the MSA level. To proxy for subjective well-being, we use two different types of questions. The first question comes from the Behavioral Risk Factor Surveillance System (BRFSS) and is stated as follows: "In general, how satisfied are you with your life?". The four possible answers are "Very satisfied" "Satisfied" "Dissatisfied" "Very dissatisfied" . In the Gallup Healthways Wellbeing Index, subjective well-being is assessed through the so-called Cantril ladder of life, which itself is constructed based on the following question: "Imagine a ladder with steps numbered from zero at the bottom to 10 at the top; the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time? Which level of the ladder do you anticipate to achieve in five years?". We will refer to answers to the first question as the "current ladder" and to answers to the second as the "anticipated ladder". Another measure of well-being we consider, and which more directly captures how individuals react to the risk involved in creative destruction, is the "worry" measure. The "worry" variable takes values 0 or 1, according to an individual's answer to the question: "Did you experience some worry yesterday?". Gallup collects data on 1,000 randomly selected Americans each day. The period covered is 2008-2011. The BRFSS starts asking the question about life satisfaction in 2005. The sample size of these two data sources are roughly comparable and very large compared to alternative subjective well-being data.

In the first part of the paper we develop a simple Schumpeterian model of growth and unemployment to organize our thoughts and generate predictions on the potential effects of turnover on life satisfaction. In this model growth results from quality-improving innovations. Each time a new innovator enters a sector, the worker currently employed in that sector loses her job and the firm posts a new vacancy. Production in the sector resumes with the new technology only when the firm has found a new suitable worker. Life satisfaction is proxied by the expected discounted valuation of an individual's future earnings. In the model a higher rate of turnover has both a direct and an indirect effect on life satisfaction. The direct effect is that, everything else equal, more turnover translates into a higher probability of becoming unemployed which in turn reduces life satisfaction. The indirect effect is that a higher rate of turnover implies a higher growth externality and therefore a higher net present value of future earnings: this enhances life satisfaction. A second prediction is that higher turnover has a less positive (or more negative) effect on life satisfaction for more risk-averse individuals. We characterize the transitional dynamics of the model, and also extend the analysis to the case where job destruction can be partly exogenous, or to the case where the turnover rate is endogenously determined by a free entry condition.

In a second part of the paper we analyze the relationship between subjective well-being and creative destruction in the data. Our main finding is that the effect of the turnover rate on well-being is unambiguously positive when we control for the unemployment rate. This holds at various levels of analysis - individual, MSA, state - and with different measures of creative destruction. The effect is particularly strong for anticipated well-being, for which job turnover explains much more of the variation than any other MSA-level covariates. However, we also find that creative destruction increases individuals' worry - which reflects the fact that more creative destruction is associated with higher perceived risk by individuals -. Next, when interacting creative destruction with state-level labor market policy, we find that creative destruction increases life satisfaction more in states with more generous unemployment benefits. [1]

The paper relates to several strands of literature. First to the literature on growth, job turnover and unemployment.[2] In particular this literature points to two opposite effects of growth on unemployment. One is a "capitalization" effect whereby more growth reduces the rate at which firms discount the future returns from creating a new vacancy: this effect pushes towards creating more vacancies and thus towards reducing the equilibrium unemployment. The counteracting effect is a " creative destruction" effect whereby more growth implies a higher rate of job destruction which in turn tends to increase the equilibrium level of unemployment. We contribute to this literature

[1] In addition, creative destruction appears to increase life satisfaction more for younger individuals than for older ones, for non religious individuals than for religious ones, for smokers than for non-smokers, for less educated people than for college graduates, and for non-hispanic whites than for other ethnicities.

[2] E.g see Davis, Haltiwanger, and Schuh (1996), Mortensen and Pissarides (1998), and Aghion and Howitt (1998).

by looking at the counteracting effects of innovation-led growth on subjective well-being.

More closely related to our paper is the literature on income and well-being. In his 1974 seminal work, Richard Easterlin provided evidence that, within a given country, happiness is positively correlated with income across individuals but this correlation no longer holds across countries nor within a given country over time.[3] The so-called Easterlin paradox has been rationalized by resorting to relative income stories.[4] However, recent work rejected the existence of a critical income threshold above which income has no further effect on life satisfaction : in his cross-country analysis of the Gallup World Poll, Deaton (2008) indeed finds a relationship between log of per capita income and life satisfaction close to linear, i.e. a similar slope for poor countries and rich ones[5]

Our paper contributes to this literature by looking at how one important engine of growth, namely creative destruction with its resulting flow of entry and exit of firms and jobs, affects subjective well-being differently for different types of individuals and in different types of labor markets.

The remaining part of the paper is organized as follows. Section 2 develops the model and generates predictions on how the effects of turnover on subjective well-being depend upon individual or local labor market characteristics. Section 3 presents some theoretical extensions. Section 4 describes the data and the empirical approach. Section 5 explains the empirical results. Section 6 documents additional findings. Section 7 concludes.

2 Theoretical analysis

2.1 A toy model

In this section, we will offer a simple model to motivate our empirical analysis. The source of economic growth is Schumpeterian creative destruction which at the same time generates endogenous

[3] Easterlin's results have been much debated. Some work even rejects the importance of income on life satisfaction across individuals within a country, arguing that income has a small effect relative to other circumstances of life such as unemployment or marital status (Blanchflower and Oswald, 2004), or that the effect of income is only temporary (Di Tella et al, 2007, suggest that the effect of an income shock on life satisfaction disappears within four years.

[4] The idea is that, past a certain threshold, additional income enters life satisfaction only in a relative way, meaning that, provided you can fulfill basic needs, what really matters for happiness is to be richer than one's neighbor or reference person.

[5] An important step forward in this literature has come from the distinction, among all subjective well-being measures, between "evaluative well-being", which captures people's judgement over their whole life, and "hedonic/emotional well-being", which is more about the current experience. Thus, Deaton and Stone (2013), provide within US evidence on hedonic well-being ("did you experience a lot of happiness yesterday?) that could be consistent with a relative income story whereas evaluative well-being (as measured by how individuals assess their lives on a 0 to 10 ladder) is more closely related to absolute income. They also suggest alternative explanations for their overall evidence that would have to do with evaluative well-being being determined by "permanent income and hedonic well-being by more "transitory income, but they mostly argue that relative income and well-being is a remaining puzzle of the literature.

obsolescence of firms and jobs. The workers in the obsolete firms join the unemployment pool until they are matched to a new firm. Hence, creative destruction will have both a positive effect (by increasing economic growth) and a negative effect (through unemployment due to obsolescence) on well-being. Which effect dominates will depend both upon individual characteristics (discount rate, degree of risk-aversion,...) and upon policy characteristics (in particular, the generosity of unemployment benefits).

2.1.1 Production technology and innovation

We consider a multi-sector Schumpeterian growth model in continuous time. The economy is populated by infinitely-lived and risk-neutral individuals of measure one, and they discount the future at rate[6]

$$r = \rho. \tag{1}$$

The final good is produced using a continuum of intermediate inputs, according to the logarithmic production function:

$$\ln Y_t = \int_{j \in \mathcal{J}} \ln y_{jt} dj$$

where $\mathcal{J} \subset [0,1]$ is the set of active product lines. We will denote its measure by $J \in [0,1]$. The measure J is invariant in steady state.

Each intermediate firm produces using one unit of labor according to the following linear production function,

$$y_{jt} = A_{jt} l_{jt},$$

where $l_{jt} = 1$ is the labor employed by the firm, and the same in all sectors. Thus the measure of inactive product lines is equal to the unemployment rate

$$u_t = 1 - J_t,$$

where u denotes the equilibrium unemployment rate. Our focus will be on balanced growth path equilibrium, therefore when possible, we will drop time subscripts to save notation.

2.1.2 Innovation and growth

An innovator in sector j at date t will move productivity in sector j from A_{jt-1} to $A_{jt} = \lambda A_{jt-1}$. The innovator is a new entrant, and entry occurs in each sector with Poisson arrival rate x which we assume to be exogenous for now.[7] Upon entry in any sector, the previous incumbent firm

[6] The analysis in this section can be straightforwardly extended to the case where individuals are risk-averse. See Section 2.3.2

[7] See Section 2.3.3 where weendogeneize entry.

becomes obsolete[8] and its worker loses her job and the entering firm posts a new vacancy with an instantaneous cost cY.[9] Production in that sector resumes with the new technology when the firm has found a new suitable worker.

2.1.3 Labor market and job matching

Following Pissarides (1990), we let

$$m(u_t, v_t) = u_t^{\alpha} v_t^{1-\alpha} \tag{2}$$

denote the arrival rate of new matches between firms and workers, where u_t denotes the number of unemployed at time t and v_t denotes the number of vacancies. Thus the flow probability for each unemployed worker to find a suitable firm is

$$m(u_t, v_t)/u_t,$$

whereas the probability for any new entrant firm to find a suitable new worker is

$$m(u_t, v_t)/v_t.$$

Finally, we assume that in each intermediate sector where a worker is currently employed, the worker appropriates fraction β of profits whereas the complementary fraction $(1-\beta)$ accrues to the employer.

2.1.4 Valuations and life satisfaction

Our proxy for life satisfaction is the average present value of an individual employee, namely:

$$W_t = u_t U_t + (1-u_t) E_t,$$

where U_t is the net present value of an individual who is currently unemployed, and E_t is the net present value of an individual who is currently employed.[10]

The value of being currently employed, satisfies the asset equation:

$$\rho E_t - \dot{E}_t = w_t + x(U_t - E_t).$$

In words: the annuity value of being currently employed is equal to the capital gain $\dot{E}_t$ plus the wage rate w_t at time t and with arrival rate x the worker becomes unemployed as the incumbent

[8] In the Appendix we extend the model so as to also allow for exogenous job destruction.

[9] Below we provide sufficient conditions under which the incumbent firm in any sector will choose to leave the market as soon as a new entrant shows up in that sector. The basic story is that, conditional upon a new entrant showing up, it becomes profitable for the incumbent firm to seek an alternative use of her assets.

[10] Thus our theoretical measure of subjective well-being is the ex ante expected valuation of a representative individual who does not know yet whether she will start being employed or unemployed. In the next section, we shall argue that the anticipated Cantril ladder is a good empirical proxy for this ex ante valuation indicator.

firm is being displaced by a new entrant. Here we already see the negative effect of turnover on currently employed workers.

Similarly the value of being unemployed satisfies the asset equation:

$$\rho U_t - \dot{U}_t = b_t + (m(u_t, v_t)/u_t)(E_t - U_t).$$

As before, the annuity value of being currently unemployed is equal to the capital gain $\dot{U}_t$ plus the unemployment benefit b_t accruing to an unemployed worker, and with arrival rate $m(u_t, v_t)/u_t$ the unemployed worker escapes unemployment. For any given unemployment rate, turnover has a positive effect on the value of unemployed because it creates job opportunities.

2.2 Solving the model

We now proceed to solve the model for equilibrium production and profits, for the equilibrium steady-state unemployment rate, for the steady-state growth rate, and for the equilibrium value of life satisfaction.

2.2.1 Static production decision and equilibrium profits

Let w_t denote the wage rate at date t. The logarithmic technology for final good production implies that final good producer spends the same amount Y_t on each variety j. As a result, the final good production function generates a unit elastic demand with respect to each variety: $y_{jt} = Y_t/p_{jt}$.

Note that the cost of production is simply w_{jt} which is the firm-specific wage rate. Then the profit is simply

$$\pi_{jt} = p_{jt}y_{jt} - w_{jt} = Y_t - w_{jt}. \tag{3}$$

Next, the above sharing rule between wage and profits implies that

$$w_{jt} = \beta\left(Y_t - w_{jt}\right),$$

hence

$$w_{jt} = w_t = \frac{\beta}{1+\beta}Y_t$$

and

$$\pi_{jt} = \frac{1}{1+\beta}Y_t = \pi Y.$$

Clearly β determines the allocation of income in the economy, with a higher β shifting the income distribution towards workers.[11]

[11] Denote the value of an incumbent before entry by V_1 and after entry V_2.

2.2.2 Steady state equilibrium unemployment

Our focus is on a steady state equilibrium in which all aggregate variables (Y_t, w_t, U_t, E_t) grow at the same constant rate g, and where the measure of unemployed u and the number of vacancies and the interest remain constant over time. Henceforth, we can drop the time index from now on.

In steady state, the flow out of unemployment must equal the flow into unemployment. Namely:

$$m(u, v) = (1 - u)x. \tag{6}$$

The left-hand side is the flow out of unemployment, the right hand side is the flow into unemployment, equal to the number of active sectors $(1 - u)$ time the turnover rate x.

In addition, the number of sectors without an employed worker is equal to the number of sectors with an open vacancy, $u = v$. Combining this fact with the matching technology (2), we get:

$$m = u = v. \tag{7}$$

Putting these equations (6) and (7) together, we obtain the equilibrium unemployment rate $u = (1 - u)x$, or equivalently

$$u = \frac{x}{1 + x}, \tag{8}$$

which is increasing in the turnover rate x.

Now we can express the growth rate of the economy.

Lemma 1 *The balanced growth path growth rate of the economy is equal to*

$$g = m \ln \lambda,$$

Then we can express these value functions as

$$\begin{aligned} rV_1 - \dot{V}_1 &= \pi Y + x\,(V_2 - V_1) \\ rV_2 - \dot{V}_2 &= \pi Y + \frac{m}{v}\,(0 - V_2) \end{aligned}$$

since in equilibrium $m = v$ we get

$$V_2 = \frac{\pi Y}{1 + r - g}. \tag{4}$$

Then we can express V_1 as

$$V_1 = \frac{(1 - \beta)\pi Y + xV_2}{x + r - g} \tag{5}$$

Note that (4) implies $\pi Y = (1 + r - g)\,V_2$. Substitute this into (5) :

$$\begin{aligned} V_1 &= V_2 + \frac{V_2}{x + r - g} \\ &> V_2. \end{aligned}$$

Hence any outside option O such that $V_1 > O > V_2$:

$$\frac{\pi Y}{1 + r - g}\left(1 + \frac{1}{x + r + g}\right) > O > \frac{\pi Y}{1 + r - g}$$

implies the incumbent firm will exit as soon as there is a new entrant. This is what we assume throughout this section.

where m denotes the flow of sectors in which a new innovation is being implemented (i.e., the rate at which new firm-worker matches occur).

Proof. See Appendix. ■

Then, using the fact that in steady-state equilibrium we have:

$$m = u = \frac{x}{1+x},$$

we get the equilibrium growth rate as,

$$g = \frac{x}{1+x} \ln \lambda. \tag{9}$$

As expected, the growth rate is increasing in the turnover rate x and with the innovation step size λ.

2.2.3 Equilibrium valuations and life satisfaction

Recall that our proxy for life satisfaction is the average present value of an individual employee, namely:

$$W = uU + (1-u)E,$$

where:

$$\begin{aligned} rE - \dot{E} &= \beta\pi Y + x(U-E) \\ rU - \dot{U} &= bY + (m(u,v)/u)(E-U) \end{aligned}$$

Now, using the fact that in steady state

$$\dot{E} = gE \text{ and } \dot{U} = gU,$$

and that in equilibrium (see equation (7))

$$m/u = 1,$$

we obtain, after subtracting the second equation from the first:

$$(r-g)(E-U) = BY + (1+x)(U-E),$$

where

$$B \equiv \beta\pi - b.$$

This in turn implies that the difference between the value of being employed and unemployed depends positively on the flow income difference B, also positively on the growth rate but negatively on the turnover rate as a higher turnover rate implies an increased risk of becoming unemployed:

$$E - U = \frac{BY}{r-g+1+x}.$$

Substituting for $(E-U)$ in the above asset equations (11) and (10), yields:

$$\begin{aligned} U &= \left[bY + \frac{BY}{r-g+1+x}\right]\frac{1}{r-g}; \\ E &= \left[\beta\pi Y - \frac{xBY}{r-g+1+x}\right]\frac{1}{r-g}. \end{aligned}$$

so that, after substituting for E and U in the expression for W, and using the fact that in equilibrium $u = x/(1+x)$, we get the following expression for life satisfaction when individuals are risk neutral with $u(c) = c$:

$$W = \frac{Y}{r-g}\left[\beta\pi - \frac{xB}{1+x}\right]$$

where

$$g = \frac{x}{1+x}\ln\lambda.$$

We thus see two effects of turnover on life satisfaction. First, for given growth rate g, more turnover reduces life satisfaction. This is the *displacement* effect mentioned in the introduction: namely, higher turnover leads to a higher probability of workers losing their current job. On the other hand, higher turnover increases the growth rate g which in turns acts favorably on life satisfaction: this is the *capitalization* effect mentioned in the introduction. When does either effect dominate the other? The following proposition answers that question:

Proposition 1 *A higher turnover rate x increases life satisfaction W more the lower the discount rate ρ, i.e.:*

$$\frac{\partial^2 W}{\partial x \partial \rho} < 0$$

And life satisfaction increases with turnover when $\rho < \frac{\beta\pi\ln\lambda}{B}$, and it decreases with turnover otherwise. Moreover, life satisfaction increases more with creative destruction (i.e. with x) when the unemployment benefit is more generous. i.e.:

$$\frac{\partial^2 W}{\partial x \partial b} > 0.$$

Proof. The proposition follows immediately from the fact that:

$$\frac{\partial W}{\partial x} = \frac{Y\left[\beta\pi\ln\lambda - B\rho\right]}{\left[(1+x)(\rho-\ln\lambda)+\ln\lambda\right]^2} > 0.$$

so that

$$\frac{\partial^2 W}{\partial x \partial b} = \frac{Y\rho}{\left[(1+x)(\rho-\ln\lambda)+\ln\lambda\right]^2} > 0.$$

■

The condition for creative destruction having a positive net effect $\left(\beta\pi\left[1-\frac{\ln\lambda}{\rho}\right] < b\right)$ is intuitive: If people care more about the future (lower ρ), or if the innovation step size is bigger (bigger

λ), then the growth effect dominates and life satisfaction increases in the turnover rate x. Young workers have longer horizon than old workers. Therefore we can approximate worker age by their discount rate such that older workers have higher ρ. Then the above proposition generates the prediction that life satisfaction should increase more with turnover for younger individuals than for older individuals, and that it may actually decrease with turnover for the latter when it increases with turnover for the former.

Remark 1: The above analysis and proposition consider the effect of creative destruction on life satisfaction, factoring in the effect of creative destruction on unemployment. Now *if we look at the effect of turnover on life satisfaction controlling for unemployment, this effect is unambiguously positive*. To see this formally, recall that:

$$W = uU + (1-u)E,$$

where:

$$\begin{aligned} rE - \dot{E} &= \beta\pi Y + x(U-E) \\ rU - \dot{U} &= bY + (m(u,v)/u)(E-U) \end{aligned}$$

Now, using the fact that

$$m(u,v)/u = (1-u)x/u$$

and that in steady state

$$\dot{E} = gE \text{ and } \dot{U} = gU,$$

we obtain:

$$E - U = \frac{BY}{r - g + x/u}.$$

Substituting for $(E-U)$ in the above asset equations, yields:

$$U = \left[bY + [(1-u)x/u]\frac{BY}{r-g+x/u}\right]\frac{1}{r-g}, \tag{10}$$

and

$$E = \left[\beta\pi Y - \frac{xBY}{r-g+x/u}\right]\frac{1}{r-g}. \tag{11}$$

so that we get the following expression for life satisfaction when individuals are risk neutral with $u(c) = c$:

$$W = \frac{Y}{r-g}[ub + (1-u)\beta\pi]$$

which for given u is increasing in x since it is increasing in g and g is increasing in x.

Remark 2: The model delivers an additional prediction on the interaction between turnover and the unemployment rate. To see this, we first use the fact that:

$$W = uU + (1-u)E = E - u(E-U),$$

where

$$E - U = \frac{BY}{r - g + 1 + x}.$$

and

$$E = \left[\beta\pi Y - \frac{xBY}{r - g + 1 + x}\right]\frac{1}{r - g}.$$

It follows that

$$\frac{\partial W}{\partial u} = -(E - U) = -\frac{BY}{r - g + 1 + x}.$$

and therefore

$$\frac{\partial^2 W}{\partial u \partial x} = \frac{BY}{(r - g + 1 + x)^2}(1 - (\frac{1}{1 + x})^2 \ln \lambda).$$

In particular this cross partial derivative is negative when λ is sufficiently large, which is also the case where x is most likely to have a positive effect on W. In other words, in situation where turnover affects well-being positively, we should expect the effect to be less positive the higher the unemployment rate.

2.3 Theoretical Extensions

2.3.1 Transitional dynamics

Now we focus on a sudden change in the entry rate to analyze its impact on the economy's transition from one steady state to the next.

Assume that the economy starts at its steady state with entry rate x_{low} and the entry rate suddenly increases from x_{low} to x_{hgh} such that $x_{hgh} > x_{low}$. We start by focusing on the unemployment rate first. After the change in the entry rate, the flow equation of the unemployment rate becomes

$$\dot{u}_t = (1 - u_t)\, x_{hgh} - m_t.$$

Since $u_t = v_t$ in every period, we get $m_t = u_t = v_t$; therefore

$$\dot{u}_t = x_{hgh} - (1 + x_{hgh})\, u_t. \tag{12}$$

The solution to this differential equation is simply

$$u_t = \left[\frac{x_{low}}{1 + x_{low}} - \frac{x_{hgh}}{1 + x_{hgh}}\right] e^{-(1+x_{hgh})t} + \frac{x_{hgh}}{1 + x_{hgh}}.$$

Recall that the growth rate is simply $g = m \ln \lambda$. Therefore the aggregate growth rate of this economy during transition is

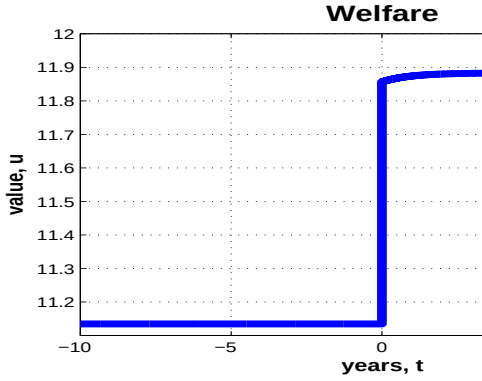
$$g_t = \left\{\left[\frac{x_{low}}{1 + x_{low}} - \frac{x_{hgh}}{1 + x_{hgh}}\right] e^{-(1+x_{hgh})t} + \frac{x_{hgh}}{1 + x_{hgh}}\right\} \ln \lambda.$$

Now we turn to the value functions

$$\begin{aligned} rE_t - \dot{E}_t &= \beta\pi Y_t + x_{hgh}(U_t - E_t) \\ rU_t - \dot{U}_t &= bY_t + (m_t(u_t, v_t)/u_t)(E_t - U_t). \end{aligned}$$

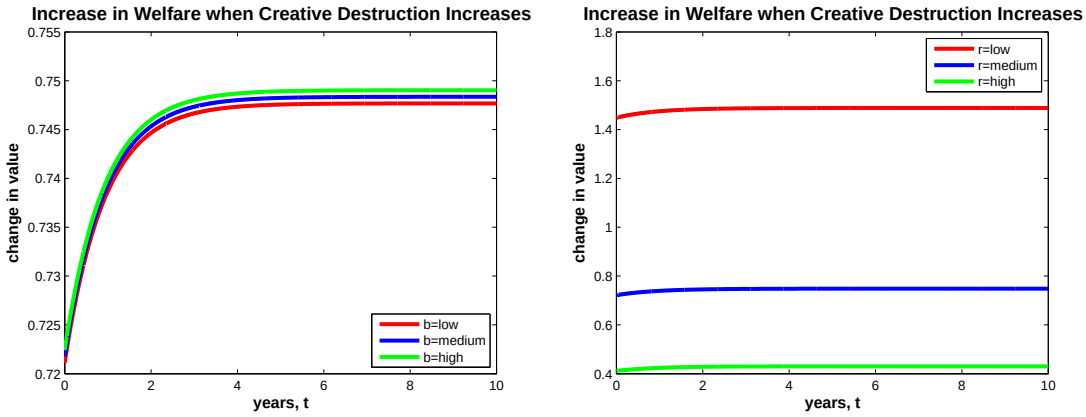
Note that out of the steady state, it is not possible to solve these value functions further analytically. However, we can explore them numerically. For that, we need to determine 6 parameters: λ, x_{hgh}, x_{low}, ρ, β, and b. Since our model is stylized, our goal here is to show you the numerical properties of the model, rather than trying to provide a detailed calibration exercise. We pick the discount rate, which also corresponds to the interest rate in the benchmark model, to be $\rho = 5\%$. We will set $x_{low} = 6.4\%$ and $x_{hgh} = 8.7\%$ such that the steady-state unemployment rates are 6% and 8%, respectively. We set $\lambda = 1.18$ in order to obtain an initial steady state growth rate of 1%. The worker share of output is chosen to be $\beta = 0.9$ such that the profit share of the firm is 10%. Finally we set the unemployment benefit to be $b = 0.3\%$ and show the results with respect to some alternative values.

The following figures illustrate this experiment. Until time 0, the economy is at its initial steady state and at $t = 0$, the rate of creative destruction increases from x_{low} to x_{hgh}. The left figure shows the evolution of the unemployment rate and the right figure shows the effect on equilibrium welfare. For expositional purposes, we plot the welfare after normalizing it by the aggregate output every period.



After the change, the unemployment rate starts to evolve towards its new level according to the law of motion in (12) . What we see is that the convergence is quick and the economy assumes its new steady state value almost after 6 years. The impact on welfare is slightly different. After the sudden change, the welfare function features a sudden jump at time 0 and then starts to evolve towards the new steady state. The big change in welfare occurs at the time of the change in creative destruction and the remaining portion of the transition has much lower impact on the new level of welfare.

The following figures illustrate the change in welfare, i.e. $\Delta W_t = W_{t>0} - W_{t=0}$ for different values of the discount rate ρ and unemployment benefit b.



These results confirm the steady state results in Proposition 1. The left figure shows that the increase in welfare after the increase in entry is higher, the higher is the unemployment benefit. Similarly, the increase in welfare is higher, the lower is the discount rate. Hence, the steady state results of the benchmark model are confirmed in this simple numerical exercise even when the transitions are taken into account.

2.3.2 Risk aversion

We now consider the case where individuals are risk averse with instantaneous preferences $U = \ln C$, and compute the steady-state value functions under this assumption. Recall that the individuals discount the future at the rate ρ. Then the value functions for currently employed and unemployed individuals satisfy the asset equations:

$$\begin{aligned} \rho E - \dot{E} &= \ln(\beta\pi Y) + x(U - E) \\ \rho U - \dot{U} &= \ln(bY) + (m(u,v)/u)(E - U) \end{aligned}$$

From this we get:

Lemma 2 *The value functions take the following form*

$$\begin{aligned} E &= \frac{1}{\rho}\left[\ln(\beta\pi) - \frac{x\ln(\beta\pi/b)}{1+x+\rho} + \frac{g}{\rho} + \ln Y\right] \quad \textit{and} \\ U &= \frac{1}{\rho}\left[\ln(b) + \frac{\ln(\beta\pi/b)}{1+x+\rho} + \frac{g}{\rho} + \ln Y\right] \end{aligned}$$

Proof. See Appendix. ■

Using the above expressions for E and U, well-being can be shown to be equal to:

$$W^{u(c)=\ln c} = \frac{1}{\rho}\left[\frac{x}{1+x}\ln(b) + \frac{1}{1+x}\ln(\beta\pi)\right] + \frac{1}{\rho}\left[\frac{g}{\rho} + \ln Y\right]$$

This expression shows that for given growth rate well-being is affected more negatively by creative destruction than in the risk neutrality case: since here the agent is risk averse, more asymmetry between the returns when employed ($\beta\pi$) and when unemployed (b) lowers her well-being by more.

The net effect of creative destruction on well-being will ultimately depend upon the size of the asymmetry and upon the magnitude of the growth effect: in particular, if the unemployment benefit is too low relative to the wage rate, or if the growth effect is too small, then the overall effect of creative destruction on well-being is negative. More precisely:

Proposition 2 *When agents are risk averse with $U = \ln C$ and the unemployment benefit is sufficiently low, namely $b < \frac{\beta\pi}{\lambda^{1/\rho}}$, then a higher turnover rate x decreases life satisfaction W :*

$$\frac{\partial W^{u(c)=\ln c}}{\partial x} < 0.$$

This proposition states that, when agents are risk averse, job loss is perceived more detrimentally than when they are risk neutral. Consequently, there is a range of unemployment benefits for which higher turnover reduces life satisfaction for risk averse individuals with log preferences whereas it would increase life satisfaction for risk-neutral individuals:

$$\beta\pi\left[1 - \frac{\ln\lambda}{\rho}\right] < b < \frac{\beta\pi}{\lambda^{1/\rho}}$$

Finally, moving continuously from the baseline case where individuals are risk-neutral towards the risk-averse case where individuals have log preferences, makes the effect of creative destruction on life satisfaction become increasingly less positive (or increasingly more negative).[12]

2.3.3 Endogeneizing the turnover rate

In this section, we endogeneize the turnover rate x. To this end, we first solve for the value function of posting a vacancy (V) and a filled vacancy (P) that is currently producing. If the cost of posting

[12] More formally, if

$$W(x,\varepsilon) = (1-\varepsilon)W^{u(c)=c}(x) + \varepsilon W^{u(c)=\ln c}(x),$$

where

$$W^{u(c)=c} = \frac{Y}{r-g}\left[\beta\pi - \frac{xB}{1+x}\right]$$

is the equilibrium life satisfaction when individuals are risk neutral with $u(c) = c$ (see above), the variable ε reflects the degree of risk aversion, and we have

$$\frac{\partial^2 W}{\partial x \partial \varepsilon} < 0.$$

a vacancy is cY, which we think as the registration fee that has to be paid to the government, then we can write the value of a vacancy as

$$rV - \dot{V} = -cY + \frac{m}{v}\left[P - V\right].$$

Note that a vacancy is filled at the rate $\frac{m}{v}$. The value of a filled vacancy is

$$rP - \dot{P} = \pi Y + x\left[0 - P\right]$$

In steady state we get the following values

$$P = \frac{\pi Y}{r - g + x} \tag{13}$$

and

$$V = \frac{Y}{r - g + 1}\left[-c + \frac{\pi}{r - g + x}\right]. \tag{14}$$

Now we are ready to introduce free entry. There is a mass of outsiders enter at the flow of innovation x. Then the free entry condition is simply equates the value of vacancy to 0:

$$V = 0. \tag{15}$$

Then using (14) and (15) we find the entry rate as

$$x = \frac{\pi}{c} - r + g.$$

This equation is intuitive. The entry rate increases in flow profits and decreases in the cost of vacancy. Moreover, it increases in the equilibrium growth rate due to *capitalization* effect (it indicates that any formed business today will have higher future growth opportunities).

Recall that $r = \rho$ from the household maximization and $g = \frac{x}{1+x}\ln\lambda$. Hence equation (15) is reexpressed as

$$x = \frac{\pi}{c} - \rho + \frac{x}{1+x}\ln\lambda.$$

To ensure the existence of a unique equilibrium, it is sufficient to have the following assumption.

Assumption: The discounted sum of future profits is greater than cost of posting vacancy

$$\frac{\pi}{\rho} > c.$$

Then the entry rate is implicitly determined as

$$x = \Pi + \frac{x}{1+x}\ln\lambda$$

where $\Pi \equiv \frac{\pi}{c} - \rho$. Hence

$$x = \frac{-\left(1 - \Pi - \ln\lambda\right) + \sqrt{\left(1 - \Pi - \ln\lambda\right)^2 + 4\Pi}}{2}. \tag{16}$$

Proposition 3 *There exists a unique entry rate x. Moreover, the equilibrium entry rate is increasing in profits π and innovation size λ and decreasing in the cost of posting vacancy c and discount rate ρ*

$$\frac{\partial x}{\partial \pi}, \frac{\partial x}{\partial \lambda} > 0 \quad \textit{and} \quad \frac{\partial x}{\partial \rho}, \frac{\partial x}{\partial c} < 0.$$

Finally, we close the model by specifying the budget constraint of the government that has to finance the unemployment benefit bY_t. One can think of the vacancy cost as the tax (or registration fee) that has to be paid to the government to enter the economy and actively search for a worker. To keep the model tractable, we can assume that this fee paid to the government is equal to the unemployment benefit such that

$$c = b$$

which would also ensure that budget constraint of the government is satisfied period by period.[13] An intuitive implication of this assumption would be that if the unemployment benefits are higher, this would discourage entry into vacancy due to lower returns from doing business.

Now we can summarize the balanced growth path equilibrium of this economy as follows.

Definition (Balanced Growth Path Equilibrium): In the above economy with endogenous entry, a balanced growth path equilibrium is defined as a tuple $\{p_j, y_j, x, u, U, E, P, V, r, g\}$ such that: (i) p_{jt} and y_{jt} maximize the monopoly profit of the incumbents (3), (ii) x solves the free-entry condition (16) , (iii) unemployment rate is determined by the flow equation (8) , (iv) the value functions U, E, P, and V satisfy the continuous-time Hamilton-Jacobi-Bellman equations (10) , (11) , (13) , and (15) , (v) interest rate is determined through the household maximization (1) , and (vi) the growth rate is consistent with the equilibrium entry rate (9) .

Our model solution delivers the following result.

Proposition 4 *The balanced growth path equilibrium of the model with free-entry exists and it is unique.*

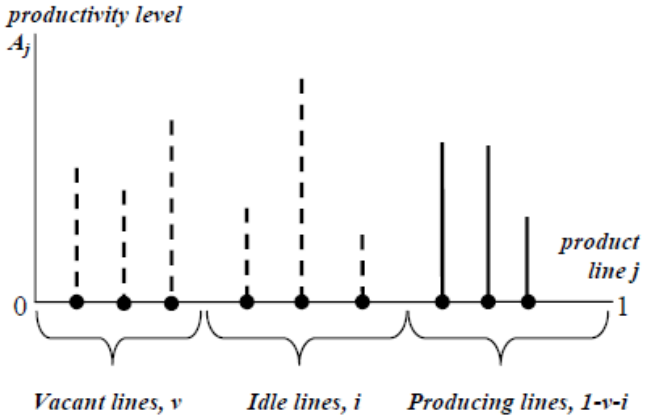
2.3.4 Exogenous job destruction

In our baseline model, the only source of job destruction, as well as job creation, was new entry. However, as it is common in the literature, one can consider an additional exogenous job destruction rate which captures the all other sources of exit other than the creative destruction. To capture this, assume that each job is destroyed at the rate ϕ. Upon this shock, worker joins the unemployment

[13] If revenues were generated through other sources, in particular through taxing incumbents , then revenues might be larger than the benefits that are distributed in the economy. In that case, we would need to assume that the government burns the additional surplus or gives it back to individuals, which then would translate into higher *effective* benefits. Since such an equilibrium feedback (or more generally the optimal policy to raise government revenue) is not the focus of our analysis, we simply assume $c = b$.

pool and the product line becomes idle. When a new entrant comes into this product line at the rate x, it first posts a vacancy in which case then the same product line moves from "idle" into "vacant" state. Finally, when a vacant product line finds a suitable worker, the product line enter into "production state". Similarly, if a new entrant enters into a actively producing line, then the worker joins the unemployment pool and the new firm posts a vacancy as in the previous model.

In steady state, there will be some product lines that are vacant (of measure v), some will be idle (of measure i) and the rest will be producing. We illustrate this economy in the following figure:



In this new model, Now we can express the flow equations into vacancy and idle product lines as

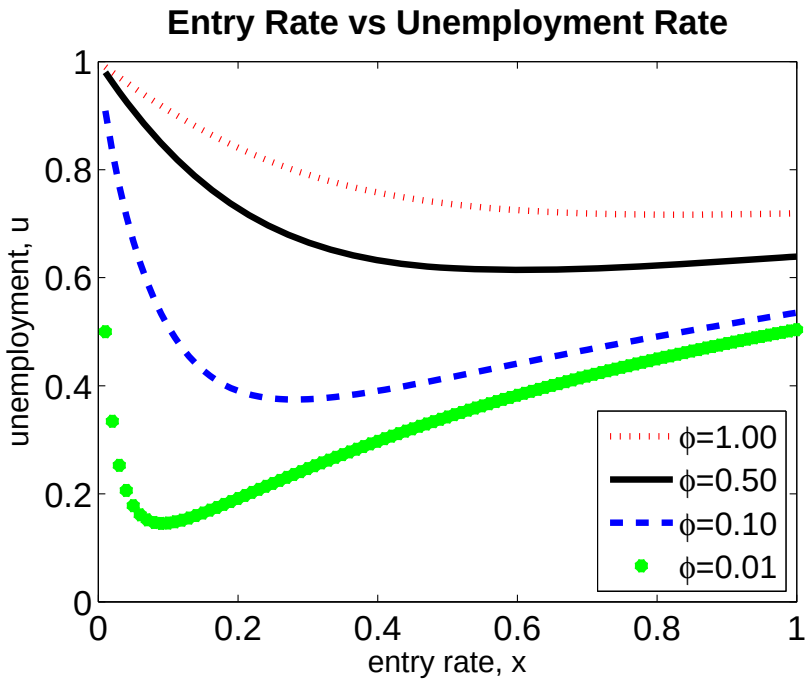
$$(1-v)\,x = m, \text{ and } (1-v-i)\,\phi = ix.$$

For analytical tractability, assume $\alpha = 0.5$. Then the unemployment rate is simply

$$u = 1 - \frac{(\Psi+1) - \sqrt{(\Psi+1)^2 - 4\left[\Psi - \Psi^2 x^2\right]}}{2\left[\Psi - \Psi^2 x^2\right]}$$

where $\Psi \equiv 1 + \phi/x$. This expression already shows the possible non-linear relationship between unemployment rate and the entry rate. In this current model, jobs are destroyed both by creative destruction at the rate x and also by the exogenous shock ϕ. The only source of job creation is job posting that happens though new entrants. Hence, one would expect that when ϕ is large, then the main role of entry will be job creation whereas when ϕ is very low, then we are back to the previous model and entry will mainly create unemployment. This is evident in the following figure that plots the unemployment rate against the entry rate for various values of the exogenous destruction rate $\phi \in \{1, 0.5, 0.1, 0.01\}$. As expected, as $\phi \to 0$, entry and unemployment becomes

positively correlated whereas when ϕ is very high, then the relationship is negative.



3 Data and empirical framework

3.1 Data

The data on creative destruction come from the Business Dynamics Statistics, which provide, at the metropolitan level (MSA), information on job creation and destruction rates as well as on the entry and exit rates of establishments. These rates are computed from the whole universe of firms as described in the Census Longitudinal Business Database. Our main measure of creative destruction is the "job turnover rate", i.e. the sum of the job creation rate and the job destruction rate. We also analyze the role of creation rates and destruction rates separately. We look at alternative measures of creative destruction in our robustness checks, especially "establishment turnover" defined as the sum of establishment entry rates and exit rates.

The data on subjective well-being come from the Gallup Healthways Wellbeing Index and from the Behavioral Risk Factor Surveillance System. To our knowledge there are no datasets on subjective well-being with larger sample size. Gallup collects data on 1,000 randomly selected Americans each day through phone interviews. The period covered is 2008-2011. Subjective well-being in Gallup is assessed through various questions aimed at capturing different dimensions of well-being. Some questions target the individual's current *emotional* state [14] and are framed along those lines: "Did you experience some worry/sadness/happiness etc yesterday?" Answers to these

[14] See Kahneman and Deaton (2010)for the distinction between emotional and evaluative well-being

questions are binary. Alternatively, the so-called "Cantril ladder of life" questions aim at measuring an individual's *evaluation* of her life and thus at capturing well-being in a broader and potentially more nuanced fashion. The individual is asked: " Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top; the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you; on which step of the ladder would you say you personally feel you stand at this time?"; and then "which level of the ladder do you anticipate to achieve in five years?". We refer to answers to the first question as the "current ladder" and to the second one as the "anticipated ladder". Our preferred empirical proxy for the theoretical well-being indicator W analyzed in the previous section is the "anticipated ladder", as we recall that W is the ex ante expected valuation of an individual who does not know yet whether she will start being employed or unemployed. Yet we will also show the effects of creative destruction on the "current Cantril ladder" and on worry, which is the variable most likely to capture the effect of the (unemployment) risk associated with creative destruction. In the BRFSS data, respondents are asked: "In general, how satisfied are you with your life?". The four possible answers are "Very satisfied"(1) "Satisfied"(2) "Dissatisfied"(3) "Very dissatisfied"(4) . To ease the interpretation of the results, we recoded the answers so that an increase in the variable means an increase in satisfaction.

The descriptive statistics of our data can be found in table 1.

TABLE 1 *HERE*

3.2 Empirical methodology

The model highlights two opposite forces whereby creative destruction impacts subjective well-being: a negative effect that comes from the higher risk of unemployment and a positive effect through higher (long-run) growth expectations. A testable prediction of the model is that when regressing subjective well-being measures on creative destruction variables, controlling for the unemployment rate should absorb (part of) the negative effect of creative destruction and thus lead to a higher coefficient of creative destruction than without controlling for unemployment.

Our measure of creative destruction varies at the MSA level, so we estimate MSA-level regressions. However to take advantage of our micro-level data on subjective well-being, we also perform individual-level regressions that allow us to have a richer and more meaningful set of controls [15] .

The first exercise we perform is to look at purely cross-sectional regressions where we average our subjective well-being data at the MSA-level and across the different years available. For the BRFSS data, we can compare results for 2005-2010 averages and for crisis v. non-crisis years separately

[15] Individual characteristics like marital status do not vary much when we aggregate them at the MSA level, yet they are important determinants of well-being at the individual level.

(i.e. 2005-2007 v. 2008-2010). For the Gallup data, we only look at 2008-2011 averages but we consider various subjective well-being outcomes (current ladder, anticipated ladder and worry). In all cases, we compare the coefficients from specifications with and without a control for the MSA unemployment rate. We also look at how the effect of creative destruction is decomposed into a "job creation" effect and a "job destruction" effect.

We then perform individual level regressions, so that we can control for individual characteristics such as education and ethnicity, as well as gender, marital status, and age. Income is not an innocuous control as the effect of creative destruction is likely to operate precisely through income, so we show results separately with and without this control. The specification is as follows.

$$SWB_{i,m,t} = \alpha CD_{m,t} + \beta U_{m,t} + \delta X_{i,t} + T_t + \epsilon_{i,t} \tag{17}$$

where $SWB_{m,t}$ is subjective well-being for individual i who lives in MSA m in year t. This measure is derived either through the life satisfaction question of the BRFSS or the current ladder question of Gallup or the anticipated ladder question in that same Gallup survey. $CD_{m,t}$ is creative destruction in MSA m in year t, which we take to be either the sum of the job creation rate and the job destruction rate, or these two components introduced separately but simultaneously in the regression. $U_{m,t}$ is the unemployment rate in that MSA in year t. $X_{i,t}$ are individual-level controls: gender, a polynomial in age, race, detailed education, detailed family status and in some specifications employment status and log of income. T_t are year and month fixed effects. $\epsilon_{m,t}$ is the error term. A constant is included and standard errors are clustered at the MSA level. The main parameter of interest is α. We look at how it changes depending on whether or not we control for unemployment.

We also split the sample between employed and non employed individuals. We can only do this in the BRFSS, not in the Gallup. Even in the BRFSS we cannot distinguish between the unemployed and those out of the labor force, so we compare "employed" individuals and "not employed" individuals, who are either unemployed or out of the labor force. However, we restrict attention to working age individuals, therefore we do not include retirees. We look at whether creative destruction has a different effect on the two groups of individuals by adding an interaction term between turnover and the employment status in the baseline specification (17).

Eventually we turn our attention to the mechanisms lying behind the effect of creative destruction on subjective well-being. Hence we look at how the baseline effect varies with the (state-level) unemployment insurance generosity. We proxy UI generosity by the state's maximum weekly benefit amount, a standard approach in the UI literature.

In the last section of the paper, we document the effect of creative destruction on other subjective well-being measures, such as "worry". We also provide some evidence on how the effect of creative

destruction differs according to individual characteristics. More precisely we look in the individual level regressions at the interaction with age, gender, race, education (at least a college degree v. no college degree), religiosity, marital status and smoking behavior.

4 Empirical results

4.1 Baseline results

Tables 2 and 3 show the results from the baseline cross-section OLS regressions at the MSA level. We look at averages across years to mirror the steady-state analysis of the model. Table 2 uses data from the BRFSS and the dependent variable is life satisfaction. Table 3 uses data from Gallup and the dependent variable is either current ladder (panel A) or future ladder (panel B) or worry (panel C). In each table, column (3) and (5) control for unemployment and are to be compared respectively with column (2) and (4), which do not.

TABLES 2 and 3 *HERE*

Our first finding is that creative destruction has a significantly positive effect on subjective well-being when we control for unemployment. When we do not control for unemployment, the effect of creative destruction is weaker and insignificant in some cases. Controlling for unemployment reduces the negative effect of the job destruction rate, as can be seen from comparing column (4) with column (5) in either Table 2 or Table 3. This is consistent with the model where, when we control for unemployment, we only have the positive effect of creative destruction through growth; whereas, when we do not control for unemployment we have the additional unemployment risk effect of turnover playing in. Indeed, as Figure 1 shows, creative destruction and unemployment are positively correlated.

FIGURE 1 *HERE*

The effect of creative destruction is of a similar magnitude as the effect of the unemployment rate. In particular, moving from an MSA which is at the 25th percentile in terms of its level of creative destruction (i.e with a job creation rate + job destruction rate at 26,8%) to an MSA at the 75th percentile (i.e with a job creation rate + destruction rate at 31,8%) is associated with an increase in subjective well-being of 0,5% with respect to its mean. As a benchmark, moving from the 75th to the 25th percentile in terms of the unemployment rate (that is, from a 7.1% to a 5.6% unemployment rate) is associated with an increase in life satisfaction of 0.7%. (These magnitudes are computed for column (3) of Table 2). If we look at the effect on anticipated well-being (Table 3, panel B, column 3), going from an MSA at the 25th to an MSA at the 75th percentile in terms of

job turnover is associated with an increase of 1.3% in well-being whereas going from an MSA at the 75th to an MSA at the 25th percentile in terms of unemployment rate is associated with an increase of 0.6% in well-being. In other words, creative destruction has an effect on subjective well-being of the opposite sign from that on unemployment but of a magnitude roughly similar and rather bigger when focusing on anticipations. Moreover in panel B of Table 3, comparing the R-squares of the different columns provide evidence that creative destruction explains more of the variation in anticipated well-being than current measures of the usuallly very significant determinants of well-being such as the unemployment rate.

In Tables 4, 5 and 6 we perform the individual-level regressions using our micro data and find qualitatively similar results. One difference is that the R-squares are now much lower, which in turn is due to the variance in life satisfaction across individuals being much higher than the variance in mean life satisfaction across MSAs. However, the magnitude of the creative destruction effect is similar (a 0.35% increase in life satisfaction and a 0.9% increase in anticipated well-being when moving from an MSA at the 25th percentile to an MSA at the 75th percentile, controlling for individual covariates), and, for anticipated well-being, the effect is still much bigger than that of the current MSA's unemployment rate (a 0.35% increase in well-being when moving from the 75th to the 25th percentile).

TABLES 4, 5 and 6 *HERE*

4.2 Interactions with the unemployment rate and the unemployment status

Here we check how job turnover interacts with the MSA-level unemployment rate and with the individual employment status.

We first split the sample between "employed" individuals and "not employed" individuals (who are either out of the labor force or unemployed), restricting attention to working age individuals (18-60 years old). We see that the job creation rate has a significantly more positive effect on "not employed" individuals than on employed ones. Overall job turnover has a more positive effect on not employed individuals, because it increases their probability to find a job if they are looking for one, whereas the employed individuals bear most of the higher displacement risk entailed by creative destruction. Table 7 shows the results where employed are defined as wage earners and self-employed are dropped from the analysis. Results are very similar when self-employed people are included into the "employed" group.

We then split the sample between MSAs above and below median in terms of their unemployment rate and perform the baseline invidual-level specification with an interaction term for being above median and job turnover. The coefficient of the interaction term is significantly negative,

even after controlling for a lot of individual level covariates (see Table 8). This in turn suggests that the effect of creative destruction is stronger when the unemployment rate is lower.

TABLES 7 and 8 *HERE*

4.3 Robustness analysis

We check the robustness of our results to alternative measures of creative destruction. We look at establishment turnover, defined as the sum of establishment entry rate and exit rate. We also consider a "predicted CD" measure (or Bartik-type measure) of creative destruction which is constructed as follows:

$$\widehat{CD}_{m,t} = \sum_i \omega_{i,m,2004} \times CD_{i,USA,t}$$

For each MSA m in year t, the predicted level of creative destruction, $\widehat{CD}_{m,t}$, is computed by taking a weighted average of countrywide sector-based turnover measures, $CD_{i,t}$, with weights determined by the sectoral structure in the MSA in 2004, $\omega_{i,m,2004}$. This is to neutralize variations in creative destruction across MSAs that would be driven by changes in the sectoral composition.

The estimation equation is the same as in (17), except that CD is now replaced by the "predicted CD" variable and that we control for the initial sectoral composition of the MSA. The magnitude of the creative destruction effect is larger than when using our predicted CD measure (Table 9) than when using the direct CD measure (Table 4): roughly 1.1% in Table 9 instead of 0.35% in Table 4) .

TABLE 9 *HERE*

4.4 Mechanisms

Figure 2 investigates how unemployment insurance affects the magnitude of the effect that creative destruction has on subjective well-being. We split the sample according to the generosity of unemployment benefits, which we proxy by the maximum weekly benefit amount. That is, we split the sample between MSAs in states above median (panel A) and MSAs in states below median (panel B) in terms of the maximum benefit amount. We look at the correlation between job turnover and life satisfaction, conditional on the unemployment rate. This correlation is only significant in states above median and it is positive. We also perform a regression analysis with an interaction between job turnover and being in a state above median in terms of UI. The coefficient of the interaction term allows us to reject the hypothesis that the effect is the same in both cases: the

effect of creative destruction is significantly stronger in states with more generous unemployment benefits.

FIGURE 2 HERE

5 Additional findings

5.1 Other measures of subjective well-being

The comparison between the effects of creative destruction on the ladder and the future ladder suggest that creative destruction increases more anticipated well-being than current well-being. This in turn is consistent with the view that creative destruction improves individuals' future income prospects, but that this income-led effect is mitigated by a counteracting risk-led effect. To check this further, we consider another measure of subjective well-being, which more directly captures the risk-led effect: namely, the "worry" measure. The "worry" variable in the Gallup takes values 0 or 1, according to an individual's answer to the question: "Did you experience some worry yesterday?". Table 10 regresses this worry measure on creative destruction, following the individual-level specification. We find an unambiguously positive and significant effect of creative destruction on worry when we do not control for unemployment rate. The effect tends to be smaller when we control for unemployment. If we look at the magnitude of this effect (from panel B), moving from an MSA at the 25th percentile in terms of CD to an MSA at the 75th percentile is associated with a 1.3% increase in worry with respect with the baseline mean if we control for the unemployment rate, and with a 2.1% increase in worry if we do not control for the unemployment rate (which confirms the further effect of unemployment on individuals' perceived risk).

TABLE 10 HERE

5.2 Interactions with individual characteristics

Table 11 looks at how the effect of creative destruction interacts with individual characteristics. We first consider religiosity. In terms of our model the interaction with religiosity may speak to the comparative statics on risk-aversion, in particular if we believe that religiosity is partly driven by the so-called "Pascal bet": Pascal's theory is that, faced with the uncertainty as to the existence of God, becoming religious acts as an insurance device. If we believe in this theory, religious individuals should be more risk averse on average than non religious individuals. If we believe in this correlation then our model predicts that creative destruction should have a more positive effect on subjective well-being for the non religious. And indeed, significantly negative coefficient

for the interaction term between creative destruction and religiosity in panel A provides evidence that creative destruction has a more positive effect on anticipated life satisfaction for non religious individuals than for religious ones.

Panel B looks at the interaction between creative destruction and an education dummy (less than a college degree versus at least a college degree). Somewhat surprisingly, we find that establishment turnover has a more positive effect on life satisfaction for low-educated than for high- educated individuals. In terms of our model, this could be explained by a higher (private) disutility of being currently unemployed for the highly educated individuals. It could also reflect differences in matching probabilities between high- and low-educated individuals which the matching technology in our model did not factor in.

Panel C looks at the interaction with smoking behavior. We see that establishment turnover has a more positive effect on life satisfaction for smokers than for non smokers. One explanation might be that smoking helps individuals escape from the negative risk-enhancing effects of creative destruction. Another explanation might be that smokers do not perceive risks the same way as non-smokers do.

TABLE 11 *HERE*

6 Conclusion

In this paper we have analyzed the relationship between turnover-driven growth and subjective well-being, using MSA level turnover data from the Business Dynamics Statistics and subjective well-being data from the Behavioral Risk Factor Surveillance System and from Gallup. We found that the effect of creative destruction on anticipated life satisfaction is unambiguously positive if we control for MSA-level unemployment, less so if we do not. We also found that creative destruction is associated with higher "worry". This suggests that individuals perceive both the positive income growth and the negative risk impacts of creative destruction on well-being. Moreover, we found that creative destruction has a more positive effect on the ladder in states with more generous unemployment benefits. We also found that the effect of creative destruction on the ladder tends to be more positive for the non-religious, for the smokers, and for the less educated.

The analysis in this paper can be extended in several directions. A first avenue would be to compare more systematically the determinants of (per capita) GDP growth with the determinants of life satisfaction. A second extension would be to look at other individual characteristics or characteristics of labor market (training systems, availability of vocational education,..) which should also impact on the effects of turnover on subjective well-being. A third avenue would be to

gather more data in order to perform event studies: in particular one would like to be able to track a same individual through successive periods of employment and unemployment and look how the well-being indicators for that individual evolve over time as this individual moves back and forth between employment and unemployment. These and other extensions of the analysis in this paper are left for future research.

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7 Appendix

Proof. [Proof of Lemma 1] The output in this economy is

$$\begin{aligned} \ln Y_t &= \int_{j\in\mathcal{J}} \ln A_{jt} dj. \\ &\equiv (1-u)\ln \bar{A}_t \end{aligned}$$

Then

$$\begin{aligned}
\ln Y_{t+\Delta t} &= \int_{\mathcal{J}} \left[x\Delta t \times 0 + (1 - x\Delta t) \ln A_{jt}\right] dj + \int_{\mathcal{J}'} \left[\frac{m}{v}\Delta t \ln(1+\lambda)\, \bar{A}_t + \left(1 - \frac{m}{v}\Delta t\right) \times 0\right] dj \\
&= (1 - x\Delta t)(1-u) \ln \bar{A}_t + u\frac{m}{v}\Delta t \ln(1+\lambda)\, \bar{A}_t \\
&= [1-u] \ln \bar{A}_t + m\Delta t \ln(1+\lambda)
\end{aligned}$$

Hence

$$g = \lim_{\Delta t \to 0} \frac{\ln Y_{t+\Delta t} - \ln Y_t}{\Delta t} = m \ln(1+\lambda)$$

■